AN APPRAISAL OF GREEN BUILDING KNOWLEDGE, RESOURCE AVAILABILITY, AND UTILIZATION FOR GREEN PROCUREMENT PROJECTS IN NIGERIA'S FEDERAL CAPITAL TERRITORY

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Abstract

Traditional building construction is known for environmental degradation, high amounts of energy consumption, carbon-dioxide emissions, solid waste production and water pollution resultant from massive utilization of natural resources. The increased concern for global regulation of construction industry's environmental degradation tendencies has necessitated the adoption of sustainable construction mode using the green building procurement option. This study therefore, assesses green procurement stakeholders' knowledge-base, and evaluates the availability and utilisation of green construction resources in Nigeria's Federal Capital Territory projects. The methodology involved quantitative research design, in which questionnaire was administered to Four Hundred (400) construction industry stakeholders in the FCT. Two Hundred and Sixty-Eight (268) valid responses were retrieved representing 67% response rate while descriptive statistics using mean (M) was applied for this study's analysis. The results reveals 'speed (M=4.4776)', 'thermal comfort (M=4.4428)', as the highest level of green procurement project knowledge-base among FCT development stakeholders. The results also showed that 'composite roofing shingles (M=4.8259)', 'reclaimed wood (M=4.5423)', as the topmost -ranking green construction materials available. The study further reveals that 'composite roofing shingles (M=4.4762)', 'reclaimed wood (M=4.4339)', as the most utilized green construction materials amongst construction industry stakeholders in Federal Capital Territory projects. The study concludes that green construction knowledge-base, the availability and utilisation of green construction material resources in FCT projects are reasonably high. The study therefore recommends a strengthening of existing Government's regulations and policies towards the promotion and growth of green construction procurement in the FCT and the Nigeria nation.

Keywords: Green Building, Green Procurement, Knowledge, Projects, Resource Availability.

INTRODUCTION

Nigeria has the largest population in Africa of about 201 million which would double by year 2050 (Statista, 2020). It is also projected that by year 2024, the value of Nigeria's construction industry would hit 13 trillion Naira (USD 34.6 Billion) (Research and Markets, 2020). Nigeria's population trajectory would compel need for supportive infrastructure, hence the growth of demand for green buildings. Studies show that by year 2019, 16.60% of Africa continents' projects were located in the West African sub-region, with Nigeria having as much as 28% (Deloitte, 2019). The government having realized the position of the country as the biggest emitter of

greenhouse gases (GHGs) in the continent has re-strategized to cut down greenhouse gas emission by 20% by year 2030 (Daisy, 2020). Daisy (2020), reports that the growth demand for green buildings would help facilitate the change, as traditional building construction are known major emitters of GHGs. Some of Nigeria's major green construction projects includes- Eko Atlantic City, Onne Port Complex, and the Centenary City Project (Eko Atlantic, 2021). In sum, investment in green buildings is a necessary step for the growth of the Nigerian Economy, by bridging the infrastructure gap created by an ever-growing population (Boyi, 2019).

GlobalData (2023), reveals that venture capital (VC) investment in green construction experienced significant growth, rising from 6.9 million USD in 2021 to a whooping 115 million USD in 2022. This trajectory signals the sector's expected growth in the decades ahead. GlobalData (2023), asserts that the increasing investment-level in green construction is attributable to growing technological innovation, the use of new materials, and an uptake of artificial intelligence (AI) to improve efficiency and reduce construction wastes. Aside technological deployments, the issue of increased global regulation in the construction industry would make developing economies experience more growth in green building procurement. The top five countries leading the green construction market are China, valued at USD178.10 million by 2021; followed by the US valued at USD 83.1 million., and then by India, Mexico, and Indonesia with a cumulative market value of USD 58.5 million in 2021 (GlobalData, 2023). The innovation that took place globally within the green construction industry in 2022, has the potentials to make major sustainability improvements over the next decade (GlobalData, 2023). Alqadami *et al.* (2019), states that construction sustainability is no longer an option, but a necessity and argued that it is an imperative for nations' advancement. However, green procurement is fraught with several obstacles of which the level of knowledge and awareness by project stakeholders, the fragmented strategies and isolated practices that promote green procurement are key (Alquadami *et al.*, 2020; Bidin *et al.*, 2018; Bohari *et al.*, 2017; Abas, 2016). Also, the study of Montalban *et al.* (2017), reveals that the major obstacles to green procurement globally is the fact that methodology adopted and the materials utilized are at variance with traditional procurements. This assertion underpins this research. Therefore, it is on this backdrop that the researchers propose to undertake an assessment of green procurement knowledge-base among construction stakeholders, and to evaluate green construction resource availability and utilisation in Nigeria's Federal Capital Territory projects.

