Journal of Procurement & Supply Chain

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Brenda Mululu, Dr. Patrick Joseph Owuori & Dr. John Odhiambo Mudany

ISSN: 2617-3581

Stratford Peer Reviewed Journals and Book Publishing
Journal of Procurement & Supply Chain
Volume 9||Issue 4||Page 38-65 ||December||2025|
Email: info@stratfordjournals.org ISSN: 2616-8472

Green Procurement and Sustainability in Infrastructure Projects: Employing the EcoVadis Model

[1]Brenda Mululu*
University of Nairobi, Faculty of Business and Management Sciences

[2]Dr. Patrick Joseph Owuori, PhD
Research Fellow, INTI International University, Malaysia

[3]Dr. John Odhiambo Mudany, PhD,

Senior Lecturer, United States International University (USIU)

***How to cite this article*: Mululu B., Owuori P., J. & Mudany J., O. (2025). Green Procurement and Sustainability in Infrastructure Projects: Employing the EcoVadis Model. *Journal of Procurement & Supply Chain. Vol* 9(4) pp. 38-65.** https://doi.org/10.53819/81018102t2539

Abstract

This study investigated the integration of green procurement (GP) and sustainability in infrastructure projects, with a focus on the application of the EcoVadis model as a transformative tool for procurement reform. Green procurement is increasingly recognized as a strategic mechanism for embedding environmental, social, and governance (ESG) principles into project delivery, aligning infrastructural development with global climate and sustainability agendas. The paper sought to examine the interplay between green procurement and sustainability in infrastructure projects and how employing the EcoVadis Model contributes to sustainability within the projects. By examining the theoretical underpinnings of the Resource-Based Theory (RBT), Dynamic Capability Theory (DCT), and Institutional Theory, the paper situated GP as both a strategic resource and an adaptive capability, while also acknowledging the role of institutional pressures in shaping procurement practices. The research adopted a Systematic Literature Review (SLR) to synthesize empirical findings from global and regional contexts, highlighting enablers, barriers, and impacts of GP adoption. Case studies from Kenya and other regions underscore the potential of GP to reduce lifecycle costs, enhance environmental performance, and generate long-term socio-economic benefits when effectively embedded in governance structures. The EcoVadis model was presented as a standardized framework for evaluating supplier sustainability performance, fostering accountability, transparency, and competitive advantage in infrastructure projects. Findings revealed that while GP offers significant environmental and cost-efficiency advantages, challenges such as capacity gaps, upfront costs, fragmented policies, and resistance from stakeholders impede its mainstreaming. The study emphasized the critical role of capacity development, digital technologies, policy alignment, and collaborative governance in overcoming these barriers. The conclusion highlighted that GP must be viewed as both a strategic and moral imperative in addressing climate change and resource scarcity, while the recommendations

Stratford Peer Reviewed Journals and Book Publishing
Journal of Procurement & Supply Chain
Volume 9||Issue 4||Page 38-65 ||December||2025|
Email: info@stratfordjournals.org ISSN: 2616-8472

underscore the importance of aligning policies with global standards, strengthening capacity building, adopting digital technologies, engaging suppliers, and fostering collaborative governance. Ultimately, the paper demonstrates that green procurement, when strategically institutionalized, not only mitigates ecological and financial risks but also catalyzes innovation, resilience, inclusivity, and sustainable transformation in infrastructure development across diverse economies.

Keywords: *Green procurement, Sustainability, Infrastructure Projects, Capacity Development*

Introduction

Green procurement, also referred to as sustainable procurement, refers to the process of purchasing goods, services, and works with a reduced environmental impact throughout their life cycle (Testa et al., 2023). Within the context of infrastructure development, green procurement extends beyond simply acquiring environmentally friendly materials; it encompasses design, construction, and operation practices that minimize carbon emissions, energy use, and ecological degradation. The shift from traditional procurement practices to sustainable alternatives reflects an emerging paradigm in infrastructure governance that prioritizes long-term ecological and social benefits over short-term economic gains.

The infrastructure sector is a major contributor to greenhouse gas emissions and resource depletion, making the case for green procurement particularly urgent (UNEP, 2022). Traditional procurement models often ignore environmental externalities and lifecycle impacts. By contrast, green procurement promotes lifecycle costing (LCC), eco-labeling, and environmental performance benchmarks in tendering processes. These strategies are designed to internalize environmental costs and shift market behavior toward sustainability. Consequently, infrastructure procurement is no longer just a technical or economic decision but also a moral and environmental imperative (Tian et al., 2024).

Incorporating sustainability in procurement requires institutional support and strategic policy frameworks. Governments and multilateral development banks (MDBs) are increasingly embedding sustainability criteria into procurement legislation and project funding requirements. For instance, the World Bank and African Development Bank have revised their procurement frameworks to integrate climate risk analysis and sustainable development goals (World Bank, 2023). This demonstrates a global commitment to transforming procurement into a tool for achieving sustainable infrastructure.

Globally, the international bodies promote sustainable procurement frameworks such as ISO 20400 and UNEP's 2022 Global Review. MDBs, including the World Bank and AfDB, now integrate climate risk analysis and sustainability criteria into procurement frameworks (World Bank, 2023; AfDB, 2024). In practice, the EU's Green Public Procurement criteria have spurred innovation and increased eco-labeled product supply (European Commission, 2023). The U.S. has piloted "Buy Clean" policies, requiring low-carbon materials in federal projects, though adoption varies by state (ICF, 2023). Evidence suggests such policies reduce embodied emissions while stimulating green industries, though barriers remain in monitoring and market readiness (Testa et al., 2023).

In Africa, procurement reform is increasingly linked to green industrialization and Agenda 2063. The AfDB mainstreams climate considerations in procurement through safeguards and financing

requirements, improving environmental compliance in projects (AfDB, 2023). The EAC's SPPEL project advanced eco-labeling and lifecycle costing, with SMEs reporting improved competitiveness when certified (UNEP, 2022). However, challenges persist. Many African suppliers lack the certifications needed for green tenders, while procurement staff often lack technical skills for lifecycle analysis (Ahsan & Rahman, 2023). Evidence from South Africa shows coupling procurement with supplier development programs reduces costs and expands participation (DTI, 2020), highlighting the need for integrated industrial and procurement strategies.

