

Factors Influencing Sustainable Public Procurement Management in Bauchi State, Nigeria

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Abstract

Purpose – Sustainable public procurement (SPP) is widely promoted as a lever for meeting development goals, yet its uptake among sub-national public institutions in Nigeria remains limited and is poorly documented at the level of specific enabling factors. This study examines how four factors identified by the Bauchi State Bureau of Public Procurement (risk evaluation, technology, procurement training, and transparent procurement rules) are perceived to influence sustainable public procurement management.

Design/methodology/approach – A cross-sectional descriptive survey was administered to procurement personnel drawn from three public institutions responsible for procurement in Bauchi State: the Bureau of Public Procurement, the Public Service Commission, and the Ministry of Finance. From a population of 180 staff, a sample of 123 was determined using Krejcie and Morgan's (1970) table; 119 usable structured questionnaires (96.7% response rate) were analysed using descriptive statistics (means, standard deviations and rank ordering).

Findings – Economic efficiency (cost-effectiveness while meeting sustainability goals) was the most highly rated risk-evaluation consideration; digital procurement platforms and e-procurement systems were the most valued technological enabler; enhancement of staff knowledge of sustainable-procurement principles was the most valued training outcome; and reduced corruption with enhanced accountability was the most valued benefit attributed to transparent procurement rules.

Practical implications – The findings support targeted investment in e-procurement and digital infrastructure, mandatory sustainability-focused training and certification for procurement personnel, and stronger enforcement of transparent procurement rules as practical levers for advancing sustainable procurement in Nigerian sub-national government.

Originality/value – The study offers one of the first factor-level, empirically grounded accounts of sustainable procurement enablers within a Nigerian state-level procurement bureaucracy, situating Triple Bottom Line, Technology Acceptance, and Technology–Organization–Environment perspectives within an under-researched sub-national public-sector setting.

Keywords: Sustainable procurement; public procurement; e-procurement; risk evaluation; procurement training; transparency; Nigeria; Bauchi State

1. Introduction

Procurement is the process through which organizations acquire the goods, works and services needed to execute their mandates, and has traditionally been evaluated against three criteria: cost, quality and delivery. Sustainable procurement (SP) extends this remit by embedding environmental and social considerations into sourcing decisions, in line with the Brundtland Commission's definition of sustainable development as development that meets present needs without compromising the ability of future generations to meet their own (World Commission on Environment and Development [WCED], 1987). International standards such as ISO 20400 have since formalised sustainable procurement as procurement that generates the most positive environmental, social and economic impact across the life cycle of a good or service. Because public bodies are among the largest buyers in most economies, governments increasingly use their purchasing power to advance social and environmental policy objectives alongside conventional value-for-money goals.

Despite this global momentum, empirical evidence on how public procurement institutions in developing countries are operationalising sustainability remains scarce and is scarcer still at the sub-national level. In Nigeria, public infrastructure delivery continues to be characterised by delays, cost overruns and project abandonment, outcomes that sit uneasily alongside stated commitments to sustainable development and suggest that sustainability considerations are not yet firmly embedded in procurement practice. Digitalisation is increasingly presented as part of the solution: e-procurement portals, data-driven monitoring and related digital tools are being adopted across public procurement systems worldwide, but their uptake depends on infrastructure, staff skills and organisational readiness that vary considerably across contexts. The Bauchi State Bureau of Public Procurement (2020) identifies risk evaluation, technology adoption, procurement training and transparent procurement rules as the principal areas through which sustainable public procurement management is being pursued, and equally where implementation challenges arise. However, the relative weight that procurement personnel themselves attach to specific dimensions of each of these four factors has not previously been documented empirically. This gap motivates the present study, which set out to:

- i. . determine how risk evaluation influences sustainable public procurement management in Bauchi State;
- ii. investigate how technology influences sustainable public procurement management in Bauchi State;
- iii. investigate how procurement training influences sustainable public procurement management in Bauchi State; and
- iv. examine how transparent procurement rules influence sustainable public procurement management in Bauchi State.