LITERATURE REVIEW

The Emergence and Growth of Green Construction

The construction industry is a sector of the national economy that enhances the social and economic values of a country (Kharo *et al.*, 2021). It is also reputed for the enhancement of existential living by provision of accommodation, supportive infrastructures, and job creation (Stasiak-Betlejewska and Potkany, 2015; Talpur *et al.*, 2013). Despite the laudable advantages of the construction industry in infrastructure provisioning, the sector is considered a major source of

environmental degradation (Alqadami, *et al.*, 2019). The traditional construction techniques are characterized by high energy usage, needed for transportation of materials, construction, and maintenance of infrastructures (Varnas, *et al.*, 2009). Traditional construction activities is known to consume approximately 45% of the world's energy (StatisticalData, 2010) and produces 40% of CO_2 emissions, 30% of solid wastes and 20% water pollution globally (Series, 2010; Dixon, 2010; Thakur *et al.*, 2018). According to Global Data (2023), the United Nations' 2030 Agenda for Sustainable Development play influential role in the growth of more environmental friendly construction. Researches by Bohari *e. al* (2020); Ali, et.al, (2019); Yang, et.al (2019) variously aver that the adoption of green construction procurement mode would entrench sustainability and checkmate the adversities caused by the traditional construction methods. Examples of green construction projects across the globe includes but not limited to Bullitt Centre, Seattle; Acros Fakuoka, Southern-Japan; Vancouver Convention Centre, Vancouver; One Central Park, New South wales; Park Royal Hotel, Singapore; Bank of American Tower, New York;Shangai Tower, Shangai; One Angel Square, Manchester; Manitoba Hydro Place , Winnipeg; Cocina Abierta Toure Reforma , Mexico. Also, examples of green buildings in Africa abound, namely - Agostinho Neto University, Angola; Sandbag Houses, South- Africa; EcomoHomes, South-Africa, Eastgate Centre, Zimbabwe, Inno-Native Home, Ghana; El-Mandara Eco-Resort, Egypt; Gando Primary School, Burkina Faso; Vissershok School, South- Africa. The following green buildings are in use in Nigeria, namely-Stanbic IBTC Bank, Idego branch, Victoria Island; MISA, Glover Road, Ikoyi, Lagos; Lekki Pearle Estate, Sangotedo, Lagos; Alliance Place, Ikoyi, Lagos; Alphal-Eco Atlantic City, Victoria Island, Lagos; Greenage Student Housing, University of Abuja, Gwagwalada, Abuja; Blue-Water, Lekki Phase-1, Lagos; Cornerstone Tower, Lekki, Lagos, and Peridot Parkland Estate, Badagri, Lagos.

The Concept of Green Procurement

There is recently an urgent call for sustainable development in order to minimize the adverse effects of traditional construction procurement mode on the environment and in order to align with the prescriptions of the UN 2030 Agenda for Sustainable Development (Alqadami *et al.*, 2019). According to Kofoworola and Gheewela (2009); Salam (2008), green sustainability practices has become a necessity for all industrial sectors of a national economy including the construction industry; it is also recommended as a solution to the numerous environmental problems that plague industries. Thus, the fundamental principle behind the green procurement advocacy is in the promotion of the principles of sustainable development. Sustainable development has become a critical imperative and a new world order in the ardent pursuit of energy and resource savings, material recycling, reduction of emission of toxic substances, and the enhancement of indoor quality (Mun, 2009). The concept of green procurement involves the infusion and implementation of environmental friendly practices throughout the several phases of a construction life cycle (Alqadami *et al.*, 2020). Bohari *et al*. (2017), defines green procurement as the 'act of obtaining or disposal and recognition of goods,

