American Journal of Engineering Research (AJER)
e-ISSN: 2320-0847 p-ISSN : 2320-0936
Volume-12, Issue-2, pp-17-22
www.ajer.org
Research Paper Open Access

Risk Probability Factors Affecting Sustainable Construction Project Goals

Olowolayemo Oluwaseun Ebenezer[1*];Fadugba Oluwatosin Oluwafunsho[2]; OgunbodeAkintoye Benson[3]; Awosusi Abiodun Racheal[4];AdeyeyeMayowa Faith.[5]

1-5 Department of Quantity Surveying, Rufus Giwa Polytechnic, Faculty of Environmental Studies, Owo. NIGERIA.

Abstract
It is established that sustainable construction project risk management processes entails planning, design, construction, and operations, which are generally more complicated and involve a greater number of stakeholders' interactions than traditional construction project goals. This study identified the risk probability factors affecting sustainable construction project goals. This was with a view to enhancing construction techniques. This study adopted a non-probability sampling techniques and data were collected through the use of well-structured Self-administered questionnaires that were administered to registered professionals in Ondo State, South western, Nigeria. The target population comprises of Quantity Surveyors, Architects, Builders, and Structural Engineers.One hundred and Thirty (130) questionnaires were administered in person in each of the three senatorial districts of the state. In addition, respondents came from both the consulting and contracting firms with a retrieval of One hundred (100).The data retrieved were analyzed using descriptive statistics. Mean score response analysis and percentages. The study concluded that the major risk probability factors affecting sustainable construction project goals are as follow: the public's satisfaction with the project is very low, operational performance fails to meet the objectives of the project, construction accident etc. It also recommends that public satisfaction must be considered in the execution of any sustainable construction project, proper operational performance must be put in place in order to meet the objectives of the project and adequate safety should be put in place to prevent construction accident.
Keywords: Construction, Project goals, Riskprobability,Sustainable, Sustainable construction.

Date of Submission: 20-01-2023 Date of acceptance: 03-02-2023

I. Introduction

Project risk on sustainable construction projects is rising, and the standard for construction project goals is improving, paving the way for new technology and materials to be used. Understanding what projects mean is essential. Oklahoma (2015), concluded that projects are the vehicles for beneficial change because they aim to create something new.

Sustainable construction project risk goals typically center on broad issues like access to fresh water, biodiversity, global warming, and energy and material consumption. It is difficult for project owners to clearly specify the requirements for sustainable construction projects despite the fact that this society-wide focus is absolutely necessary (FIDIC, 2018). Demaid&Quintas (2016), observed that working in local contexts that are the result of distinct national and international priorities for sustainability as well as distinct national construction project ethics create a complex industrial world that is susceptible to rapid and unpredictable change.

II. Literature Review

Risk probability factors affecting sustainable construction project goals

The strategy of sustainable development is deemed to be the primary development strategy by Chan, Chan, Lam, Yeung, & Chan (2021), who asserted that risk probability factors is affecting sustainable construction project goals. However, 95% of Nigeria's annual new housing constructions are high-energy-

consumption buildings, with an average energy consumption that is 2-3 times that of developed countries. The sustainable development of resources is an important condition for all sustainable development strategies and a significant constraint to sustainable development. As a result, China's construction industry's enormous energy consumption and gas emissions have become a "stumbling block" for the country's transition to "energy saving, high efficiency, and environmental protection." Therefore, for sustainable development in Nigeria and around the world, reducing energy consumption in the construction industry is crucial. Wan, Qin, and Xuan (2020), identified the important step Nigeria can take toward sustainable development a to concentrate on setting project goals for low-cost, high-efficiency, economical, and environmentally friendly sustainable buildings.

The central government and the local governments have realized the significance of sustainable buildings from the assessment standards for sustainable buildings that were proposed in 2006 and 2014 by the Housing and Urban-Rural Development Department as well as some policies that encourage the development of sustainable buildings projects that were proposed by the central government and the local governments, as the implementation of sustainable building projects continues to grow (Qin, Mo, and Jing, 2019).