By reporting how procurement personnel in one of Nigeria's largest and fastest-growing states rank the sub-dimensions of each factor, the study contributes an empirical, factor-level baseline that can inform both policy design and future hypothesis-driven research on sustainable procurement in sub-national African government. The remainder of the paper reviews the relevant literature and theoretical framework, describes the survey methodology, presents the descriptive findings, and discusses their implications, limitations and directions for future research.

2. Literature Review and Theoretical Framework

2.1 Sustainable procurement

Sustainable procurement broadens conventional purchasing criteria to incorporate environmental stewardship, social responsibility and long-term economic value alongside cost, quality and delivery. It is widely treated as one of several sustainable supply chain activities

through which a focal organisation extends sustainability objectives to its suppliers and, ultimately, to the wider economy (Carter & Rogers, 2008). Cross-country and sectoral studies of green and sustainable public procurement generally report that adoption is driven by a combination of regulatory pressure, top-management commitment, and the availability of enabling infrastructure, but that translating policy commitment into everyday purchasing behaviour remains difficult even where formal frameworks exist (Appolloni, Sun, Jia & Li, 2014; Adham & Siwar, 2012; Bratt, 2011; Bouwer et al., 2006).

2.2 Risk evaluation and performance indicators

Risk-based approaches to procurement management link cost-effectiveness, environmental exposure, social responsibility and supply-chain continuity within a single evaluative frame. Carter and Rogers (2008) argue that sustainable supply chain management requires organisations to manage economic, environmental and social risks jointly rather than treating cost efficiency and sustainability as competing goals; effective sourcing and supplier-relationship practices are associated with both cost savings and improved supplier accountability. This literature underpins the expectation that procurement personnel would rate economic efficiency and environmental impact among the most salient risk-evaluation considerations shaping sustainable procurement practice.

2.3 Technology and e-procurement

A substantial literature links digital technology adoption to improved efficiency, transparency and sustainability in procurement and supply chain management. E-procurement systems reduce information asymmetry between buyers and suppliers and have been shown to improve project outcomes in public infrastructure procurement (Chen & Hu, 2020); in the public sector specifically, e-procurement adoption is associated with measurable gains in supply-chain performance, albeit unevenly across institutions (Mugera & Iddrisu, 2019). Emerging technologies extend this potential further: blockchain applications are increasingly proposed as a mechanism for strengthening supply-chain transparency and traceability (Kim, Lacity & Vician, 2020), while artificial intelligence and big-data analytics are positioned as tools for risk assessment and evidence-based procurement decision-making (Kumar, Luthra, Haleem, Mangla & Barua, 2021). At the same time, technology adoption in supply chains is contingent on organisational and environmental readiness rather than technical availability alone (Heckmann, Comes, Nickel & Garcia-Herreros, 2019; Sarkis & Zhu, 2018), which suggests that infrastructure and skills gaps can blunt the sustainability benefits of otherwise promising digital tools; a pattern also observed in Nigerian manufacturing and supply-chain settings (Idowu, Afolabi & Oke, 2020; Amankwah-Amoah, Khan & Wood, 2019).

2.4 Procurement training and capacity building

Capability development is repeatedly identified as a precondition for translating sustainability policy into procurement practice. Where procurement personnel lack up-to-date knowledge of sustainability principles, compliance requirements and emerging digital tools, technology and rule-based interventions are less likely to be applied consistently (Heckmann et al., 2019; Amankwah-Amoah et al., 2019). This underpins calls for periodic, needs-based training and alignment with international professional certification bodies as a route to embedding sustainable procurement competence within public institutions.

2.5 Transparency and procurement rules

Transparent, rules-based procurement is consistently linked to reduced corruption, fairer competition and stronger public trust. By reducing information asymmetry between procuring entities and suppliers, digitally enabled and rules-based procurement processes make it harder

to conceal preferential treatment or non-compliance, thereby strengthening accountability (Chen & Hu, 2020). Green and sustainable procurement research similarly identifies clear guidelines and enforcement mechanisms as necessary complements to technology and training, since discretionary, poorly monitored procurement processes tend to undermine both anti-corruption and sustainability objectives (Appolloni et al., 2014).

