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EVALUATION OF FACTORS THAT CONSTITUTE GREEN CONSCIOUSNESS AT FEASIBILITY STAGE OF BUILDING PROJECT PROCESSES: CASE STUDY OF BAUCHI STATE

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ABSTRACT
Construction sector has continuously increased the Earth's pollution over the past centuries hence, contamination of the air and water, climate change, biodiversity loss, and the reduction of natural bank account of non - renewable resources are some of the negative impacts that construction activities have been generating on the environment. Efforts to curtail the adverse effects of human developments on the environment and socio-economic settings gave birth to the sustainability concept that resulted in the global conviction that all human development should meet today's need without compromising that of tomorrow. However, to effectively achieve sustainability, the goals across all the dimensions and aspects that constitute sustainability must be maximized; hence, this research investigates the factors of green consciousness of building projects in Bauchi state. Questionnaire was used to obtain data from procurement administrators in ministries and agencies responsible for construction projects delivery across Bauchi state. One hundred and seventy-five questionnaires were distributed and 105 (61%) responses were returned and analyzed using the statistical package for social sciences for Windows, Version 21.0. Result of the study revealed 9 factors that constitute determinants of sustainability consciousness at the feasibility stage and top among them include comprehensive client's brief and communication throughout project life cycle, Develop potential for mitigating project negative impacts on site landscape, effective project life cycle health & safety management plan, and ICT project sustainability evaluation life cycle support system. The findings shed lights on factors of green consciousness at the feasibility stage in Bauchi state. Therefore, it was recommended to improve key project stakeholders' sustainability, awareness and green construction should be integrated into building project procurement.

***Keyword**: green construction, feasibilty, construction industry, procurement, consciousness.*

INTRODUCTION

The pronouncement by the World Commission on Environment and Development in 1987 that all spheres of human development should meet the needs of the present generation without compromising the ability of future generations to meet their needs set the pace for all human development to embrace the concept of green (Geach, 2016). This triggered the thinking of the construction industry (CI) to re-align its projects in line with green concept to attain Green construction (GC). GC is committed to curtailing the enormous pressure exerted by the CI operations and products on global natural resources, economy and the society by creating and operating healthy-built environment based on resource efficiency and ecological design (Inuwa&Diang'a, 2015; Phoya, 2018). Inuwa and Diang'a (2015) describes GC as an all-encompassing construction procurement exercise that addresses the adverse effects emerging from the realisation of a construction facility on the environment, as well as harness the economic and social benefits that can be derived from such construction facility, with the aim of delivering a facility that supports environmental friendliness, economic efficiency and social integration.

Shen *et al.* (2007) acknowledged that factors affecting the green conscious performance of a construction project are different at various stages across construction project procurement process. This implies that each stage of project procurement process has peculiar green requirements that should be individually addressed and coordinated throughout the project procurement process. According to Bragança *et al.* (2014), construction project procurement process is assigned different names by different authors. In general they are the same and have the same goals (Shen *et al.*, 2007). In view of the above, several studies contributed to GC by focusing on green improvements within the context of construction project procurement process. Bragança *et al.* (2014) revealed that green or green enhanced design ensures environmental friendliness, better performance and meet life-cycle cost effectiveness. Othman and Abdelrahim (2019) discovered that a green sustainable design developed using the concept of value management reduces waste on construction sites. Phoya (2018) observed that the nature of sustainable construction practices implemented by Tanzanian contractors on construction sites is low, while waste management and energy efficiency are leading practices. Inuwa and Diang'a, (2015) highlighted that effective green practices cut across project predesign, design and construction stages. Shen *et al.* (2007) developed framework of green performance checklist for project life-cycle. O'Connor, Torres and Woo (2016) enumerated construction phase green actions that project teams can use during project execution to prioritize and carry out green solutions. Shen, Wu and Zhang (2011) established key assessment indicators for assessing the green performance of an infrastructure project. Despite the significance of these studies, none was able to explore empirically the green consciousness factors that are embedded in the interdependent stages of construction project procurement process and their effects on GC.

GREEN CONSTRUCTION PROJECT PROCUREMENT PROCESS

Construction procurement process is a series of operations or actions taken to achieve the intended aim of construction project procurement. Its scope is extensive and covers every aspect of project delivery (Inuwa, 2014). Hence, to achieve green construction each operation in the procurement process must be executed with green consciousness. The scope and operations in construction project procurement process comprised of: Initiation- identification of product or service; Preliminary feasibility studies, strategic and finance planning, preliminary estimation; Evaluation of project brief-engineering/construction technology and costing, approximate quantities method-estimation; Design management- detailed drawings and cost planning (cost allocation and target); Contracts and procurement-contractor selection (bid invitation and evaluation); Manufacture; and construction- installation and construction (Actualization of plan) (7) Commissioning handing over and commissioning (8) Facility management operation and maintenance (Inuwa, 2014).