Kenya's PPADA (2015) and PPRA Strategic Plan (2023–2027) provide legal scope for integrating sustainability in procurement (PPRA, 2023). Climate legislation, including the Climate Change (Amendment) Act (2023), reinforces carbon accountability and aligns procurement with national NDCs (Government of Kenya, 2023). Yet adoption remains uneven. A survey found 62% of state corporations had sustainability clauses in tenders, but only 28% applied lifecycle costing (Kariuki & Kimani, 2022). County governments vary widely, with some integrating green procurement in water projects while others lag (Mwangi, 2023). Market readiness is another constraint: suppliers cite high certification costs as a barrier (Omondi, 2023). Positive examples exist. Kenya Power's procurement of energy-efficient transformers reduced losses by 15% (KPLC, 2022), while environmental clauses in the Nairobi Expressway project improved waste and noise management (World Bank, 2023). The new Capacity Building Levy (2024) provides resources for training officers, which could mainstream green procurement practices across sectors (PPRA, 2024).

However, operationalizing green procurement in practice remains complex. Barriers include inadequate technical capacity, fragmented regulations, high upfront costs, and resistance from stakeholders accustomed to conventional procurement methods (Ahsan & Rahman, 2023). Moreover, developing countries face added constraints in aligning procurement reforms with local market conditions and institutional capacities. There is thus a pressing need for capacity-building and international collaboration to mainstream green procurement in infrastructure planning and execution. Despite these challenges, the conceptual framing of green procurement is evolving to accommodate not only environmental but also social and governance dimensions-embodying the ESG (Environmental, Social, Governance) principles. This expansion ensures that green procurement aligns with broader global frameworks such as the Paris Agreement, SDGs, and climate adaptation strategies. Thus, conceptual clarity must be matched with operational integration to realize the full potential of sustainable infrastructure procurement (Li & Zhou, 2024).

Objectives of the Study

The paper examined the interplay between green procurement and sustainability in infrastructure projects and how employing the EcoVadis Model contributes to sustainability within the projects.

Theoretical Foundation

The theoretical framework was anchored on the resource-based view theory, the dynamic capability theory of constraints and the institutional theory.

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Resource-Based Theory (RBT): A Theoretical Lens on Sustainable Procurement and Cost Performance

The Resource-Based Theory (RBT), originally proposed by Penrose (1959) and later refined by Wernerfelt (1995) and Barney (1991), postulates that an organization's competitive advantage is rooted in the possession of unique, valuable, and strategically significant resources. Unlike the classical industrial organization model that emphasizes external market structures, RBT contends that internal firm heterogeneity drives differences in performance. According to Zulkiffli, Zaidi, Padlee, and Sukri (2022), firms in the same sector can demonstrate varying levels of competitiveness due to their distinct resource portfolios. In this context, sustainable procurement practices are increasingly regarded as valuable organizational resources that can generate a sustained competitive advantage (Wu, Yan, & Umair, 2023).

Sustainable procurement, which includes green purchasing and ethical sourcing, aligns closely with RBT's emphasis on unique, inimitable capabilities. These procurement practices are not only operational tools but also strategic resources that fulfill the VRIN criteria (valuable, rare, inimitable, and non-substitutable). As Vieira, Jaramillo, Agnihotri, and Molina (2023) argue, VRIN resources cannot be easily transferred or monetized via traditional contracting mechanisms. Their value lies in their embeddedness within organizational routines and culture, making them difficult for competitors to replicate. In Kenya's construction sector, firms that institutionalize sustainable procurement are positioning themselves as leaders in cost-efficient and environmentally conscious project delivery.

Teece (2023a) highlights the presence of "isolating mechanisms" that protect these valuable resources from diffusion. These mechanisms include proprietary knowledge, firm culture, and strategic alliances with sustainable suppliers. In construction projects, such mechanisms ensure that sustainable procurement practices contribute to cost performance through reduced waste, compliance with environmental regulations, and avoidance of reputational damage. Nangpiire, Gyebi, and Nasse (2024) demonstrated that SMEs in Ghana that adopted sustainability-oriented procurement outperformed their peers in financial and operational metrics, validating RBT's central claims.

Alvarez, Newman, Barney, and Plomaritis (2023) extend the application of the RBT by suggesting that firms must constantly evaluate and classify their resources using the VRIN framework to maintain competitiveness. Applying this to the Kenyan context, green purchasing and ethical procurement emerge as critical organizational resources that drive both sustainability outcomes and cost performance. Therefore, RBT serves as the conceptual foundation for evaluating how internal procurement capabilities translate into project efficiency and economic performance in infrastructural development.

In conclusion, the RBT provides a compelling explanation for the variance in performance among construction firms, particularly in developing countries where resource limitations are prevalent. By framing sustainable procurement practices as strategic resources, RBT highlights their dual role in fostering environmental stewardship and improving project cost outcomes. This theory not only justifies the strategic prioritization of green and ethical procurement but also underscores their transformative potential in the infrastructure projects in Kenya.

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Dynamic Capability Theory: Navigating Change Through Sustainable Procurement

The Dynamic Capability Theory (DCT), introduced by Teece, Pisano, and Shuen (1990) and expanded by Eisenhardt and Martin (2000), focuses on a firm's capacity to adapt, integrate, and reconfigure internal and external resources in response to dynamic environmental conditions. In contrast to the more static Resource-Based View, DCT emphasizes the processes through which capabilities evolve. According to Martins (2023), dynamic capabilities enable firms to remain competitive in volatile contexts, such as the infrastructure sector in developing nations.

Muneeb, Ahmad, Abu Bakar, and Tehseen (2023) argue that sustainable procurement exemplifies a dynamic capability when organizations effectively reorient their supply chain and procurement functions in response to environmental regulations and societal expectations. This includes the integration of e-procurement platforms, supplier sustainability assessments, and lifecycle cost analyses. In Kenya, the implementation of these practices in rural construction projects has shown potential for enhanced cost control, regulatory compliance, and stakeholder satisfaction.

DCT also responds to the limitations of the Resource-Based Theory by accounting for rapidly changing environments. Teece (2023) emphasizes that competitive advantage no longer stems solely from owning valuable resources but from the firm's ability to continuously adapt and transform those resources. In this regard, sustainable procurement is not just a capability but a dynamic one that evolves through innovation and strategic learning. For example, transitioning from manual to digital procurement systems reflects a firm's dynamic capability to enhance transparency, efficiency, and traceability.

Furthermore, DCT supports a systemic approach to procurement transformation. According to Hällerstrand, Reim, and Malmström (2023), construction firms that possess dynamic capabilities are better positioned to absorb technological disruptions and environmental shifts. In Kenya, such adaptability is particularly relevant given the infrastructural backlog, shifting donor requirements, and the increasing demand for ESG compliance. Firms with strong dynamic capabilities are thus more likely to succeed in delivering cost-effective and sustainable infrastructure. The DCT offers a future-facing perspective that complements the static focus of RBT. It underscores the importance of developing and reconfiguring procurement capabilities to respond to environmental turbulence. For infrastructure firms in Kenya, DCT validates the strategic imperative of embedding agility into procurement systems, thereby enhancing both sustainability and cost performance in infrastructure projects in Kenya.