services, engineering and construction works and the integration and implementation of environmental friendly practices throughout the processes of a construction output'. Green procurement is considered as the first crucial step towards sustainable construction in the green supply chain. The benefits that accrue in the implementation of green procurement in the construction industry include- reduction of energy consumption, performance improvement and durability of the infrastructure, and natural resource protection (Yang, *et al*., 2019); it helps address environmental challenges of projects (Zhu *et al.,* 2013), enhances sustainable practices amongst project stakeholders (Li *et al.,* 2020), decreases pollution, and promotes recycled material usage (Wong *et al.*, 2016), improves financial and environmental performance (Shen *et al.*, 2017), promotes a green supply chain that ensures usage of only environmental friendly materials in green buildings (Li *et al.,* 2020). In sum, green procurement is a contemporary worldclass methodology that improves environmental and overall project performance (GreenCouncil, 2010).

Challenges of Green Procurement in Nigeria

There is a need to proactively address the shortcomings associated with the traditional construction method by promoting a more sustainable development method through green procurement technique. This is achievable through arrangements that seek to improve existing construction practices (Zhu and Sarkis, 2006). Project performance will improve, when necessary, arrangements are made to limit the negative impacts of traditional construction methodologies (Kharo *et al*., 2021). Although it has been reported that green procurement has shown positive results in various countries (Faith-Ell, 2005; Musa *et al.,* 2013), its adoption has not been an easy journey and requires the commitment of the Government and the various stakeholders with a common purpose of creating environmental sustainable infrastructures (Bohari *et al.*, 2020). It is viewed that an effective preliminary planning by project stakeholders is a sine-qua-non for successful green procurement owing to associated challenges, especially in developing economies like Nigeria (Alqaifi *et al.,* 2016). Green procurement is fraught with several obstacles of which the level of knowledge and awareness by project stakeholders, the fragmented strategies and isolated practices that promote green procurement are key (Alquadami *et al.,* 2020; Bidin *et al.,* 2018; Bohari *et al.,* 2017; Abas, 2016).

Extant literature on the challenges of green procurement also reveals a near-absence to fragmented practical guidelines on green public procurement (GPP) (Bohari *et al.,* 2017), a focus on specific impacts of green procurement by most researchers, and a lack of robust conversation on GPP especially with respect to its efficiency and innovation (Buniamin *et al.,* 2016). Further literature sources reveal lack of practical guidelines to aid stakeholders procure environmental-friendly construction projects thus leading to a disaggregation between policy formulation and actual project delivery (Ewuga & Lloyd, 2017). Other challenges to green procurement include high upfront cost and lack of legislation for green adoption (Alqadami *et al.,* 2019), difficulty to switch stakeholder's method of strategy and organisation (Appolloni *et al.,* 2014; Rais

et al., 2018), lack of stakeholders' knowledge for green procurement implementation (Rais *et al.,* 2018). Knowledge of green construction base factors for green procurement like 'speed', 'thermal comfort', 'investment' and 'energy conservation', etc, by project development stakeholders also constituted challenges. Research by Ntuli & Abu-Mahfouz (2016); Myeong *et al.* (2019); averred to the importance of these factors to the delivery of green construction projects. Adequate knowledge of energy conservation such as solar energy, renewable and non-renewable energy, turbine energy production was also crucial to green procurement (Babanyara & Saleh 2010; Pardo-Bosch *et al.,* 2022).

