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# Assessing Barriers to Sustainable Public-Works Procurement Compliance at the Tender Evaluation Stage in Ghana

**Track 2:** ESG/ CSR and Sustainability of Public and Private Sector Institutions in Africa

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## Abstract

Existing studies indicate that the construction sector is critical to the integration of sustainable public-works procurement towards the achievement of the Sustainable Development Goals 12.7 (SDGs). However, significant impediments to effective and efficient compliance with sustainable public-works procurement exist. The focus of this study is to identify the specific barriers to compliance with Sustainable Public-works Procurement. Through a scientific literature review and questionnaire survey, seventeen (17) barriers were identified and analyzed using the Principal Component Analysis (PCA) variant of factor analysis to assess the significant barriers to sustainable public-works procurement. Four clusters of factors were concluded as critical barriers to compliance with sustainable public-works procurement at the tender evaluation stage. (1) sustainable adaptability cluster; (2) managerial challenges cluster; (3) knowledge incapacity cluster; and (4) legal, policy, and evaluation cluster. The study presents a basis for experts along with researchers to appreciate the barriers to compliance and the need to improve compliance with sustainable public-works procurement in Ghana. The study adds to the pool of knowledge and provides the first survey on the specific barriers that inhibit compliance with sustainable public works procurement at the tender evaluation stage in Ghana.

**Keywords:** Public-works; Procurement; Sustainability; Barriers; Compliance

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## Introduction

Sustainable Development is the adoption of sustainable principles in the built environment to meet the present needs of humankind, without compromising the future generation's ability to meet their own needs (Berry and McCarthy (2011). Contemporary public procurement acts as a catalyst for promoting good governance and sustainable development by optimizing resources, enhancing project delivery, fortifying public procurement systems, and fostering stakeholder participation to promote the country's social, environmental, and economic policies (Adjei-Bamfo and Maloreh-Nyamekye, 2019; Adjei, 2010). Governments around the world have relied heavily on public procurement due to the substantial amount of procurement expenditure on the economy and as such must be well handled (Thai, 2009). Mahmood (2010) agreed by indicating that public procurement represents 18.42% of the world GDP. Furthermore, the Ghanaian construction industry generated 14.34 percent of the country's GDP on average, and it is the second highest contributor in terms of jobs created between 2009 and 2013 (Ghana Statistical Service, 2018). However, Construction has an impact on the economy, society, and the environment, and multiple authors have noted that it underperforms in all three main elements of sustainability: social, economic, and environmental (Bratt et al., 2013; Tsai and Chang, 2012). Thus, both industrialized and underdeveloped nations are taking measures toward incorporating sustainable procurement criteria into the country's national procurement (Islam et al., 2016). Despite these endeavors, the primary barriers to the compliance of sustainable public procurement have been identified as the misconduct of procurement officers and non-adherence to procurement policies and procedures (Gelderman et al., 2006). In a study conducted on sustainability standards in public procurement, Montalban-Domingo et al., (2018) argue that the lack of objective evaluation of sustainability compliance during sustainable public-works procurement evaluation is the main obstacle faced in the integration of sustainable public procurement. Also, the lack of empirical studies on the specific barriers that hinder sustainability compliance at the tender evaluation stage of public procurement is a major gap in the scientific literature. In 2016, the Public Procurement Authority of Ghana amended its objective to align with the Sustainable Development Goals, specifically target 12.7 which focuses on sustainable procurement. The amendment seeks to guarantee that public procurement is carried out in a manner that ensures environmentally and socially sustainable procurement (PPA, Act 663 as Amended Act 914, 2016). Despite these enormous efforts and resources invested in this regard, success has been slow and stagnant, especially in sustainable procurement (Montalban-Domingo et al., 2018; Bratt et al., 2013). Against this background, this research seeks to explore the barriers to compliance with Sustainable Public-works Procurement at the Tendering stage.