2.6 Theoretical framework

The study draws on three complementary theories. The Triple Bottom Line (TBL) framework (Elkington, 1998) provides the normative basis for treating economic, environmental and social outcomes as jointly necessary criteria for sustainable procurement and underlies the risk-evaluation construct examined here. The Technology Acceptance Model (TAM) (Davis, 1989) explains why perceived usefulness and ease of use shape whether procurement personnel engage with e-procurement platforms and digital tools, informing the technology construct. The Technology–Organization–Environment (TOE) framework (Tornatzky & Fleischer, 1990) situates technology adoption within organisational capacity (including training) and the external regulatory environment (including procurement rules), providing the conceptual bridge between the study's technology, training and transparency constructs. Read together, these three perspectives justify treating risk evaluation, technology, training and transparent rules as related but analytically distinct enablers of sustainable public procurement management, which the survey instrument operationalised as four separate constructs.

3. Methodology

3.1 Research design

The study adopted a cross-sectional descriptive survey design, appropriate for capturing the perceptions of a defined population of procurement personnel at a single point in time regarding the factors shaping sustainable procurement management in their institutions.

3.2 Population, sample and sampling technique

The study population comprised 180 procurement personnel across three public institutions that constitute the core of Bauchi State's procurement machinery: the Bauchi State Bureau of Public Procurement, the Public Service Commission, and the Ministry of Finance. These three institutions were purposively selected because they are directly responsible for procurement policy, oversight and execution in the state. Using Krejcie and Morgan's (1970) table for determining sample size from a known population, a minimum sample of 123 respondents was required; within each institution, individual respondents were then selected by simple random sampling.

3.3 Instrumentation

Data were collected using a structured questionnaire comprising two sections: respondent demographic information (age, educational qualification, gender and years of experience), and four construct blocks of five-point Likert-type items corresponding to the study's four objectives — risk evaluation and performance indicators, technology, procurement training, and transparent procurement rules. Item content was informed by the sustainability and procurement literature reviewed above and by challenges identified in the Bauchi State Bureau of Public Procurement's (2020) own assessment. The instrument's content was reviewed by the research supervisor prior to administration; a formal internal-consistency reliability statistic (e.g., Cronbach's alpha) was not computed for the multi-item scales, which we flag explicitly as a limitation in Section 7.

3.4 Data collection and analysis

Questionnaires were administered face-to-face by the researcher and trained field assistants across the three participating institutions. Of the 123 questionnaires distributed, 119 usable responses were returned, giving a response rate of 96.7%. Data were analysed descriptively in SPSS (version 26), using frequencies and percentages for demographic variables, and means, standard deviations and rank ordering to identify the sub-dimensions of each construct that respondents rated most influential. Because the analysis is descriptive, the findings should be interpreted as indicative priority-rankings of perceived influence rather than as statistically tested causal effects; no inferential or multivariate procedures (e.g., correlation, regression or structural equation modelling) were conducted to test the significance or direction of relationships between the four factors and sustainable procurement outcomes.

4. Results

4.1 Response rate and respondent profile

Table 1 summarises the questionnaire distribution and return rate.

Table 1. Questionnaire distribution and response rate

Item	Number	Percentage (%)
Questionnaires distributed	123	100.0
Usable questionnaires returned	119	96.7

Source: Field survey, 2025.

Table 2. Demographic profile of respondents (n = 119)

Variable	Category	Frequency	Percentage (%)
Age	25–35 years	15	12.60
	35–45 years	40	33.61
	45–55 years	48	40.33
	55 years and above	16	13.44
Educational status	Diploma	9	7.56
	HND	55	46.21
	B.Tech/B.Sc.	39	32.77
	M.Sc. and above	16	13.44
Gender	Male	79	66.38
	Female	40	33.61
Years of experience	1–5 years	20	16.81
	5–10 years	35	32.77
	10–15 years	39	29.41
	15 years and above	25	21.01

Source: Field survey, 2025. Note: the 10–15 years experience category is reported at 29.41%, which, together with the other categories, totals 100.02% owing to rounding in the original survey computation.