Institutional Theory: Legitimacy, Isomorphism, and Sustainable Procurement

Institutional Theory, as articulated by Lawrence and Suddaby (2006) and expanded upon by Cooper, Ezzamel, and Willmott (2008), emphasizes that organizational practices are often adopted not for efficiency alone but for legitimacy. This theory is particularly pertinent to public infrastructure projects, where stakeholder expectations, legal compliance, and normative pressures heavily influence procurement practices. Eitrem, Meidell, and Modell (2024) describe institutional environments as fields of stability, where organizations converge toward similar behaviors due to shared norms and expectations. Institutional theory identifies three forms of isomorphism: coercive, mimetic, and normative (Lin & Yeh, 2024). Coercive pressures arise from regulatory frameworks and donor conditions that mandate sustainable procurement. Mimetic isomorphism occurs when firms emulate industry leaders who have successfully implemented green practices. Normative pressures derive from professional standards and civil society expectations. In Kenya,

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these forces are evident in the National Construction Authority's emphasis on green procurement, as well as in the expectations set by multilateral donors and NGOs.

According to Ma et al. (2021), when senior leaders champion sustainability, it signals organizational commitment and enhances legitimacy among stakeholders. This often leads to institutionalization of sustainable procurement practices, including mandatory supplier audits, eco-labeling, and ethical sourcing protocols. In Kenya's construction sector, firms that respond to these pressures not only avoid penalties but also improve access to funding and stakeholder trust, ultimately enhancing cost performance.

Empirical studies support the theory's applicability to procurement. Nangpiire et al. (2024) observed that SMEs in Ghana adopted sustainable practices primarily due to institutional pressures rather than intrinsic motivation. Similarly, Nawaz and Guribie (2024) showed how institutional isomorphism influenced the adoption of social procurement practices in the Chinese construction industry. These findings suggest that compliance with institutional expectations is a strategic necessity for firms seeking legitimacy and performance. Finally, Glynn and D'aunno (2023) argue that public scrutiny and environmental activism have amplified institutional pressures on firms. In Kenya, where infrastructure projects are highly visible and politically significant, firms must align procurement practices with sustainability mandates to maintain legitimacy. Forster et al. (2024) add that institutional theory also explains the diffusion of sustainable procurement norms across industries, creating a baseline expectation for responsible practices. Institutional Theory complements both RBT and DCT by explaining the socio-political context within which procurement decisions are made. It underscores that sustainable procurement is not just a strategic asset or adaptive capability, but also a legitimizing force that ensures long-term organizational survival in regulated and scrutinized environments.

The Role and Framework of Green Procurement in Infrastructure

Green procurement (GP) has emerged as a strategic tool in aligning infrastructural development with sustainability objectives. Defined by ISO 20400 (2021) as a process that incorporates environmental, economic, and social considerations into procurement decisions, GP serves as a catalyst for reducing the environmental footprint of public and private infrastructure projects. KPMG (2023) notes that with global infrastructure accounting for nearly 60% of CO_2 emissions, procurement is a critical intervention point for climate-resilient outcomes.

Public-private partnerships (PPPs) are increasingly used to deliver infrastructure, yet the integration of sustainability clauses remains inconsistent. Vanhoucke et al. (2022) observed that while PPPs can incentivize innovation, many fail to enforce environmental or social sustainability in tender documentation or performance monitoring. This gap is particularly evident in developing nations, where sustainability metrics are often omitted due to weak institutional capacity or lack of awareness (Osei-Kyei & Chan, 2021). The European Commission's Circular Economy Action Plan (2022) has advanced green procurement by mandating minimum requirements for product durability, reparability, and recycled content. These directives aim to shift procurement from linear models to circular systems, emphasizing life-cycle impact over lowest upfront cost. According to Agyekum et al. (2021), the adoption of circular procurement practices in Europe is gaining traction in construction, although the pace remains uneven.

Digitalization is further enabling the green procurement movement. Arif et al. (2023) highlight that digital procurement platforms with embedded sustainability scoring and supplier analytics are

being used to monitor green compliance in real-time. This increases transparency, reduces corruption, and supports the alignment of procurement with sustainability KPIs. In summary, while the frameworks supporting green procurement are evolving, their effectiveness is contingent on enforcement, institutional capacity, and procurement professionalism. Without systemic adoption and integration into project governance structures, GP risks remaining a rhetorical commitment rather than a functional lever of sustainability (Flyvbjerg, 2023).

Green Procurement and Sustainability: A Critical Analysis

The concept of green procurement has increasingly gained global recognition as a critical approach to enhancing sustainability in development projects. Governments and institutions worldwide are adopting innovative procurement strategies that prioritize environmental considerations, demonstrating the viability and benefits of sustainable practices across diverse sectors and regions. Over the past two decades, multiple literature reviews have contributed to the understanding of green procurement by exploring various themes, sectors, and methodological approaches. However, many of these studies remain limited in scope, either due to the narrow time frame covered, focus on specific sectors (private) or reliance on traditional review methods that lack comprehensive qualitative analysis.

In the United States, for instance, green procurement has been effectively embedded into large-scale infrastructure undertakings such as the California High-Speed Rail project. This initiative employed recycled construction materials and energy-efficient technologies, contributing to a measurable reduction in greenhouse gas emissions (California High-Speed Rail Authority, 2021). In Germany, the Berlin-Brandenburg Airport development integrated sustainable construction materials and advanced waste management systems, setting a precedent for eco-conscious project delivery in the aviation sector (Scholz, 2020).

Similarly, Japan's Toyota Eco-Factory exemplifies the application of green procurement in manufacturing. The facility prioritized sourcing low-impact materials and technologies, aligning with the company's broader carbon neutrality objectives (Toyota Motor Corporation, 2022). Australia's Sydney Metro project also embraced environmentally responsible practices, including energy-efficient design and sustainable resource use, resulting in improved environmental and operational outcomes (Green Building Council of Australia, 2023).

The United Kingdom's London 2012 Olympics serves as another landmark case. Organizers implemented a sustainable procurement framework that mandated contractors to meet stringent environmental criteria, ultimately minimizing the event's ecological footprint (DEFRA, 2021). In Canada, the Greater Toronto Area's Green Infrastructure Initiative focused on sustainable technologies and water conservation measures, reinforcing the connection between green procurement and improved resource efficiency (Environment and Climate Change Canada, 2022).