## Literature Review

### Sustainable Public Procurement

Public procurement constitutes 18.42 percent of the global Gross Domestic Product (Mahmood, 2010) and is progressively acknowledged as vital in enhancing service delivery in developing countries (Basheka and Bisangabasaija, 2010), representing a substantial proportion of overall expenditures. They further stated that public procurement constitutes 60% of the Kenyan government's

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expenditures, 58% in Angola, 40% in Malawi, and 70% in Uganda (Government of Uganda, 2006), making it the second-largest expenditure in Tanzania after employee salaries (NPPP, 2012). Several countries have begun to change their procurement systems in recent years to simplify and harmonize their legal and institutional frameworks (Vitor, 2015). In Ghana according to Section 3 of the PPA Act, Act 663 as Amended Act 914, 2016, Procurement is defined as the process where a procurement entity purchases, employs, leases, or otherwise acquires goods, work, or services, and/or a procurement entity that acquires goods, construction, or services. This contains all functions related to procurement such as the specification of requirements, selection, and invitation of tenders, contract drafting, awarding, and management. In recent years, both the public and private sectors have recognized the need for sustainable procurement as a well-positioned means to aid the commercialization of the built environment. The connection between procurement and sustainability is intricate, necessitating additional research to ascertain effective methods for aligning these two objectives. (Laryea et al. 2013). The notion of sustainable development is commonly categorized into three components: environmental sustainability, economic sustainability, and social sustainability. To improve the link between procurement and sustainability thereby attaining sustainable procurement, it is important to balance economic, environmental, and social considerations in procurement. Mensah and Ameyaw (2012), posited that developing a sustainable procurement strategy necessitates the ability to describe the circumstances under which a procurement process qualifies as sustainable. The Whole Life Cycle approach, they claim, is one means for measuring sustainable procurement. Researchers like Agbesi et al. (2020) and Mensah and Ameyaw (2012) explained sustainable procurement as a process where the client and collaborating organizations meet design and development requirements in a manner that ensures value for money throughout the entire project life cycle. This approach aims to generate benefits for project stakeholders, society, and the economy, while simultaneously minimizing environmental harm.

They also indicated that it involves procedures and measures to ensure value for money throughout the entire life cycle, counting for the profitable, environmental, social, and ecological issues associated with the procurement of goods, works, and services while causing no or little detriment.

### Sustainable Public Procurement in the Construction Industry

As stated by Bamgbade et al. (2017), the construction sector significantly contributes to a nation's economic and social advancement, but concurrently imposes substantial environmental harm. Bo et al. (2015) highlight that the construction industry accounts for approximately 10% of the global economy. Xia et al. (2015) emphasize that due to its vast size, extensive resource consumption, and profound impact on the built, natural environment, and society, the construction industry plays a pivotal role in embracing sustainable development principles. The industry contributes to long-term progress by providing human (labor), social (welfare), and environmental capital. Rode et al. (2011) reveal that roughly 10% of global energy consumption is used for producing building materials. Construction and demolition activities generate over 40% of solid waste in developed nations, while construction materials contribute to about 40% of total global greenhouse gas emissions.In Ghana, the construction sector contributes an average of 14.34% to the country's Gross Domestic Product,

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as reported by the Ghana Statistical Service (2018), which emerged as the second largest job creator between 2009 and 2013. Despite these insights, the construction industry has struggled to fully integrate sustainable principles into their procurement choices (Islam et al., 2016). Scientific literature indicates that the construction industry lags behind other sectors in the adoption and implementation of sustainability measures, as observed by Brennan and Cotgrave (2014).Governments at national and international levels are under significant pressure from various organizations to formulate and enact policies and strategies for sustainable procurement (Islam et al., 2016; Wong et al., 2016; Meehan and Bryde, 2015). The growing legal and regulatory concerns are pushing institutions to adopt sustainable procurement strategies for reduced environmental impact (Islam et al., 2016). It is widely acknowledged that clients not only influence the selection of building materials but also impact the choice of stakeholders, including consultants and contractors. Such a decision-making process can largely affect the adoption of sustainable sourcing practices (Wilkinson et al., 2015; Glass et al., 2011). Given this, active participation from government entities in the construction sector is essential for formulating and executing SP policies that prioritize sustainable development principles (Islam et al., 2016).