However, it has been observed that the public's level of satisfaction with the project is very low because selection of an appropriate contractor increases the likelihood of the construction project's successful completion, which satisfies the client's goal of keeping the schedule of cost, time, and quality, thereby increasing project satisfaction (Plebankiewicz, 2019). It is expected of a contractor to complete projects on time, within budget, and in accordance with the client's specifications. Sadly, this is not always the case in the Nigerian construction industry, which is dominated by local contractors. Though, indigenous contractors were only involved in about 7% of the contracts awarded by the Federal government between 1974 and 1984 (Reports of Ministerial Committee on Causes of High Government Contracts, 2012). Despite the fact that their fees are significantly higher than those of their indigenous counterparts, foreign contractors, who have a percentage numerical strength of approximately 7% in Nigeria, carry out over 90% of the total value of construction contracts in Nigeria.

Lim and Mohamed (1999), cited in Toor and Ogunlana (2009), further discussed that operational performance does not meet the project's goals as part of the factor affecting sustainable construction project goals. Two perspectives on operational performance exist: both the macro- and micro-levels. The study stressed further that the macro view point checks to see if the project's original goals and ideas were met. The project design team, consultants, contractors, and suppliers, on the other hand, examine projects from a micro perspective, focusing on poor quality, delivery time, and budget, rather than the end users and beneficiaries of the project.

Some stakeholders, particularly project users and private owners, view failed projects as situations in which a completed building project collapsed, a completed dam project stopped functioning after a few days, or a completed road project broke down after a few months. "Poor quality," "cost overrun," and "time overrun" are important indicators of project failure. There are instances in which obtaining a green building certification must be accomplished through a costlier method. Green building certified residence cases had an average construction cost that was only 1.58 percent higher than that of standard residences (Gabay, Meir, Schwartz, and Werzberger, 2017).

Accident on a construction site: Construction site accidents are a major cause of preventable illness; death and injury Department of Health more than one person suffers severe injuries or dies each week as a result of accident-caused. According to DOH (2003), one of the most significant factors in health service utilization is on-site accidents. In an industry where the construction process is complex and influenced by multiple factors that may be related to one another, efforts to improve health and safety on the job site have been of the utmost importance (Chileshe, 2010).

As a result, a comprehensive comprehension of this intricate process is necessary for an accident prevention strategy. Yaman (2012), suggested that investigation will provide a well-informed foundation for the creation of an effective strategy for preventing accidents. Despite the documented positive gains brought about by the construction industry, construction work comes with some drawbacks. The International Labor Organization estimates that 60,000 fatal accidents occur annually on construction sites worldwide, or one in six of all fatal accidents involving the workplace. Construction work is dangerous. The number is much higher, at 108,000, according to the global union federation, and construction accounts for 30% of all workplace accidents Hore(2011).

Sheth (2016) described green building market (GBM) as special materials for the construction of sustainable buildings and their adaptation as being sustainable in comparison to conventional buildings. Demand forecasting for the green building market is not permitted. Because they are sensitive to the environment, these materials reduce environmental issues. Onyegiri and Ugochukwu (2016) say that GBM materials are good for the environment because they can be reused or recycled and don't harm the environment. Furthermore,Aghimien, Izvekova, and Roy (2016), supports that these materials basically assist in satisfying the requirements of the current generation without depriving subsequent generations of the requirement to satisfy

their own requirements. As a result, ensuring that the requirements of both the present and future generations are met is a major driver of GBM adoption and incorporation.

Sustainable construction will be encouraged if there is a surge in demand for GBM products and services in the construction industry, which is essential to ensuring a safer and cleaner environment. According to Ashuri and Durmus-Pedini (2010), this surge is a loop that was created as a result of positive feedback from customers in the market. It adds to the benefits of the environment, health, and finances.