Further identified challenges of green procurement included: insufficient monitoring guidelines for environmental requirements and technology (Buniamin *et al.,* 2016), and lack of consistent indicators to assess green procurement performance (Buniamin *et al.,* 2016). Attempts have been made by some scholars to classify the challenges to green procurement implementation in the construction industry. Rais *et al.* (2018), broadly classified the challenges of implementing green construction into - knowledge, training, awareness, policy, commitment, demand, integration, time, cost and availability of green material resources. Khan *et al.* (2018), classified the challenges of green procurement implementation into four, namely political, environmental, economic and social challenges. According to Khan *et al.* (2018), politically government has a role in enacting laws that would legitimize, enforce and promote green construction practices. Roman (2017), argues that technical and organisational policy dynamics could also pose a challenge to green procurement implementation. In this regard, the commitment of organisational leadership and procurement representatives at all levels is key (Khan *et al.,* 2018). Politically, the absence of legislative mandates at local, state, and national levels constitutes obstacles to green procurement practice (Khaderi *et al.,* 2022). Certain environmental factors also constitute challenges to green procurement practice as research by Bohari & Bo (2015), Buniamin *et al.* (2016), and Rais *et al.* (2018), variously aver that 'lack of understanding by green procurement stakeholders' constitutes a major challenge in the implementation of green procurement practice.

According to Khan *et al.* (2018), developers possess little knowledge and experience in green procurement, and managers are ignorant on how sustainability can be integrated into construction (Roman, 2017), whereas Buniamin *et al.* (2016), declared the dearth of skilled workforce in green procurement. practice. The literature on economic challenges to green procurement is succinctly presented by the studies of Montalban *et al.* (2017), in which they declared that the major obstacles to green procurement globally is 'economic constraints' as their studies reveals that cost constituted a major barrier in green procurement projects owing to the fact that methodology adopted and the materials utilized is fundamentally at variance with traditional construction mode. Socially, the challenges of green procurement include resistance to change as the stakeholders and the larger society are yet to come to terms with the imperatives of sustainability as the new way to go

(Djokoto *et al.,* 2014). It has been difficult for many individuals and consumers to change from their apparently conservative orientations of orthodox or traditional construction methodologies to sustainable construction techniques (Khan *et al.,* 2018). Further, social literature shows that there is also no available methods for identifying the effectiveness of existing sustainability tools (Khaderi *et al.,* 2022; Chan *et al.,* 2017). Additionally, there are no available instruments for the application of green procurements by way of handbooks or internet tools (Rais *et al.,* 2018), the lack of management commitment (Wong *et al.,* 2016) and the lack of financial and time management commitments that inhibits green procurement (Buniamin *et al.,* 2016).

Green Materials for Sustainable Development

Green procurements as a contemporary development option primarily uses natural materials and renewable resources. Green materials are considered environmentally responsible because their impacts are considered low over the life of the product (Spiegel and Meadows, 2010).A number of National guidelines, for example, the Nigerian National Building Code (NBC) developed by the National Council of Housing and Urban Development (NCHUD) extensively support sustainable development agenda. The guidelines establish the requirements for building occupier's health and safety, use of local and safe building materials, energy efficiency, etc (Geisler *et al.,* 2018). Sustainable development involves economic, social and ecological approaches to building construction. Although, sustainable resources can be considered green, not all the green resources are sustainable. Green materials are naturally occurring, renewable and they also do not directly contribute to environmental pollution (Findik and Kernal, 2015). Findik and Kernal (2015), stated that green materials are characterized by high recycled content made from rapidly renewable sources, has very low emissions, and minimal to zero environmental pollution. Sheth (2016), compliments the views of other researchers on green materials as having the following characteristics - absence of negative impact on the environment, does not adversely affect the health of building occupants, energy efficient, designed for natural ventilation, materials used are appropriate and economical.

RESEARCH METHODOLOGY

Research Design

The methodology adopted in this study is quantitative research design which involves the collection of data through the administration of semi-structured questionnaires to the targeted respondents and analysed using descriptive analytical method.