### Barriers to Sustainable Procurement Compliance

Despite Global and national efforts to integrate sustainability in public procurement, there are still obstacles that vitiate these efforts, particularly at the tendering stage of the public-works procurement. Barriers to sustainable procurements encompass challenges in altering procurement practices, a lack of contractors offering sustainable projects, products, or services, complexities in conducting cost/ value assessments, challenges in integrating factors beyond environmental considerations, and a perception that the process and outcomes are more expensive or time-consuming (UN, 2016). The most constantly cited barriers to sustainable procurement include the perception that it increases costs, a limited understanding of the necessity for sustainable procurement and its associated processes, insufficient expertise, client risk aversion, regulatory constraints, leadership challenges, and inertia (Sustainable Development Commission, 2004). Also, regular practice of an organization establishes a sense of dependability, making processes habitual. Consequently, changes become more challenging, as it would disrupt the established routine (Meehan and Bryde, 2011; Belfast et al., 2011). Another issue is the provocation of conflict. Procurement professionals may feel compelled to disagree with the sustainable procurement plan. This might indicate a contradiction between the constraints on workers and the more vital driving force prompting them to continue the other conventional approach.

The third hedge is a hollow formality. Though numerous companies validate sustainable procurement strategies in their periodic reports, it would be intriguing to learn how important these programs impact procurement opinions within a company. Ruparathna and Hewage (2015) observed in a study that the absence of sustainability criteria in tender assessment was the most critical debit of sustainable procurement. Other factors include a need for more traditional procurement styles and an understanding of the actual reality. According to McMurray, (2014), the main issues militating against sustainable procurement were a lack of capability, a lack of coffers, a lack of a long-term

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approach to procurement choices, a lack of assistance, and a lack of political backing. A study by Adham and Siwar (2012), revealed that challenges in measuring SP technologies mainly revolve around criteria at the tender evaluation stage including the choice of metrics and scoring methods. Opoku et al. (2019) also examined obstacles impeding built environment consultants in promoting the environmental sustainability (ES) of construction projects. The main findings from their research encompass perceived initial cost, limited understanding of environmentally sustainable (ES) practices, technological challenges, external influences affecting the adoption of environmental sustainability (ES) approaches, and environmental circumstances in developing countries. Ayarkwa et al. (2020) investigate obstacles to implementing environmentally sustainable procurement in public universities. The study findings indicate that eight primary barriers impede the effective adoption of environmentally sustainable procurement in public universities. These obstacles include inconsistencies in decision-making, centralization/decentralization challenges, resistance to change, challenges in interacting with government agencies, collaboration among stakeholders, deficient planning, insufficient budget allocation, and a lack of training for procurement professionals and suppliers. Using Ghana as an example, Mensah and Ameyaw (2012) contended that to achieve sustainable procurement in a developing nation, the following obstacles need attention: inadequate internal management structures supporting sustainable procurement, insufficient social commitment from key stakeholders, a lack of technical and management capacity, an ineffective stakeholder management approach, high initial costs linked to green products, insufficient stakeholder education, a lack of government interest and political will, corruption among procurement practitioners, and restricted capacity for small-scale suppliers and contractors.

*They concluded that the primary barriers to sustainable procurement practice in Ghana were insufficient comprehension of the sustainable procurement concept and higher initial costs associated with sustainable procurement. In the context of another developing country, Ross (2012) identified barriers as a legal framework and guidelines that discourages sustainable public procurement, inadequacies in capacity, guidance materials and practical tools, the complication of sustainable public procurement, perceived increased costs, and rigid budgetary mechanism. Given that the degree of implementation and the hurdles to implementation differ by country, the goal of this study is to examine the specific factors that constitute barriers to compliance with Sustainable Public-works Procurement at the tendering stage in Ghana.*

***Table 1. List of barriers from previous publications***

| Item | Barriers | References |
|---|---|---|
| 1 | Lack of knowledge and awareness of sustainability concepts and practice | Oyewobi and Jimoh (2022); Murphy et al. (2021); Dza et al. (2021); Ayarkwa et al. (2020); Oluwabukunmi et al. (2019); Opoku et al. (2019); Sourani and Sohail (2019); Wanner and Probstl-Haider (2019); Iles and Ryall (2016); Djokoto et al. (2014); Mcmurray et al. (2014); Sourani and Sohail (2011) |