The respondent profile indicates a predominantly experienced, male and moderately senior workforce: 40.3% of respondents were aged 45–55 years, 66.4% were male, 46.2% held a Higher National Diploma as their highest qualification, and 51.3% had ten or more years of procurement-related experience. This profile suggests that the survey captured the perceptions of an established procurement cadre rather than entry-level staff, lending face credibility to their assessments of long-standing institutional practice.

4.2 Risk evaluation and sustainable procurement management

Table 3. Risk-evaluation factors influencing sustainable procurement management

Item	Mean	SD	Rank
Economic efficiency ensures procurement processes are cost-effective while meeting sustainability goals	4.4783	0.630	1st
Environmental impact considerations encourage eco-friendly procurement	4.2681	0.963	2nd
Social responsibility promotes ethical sourcing and community development	3.8551	1.235	3rd
Environmental and social risk assessment helps managers select responsible suppliers	3.7899	1.199	4th
Supply-chain risk assessment ensures continuity in sustainable sourcing	3.7609	1.064	5th
Compliance-risk assessment prevents penalties and reputational damage	3.5362	1.599	6th
Governance and transparency risk assessment improves accountability	3.4130	1.655	7th
Financial-risk assessment keeps sustainable procurement economically viable	3.3478	1.428	8th

Source: Field survey, 2025.

Economic efficiency was rated the most influential risk-evaluation consideration (mean = 4.478, SD = 0.630), followed by environmental impact (mean = 4.268) and social responsibility (mean = 3.855). Financial-risk and governance/transparency risk items were rated lowest and showed the widest dispersion of responses (SD > 1.4), suggesting less consensus among respondents on their relative importance.

4.3 Technology and sustainable procurement management

Table 4. Technology factors influencing sustainable procurement management

Item	Mean	SD	Rank
Digital procurement platforms and e-procurement systems	4.2971	0.939	1st
Blockchain for supply-chain transparency	4.2826	0.616	2nd
Big data and AI for risk assessment and decision-making	4.2536	0.580	3rd
Mobile and cloud-based solutions for accessibility	3.7101	1.410	4th
Green technologies and renewable energy in procurement	3.5725	1.171	5th
IoT and RFID for sustainable logistics	3.5000	0.946	6th
Ensuring eco-friendly and socially responsible sourcing	3.4420	1.279	7th
Overcoming infrastructure and skill gaps to unlock full potential	3.2609	1.395	8th

Source: Field survey, 2025.

Digital procurement platforms and e-procurement systems were rated the most influential technological enabler (mean = 4.297), closely followed by blockchain applications for supply-chain transparency (mean = 4.283) and big data/AI tools for risk assessment (mean = 4.254). Notably, "overcoming infrastructure and skill gaps" was rated lowest (mean = 3.261) with

relatively high dispersion ($SD = 1.395$), consistent with respondents perceiving infrastructure and capacity constraints as a barrier rather than a realised enabler.

4.4 Procurement training and sustainable procurement management

Table 5. Training-related factors influencing sustainable procurement management

Item	Mean	SD	Rank
Enhancing knowledge of sustainable procurement principles	3.8841	0.872	1st
Improving compliance and risk management	3.8478	1.107	2nd
Driving innovation and technology adoption	3.8406	1.263	3rd
Strengthening supplier relationships and local content development	3.8043	1.183	4th
Trained professionals are essential to achieving sustainable procurement goals	3.6449	1.278	5th
Cost savings and long-term value creation	3.4348	1.388	6th
Building expertise in ethical sourcing, risk management and green procurement	2.9855	1.460	7th
Driving long-term economic and environmental benefits	2.9638	1.149	8th

Source: Field survey, 2025.