Population of study and Sample size determination

The study targeted the various construction industry professionals/ stakeholders engaged in building construction projects in the Federal Capital Territory due its large construction activities as the high possibility of the utilization of green resources. These construction professionals entail Project Managers, Quantity Surveyors, Architects, Engineers of various specializations (Structural, Mechanical, Electrical Engineers), Site Agents/Managers, Estate Surveyors, and Builders. A population

size involving a total of 4,525 Abuja-based construction industry professionals sourced from the various construction industry professional institutions as at 30th September 2023 was used for the study. The sample size (n) for this study was calculated using a simplified version of Yamane (1973) formula,

$$n = \frac{N}{1 + N(e)^2}$$

$4525/ [1 + 4525 (0.05)^2]$ = **400**

From the above result, at total of 400 respondents were selected for the study and subsequently issued research questionnaires, with 268 responses, thus implying a 67 % response rate. Moser (2017), posits that response rates lower than 30-40% are subject to bias and as such, of little value. Thus, the return rate of this research (67%), is adjudged adequate and representative of the sample population for purposes of inference from the findings and for recommendations on the study. The study employed only descriptive statistics of mean (M), standard deviation (SD) and Rank.

Method of Data Collection and Analysis

Data collection plays a crucial role in any study, all of which fall into two categories, for instance primary and secondary data (Douglas, 2015). As the name suggests, primary data was employed for this study and gotten from the administration of well-structured questionnaires. This study employs a 5-point Likert scale ranging from 1 to 5 as suggested by Enshassi *et al.* (2009) and cited in Muhammed et al. (2022a). These are "5 = Extremely Significant", "4 = Very Significant", "3 = Moderately Significant", "2 = Slightly Significant" and "1 = Not Significant". Descriptive analysis technique of mean, frequency, percentages and standard deviation are applied for this study's analysis.

The Study Area

The Federal Capital Territory (FCT) is divided into area councils, namely; - Gawagwalada, Bwari, Abaji, Kuje and Municipal area councils (Odunsi, 2018). These were chosen as the study areas as the various construction industry practitioners that served as respondents in this study, had their practices domiciled in the said municipal councils of the FCT.

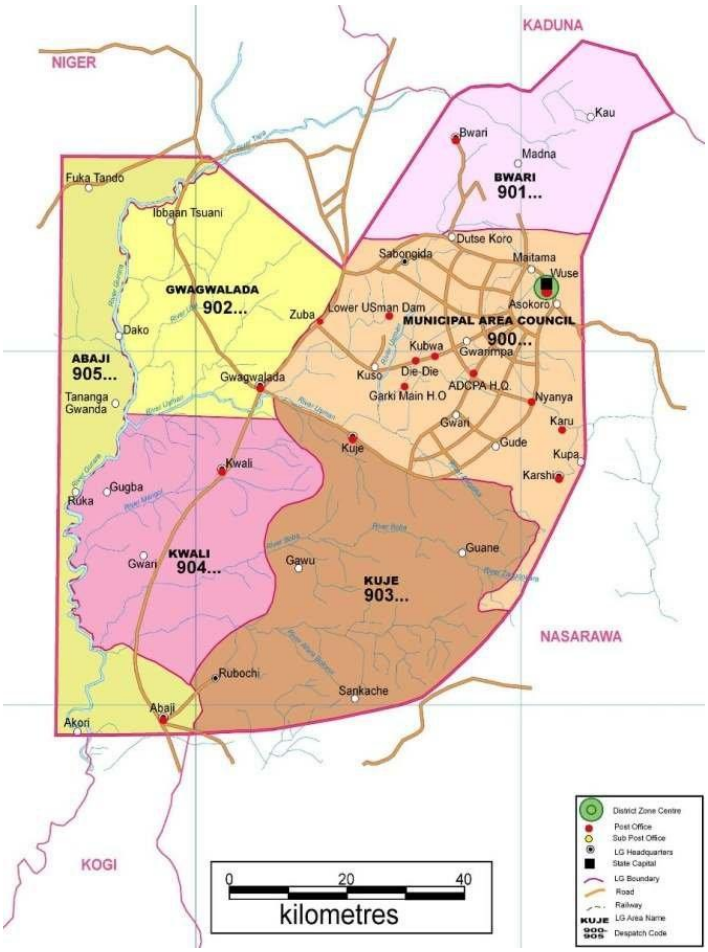

Figure 1: Map of Abuja showing all the Area Councils and the Boundary States
Source: Obi – Anike *et al*. (2017)