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|---|---|---|
| 2 | Perception of higher initial associated costs on sustainable projects | Murphy et al. (2021); Opoku et al. (2019); Wanner and Probstl-Haider (2019); Djokoto et al. (2014); Bangdome-Dery et al. (2014); Laryea, et al. (2013); Mensah and Ameyaw, (2012); Sourani and Sohail (2011) |
| 3 | Reluctance in embracing new knowledge or Resistance to change | Oyewobi and Jimoh (2022); Dza et al. (2021); Sourani and Sohail (2019); Oluwabukunmi et al. (2019); Iles and Ryall (2016), Sourani and Sohail (2011); Djokoto et al. (2014) |
| 4 | Lack of regulatory framework for sustainable public procurement | Oluwabukunmi et al. (2019); Wanner and Probstl-Haider (2019); Murphy et al. (2021); Djokoto et al. (2014); Sourani and Sohail (2019) |
| 5 | Insufficient time to address sustainability issues | Oyewobi and Jimoh (2022); Jimoh, (2022); Dza et al. (2021); Sourani and Sohail (2019); Oluwabukunmi et al. (2019); Sourani and Sohail (2011) |
| 6 | Inadequate training and education in sustainable procurement | Oyewobi and Jimoh (2022); Opoku et al. (2019); Mensah and Ameyaw (2012); Djokoto et al. (2014) |
| 7 | Lack of motivation or incentives for the implementation | Oluwabukunmi et al. (2019); Opoku et al. (2019); Djokoto et al. (2014) |
| 8 | Slow uptake on sustainable public procurement concept | Asman et al. (2019); Woodcraft (2012); Boschetti et al. (2012) |
| 9 | lack of planning and coordination, | Murphy et al. (2021); Wanner and Probstl-Haider (2019) |
| 10 | Corruption among procurement practitioners | Oluwabukunmi et al. (2019); Mensah and Ameyaw (2012) |
| 11 | lack of expertise | Murphy et al. (2021); Wanner and Probstl-Haider (2019); Djokoto et al. (2014) |
| 12 | Vagueness of sustainability definitions and interpretations | Dza et al. (2021); Sourani and Sohail (2019); Sourani and Sohail (2011) |

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|---|---|---|
| 13 | Insufficient research and development on Sustainable Procurement | Dza et al. (2021); Sourani and Sohail (2019); Sourani and Sohail (2011) |
| 14 | Lack of government/ political will | Oyewobi and Jimoh (2022); Mensah and Ameyaw (2012) |
| 15 | Lack of sustainability measurement tools | Oyewobi and Jimoh (2022); Djokoto et al. (2014) |
| 16 | Insufficient understanding of the Sustainable Procurement Concept | Mensah and Ameyaw (2012) |
| 17 | Lack of sustainable technologies | Opoku et al. (2019); Djokoto et al. (2014) |
| 18 | Lack of human resources capacity | Oluwabukunmi et al. (2019) |
| 19 | Cognitive abilities | Griessler and Littig (2005) |
| 20 | Lack of enforcement of relevant laws | Oluwabukunmi et al. (2019) |
| 21 | Lack of demand from stakeholders on sustainability incorporation | Djokoto et al. (2014) |
| 22 | Lack of expertise | Djokoto et al. (2014) |
| 23 | Lack of government support | Djokoto et al. (2014) |
| 24 | Inadequate database and access to information | Djokoto et al. (2014), |
| 25 | Less priority on sustainability | Bangdome-Dery et al. (2014) |
| 26 | Lack of design and construction team | Opoku et al. (2019), |

*Source: Author construct, (2023)*

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## Methodology

### Approach/Strategy

Mix-method research involving literature review, interviews, and questionnaire survey was adopted. As a result, qualitative and quantitative paradigms were utilised. The first stage was conducted using a qualitative research approach. Based on the comprehensive literature review, semi-structured questions were asked of Nine (9) experts (construction professionals and researchers in procurement and sustainable development from public universities and consultancy firms) possessing a minimum of ten years of experience in the construction industry. These experts were asked to comment on whether the barriers indicated in the literature apply to the Ghanaian construction industry and to aid in the improvement and merging of pertinent barriers to sustainability compliance at the tender evaluation stage of works procurement. The interviews validated the existence of 17 barriers, with nine barriers either rejected or integrated into the identified barriers in the questionnaire.

### Sampling technique and sampling size

The selection of respondents for questionnaire administration utilized purposive sampling.

(Fellows and Liu, 2015) Professionals who have been involved in the procurement of public-works at the public universities in Ghana. This includes procurement professionals at the universities physical and development offices, consultants on university projects and sustainable construction experts. A total of 96 surveys were administered purposefully online (using Google forms) and in person.

### Analysis of data

Quantitative analysis of the survey data was conducted using the IBM Statistical Package for Social Scientists (SPSS) Version 23. As outlined by Dawson (2019), this methodology allows for the quantitative exploration of a diverse range of respondent opinions. Furthermore, utilizing this approach improves the overall applicability of research findings and outcomes (Tezel et al., 2018). Principal Component Factor Analysis (PCFA) was used to examine the fundamental connections between the identified barriers.