Hakkinen and Belloni (2011), concluded that professionals in the construction industry will be the primary drivers of the implementation of green buildings. Also the construction industry is client-driven, the client also plays a crucial role in the adoption of sustainable construction (Davies and Davies, 2017). A market for GBM products and services will be sparked by informing customers about the inherent advantages of incorporating GBM. The majority of key stakeholders are unaware of the potential benefits of implementing sustainable construction (Aigbavboa, Stjepanovi c, Tomi c, and Kare, 2017). Information regarding the potential advantages of GBM is essential to the adoption, incorporation, implementation, and establishment of a sustainable market for GBM products and services.

Green building benefits may result in the development, expansion, and shaping of green product and service markets (Darko and Garrett-Peltier 2013). Aghimien, Brown, Soni, and Li (2019a), realizing that the advantages of incorporating GBM into construction could lead to a shift away from conventional traditional materials and toward more sustainable options. Clients, professionals, and other key construction participants will be better able to overcome some of the major obstacles that prevent them from adopting GBM if they are aware of the advantages of GBM and green/sustainable construction concepts. GBM and its products have been utilized by university administrators in the educational sector of advanced nations like the United States and Canada in academic planning and management education, energy demand and consumption control, water consumption control, waste generation and minimization, buildings, and transportation management (Zhu, Richardson, and Lynes 2020).

Local businesses could work with international and multinational construction companies that are experienced in sustainable concepts to transfer knowledge and build local capacity.

In conclusion, other researchers' identified; having negative impact on society, poor construction environment, project evaluation results did not reach the expected level, increase in the cost of green building projects, poor habitability, inflation, change of government support policy, the cost of conducting a green building standard assessment becomes higher, unstable performance during green building operation, poor organization and coordination ability of managers, irrational responsibilities assignment matrix, green building energy efficiency has not reached the expected level, insufficient on-site investigation resulted that not adjust measures to local conditions, labour disputes and lack of experienced managers in the operational phase as part of therisk probability factors affecting sustainable construction project goals

III. Materials and Methodology

This study adopted a non-probability sampling techniques and data were collected through the use of well-structured Self-administered questionnaires that were administered to registered professionals in Ondo State, South western, Nigeria. The target population comprises of Quantity Surveyors, Architects, Builders, and Structural Engineer. The questionnaires were divided into two sections: the respondents' demographic information (Section A) and therisk probability factors affecting sustainable construction project goals (Section B). One hundred Thirty (130) questionnaires were administered in person in each of the three senatorial districts of the state. In addition, respondents came from both the consulting and contracting firms with a retrieval of One hundred (100).

Data on therisk probability factors affecting sustainable construction project goals was analyzed using descriptive statistics. Mean score response analysis. Furthermore, frequency and percentage were used to analyze the demographic information of the respondent.

Table 1: Distribution of questionnaires

Number distributed	Number retrieved	Rate of return (%)
130	100	76.92%

According to table 2, the building projects accounted for approximately 30% of the total respondents, making them the most common type of project in this study. Civil Engineer made up 25%, Heavy Engineering had 15%, and other projects made up 31.2%. The result indicates that the majority of the project types in the study area were well-known.

Table 2: Type of project involved

Options	Frequency	Percentage
Building Project	30	30
Civil Engineering Project	25	25
Heavy Engineering Project	15	15
Others	30	30
Total	**100**	**100**

Table 3 shows the years of experience of the respondents in the construction industry, 20% of the respondents have 5-10 years, 11-15years and 16-20 years of experience respectively while 15% has 16-20 years of experience and 25%of the respondents has above 20 years of experience in the construction industry.

Table 3: Years of experience in the construction industry

Classification	Frequency	Percentage (%)
0 – 5	20	20
5 – 10	20	20
11 – 15	20	20
16 – 20	15	15
Above 20	25	25
Total	100	100

The academic qualification of the respondents is summarized in Figure 4.4 of which National Diploma (ND) 10%, the other categories of academic qualification are given as follows; Higher National Diploma (HND) 30%, Bachelor of science (BSc.) 30%, Postgraduate Diploma (PGD) 5%, 20% are Master of Science (M.Sc.) holders. and 5% are PhD. The academic qualification of the respondents is important and supports the fact that they are knowledgeable and capable of providing the much-needed professional judgment required for the credibility of the data collected for the research.