Across Africa, various countries have initiated green procurement programs to address pressing environmental and developmental challenges. South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) exemplifies this trend, with an emphasis on renewable energy technologies and minimized environmental degradation (Department of Mineral Resources and Energy, 2021). Nigeria's Lagos Urban Renewal Project integrated energy-efficient building materials and eco-sensitive urban design to promote sustainable urbanization (Adesina, 2020).

In East Africa, Kenya's Nairobi Water Supply Project adopted sustainable technologies to improve urban water infrastructure (Nairobi Water Authority, 2021), while Rwanda's Green Housing Initiative promoted the use of low-impact materials in affordable housing developments (Rwanda Housing Authority, 2022). Ghana's Green Agriculture Program utilized organic and eco-friendly fertilizers to balance productivity with environmental stewardship (Asante, 2020), and Tanzania's Dar es Salaam Infrastructure Project incorporated recycled materials in transport development (Mziray, 2019). Uganda's Renewable Energy Expansion Project similarly prioritized sustainable procurement to enhance energy access and efficiency (Kato, 2021).

Several eco-tourism and public sector initiatives have further illustrated green procurement's diverse applicability. Tanzania's Serengeti Eco-Tourism Development integrated environmentally sensitive materials in park infrastructure (TANAPA, 2020), while Uganda's Green Health Infrastructure program employed sustainable construction practices in healthcare facilities (Mugisha, 2020). Kenya's Geothermal Development Project has advanced green energy goals through procurement of low-emission technologies (Kenya Energy Authority, 2022), and Rwanda's Green Schools Initiative focused on sustainable materials in educational infrastructure (Rwanda Education Board, 2021).

Within Kenya specifically, numerous projects demonstrate the growing institutional commitment to green procurement. The Nairobi Waste Management Program utilized eco-friendly waste processing technologies to address urban sanitation challenges (Nairobi City Council, 2021). Mombasa's Port Development Project integrated energy-efficient and sustainable design elements to enhance operational efficiency (Mombasa Port Authority, 2022). Kisumu's Green Housing Project promoted climate-resilient construction, while Eldoret's Green Agriculture Initiative emphasized bio-fertilizers and organic inputs (Eldoret Agricultural Board, 2021).

Other notable efforts include Garissa's Water Management Program, which introduced sustainable irrigation and conservation technologies (Garissa Water Authority, 2020), Marsabit's Sanitation Improvement Project (Marsabit County Government, 2021), and Isiolo's Renewable Energy Initiative focusing on decentralized, clean energy systems (Isiolo Energy Authority, 2021). Kericho's Health Facility Upgrades leveraged eco-friendly building materials (Kericho County Health Department, 2021), while Nakuru and Nyeri have led public sector and educational initiatives through sustainable procurement policies (Nakuru County Government, 2021; Nyeri Education Department, 2021).

Appolloni et al. (2014) conducted a systematic review of green procurement literature published between 1996 and 2013, focusing on the private sector. Their study identified three primary research themes at the time: motivations and drivers of green procurement adoption, barriers to implementation, and the performance outcomes associated with green practices. Agyepong and Nhamo (2017) contributed to this discourse by evaluating legislative frameworks for green procurement in South Africa's metropolitan municipalities, emphasizing its intersection with climate change and sustainable development objectives. Cheng et al. (2018) analyzed scholarly articles on green public procurement from 2000 to 2016, revealing that much of the literature was oriented toward evaluating policy impacts, while relatively less attention was paid to innovation and policy efficiency. Beer and Lemmer (2011) offered insights into green procurement in the food supply chain, noting its potential to reduce pollution, enhance water quality, and lower greenhouse gas emissions.

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More recently, Vejaratnam et al. (2020) reviewed 29 studies to identify barriers to government adoption of green procurement. Their findings indicated that a lack of knowledge and awareness remains the most significant obstacle, while financial constraints were less prominent. Similarly, Polonsky et al. (2022) synthesized existing research to examine factors influencing the procurement of products made from recycled or recovered materials. Their study highlighted the importance of standardized green procurement practices, internal organizational support, and the flow of information across organizational and inter-organizational levels. Sönnichsen and Clement (2020) conducted a comprehensive review of literature spanning from 2000 to 2020, with a specific focus on the evolution of green and sustainable public procurement. They emphasized the growing need to embed circular procurement principles within public institutions and suggested that the beliefs and values of public procurers significantly influence procurement strategies, particularly when shifting from cost-centric to life cycle-based decision-making.

Xu et al. (2022) expanded on this by analyzing literature on circular procurement across public and private sectors between 1998 and 2021, categorizing it into three thematic clusters: antecedents, practices, and outcomes. Complementing these efforts, Qazi and Appolloni (2022) examined 100 scholarly articles related to sustainable procurement and circular economy. Their comprehensive review identified 55 enablers and barriers, which were grouped into key themes, offering a more nuanced understanding of implementation challenges.

These diverse case studies collectively illustrate the transformative potential of strategic green procurement in enhancing environmental performance, improving resource efficiency, and supporting long-term development goals. As global challenges related to climate change and resource scarcity intensify, green procurement emerges not only as an environmental imperative but also as a catalyst for innovation, cost savings, and improved project outcomes.