## Results and discussions

### Respondents Biodata

Respondents were requested to submit general information, to better inform the researcher about the reliability and validity of the responses being gathered, such as their greatest degree of education and years of experience in their respective field. They were also asked if they had any experience with sustainable procurement training. Table 2.10 provides an accurate overview of the data gathered.

*Table 2.10: Background of the respondents for the questionnaire survey*

| Respondent Background | Frequency | Percentage |
|---|---|---|
| **Educational level** | | |
| HND. | 4 | 4.2 |
| BSc. | 14 | 14.6 |

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| | | |
|---|---|---|
| MSc. | 52 | 54.2 |
| Ph.D. | 26 | 27.1 |
| **Professional position** | | |
| Quantity Surveyor | 48 | 50.0 |
| Engineer | 14 | 14.6 |
| Architect | 16 | 16.7 |
| Procurement Officer | 10 | 10.4 |
| Project Manager | 8 | 8.3 |
| **Years of Experience** | | |
| Less than 3 yrs | 2 | 2.1 |
| 3 - 6 yrs | 2 | 2.1 |
| 6 - 9 yrs | 20 | 20.8 |
| 10 years and above | 72 | 75.0 |
| **Building Projects Undertaken During the Last Six Years** | | |
| 1-5 projects | 25 | 26.0 |
| 5-10 projects | 27 | 28.1 |
| 10- 15 projects | 35 | 36.5 |
| 15-20projects | 9 | 9.4 |
| **Any Training in Sustainable Procurement?** | | |
| Yes | 32 | 33.3 |
| No | 64 | 66.7 |

*Source: Field survey, (2023)*

### Barriers to Compliance with Sustainable Public Procurement of Works

Barriers are channels and qualities that prevent system development and implementation (Agyekum, 2018). The goal was to use mean score and primary factor analysis to analyze the major impediments to sustainable public-works procurement, as detailed in Chapter Three. A total of twenty-six (26) factors were discovered through literature research to accomplish this. A pilot study was conducted in-which certain factors were eliminated or added to the list. Ten (10) professionals (quantity surveyors, procurement officials, sustainability experts, and academics) with at least ten years of experience were asked to answer semi-structured questions. After the pilot study, seventeen (17) factors were concluded and Professionals in the construction industry were provided with questionnaires utilizing a Likert scale, ranging from Very low to Very high using purposive and snowball sampling techniques. The survey data was analyzed in two distinct ways using the IBMS Statistical Package for Social Scientists (SPSS) Version 23. The initial step involved ranking the critical obstacles based on their mean scores. Subsequently, the second step entailed examining the fundamental connections among the prominent obstacles through Principal Component Factor Analysis. Principal Component Factor Analysis may reduce data to a readily accessible form. A reliability test was performed to ensure that the consistency of the barriers accurately reflects the construct that was measured statistically (Norusis



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1993; Ameyaw 2014). The overall alpha value obtained from the dataset was 0.803, exceeding the recommended threshold of 0.70 (Eybpoosh et al., 2011; Oyedele, 2013). This indicates that the data acquired from the field check had substantial internal consistency and reliability. Based on that, the five-point scale system was reliable.

**Ranking of Critical Barriers to Compliance with Sustainable Public Procurement of Works**

The relative applicability of each detected variable was also determined using a mean score ranking. Consistent with the expected risk level, the significance threshold was also set at 95. Moreover, in cases where two or more variables share the same mean, the one with the smallest standard deviation is assigned the highest ranking (Field, 2005). The mean indicators span from 2.69 to 4.39; nevertheless, variables within the range of 3.50 to 4.39 were considered as having lower and maximum inflexibility. Table 4.11 indicates the slow uptake on the conception of sustainable public–works procurement, perceived high costs of adopting sustainable solutions against lower returns on sustainable public-works procurement projects, the vagueness of definitions and variety of interpretations, lack of awareness and knowledge of sustainability concepts, difficulty in embracing new knowledge or change, lack of enforcement of relevant laws was identified as the most severe factor in terms of critical barriers to compliance with Sustainable Public Procurement of works.