RESULTS AND DISCUSSION OF FINDINGS

Descriptive Statistics of the Respondents Profile

In line with the outcome of table 1 below, there were 197 Male and 71 Female respondents in this study which represents about 73.51 and 26.49 percent respectively which agrees with the outcome of Muhammed et al. (2022b) that posits that men dominates the Nigerian built environment due to the masculine and stressful nature of the job inherent in it. The age of the respondents indicates 20-30 years (40), 31-40 years (75), 41-50 years (71), 51-60 years (59) and 61 and above (23) showing a response rate of 14.93, 27.99, 26.49, 22.02 and 8.57 percent correspondingly. The level of education of the respondents posits National Diploma (65), Higher National Diploma (88), First Degree (85), Master's Degree (27) and PhD (3) depicting a response rate of 24.25, 32.84, 31.72, 10.08 and 1.11 percent congruently. Similarly, the profession of the respondents includes Project Manager (31), Quantity Surveyors (39), Architects (50), Engineers (57), Site Managers (14), Estate Surveyors (24) and Builders (53) which results in 11.58, 14.55, 18.66, 21.27, 5.22, 8.96 and 19.76 percent correspondingly. Also, the general work experience of the respondent

encompasses less than 3 years (18), 3-7 years (71) and above 7 years (179) entailing about 6.72, 26.49 and 66.79 percent respectively. Equally, the company status includes Contracting Firms (93), Consulting Firms (60), Client Organization (47), Government Ministry/ Parastatals/Institutions (38) and Manufacturers/Vendors (30) which represent 34.70, 22.39, 17.54, 14.18 and 11.19 percent compatibly.

Table 1: Respondents' Profile

Variables	Frequency	Valid Percent	Cumulative Percent
Gender			
Male	197	73.51	73.51
Female	71	26.49	100.0
Total	**268**	**100.0**	
Age			
20-30 years	40	14.93	14.93
31-40 years	75	27.99	42.92
41-50 years	71	26.49	69.41
51-60 years	59	22.02	91.43
61 and above	23	8.57	100.00
Total	**268**	**100.0**	
Level of Education			
National Diploma	65	24.25	24.25
Higher National Diploma	88	32.84	57.09
First Degree	85	31.72	88.81
Master's Degree	27	10.08	98.89
PhD	3	1.11	100.00
Total	**268**	**100.0**	
Profession of Respondents			
Project Managers	31	11.58	11.58
Quantity Surveyors	39	14.55	26.13
Architects	50	18.66	44.79
Engineers	57	21.27	66.06
Site Managers	14	5.22	71.28
Estate Surveyors	24	8.96	80.24
Builders	53	19.76	100.00
Total	**268**	**100.0**	
General Work Experience			
Less than 3 years	18	6.72	6.72
3-7 years	71	26.49	33.21
Above 7 years	179	66.79	100.00
Total	**268**	**100.0**	
Company Status			
Contracting Firms	93	34.70	34.70
Consulting Firms	60	22.39	57.09
Client Organizations	47	17.54	74.63
Government Ministry/ Parastatals/Institutions	38	14.18	88.81
Manufacturers/Vendors	30	11.19	100.00
Total	**268**	**100.0**	

Source: Authors Field Survey, (2023)

Green Construction Knowledge-Base of FCT Developers

For the green procurement knowledge-based factors, the study's respondents indicate 'speed (M=4.47)', 'thermal comfort (M=4.44)', 'investment (M=4.29)' and 'energy conservation (M=4.23)' as their highest level of green procurement project knowledge-base of FCT development stakeholders, and are ranked 1st, 2nd, 3rd and 4th correspondingly (see table 2). According to the outcome of this study, the respondents indicates that they are well aware that the variable factors of speed, thermal comfort, investment, and energy conservation are necessary requirements in the development of green procurement project in the FCT. This is corroborated by the study of Ntuli & Abu-Mahfouz (2016) and Myeong *et al.* (2019); which stated the importance of these factors to the delivery of green procurement projects cannot be overemphasized as a result of their inherent crucial nature to such project. Also, the respondents agree that they have good knowledge of energy conservation requirements for green procurement projects of the FCT as earlier collaborated by Babanyara et al. (2010) and Pardo-Bosch *et al.* (2022). Consequently, speed, thermal comfort, investment and energy conservation are the top accessibility factors while access to public services, smart meters and energy efficiency are the least considered factors.