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Conceptual Framework

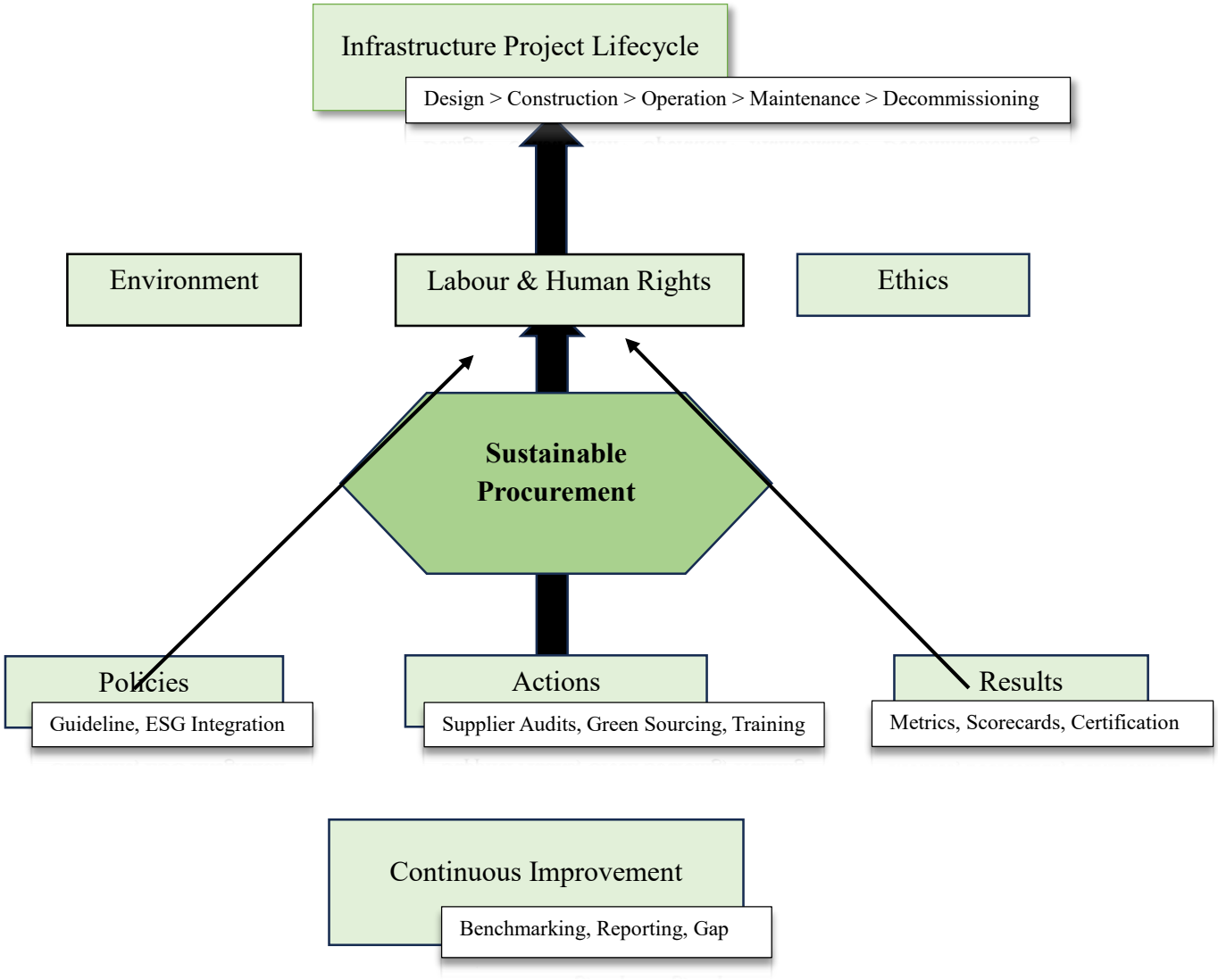

Fig 1: *Adopting Ecovadis in Achieving Sustainable Green Procurement in Infrastructure Projects*

Methodology

This study adopts a Systematic Literature Review (SLR) to explore the theoretical foundations of sustainable procurement and its impact on cost performance in Kenya's construction sector, particularly infrastructure projects. SLR offers a rigorous, transparent, and replicable method for identifying, evaluating, and synthesizing existing literature (Snyder, 2019; Tranfield et al., 2003), in contrast to the subjectivity of traditional narrative reviews. The review focused on peer-reviewed articles, conference proceedings, and industry reports published between 2020 and 2024, sourced from Scopus, Web of Science, and Google Scholar. A structured coding framework guided data extraction, analyzing studies by publication year, methodology, theoretical lens, findings, and

relevance. Thematic synthesis was aligned with three guiding theories: Resource-Based Theory, Dynamic Capability Theory, and Institutional Theory. Quality was assessed using the Critical Appraisal Skills Programme (CASP) checklist, and comprehensiveness was enhanced through backward citation tracking and data triangulation. Overall, the SLR strengthens the study's academic integrity and enables a nuanced analysis of how sustainable procurement enhances cost performance within Kenya's dynamic infrastructure environment.

Adoption of The Ecovadis Model in Infrastructure Projects

The Ecovadis model provides a holistic framework for evaluating corporate sustainability performance, focusing on four key themes: Environment, Labor & Human Rights, Ethics, and Sustainable Procurement. This model is increasingly being adopted by infrastructure stakeholders to assess suppliers and contractors in green procurement processes (Ecovadis, 2024). It enables procuring entities to embed sustainability throughout the supply chain, ensuring that environmental and ethical considerations are integral to the delivery of infrastructure projects.

Ecovadis scoring allows infrastructure developers to benchmark the sustainability performance of suppliers, identify risks, and improve procurement decisions (Schaltegger et al., 2023). This model introduces a standard approach to supplier evaluation, thereby mitigating greenwashing and enhancing accountability. In large-scale public infrastructure projects-such as transport corridors, energy grids, and water systems-this standardization becomes crucial, as it provides transparency across complex multi-tiered supply chains. The model has been successfully employed in countries like Germany, South Korea, and Sweden in public transport and renewable energy projects.

Moreover, the integration of Ecovadis scores in procurement decisions strengthens ESG compliance and fosters competitive advantage. Firms that consistently perform well in Ecovadis assessments attract partnerships, funding, and favorable public perception. Infrastructure projects can leverage this to de-risk procurement and ensure compliance with international sustainability standards, such as ISO 20400 on Sustainable Procurement and ISO 14001 on Environmental Management Systems (ISO, 2023). This positions the Ecovadis model as a practical and strategic procurement instrument.

However, its application in developing countries remains limited due to digital infrastructure gaps, data availability issues, and cost implications of vendor assessments. Additionally, SMEs involved in infrastructure development often lack the capacity to meet rigorous sustainability reporting requirements. These challenges highlight the need for localized adaptations of the Ecovadis framework and support systems to enable broader inclusion (Mugambi et al., 2024). Policymakers and international organizations must thus invest in enabling infrastructure and data ecosystems to facilitate uptake.

Ultimately, the Ecovadis model is a transformative tool for greening infrastructure procurement, but its effectiveness depends on integration into national procurement policies, sector-specific guidelines, and project delivery mechanisms. Public-private collaboration is essential in scaling its application and ensuring that procurement reforms do not marginalize smaller players while promoting inclusive, transparent, and green supply chains (Jia & Lu, 2023).

Drivers of Green Procurement in Infrastructure Projects

Several forces are propelling the adoption of green procurement in infrastructure, including regulatory pressure, investor expectations, civil society advocacy, and technological innovation.

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Governments are establishing mandatory sustainability criteria in procurement laws and public-private partnerships (PPPs), thus institutionalizing green practices (OECD, 2023). For example, the European Union's Green Public Procurement (GPP) policy mandates the inclusion of environmental requirements in all public infrastructure tenders, setting a strong precedent for global policy emulation.

Investor demand for sustainable infrastructure has also surged, particularly from institutional investors such as pension funds, who are increasingly embedding ESG metrics into investment decision-making. Green bonds and sustainability-linked loans are incentivizing infrastructure developers to adopt green procurement practices to qualify for financing (Climate Bonds Initiative, 2023). This financial conditionality acts as a powerful lever, aligning procurement behavior with sustainability goals.