On the other hand, inadequate training and education, insufficient research and development on Sustainable Procurement, lack of planning, and unfamiliarity with sustainable technologies was deemed the more severe factors in terms of critical barriers.

Overall, Slow uptake on the concept of sustainable public works procurement was ranked first (1st) with a mean score of 4.39. Perceived higher costs of adopting sustainable solutions against lower returns on sustainable public-works procurement projects was ranked second with a mean of 4.35. This was followed by Vagueness of definitions and variety of interpretations with a mean of 4.16. The least ranked barriers include Lack of motivation for practitioners; corruption; Lack of expressed interest and demand from stakeholders on sustainability incorporation of mean 2.73, 2.71, and 2.69 respectively. These barriers had a mean score of less than 3.0 and hence considered the barriers with the least severity. Except for the lack of awareness of sustainable public works procurement factors and the absence of appropriate time to address sustainability enterprises during tender, further exploration revealed that the variables had standard diversions lower than 1.0. This shows that respondents are harmonious, and the dataset has a low variation (Field, 2005). The variables with a standard deviation exceeding 1.0, on the other hand, suggest a notable disparity in how respondents scored these factors.

***Table 4.1: Mean Score ranking of critical barriers to sustainable procurement***

| Code | Barriers | Mean | Std. Deviation | Cronbach's Alpha |
|---|---|---|---|---|
| BSP 1 | Slow uptake on the concept of Sustainable Public-works Procurement | 4.39 | .622 | |

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|---|---|---|---|---|
| BSP 2 | Perceived higher costs of adopting sustainable solutions against lower returns on Sustainable Public-works Procurement projects | 4.35 | .632 | |
| BSP 3 | Vagueness of definitions and variety of interpretations | 4.16 | .701 | |
| BSP 4 | Lack of awareness and knowledge of sustainability concepts | 4.08 | .660 | |
| BSP 5 | Difficult in embracing new knowledge or change | 4.02 | .725 | .803 |
| BSP 6 | Lack of enforcement of relevant laws | 4.01 | .718 | |
| BSP 7 | Inadequate training and education | 3.92 | .981 | |
| BSP 8 | Insufficient research and development on SP | 3.91 | .769 | |
| BSP 9 | Lack of planning | 3.90 | .852 | |
| BSP 10 | Unfamiliarity with sustainable technologies | 3.75 | .995 | |
| BSP 11 | Lack of regulatory framework for Sustainable Public-works Procurement implementation | 3.38 | .932 | |
| BSP 12 | Lack of understanding of Sustainable Public-works Procurement factors | 3.33 | 1.012 | |



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| | | | |
|---|---|---|---|
| BSP 13 | Lack of human resources capacity | 3.12 | .976 |
| BSP 14 | Insufficient time to address sustainability issues during the tender | 3.00 | 1.170 |
| BSP 15 | Lack of motivation for practitioners | 2.73 | 1.000 |
| BSP 16 | Corruption | 2.71 | .983 |
| BSP 17 | Lack of expressed interest and demand from stakeholders on sustainability incorporation | 2.69 | .966 |

*Source: Researcher's survey (2023)*

**Factor Analysis of the Critical Barriers**

Barriers are channels and qualities that prevent system development and implementation (Agyekum, 2018). The goal was to use primary factor analysis to assess the significant barriers to sustainable public-works procurement. This method was used to identify the underpinning links between the seventeen (17) essential variables. This approach, as indicated by Ahadzie (2007), Oyedele (2013), and Kissi et al. (2014), aids in statistically reducing variables to an easily understood framework. The Kaiser- Meyer- Olkin (KMO) measure of adequacy and Bartlett's test sphericity are used to assess the applicability of the primary factor analysis. The KMO test result of 0.635 (Table 4.2) indicates that the data set was suitable because it surpassed the required threshold of 0.5 (Norusis, 1993). Likewise, the result of Bartlett's test of sphericity was good, with a value of 633.761 and a significance of (p = 0.000). Ameyaw (2014) and Lattin et al. (2003) conclude that the correlation matrix is not identifiable.

***Table 4.2: KMO and Bartlett's Test***

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .635 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 633.761 |
| | Df | 136 |
| | Sig. | .000 |

*Source: Researcher's survey (2023)*

Based on principal component factor analysis, four factors with eigenvalues greater than 1.00 were utilized, and Varimax rotation after five duplications were employed to explain 58.97 of the total variance. Further examination of the extracted variable loadings across various factors reveals significant item loadings, with each variable exceeding the recommended threshold of

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0.32. (Tabachnick and Fidell, 2001 Ameyaw, 2014). These loadings reflect their contribution to the underpinning factors, with reasonably high factor loadings above 0.60 confirming the acceptability of the sample size.