Table 2: Mean Scores for Green Construction Knowledge-Base for Green Construction Development by FCT developers.

ACCESSIBILITY	Mean (M)	SD	Rank
Speed	4.47	1.08	1
Thermal comfort	4.44	.69	2
Investment	4.29	.81	3
Energy conservation	4.23	.91	4
Lighting efficiency	4.17	1.34	5
Access to electricity	4.17	1.34	5
Architectural flexibility	4.08	1.22	7
Energy affordability	4.05	1.43	8
Environmentally friendly design	4.02	1.08	9
Environmental Adaptability	3.93	1.20	10
Renewable energy production	3.78	1.00	11
Safety	3.64	1.38	12
Electricity consumption	3.64	.96	13
Availability of labour	3.61	1.39	14
CO_2 emission	3.16	1.32	15
Proper infrastructure	3.15	1.40	16
Affordable price	3.00	1.39	17
Indoor air quality	2.95	1.40	18
Renewable energy use	2.77	1.53	19
Access to public services	2.52	1.70	20
Smart meters	2.18	1.72	21
Energy efficiency	2.17	1.72	22

Source: Authors Field Survey, (2023)

Availability of Green Construction Material Resources in the FCT

According to the outcome of table 3, availability of green construction resources for development projects in the Federal Capital Territory indicates that 'composite roofing shingles (M=4.82)', 'reclaimed wood (M=4.54)', 'bamboo (M=4.52)' and 'terrazzo (M=4.52)' as the topmost -ranking green construction materials available, and are thus ranked 1st, 2nd, 3rd , and 4th correspondingly. Similarly, 'sheep's wool (M=4.48)', 'precast concrete slab (M=4.44)', 'stone (M=4.34)' and 'insulated concrete forms (M=4.32)', and are ranked 5th, 6th, 7th and 8th respectively. Consequently, 'solar panels (M=4.25)' and 'rammed earth (M=4.25)' are ranked 9th while 'stone (M=4.22)', 'cork (M=4.08)', 'plant-based polyurethane rigid foam (M=4.0498)' and 'straw bales (M=3.84)' are ranked 11th, 12th, 13th and 14th respectively. Also, 'reclaimed or recycled steel (M=3.74)', 'ferrock (M=3.74)', 'cordwood (M=3.33)' and 'natural fiber floor (M=3.11)' are ranked 15th, 16th, 17th and 18th respectively. Furthermore, 'mycelium (M=3.11)', 'straw bale (M=3.10)', 'timbercrete (M=3.10)', 'Smart Glass Window (M=2.19)' and 'hempcrete (M=2.19)', and are ranked 19th, 20th, 21st, 22nd and 23rd respectively. Consequently, composite roofing shingles, reclaimed wood, bamboo and Terrazzo are the top green materials utilized while timbercrete, smart glass window and hempcrete are the least utilized materials.

Table 3: Mean Scores for the Availability of Green Construction Resources

UTILIZATION OF GREEN MATERIALS	Mean (M)	SD	Rank
Composite Roofing Shingles	4.82	.38	1
Reclaimed Wood	4.54	.91	2
Bamboo	4.52	.50	3
Terrazzo	4.52	.50	3
Sheep's Wool	4.48	1.00	5
Precast Concrete Slab	4.44	1.14	6
Stone	4.34	1.17	7
Insulated Concrete Forms	4.32	1.31	8
Solar Panels	4.25	1.30	9
Rammed Earth	4.25	1.30	9
Reclaimed or Recycled Steel	4.22	1.29	11
Cork	4.08	1.33	12
Plant-based Polyurethane Rigid Foam	4.04	1.56	13
Straw bales	3.84	1.64	14
Recycled Plastic	3.74	.96	15
Ferrock	3.74	.96	15
Cordwood	3.33	1.30	17
Natural Fiber Floor	3.11	1.45	18
Mycelium	3.11	1.45	18
Straw Bale	3.10	1.26	20
Timbercrete	3.10	1.26	20
Smart Glass Window	2.19	1.83	22
Hempcrete	2.19	1.83	22