The complexity of the process calls for the management of the process to be undertaken by people with appropriate knowledge, skills, expertise and tools (Hughes, 2012 and Inuwa, 2014). However, despite increased awareness of environmental degradation and increased social inequity, the world is becoming more, not less, unsustainable (Stål, 2015). Since construction is essentially part of human activity in providing a functional environment, green as a concept has become the most important issue concerning the construction industry (Dobson *et al.*, 2013). This is because in recent times, building in a responsible manner has become imperative with consideration to the social, economic and environmental implications as critical issues in the existence or progress of mankind thereby preserving the planet (Khalfan, Maqsood, Noor, Alshanbri &Sagoo 2015). Thus, green consciousness in building procurement process is construed to be a way of finding a balance between economic, environmental and social factors throughout the building procurement process (Aghimien *et al.,* 2017)**.** Since human activity in construction works follows a predefined stage and process, it follows that in each stage of procurement processes there is a need to outline activities that are prerequisite to attaining green conscious construction end product.

GREEN CONSCIOUSNESS AT FEASIBILITY STAGE

This stage is concerned with justifying investments in building projects (Hyari&Kandil, 2009). It looks at how doable the building project can easily or conveniently be done. According to Chitkara (2011), feasibility study is a critical examination of a client need for the development of a project; it evaluates project potential by examining technical feasibility, economic viability and financial implications. Feasibility study comes at the early stage of a construction project process and the basis used for evaluating it is the client's brief. The end result of the feasibility study is a statement of the validity of the client needs in relation to the variables that have been evaluated (Roberts & Wallace, 2004). The decisions taken during this early phase are more effective in guiding project

success (Kolltveit&Gronhaug, 2004; Sourani&Sohail, 2011). According to Shen *et al.* (2007), the feasibility stage plays a critical role in affecting the project's green performance, and as such, it should be in line with the principles of green conscious development. It is therefore noteworthy to integrate green consciousness in the entire project potential evaluation process if a sustainable construction project is to be attained. This measure will set the pace and guide the process for the attainment of a sustainable construction project (Sourani&Sohail, 2011). The basic features in feasibility study are: proposed product features, demand survey, technical studies, financial implications, economic viability, and summary of recommendation.

RESEARCH METHODS

The target population for this study was procurement administrators in ministries and agencies in Bauchi state. The rationale for selecting them was to achieve the research objective using their views. The technique of data collection exploratory using literature search and descriptive through questionnaire survey. The explorative method was employed and data were collected by means of an intensive and extensive literature search. Furthermore, the descriptive methods employed collected data through structured questionnaire.

QUESTIONNAIRE DESIGN

Information collected from literature review was used to develop a study questionnaire. The questionnaire requested respondents to choose their choice on a question from a group of options using 5-point Likert scale with interpretation of : not a priority (0.00 – 1.49), least priority (1.50 – 2.49), moderate priority (2.50 – 3.49), high priority (3.50 – 4.49), and very high priority (4.50 – 5.00).

ANALYSIS OF THE QUESTIONNAIRE RESPONSES

Table 1 presents information on questionnaire administration and respondents work experience. One hundred and seventy-five questionnaires were conveniently distributed to architects (35), builders (25), construction managers (30), engineers, and quantity Surveyors (42) and correspondingly received 21, 17, 18, 28, and 21 responses. The distribution yielded 105 valid responses which represents 61% response rate. Seventy one percent of the respondents have 11 years and above experience in the industry. In summary, the respondents have an average of nearly 11 years' experience in the construction industry. These results revealed that the respondents are qualified and experience to respond to an enquiry of this nature.

Table 1: Questionnaire administration and respondent experience

Respondents	Distribution	Returned	% Response Rate
Architects	35	21	60
Builders	25	17	68

Construction Managers	30	18	60
Engineers	40	28	70
Quantity surveyors	42	21	50
Total	175	105	61

RESPONDENTS DEMOGRAPHIC INFORMATION

Table 2 shows respondent's demographic information. The study respondents are construction professionals who ply their trades in the two sides of the Nigerian economy: namely public (55.2%) sector and the private (43.8%). Almost all the respondents are management staff in their respective organizations (99.2%): top management (11.40%), middle management (65.7%), lower management (18.1%) and others (3.8%). Their highest educational qualification is either Certificate (1.0%), National Diploma (1.0%), Higher National Diploma (14.3%), Postgraduate Diploma (17.1%), Bachelor of Science/Bachelor of Technology (33.3%), Master of Science (30.5%), or Doctor of Philosophy (2.9%). The respondent's specialized in: Architecture (20.0%), Building (12.4%), Construction Management (13.3%), Quantity Surveying (19.0%), Engineering (27.6%), and Others (7.6%). These result show that the respondents are educationally qualified and are core construction procurement professionals involve in the management of construction projects (Inuwa, 2014). The professionals are certified members of their respective regulatory bodies: ARCON (6.7%); CORBON (14%); COREN (19%); QSRBN (33%); and others (24%). These result reveals that virtually all the respondents are professionally certified to practice their respective construction procurement professions, and as such, assists the study in ensuring that all the variables that may have an influence on the correctness of the data have been analysed. By implication, this ensures that the respondents used for the study are appropriate sample (Pallant, 2011; Ekundayo *et al.*, 2013).