Table 4.3 depicts the four major components and their related variables, which are interpreted as follows:

• Component 1: Adaptability to Sustainable Public-works Procurement

• Component 2: Managerial Challenges

• Component 3: Knowledge incapacity

• Component 4: Legal, Policy, and Evaluation

*Table 4.3: Rotated Component Matrix*

| | **Component** | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Slow uptake on the concept of Sustainable Public-works Procurement | .769 | | | |
| Lack of understanding of Sustainable Public-works Procurement factors | .794 | | | |
| Perceived higher costs of adopting sustainable solutions against lower returns on Sustainable Public-works Procurement projects | .612 | | | |
| Lack of planning | .762 | | | |
| Inadequate training and education | .763 | | | |
| Unfamiliarity with sustainable technologies | .619 | | | |
| Vagueness of definitions and variety of interpretations | .557 | | | |
| Insufficient time to address sustainability issues during the tender | | .740 | | |
| Lack of expressed interest and demand from stakeholders on sustainability incorporation | | .707 | | |
| Lack of motivation for practitioners | | .716 | | |
| Lack of human resources capacity | | .708 | | |
| Lack of awareness and knowledge of sustainability concepts | | | .879 | |
| Difficult in embracing new knowledge or change | | | .759 | |
| Lack of enforcement of relevant laws | | | .572 | |
| Lack of regulatory framework for Sustainable Public-works Procurement implementation | | | | .779 |

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| | |
|---|---|
| Insufficient research and development on SP | .612 |
| Corruption | .558 |

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

*Source: Researcher's survey (2023)*

### Component 1 – Adaptability to Sustainable Public Works Procurement

The seven barrier factors identified for component 1 were slow uptake on the concept of sustainable public-works procurement (76.90%), lack of understanding of sustainable public-works procurement factors (79.4%), perceived higher costs of adopting sustainable solutions against returns on sustainable public-works procurement projects (61.20%), Lack of planning (76.2%), Inadequate training and education (76.3%), unfamiliarity with sustainable technologies (61.9%) and vagueness of definitions and variety of interpretations (55.7%). The factor loadings, represented within parentheses, indicate that this cluster contributed to 25.905% of the variance (Table 4.4). Commonalities within this cluster include a general connection to adaptability, knowledge, and awareness of sustainable public-works procurement. Mensah and Ameyaw (2012) argue that a lack of understanding of sustainable procurement is a significant hindrance to sustainable procurement in Ghana. They also concluded that very few procurement practitioners appreciate Sustainable Procurement as an approach that incorporates the environmental, economic, and social aspects of sustainability. This implies that not much difference has been realized before and after the amendment of the Public Procurement Act 2003. United Nations (2016) also highlighted as an impediment to long-term procurement the habit and the difficulties of altering purchasing behavior.

### Component 2 – Inadequate Managerial Capacity

The main component accounts for 15.461 percent of total variances and includes four specific variables: insufficient time to address sustainability issues during tender (74.0 percent), lack of expressed interest and demand from stakeholders on sustainability incorporation (70.7 percent), lack of motivation for practitioners (71.6 percent), and insufficient capacity of human resources (70.80 percent) (Table 4.4). This component was named Inadequate managerial capacity. The adoption of Sustainable Public works procurement requires good managerial and planning skills by the Employer, Consultant, and Contractor. The idea that the process and results are time-consuming is one of the major hurdles to sustainable procurement (United Nations, 2016; Renukappa et al., 2015).

### Component 3 – Knowledge incapacity

Component three identified barriers were a lack of awareness and knowledge of sustainable principles (87.9 percent), difficulty adopting new information or change (75.9 percent), and a lack of enforcement of appropriate legislation (57.2 percent). The number in parenthesis is the factor loadings. This cluster was responsible for 10.74 percent of the variation (Table 4.4). According to Olanrewaju et al. (2014), the level of knowledge of sustainability in construction among industry practitioners is

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modest. McCarthy (2011) contends that every project, particularly public infrastructure, should have a well-articulated sustainability objective. Furthermore, where practicable, procurement sustainability criteria should be contractually enforced (Ogunsanya et al., 2022). At the initial stages of the project, standards and measurement criteria should be established to ensure compliance. If this is not done at the procurement stage subsequent implementation of sustainability will be difficult during the execution stage of the project.