Table 4: Academic qualification of respondents

Education background of the respondents	Frequency	Percentage (%)
ND	10	10
HND	30	30
BSc.	30	30
PGD	5	5
MSc.	20	20
PhD	5	5
Total	**100**	**100.0**

Risk probability factors affecting sustainable construction project goals

According to Table 5, the majority of respondents agreed that the public's satisfaction with the project is very low, with a mean score of 5.0, ranking it first. Operational performance fails to meet the project's objectives, with a mean score of (4.9), rans it second, and construction accidents, with a mean score of (4.8), ranks it third. Having negative impact on Society with a mean score of (4.6) which falls into 4^{th} rank, Poor construction environment, with a mean score of (4.5) which falls into 5^{th} rank, Project evaluation results did not reach the expected level, with a mean score of (4.4) which rank falls into 6^{th} position, Green building market demand forecast is not allowed with a mean score of (4.3) which falls into the rank of 7^{th}position, Increase in the cost of green building projects, with a mean score of (4.2) falls into the 8^{th} rank, Poor habitability with a mean score of (4.1) falls into the ranking of 9^{th} position, Inflation with a mean score of (4.0) falls into the 10^{th} rank, Change of government support policy with a mean score of (3.9) falls into the position of 11^{th} rank, the cost of conducting a green building standard assessment becomes higher falls into the 12^{th} rank with a mean of (3.8), unstable performance during green building operation falls into 13^{th} rank with a mean of (3.7). Poor organization and co-ordination ability of managers and irrational responsibilities assignment matrix with a mean score of (3.6) falls into the 14^{th} rank and 15^{th} rank respectively. Green building energy efficiency has not

reached the expected level with a mean score of (3.5) falls into the 16th rank, insufficient on-site investigation resulted that not adjust measures to local conditions falls into the 17th ranks with a mean of (3.4), labour disputes with a mean of (3.2) falls into the position of 18th rank and lack of experienced managers in the operational phase falls into the 19th rank with the mean of (2.7).

Table 5: Therisk probability factors affecting sustainable construction project goals

Statement	5	4	3	2	1	Mean	Rank
The public's satisfaction with the project is very low	60	20	20	0	0	5.0	1st
Operational performance fails to meet the objectives of the project	60	20	5	5	10	4.9	2th
Construction accident	76	10	14	0	0	4.8	3th
Having negative impact on Society	55	15	25	0	5	4.6	4th
Poor construction environment	75	10	01	4	10	4.5	5th
Project evaluation results did not reach the expected level	19	27	12	20	20	4.4	6rd
Green building market demand forecast is not allowed	30	20	20	15	15	4.3	7th
Increase in the cost of green building projects	30	10	10	25	25	4.2	8th
Poor habitability	20	15	15	15	15	4.1	9th
Inflation	30	55	5	5	5	4.0	10th
Change of government support policy	20	15	30	5	25	3.9	11th
The cost of conducting a green building standard assessment becomes higher	32	38	15	15	0	3.8	12th
Unstable performance during green building operation	0	14	86	0	0	3.7	13th
Poor organization and coordination ability of managers	47	13	22	8	10	3.6	14th
Irrational responsibilities assignment matrix	90	8	2	0	0	3.6	15th
Green building energy efficiency has not reached the expected level	40	10	20	20	10	3.5	16th
Insufficient on-site investigation resulted that not adjust measures to local conditions	75	5	10	5	5	3.4	17th
Labour disputes	50	5	15	15	15	3.2	18th
Lack of experienced managers in the operational phase	45	25	15	10	5	2.7	19th

IV. Conclusion

The study concluded that the major risk probability factors affecting sustainable construction project goals are as follow: the public's satisfaction with the project is very low, operational performance fails to meet the objectives of the project, construction accident etc.

V. Recommendation

Public satisfaction must be considered in the execution of any sustainable construction project, proper operational performance must be put in place in order to meet the objectives of the project and adequate safety should be put in place to prevent construction accident on site.