Public awareness and civil society pressure have also played a significant role. In many countries, citizens are demanding transparency, climate accountability, and inclusivity in infrastructure delivery. This has led to the rise of community monitoring and participatory procurement systems, particularly in energy, transport, and housing sectors. Civil society organizations are instrumental in holding developers and governments accountable for sustainability commitments (Transparency International, 2023).

Furthermore, technological innovations-such as Building Information Modeling (BIM), AI-powered procurement analytics, and blockchain-are enhancing procurement transparency, traceability, and efficiency (Zhang et al., 2023). These tools allow project implementers to assess lifecycle impacts, track material sourcing, and identify optimization opportunities in real time. This digital shift makes it easier to incorporate green procurement criteria and monitor compliance.

However, these drivers must be integrated strategically to generate systemic change. Fragmented approaches and inconsistent enforcement dilute the effectiveness of green procurement. A multi-stakeholder governance approach - bringing together regulators, investors, suppliers, and end-users - is essential to sustain momentum and ensure that infrastructure procurement contributes meaningfully to decarbonization and resilience goals (Sharma & Ali, 2024).

For GP to be impactful, it must be embedded into broader infrastructure governance. Yet, as Osei-Kyei and Chan (2021) argue, most public-private partnerships do not integrate measurable sustainability outcomes into their key performance indicators (KPIs). Instead, they default to traditional procurement goals like cost, time, and scope, neglecting environmental and social performance.

Governance models that include sustainability criteria in contract clauses, tender evaluation, and monitoring frameworks are more likely to succeed. In an analysis of EU green infrastructure projects, Vanhoucke et al. (2022) observed that enforceable environmental KPIs resulted in improved contractor performance and compliance. Such governance measures also incentivize innovation by tying bonuses to emissions reduction and energy performance. Third-party certification tools, such as BREEAM, LEED, and GSAS, offer standardized benchmarks for evaluating the sustainability of infrastructure. While widely adopted in the Global North, their application in emerging economies remains limited due to high certification costs and technical complexity (Al-Sabah et al., 2022). Nonetheless, they offer transparency and comparability across projects.

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Monitoring and reporting are essential but often overlooked. According to Hoekstra and Wilms (2023), post-contract audits and sustainability reports were instrumental in verifying that the A16 Rotterdam project achieved its environmental goals. Without accountability mechanisms, procurement commitments risk being undermined by value engineering or budget constraints. Ultimately, governance structures that mainstream GP must include clear sustainability indicators, independent monitoring, and performance-based contracts. As Montalbán-Domingo et al. (2022) note, these structures are not only technical but political, requiring alignment across legal, financial, and institutional domains to be effective.

Enablers and Barriers in the Adoption of Green Procurement

Despite growing momentum, the implementation of green procurement in infrastructure projects is hindered by numerous barriers. One major challenge is the absence of harmonized sustainability standards across sectors and regions. While some countries have developed robust green procurement frameworks, others lack the institutional capacity or political will to enforce them (Carter et al., 2023). This inconsistency undermines procurement reform efforts and creates an uneven playing field for suppliers.

Barriers to GP implementation are well-documented. A recent study by Mugambe et al. (2023) found that 78% of construction professionals in Sub-Saharan Africa lacked sufficient knowledge of green procurement practices, citing weak institutional frameworks and poor inter-agency coordination as major obstacles. Similarly, Al-Sabah et al. (2022) emphasize that lack of political will and standardized guidelines prevents effective implementation in Middle Eastern infrastructure projects.

Conversely, stakeholder engagement and policy mandates have proven to be key enablers. In Malaysia, Noor et al. (2021) found that GP was more successfully implemented when contractors, regulators, and end-users were actively involved in co-developing sustainability specifications. This participatory approach aligns with the principles of sustainable governance and reduces resistance to change. Market mechanisms also play a critical role. In Pakistan, Khan et al. (2023) used a PLS-SEM model to demonstrate that supplier readiness and market competitiveness significantly influenced GP outcomes. As the green economy matures, increased competition among suppliers can drive innovation and reduce price premiums for sustainable goods.

Technology is another important facilitator. AI-driven procurement platforms that automate compliance checks, predict environmental impact, and assess supplier sustainability credentials are becoming more prevalent (Arif et al., 2023). These tools not only increase efficiency but also improve the accuracy of sustainability integration into procurement decisions. Despite these enablers, challenges persist. Flyvbjerg (2023) warns that without accountability, GP can devolve into a box-ticking exercise. Thus, implementation requires not just tools and policies but a shift in organizational culture and procurement ethics to prioritize long-term public value.

Cost considerations also impede implementation. Green products and technologies often have higher upfront costs, but they offer long-term savings through reduced maintenance and environmental benefits. Budget-constrained agencies may prioritize short-term cost efficiency over long-term sustainability. This underscores the importance of adopting lifecycle costing methodologies and providing fiscal incentives to bridge the affordability gap (Wang et al., 2023).

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Moreover, capacity gaps in procurement agencies pose significant challenges. Public procurement officials often lack training on sustainability criteria, environmental assessment, and supplier evaluation. As a result, tenders may fail to adequately incorporate or evaluate green considerations. Developing countries are especially affected, where procurement reforms are undermined by corruption, inadequate training, and weak monitoring systems (Kemei & Abiero, 2024). Supply chain constraints also limit green procurement implementation. In many regions, there is limited availability of certified green materials, equipment, or contractors. This leads to reliance on conventional suppliers and technologies. The lack of green-certified vendors also constrains competition and increases procurement risks. Efforts must therefore focus on developing local green markets and capacity-building of suppliers (Amemba et al., 2023).

Strategies for Enhancing Sustainability Through Green Procurement

Strategic Policy Alignment and Standards

To institutionalize green procurement, organizations must first align procurement policies with international standards such as ISO 20400:2017, which guides the integration of sustainability into procurement processes (Ajayi, 2024). This standard encourages procurement departments to adopt a life-cycle perspective and engage stakeholders across internal and external environments. At the policy level, embedding SMART sustainability targets - Specific, Measurable, Achievable, Relevant, Time-bound - enhances clarity and accountability (Bui & Mukherjee, 2024).

The importance of policy structure is underscored in the Australian public sector, where well-defined environmental targets led to more consistent adoption of green procurement practices (Bui & Mukherjee, 2024). In contrast, research in Malta indicates that symbolic adoption of green procurement, lacking real enforcement or staff training, results in minimal impact (Tandfonline, 2024). These findings suggest that without binding frameworks and capacity development, policy alone cannot transform procurement behavior.