### Component 4 – Legal, Policy, and Evaluation

The fourth component was labeled as Legal, policy, and evaluation factors collectively accounted for 6.866 of the total variances not explained by the other three factors. (Table 4.4). This assumption agrees with UNODC (2019), which alleges that approximately 20-25% of global procurement funds are siphoned off due to corrupt practices. Eyo (2017) found that deeply rooted corruption diminishes the constrained funds accessible for public expenditures on a macro level and suggests the implementation of stronger regulatory frameworks at the micro or institutional level to tackle the misconduct of public officials in sustainable public procurement in Africa. The research aligns with Elegbe's (2012) assertion that the Public Procurement Authority lacks adherence to international best practices regarding transparency. This deficiency is evident in the absence of specific guidelines for determining the required threshold for performance bonds, granting considerable discretion to procurement authorities, and leaving room for potential abuse in procurement decisions.

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***Table 4.4: Total Variance Explained Extraction Method: Principal Component Analysis***

| | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| Component | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 4.404 | 25.905 | 25.905 | 4.404 | 25.905 | 25.905 | 3.293 | 19.373 | 19.373 |
| 2 | 2.628 | 15.461 | 41.366 | 2.628 | 15.461 | 41.366 | 2.692 | 15.835 | 35.208 |
| 3 | 1.826 | 10.740 | 52.107 | 1.826 | 10.740 | 52.107 | 2.239 | 13.172 | 48.380 |
| 4 | 1.167 | 6.866 | 58.973 | 1.167 | 6.866 | 58.973 | 1.801 | 10.592 | 58.973 |
| 5 | 1.139 | 6.703 | 65.675 | | | | | | |
| 6 | .937 | 5.510 | 71.186 | | | | | | |
| 7 | .774 | 4.553 | 75.739 | | | | | | |
| 8 | .731 | 4.303 | 80.042 | | | | | | |
| 9 | .668 | 3.928 | 83.969 | | | | | | |
| 10 | .548 | 3.221 | 87.190 | | | | | | |
| 11 | .527 | 3.101 | 90.292 | | | | | | |
| 12 | .430 | 2.528 | 92.819 | | | | | | |
| 13 | .353 | 2.077 | 94.896 | | | | | | |
| 14 | .312 | 1.834 | 96.730 | | | | | | |
| 15 | .257 | 1.513 | 98.243 | | | | | | |
| 16 | .159 | .938 | 99.181 | | | | | | |
| 17 | .139 | .819 | 100.000 | | | | | | |

*Source: Researcher's survey (2023)*

## Conclusions and Recommendations

Existing research indicates that the construction sector is critical to Implementing sustainable procurement practices in the attainment of the Sustainable Development Goals.Top of Form

However, significant impediments to effective and efficient compliance with sustainable public-works procurement exist. Scientific literature also suggests that these barriers may differ by nation due to socioeconomic, demographic, and cultural factors. However, empirical studies are scarce on the specific barriers to compliance with sustainable public-works procurement at the tender evaluation stage, particularly in developing countries. Hence, this study identifies the specific barriers to compliance with sustainable public-works procurement at the tender evaluation stage. Seventeen (17) barriers were identified through literature review and expert opinion. The data were analyzed and discussed using the Principal Component Analysis (PCA) variant of factor analysis, which classified the variables into four (4) clusters: (1) adaptability to sustainable public-works procurement cluster; (2) managerial

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challenges cluster; (3) knowledge incapacity cluster; and (4) legal, policy, and evaluation cluster.

This study is one of the few studies that focus on the barriers to sustainable public-works procurement at the tendering stage of building projects. The study offers insight into the specific obstacles that inhibit compliance with sustainable public-works procurement during the tendering stage in Ghana and adds to the body of knowledge. The study also offers a basis for practitioners and scholars to understand the specific barriers that need much attention to improve compliance levels with sustainable public-works procurement in Ghana, as well as the need to strengthen compliance. It is recommended that the benefits of sustainable public-works procurement should be made known to practitioners to improve its adoption within the construction industry and increase research into the field of sustainable procurement to allow for improved knowledge and awareness of the concept.



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