Respondents rated knowledge enhancement as the most valued training outcome (mean = 3.884), ahead of compliance/risk-management improvement (mean = 3.848) and technology-adoption support (mean = 3.841). The two lowest-rated items — building expertise in ethical sourcing/green procurement and driving long-term economic and environmental benefits — both fell below the scale midpoint-plus-one threshold (mean < 3.0) and displayed the widest dispersion in this construct, indicating that respondents were considerably less convinced that current training translates into deeper sustainability expertise or measurable long-term benefit.

4.5 Transparent procurement rules and sustainable procurement management

Table 6. Transparency-related factors influencing sustainable procurement management

Item	Mean	SD	Rank
Reduces corruption and enhances accountability	4.2681	0.963	1st
Promotes fair competition and SME inclusion	3.8551	1.235	2nd
Encourages compliance with sustainability standards	3.8478	1.039	3rd
Strengthens public trust and stakeholder engagement	3.7899	1.199	4th
Essential for achieving cost-effective procurement	3.7609	1.064	5th
Facilitates data-driven decision-making	3.6014	1.137	6th
Reduces corruption and fosters competition	3.4203	1.434	7th
Enables data-driven sustainability tracking	3.4130	1.655	8th

Source: Field survey, 2025.

Reducing corruption and enhancing accountability was rated the most valued benefit of transparent procurement rules (mean = 4.268), followed by promoting fair competition and SME inclusion (mean = 3.855) and encouraging compliance with sustainability standards (mean = 3.848). Data-driven sustainability tracking was rated lowest (mean = 3.413) with the highest dispersion recorded across all four constructs ($SD = 1.655$), suggesting that although

transparency is highly valued in principle, respondents see the data infrastructure needed to track sustainability outcomes as the least developed dimension of current procurement rules.

5. Discussion

The first objective examined how risk evaluation influences sustainable procurement management. Respondents' emphasis on economic efficiency and environmental impact is consistent with sustainable supply chain management scholarship, which treats cost-effective sourcing and supplier-relationship management as complementary rather than competing with sustainability objectives (Carter & Rogers, 2008). That social-responsibility and supplier-selection items were rated below economic and environmental considerations suggests that, in this setting, sustainable procurement is currently understood primarily through an efficiency-and-compliance lens, with the social dimension of the Triple Bottom Line (Elkington, 1998) comparatively underdeveloped in practice.

The second objective addressed technology's influence. The prominence given to e-procurement platforms, blockchain and AI/big-data tools mirrors a wider literature that links digital adoption to reduced information asymmetry, improved transparency and stronger supply-chain performance in both public and private procurement (Chen & Hu, 2020; Mugera & Iddrisu, 2019; Kim et al., 2020; Kumar et al., 2021). However, the low rating given to "overcoming infrastructure and skill gaps" echoes technology-adoption research emphasising that organisational and environmental readiness, not merely tool availability, determines whether digital procurement delivers its expected benefits (Heckmann et al., 2019; Sarkis & Zhu, 2018); a pattern also reported in Nigerian manufacturing and supply-chain contexts (Idowu et al., 2020).

The third objective concerned procurement training. Respondents valued knowledge enhancement and compliance/risk-management improvement most highly, but rated the translation of training into deeper sustainability expertise and long-term measurable benefit considerably lower. This gap between awareness-level training outcomes and applied expertise is consistent with capacity-building literature suggesting that one-off or generic training builds familiarity but not necessarily the specialised competence required for advanced sustainable-sourcing practice (Amankwah-Amoah et al., 2019), reinforcing the case for structured, certification-linked training pathways.