Policy must also be adaptive to emerging global frameworks, such as the UN Sustainable Development Goals (SDG 12), and regional mandates like the EU Circular Economy Action Plan (UNEP, 2023). This involves evaluating procurement not just on price but also on environmental and social value. Finally, internal governance structures must support strategic alignment. The role of senior management in embedding sustainability goals and reviewing procurement performance ensures cross-departmental buy-in and long-term continuity (Kronos Group, 2023).

Supplier Engagement and Capacity Building

Suppliers are critical actors in delivering sustainable outcomes. Engaging them meaningfully requires structured evaluation criteria, training, and incentives. Deloitte's Scope 3 emission framework emphasizes supplier segmentation - differentiating between high-impact and transactional vendors to tailor interventions appropriately (Deloitte, 2024). Case studies such as PepsiCo's supplier engagement initiative show how major firms can demand climate disclosures, decarbonization strategies, and regenerative practices as prerequisites for long-term contracts (WSJ, 2024). These relationships incentivize suppliers to invest in sustainability as a competitive advantage. In the Kenyan context, research by Akinyi (2023) revealed a statistically significant correlation between green procurement practices - such as supplier environmental screening and waste minimization - and improved operational performance in food and beverage supply chains.

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Similarly, NGO operations in Migori County documented reductions in emissions and energy use when green criteria were applied in vendor selection (Dube & Mwasiaji, 2024).

Capacity building is crucial. Many suppliers, especially SMEs, lack the technical resources to implement green practices. Training programs, knowledge-sharing platforms, and financial incentives can close these gaps, creating mutual value for buyers and suppliers (Geraci, 2024). Behavioral change within the buyer organization is equally important. According to Emerald (2024), employee attitudes, awareness, and decision-making autonomy significantly influence the adoption of sustainable procurement. Embedding sustainability in procurement culture reinforces supplier collaboration and innovation.

Technological Integration and Transparency

The digitalization of procurement has unlocked new opportunities for transparency, traceability, and performance monitoring. Technologies such as AI, blockchain, and predictive analytics help organizations evaluate supplier sustainability profiles in real time (Lopes & Singh, 2024). Arif and Li (2024) introduced a Green AI framework capable of improving circular logistics, reducing energy usage by 25%, and emissions by 30%. These tools enable procurement professionals to forecast environmental impact, optimize resource use, and prevent sustainability violations before they occur. Machine learning algorithms are increasingly deployed to analyze supplier certifications, LCA scores, and carbon footprints - transforming how buyers assess risk and make procurement decisions (Arif & Li, 2024).

Blockchain, though in early adoption, offers secure tracking of materials across the value chain, helping prevent greenwashing and ensuring claims verification (FT, 2024). Public agencies have also benefited. Circular Computing's partnership with the Irish government provided remanufactured laptops with verifiable carbon savings, tracked through a certification-backed dashboard (Circular Computing, 2024). This level of traceability demonstrates the feasibility of technology-enabled green procurement at scale. Overall, digital procurement systems enhance accountability, integrate sustainability criteria into daily processes, and provide empirical data for decision-making and reporting (Kronos Group, 2023).

Circular Economy and Life-Cycle Procurement

Circular procurement extends green procurement by incorporating cradle-to-cradle thinking - prioritizing reuse, remanufacturing, and closed-loop systems. A recent SAGE study (2025) of construction firms showed that circular practices like modular design, reverse logistics, and deconstruction planning reduced life-cycle costs and resource consumption. The EU's GPP criteria now embed circularity in public procurement contracts, requiring environmental product declarations, minimum recycled content, and service-based procurement models (UNEP, 2023). This evolution shifts procurement from consumption to stewardship.

Real-world applications are emerging. Ireland's remanufactured ICT contracts via Circular Computing are expected to reduce CO_2 by 19 million kg and save billions of liters of water (Circular Computing, 2024). In the UK, Public Health Wales diverted 41 tonnes of furniture waste through reuse schemes, saving over 130 tonnes of carbon emissions (Sustainable Procurement Platform, 2024).

Despite benefits, adoption barriers persist. Circular procurement demands multi-disciplinary expertise, procurement redesign, and long-term performance guarantees. Without internal

alignment and supplier readiness, circular ambitions often stall (SAGE Journals, 2025). Strategically integrating circular principles into contracts and vendor selection processes ensures that sustainability considerations extend beyond initial purchasing decisions to encompass the entire life cycle of goods and services.

Monitoring, Reporting, and Continuous Improvement

To validate green procurement outcomes, organizations must establish robust monitoring frameworks. Macharia (2023) found that tea processors in Meru County using green logistics and renewable energy procurement reported significant emissions reductions and cost savings. Key performance indicators (KPIs) such as waste diverted, CO_2 savings, and energy consumption are increasingly embedded in procurement systems and supplier contracts (Ajayi, 2024). Life-cycle assessment (LCA) and carbon accounting software further support real-time tracking of sustainability outcomes.

Transparent reporting fosters accountability. Governments in South Korea, Denmark, and South Africa have institutionalized GPP tracking, leading to policy refinement and stronger public trust (Tandfonline, 2024). Corporations such as Unilever use supplier sustainability indices and third-party audits to refine sourcing strategies (Mundia, 2024). Feedback loops - through supplier reviews, internal evaluations, and stakeholder input - help refine procurement criteria over time. Procurement teams must stay agile, updating systems, training programs, and metrics to reflect evolving sustainability demands (Emerald, 2024). Continuous improvement turns green procurement from a one-off initiative into a dynamic and strategic process that evolves with stakeholder expectations, regulatory developments, and technological advances.

Collaborative Governance in the Global Green Economy

Collaborative governance has emerged globally as a cornerstone for addressing sustainability challenges, particularly in procurement and resource management. Defined by Ansell and Gash (2008) as "a governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process," collaborative governance has expanded to include multi-level, cross-sectoral partnerships (Douglas et al., 2022). This model is especially critical in navigating global green transitions that demand the inclusion of governments, businesses, and civil society alike.

In the context of climate change, the IPCC (2023) emphasizes that multi-stakeholder governance is necessary to implement mitigation strategies, particularly in cities and regions where institutional capacity varies. Globally, initiatives like the UN Global Compact Cities Programme exemplify how cities from Melbourne to Accra are collaborating across sectors to embed sustainability in public service delivery - including procurement (UN-Habitat, 2024). Such platforms foster mutual learning, resource mobilization, and innovation exchange between developed and developing economies.

Europe has institutionalized collaborative governance in sustainability through the European Green Deal, where cross-border, multi-stakeholder alliances drive circular economy policies, including sustainable public procurement (European Commission, 2023). These alliances often include NGOs, regional governments, and SMEs, ensuring that sustainability reforms are participatory and adaptable. In Africa, this model is echoed by the ICLEI Africa network, supporting local governments - including Nairobi and Kisumu - in collaborative climate action.