Reference

[1]. Aghimien, P.A.; Izvekova, O.; Roy, V.;(2016). Green technologies in the construction of social facilities. Procedia Eng. 165, 1806–1811.
[2]. Aghimien, A.; Brown, M.A.; Soni, A.; Li, Y (2019). Estimating Employment from Energy-E_ciency Investments. MethodsX, 100955.
[3]. Aigbavboa, H.; Stjepanovi´c, S.; Tomi´c, D.; Škare, M. (2017). A new approach to measuring green GDP: A cross-country analysis. Entrepren. Sustain. Issues 2017, 4, 574–590.
[4]. Ashuri, H.; Durmus-Pedini, B. (2010). Ecological indicators for green building construction. Ecol. Indic., 67, 68–77.

[5]. CIRIA (2003*), Design for Health and Safety*, Newcastle upon Tyne, January 2003.
[6]. Chan, A.P.C.; Chan, A.; Lam, A.O.; Yeung and Chan, E.E(2021). Critical barriers to green building technologies adoption in developing countries: The case of Ghana. J. Clean. Prod. 2018, 172, 1067–1079.
[7]. Chileshe, C.H(2010). Press Release: ILO Highlights Growing Risks to Worker Health and Safety.[online] Available http://www.ilo.org/public/english/bureau/inf/pr/96-
[8]. Darko, T. Y; Garrett-Peltier, H. (2013). Green versus brown: Comparing the employment impacts of energy e_ciency, renewable energy, and fossil fuels using an input-output model. Econ. Model. 2017, 61, 439–447.
[9]. Davies, A., Davies, G. E (2017). Licensee MDPI, Basel, Switzerland. This article is an open accessarticle distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).
[10]. Demaid, A., &QuintasP. (2006). Knowledge across cultures in the construction industry: sustainability,innovationanddesign.*Technovation*26(2006)603610.www.elsevier.com/locate/technovation
[11]. DOH (2003). *Social Services Performance Assessment indicators*, Department of Health Report 1992-1993, p1-2.
[12]. FIDIC (2018). A fuzzy synthetic evaluation approach for risk assessment: a case of Singapore's green projects [J]. Journal of Cleaner Production,203213.
[13]. Gabay, S.; Meir, Y.; Schwartz, Z.; Werzberger, F.; (2017). Ecological environment risks and green development modes of China-Mongolia-Russia economic corridor. In Proceedings of the IOP Conference Series: Earth and Environmental Science, Irkutsk, Russia, 23–27 September 2018; pp. 20–26.
[14]. Hakkinen, M.S.; Belloni. (2011). Critical barriers and challenges in implementation of green construction in China. Int. J. Curr. Eng. Technol., 6, 435–446.
[15]. Okland, E.D. (2015): Explaining architectural design and building energy efficiency[J]. Doors and windows, (02):359. (in Chinese)
[16]. Onyegiri, S., Ugochukwu, X.; (2016). Economic forecast corridor and environmental protection cooperation. R-Economy., 3, 161–166.
[17]. Plebankiewicz, S. (2019). Value-added and employment elects of renewable energies and the energy-e_ciency refurbishment of existing housing—case study: Berlin, Germany. In Urban Energy Transition; Elsevier: Amsterdam, The Netherlands, 2018; pp. 457–466.
[18]. Qin, V.V.; Mo, E.E.; Jing, V.E. (2019) Information Support in the Enterprise Risk Management. Intern J Manag Bus Res., 9, 158–169.
[19]. Sheth, D. (2016). Building Market Demand and Enterprise Data Solutions. China—Gross Domestic Product in Current Prices Growth Rate. Available online:https://knoema.ru/
[20]. Toor, V.M.; Ogunlana R.G(2009). Strategies to promote green building technologies adoption in developing countries: The case of Ghana. Build. Environ., 130, 74–84.
[21]. Wan, X, Qin A.B and Xuan, T (2020). Creating competitive advantage by using environment-friendly building processes. Build. Environ., 36, 291–298.
[22]. Zhu, A.Y Richardson, G.Q and Lynes, B.B (2020) Sustainable Concepts and Multi-national Construction firms, Case study from Chinese contractors [J]. Journal of Construction Engineering and Management, 280,050160897.