Source: Authors Field Survey, (2023)

Extent of Utilization of Green Construction Resources for Green Procurement Projects in the Federal Capital Territory

In line with the result depicted in table 4, the descriptive statistics for the utilization of green construction resources indicates that 'composite roofing shingles (M=4.4762)', 'reclaimed wood (M=4.4339)', 'bamboo (M=4.2963)' and 'terrazzo (M=4.2275)' 'sheep's wool (M=4.1852)', 'precast concrete slab (M=4.1852)', 'stone (M=4.1164)' and 'insulated concrete forms (M=4.0582)' are the most utilized as justified by their topmost ranking. Consequently, 'solar panels (M=3.9894)' and 'rammed earth (M=3.7778)', 'reclaimed or recycled steel (M=3.7407)', 'cork (M=3.6402)', 'plant-based polyurethane rigid foam (M=3.1640)' and 'straw bales (M=3.1534)', 'straw bales (M=3.1534)', 'recycled plastic (M=3.0370)', 'ferrock (M=3.0370)', and 'cordwood (M=3.0000)' are the medium ranked factors. Consequently, 'natural fiber floor (M=2.9577)', 'mycelium (M=2.8095)', 'straw bale (M=2.4868)', 'timbercrete (M=2.1852)', 'Smart Glass Window (M=2.1693)' and 'hempcrete (M=2.0370)' comprise of the least ranked. Consequently, composite roofing shingles, reclaimed wood, bamboo and Terrazzo are the top green materials utilized while timbercrete, smart glass window and hempcrete are the least utilized materials.

Table 4: Mean Scores for the Utilization of Green Construction Resources

GREEN MATERIAL FACTORS	Mean (M)	SD	Rank
Composite Roofing Shingles	4.47	1.07	1
Reclaimed Wood	4.43	.70	2
Bamboo	4.29	.81	3
Terrazzo	4.22	.92	4
Sheep's Wool	4.18	1.33	5
Precast Concrete Slab	4.18	1.33	5
Stone	4.11	1.23	7
Insulated Concrete Forms	4.05	1.43	8
Solar Panels	3.98	1.16	9
Rammed Earth	3.77	1.00	10
Reclaimed or Recycled Steel	3.74	.96	11
Cork	3.64	.96	12
Plant-based Polyurethane Rigid Foam	3.16	1.32	13
Straw bales	3.15	1.40	14
Recycled Plastic	3.03	1.35	15
Ferrock	3.03	1.37	15
Cordwood	3.00	1.39	17
Natural Fiber Floor	2.95	1.40	18
Mycelium	2.80	1.51	19
Straw Bale	2.48	1.72	20
Timbercrete	2.18	1.72	21
Smart Glass Window	2.16	1.72	22
Hempcrete	2.03	1.67	23

Source: Authors Field Survey, (2023)

CONCLUSION AND RECOMMENDATIONS

This study assessed green procurement stakeholders' knowledge-base, and evaluated the availability and utilisation of green construction resources in Nigeria's Federal Capital Territory projects. Study's results reveals concludes that level knowledge of green procurement project among FCT development stakeholders. It also concludes that a good number of major and common green construction materials are available and utilized in FCT projects. The study recommends need for increased Government's involvement and strengthening of existing institutional frameworks towards the promotion and growth of green construction procurement mode of sustainable development within the FCT and the Nigeria nation in general, considering its numerous benefits. The limitation of this study is predicated on its focus on the FCT where the data were retrieved from thus, affecting its generalization.

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