The fourth objective examined transparent procurement rules. The high value placed on reduced corruption and accountability, alongside fair competition and SME inclusion, aligns with evidence that transparency-enhancing mechanisms; including digitally mediated ones reduce opportunities for information asymmetry and preferential treatment in procurement (Chen & Hu, 2020; Appolloni et al., 2014). The comparatively low and highly dispersed rating for data-driven sustainability tracking suggests that, while the principle of transparency commands strong support, the monitoring infrastructure needed to operationalise it for sustainability purposes specifically is still perceived as underdeveloped. Read together, the four sets of findings support the TOE framework's premise that technology adoption for sustainability purposes is conditioned jointly by organisational capacity (training) and the external rules environment (transparency and accountability mechanisms) (Tornatzky & Fleischer, 1990), rather than by technology availability alone. They also suggest that, in this setting, the economic and compliance dimensions of sustainable procurement are more firmly embedded in day-to-day practice than the social and monitoring dimensions.

6. Implications for Theory and Practice

Theoretically, the findings extend Triple Bottom Line, Technology Acceptance and Technology–Organization–Environment perspectives to a Nigerian sub-national public-procurement setting that has received little prior empirical attention and indicate that these

frameworks travel reasonably well to this context, with the caveat that social and monitoring dimensions of sustainability appear less institutionalised than economic and compliance dimensions.

For practice, the findings point to several concrete priorities for Bauchi State and comparable Nigerian sub-national procurement institutions: (i) continued investment in, and staff engagement with, digital procurement platforms, given the strong value already attached to them; (ii) development of the data infrastructure needed to track sustainability outcomes specifically, since this was the least-developed transparency dimension identified; (iii) a shift from general awareness training toward structured, certification-linked programmes (for example in partnership with the Chartered Institute of Procurement and Supply (CIPS) or similar bodies) to close the gap between basic knowledge and applied sustainability expertise; and (iv) stronger enforcement of, and sanctions attached to, existing procurement rules, to convert the high value respondents place on accountability into practice.

7. Limitations and Directions for Future Research

Several limitations should be considered when interpreting these findings. First, the study is descriptive and cross-sectional: means, standard deviations and rankings indicate the relative priority respondents attach to different items, but do not establish statistically significant relationships, effect sizes, or causal influence between the four factors and sustainable procurement outcomes. Future studies should employ inferential and multivariate techniques (for example correlation and multiple regression, or structural equation modelling) to formally test hypothesised relationships between risk evaluation, technology, training, transparency and measures of sustainable procurement performance.

Second, the instrument's content was reviewed for face and content validity but no internal-consistency reliability coefficient (e.g., Cronbach's alpha) was reported for the multi-item scales; future replications should report such statistics to strengthen confidence in the measurement instrument. Third, the sample was drawn from three institutions within a single state, which limits generalisability to other Nigerian states or federal procurement institutions; comparative, multi-state studies would help establish whether the patterns observed here are context-specific or more broadly representative. Fourth, reliance on self-reported perceptions raises the possibility of common-method bias and social-desirability effects, particularly for sensitive items relating to corruption and accountability; triangulating survey data with objective procurement-performance records (e.g., audit outcomes, project completion rates) would strengthen future work. Finally, given the cross-sectional design, longitudinal research tracking the same institutions over time would help clarify whether perceived priorities shift as digital infrastructure, training programmes and rule enforcement evolve.

8. Conclusion

This study examined how risk evaluation, technology, procurement training and transparent procurement rules are perceived to influence sustainable public procurement management among procurement personnel in Bauchi State, Nigeria. Economic efficiency, digital procurement platforms, knowledge-focused training and corruption-reducing transparency emerged as the most highly valued sub-dimensions of each factor respectively, while social-responsibility, infrastructure-readiness, applied-expertise and sustainability-monitoring items consistently ranked lower. These patterns suggest that sustainable procurement in this setting is currently anchored more firmly in economic and compliance considerations than in social and monitoring ones, and that closing this gap will require deliberate investment in monitoring infrastructure and applied, certification-linked training alongside continued digital adoption and rule enforcement. Given the descriptive nature of the evidence, these conclusions should

be treated as a priority-setting baseline to be tested and extended through inferential, comparative and longitudinal research.

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