Table 2: Respondents experience in the industry

Years of experience	Mid value (X)	Frequency (F)	% of F	FX
Less than 5	5	23	21	115
5-10	7.5	35	33	263
11-15	13	25	23	325
16-20	18	15	14	270
Over 20	20	7	14	140
Total	105	100	1113	

RESPONSES ON THE DETERMINANT THAT CONSTITUTE GREEN CONSCIOUSNESS AT FEASIBILTY STAGE

Table 3 revealed that 8 factors which were averagely ranked with Comprehensive client's brief consideration throughout project life cycle(3.95-4.25), Develop potential for mitigating project negative impacts on site landscape(3.66-4.42), Effective project

life cycle health & safety management plan(3.87-4.46), ICT project green evaluation life cycle support system(3.33-4.14), Project concept flexibility prospects(3.18-4.20), Project economic viability prospects on its environs(3.70-4.42), Project life cycle environmental friendliness prospects(3.80-4.28), Project social integration prospects on its environs(3.70-4.42)

Table 3: Responses on determinant of green consciousness at feasibility stage

		Respondents Mean Scores										
S/N		Arc.	Bldr.	CM	QS	Eng.	Others	$\bar{X}$	SD	F	Sig	LS
	Feasibility stage											
1	Comprehensive client's brief consideration throughout project life cycle	4.04	4.23	4.42	4.35	3.95	4.00	4.15	0.829	0.975	0.437	NS
2	Develop potential for mitigating project negative impacts on site landscape	3.66	4.07	4.42	3.85	3.89	4.21	3.92	0.94	1.271	0.283	NS
3	Effective project life cycle health & safety management plan	3.95	4.46	4.07	4.05	4.24	3.87	4.12	0.906	0.757	0.583	NS
4	ICT project green evaluation life cycle support system	3.33	3.92	4.14	3.85	3.58	4.0	3.73	0.933	1.826	0.115	NS
5	Project concept flexibility prospects	3.47	3.61	4.20	4.0	13.8	3.75	4.60	29.21	0.489	0.784	NS
6	Project economic viability prospects on its environs	3.80	4.1	4.42	3.70	3.48	3.75	3.81	0.968	0.591	0.707	NS
7	Project life cycle environmental friendliness prospects	3.90	3.92	4.28	3.80	4.06	4.25	4.00	0.904	0.684	0.637	NS
8	Project social integration prospects on its environs	3.80	4.15	4.42	3.70	3.48	3.75	3.81	0.968	2.327	0.48	NS

DISCUSSION

The study discovered that effective project life cycle health, safety and environment management plan(3.87-4.46) was top. This finding agrees with the assertions of Shen et al, (2007), and Sourani and Sohail(2011). Project economic viability prospects on its environs(3.70-4.42), Project social integration prospects on its environs(3.70-4.42), Develop potential for mitigating project negative impacts on site landscape(3.66-4.42), Project life cycle environmental friendliness prospects(3.80-4.28), Comprehensive client's brief consideration throughout project life cycle(3.95-4.25), Project concept flexibility prospects(3.18-4.20), ICT project green evaluation life cycle support system(3.33-4.14)

CONCLUSION

This research was aimed at establishing factors of green consciousness at feasibility stage for building project processes. The study used a structured questionnaire to survey experience professionals. The survey responses were used to establish the factors of green consciousness at the feasibility stage. This research contributes to Nigeria's efforts in supporting the global aspiration envisioned by the United Nations Framework Convention on Climate Change, set up in 1992 at the Rio Earth Summit. The Convention upholds that any human development should ensure it meets the needs of the present generation without comprising the ability of future generations to meet their own needs. In light of the above, this research identifies green consciousness factors at the feasibility stage. This implies that adherence to green consciousness factors at the feasibility stage will result in producing a building facility that is endowed with economic benefit, environmental friendliness, and social harmony.

RECOMMENDATIONS

This proffers the following recommendations in light of its findings:

i. Building projects should adhere to green consciousness factors throughout its feasibility stage.
ii. Improves on key project stakeholders' green awareness, encourage more research on GC, and statutorily enforce green compliance in Nigeria's building project management.
iii. Green construction should be integrated as part of building project procurement process.

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