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For Kenya and other developing economies, collaborative governance is essential not only for legitimacy but also for capacity building. Projects like Kenya's Climate-Smart Agriculture Strategy (2025–2030) incorporate civil society, academia, and private firms in designing resilient food systems, where procurement plays a critical role in sourcing eco-friendly inputs (Ministry of Agriculture, 2025). Thus, governance co-creation helps localize global sustainability frameworks. The global image of collaborative governance underscores interdependence. Whether tackling e-waste in Ghana, managing green buildings in Denmark, or launching public transport reforms in Indonesia, the common thread is inclusive, networked decision-making. Without shared governance structures, the vision of sustainable, green economies cannot materialize across the globe (UNEP, 2024).

Green Procurement as a Global Sustainability Driver

Green procurement, or Sustainable Public Procurement (SPP), is now globally recognized as a strategic tool for climate resilience, innovation, and inclusive growth. According to the UNEP (2023), public procurement accounts for 12–30% of national GDP across countries and influences over 50% of certain market segments such as construction, ICT, and healthcare. Leveraging this purchasing power to support sustainable products, services, and suppliers can significantly reduce global environmental footprints.

Countries like Sweden, South Korea, and Canada have formalized SPP through legal mandates and environmental product declarations. South Korea's Green Purchasing Law (revised 2023) requires public agencies to procure environmentally certified products, leading to emission reductions equivalent to removing 1 million cars annually (KMOE, 2024). These results illustrate the potential of procurement policies to drive systemic change in production and consumption.

Developing countries are also embracing green procurement, though at varied paces. In Kenya, Uasin Gishu and Nyeri counties have piloted procurement reforms incorporating life cycle cost analysis and eco-supplier criteria (Maiywa, 2024; Njoroge et al., 2024). The UN's PAGE (Partnership for Action on Green Economy) program supports such transitions through training and policy support in several African nations, reinforcing procurement's role in achieving SDGs.

Globally, private sector collaboration is pivotal. The Together for Sustainability (TfS) initiative - led by multinational companies like BASF and Bayer - standardizes green procurement through supplier scorecards, fostering transparency and shared improvement across global supply chains (TfS, 2025). This collective approach lowers audit costs and ensures consistency in ESG evaluations, even in developing-market contexts like Kenya and Nigeria.

The global face of green procurement is not just about efficiency - it's about equity. Procurement can be a lever for empowering marginalized groups, advancing fair labor standards, and supporting circular economies. Inclusive procurement frameworks such as AGPO in Kenya, or Canada's Procurement Strategy for Indigenous Businesses, underscore how sustainability includes both ecological and social dimensions.

Sustainability Outcomes from Integrated Green Procurement

Sustainability - defined by the triple bottom line of environmental protection, social equity, and economic viability - is the end goal of integrating collaborative governance and green

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procurement. Globally, sustainable procurement is no longer just a compliance issue but a strategic priority linked to national climate goals, biodiversity targets, and social development indices (UN DESA, 2024).

Countries like Finland and New Zealand have embedded sustainability into procurement mandates, requiring agencies to evaluate carbon emissions, biodiversity impacts, and gender equity before awarding contracts. Their frameworks also incorporate performance monitoring post-contract, ensuring that sustainability is not just a promise but a delivered outcome (OECD, 2023). These metrics are now being adopted in development finance institutions such as the African Development Bank.

In Kenya, counties practicing sustainable procurement - Uasin Gishu, Laikipia, and Kiambu - have reported measurable improvements in waste reduction, energy efficiency, and vendor accountability (Maiywa, 2024; Odero, 2021). However, barriers persist, including limited budget allocations, weak supplier databases, and absence of enforcement mechanisms. National sustainability requires harmonization of procurement standards and improved digital tools for monitoring.

Sustainability is also driven by citizen participation and third-party verification. In South Africa and Chile, civil society organizations are actively involved in verifying green criteria in awarded contracts. Kenya is moving in this direction through the adoption of e-GP platforms and public procurement audits published under the Open Contracting Data Standard (OGP Kenya, 2025). These systems ensure procurement sustainability is measurable and enforceable. Globally, the sustainability of procurement decisions is increasingly linked to planetary boundaries. Whether managing water resources in Jordan or renewable energy in India, countries must align procurement decisions with climate science. The Kenyan government's plan to prioritize green energy, eco-packaging, and clean transportation in public procurement is a step toward aligning national development with global environmental targets (Kenya Vision 2030 Green Pillar, 2025).

Capacity Development, Green Procurement, and Sustainability

The successful implementation of sustainability initiatives in procurement systems hinges on the interplay between capacity development and green procurement practices. Capacity development, broadly defined as the process of improving institutional, organizational, and individual abilities to perform functions effectively and sustainably, acts as the catalyst for operationalizing green procurement - the strategic purchasing of environmentally preferable goods and services. Together, they influence how sustainability is interpreted, implemented, and measured in both public and private sectors (UNEP, 2024). Without adequate capacity, procurement officers may lack the technical skills, regulatory knowledge, or systems-thinking mindset needed to integrate sustainability criteria into procurement processes. Recent studies emphasize that training in life-cycle costing, environmental compliance, and ESG performance metrics is foundational to greening supply chains (Skills for Africa, 2025; ASPM, 2025). This highlights a feedback loop: the more institutions invest in capacity building, the more likely they are to design procurement systems that deliver long-term sustainability outcomes.

In countries like Kenya, where green procurement is still emerging, this interplay is increasingly visible. For instance, counties such as Laikipia and Uasin Gishu have adopted life-cycle costing only after training officers through institutions like the African School of Project Management and Skills for Africa (Maiywa, 2024). Here, capacity development not only precedes but also sustains

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green procurement, ensuring that procurement choices contribute meaningfully to Kenya's Vision 2030 and global SDG goals.

Moreover, the interdependence is reflected in policy coherence. National governments and international partners are now aligning training curricula with green economy goals, meaning capacity development is no longer generic but context-specific and sustainability-oriented (PAGE, 2024; World Bank, 2023). For example, World Bank-funded projects in Kenya include procurement capacity audits, which influence both training content and supplier pre-qualification practices. Therefore, capacity development, green procurement, and sustainability do not function in isolation. Instead, they form a dynamic triad: building competence facilitates green procurement; green procurement actualizes sustainability; and sustainability feeds back into justifying and expanding capacity investments. This virtuous cycle is essential for institutionalizing sustainable procurement globally.

Capacity Development as a Driver of Sustainable Procurement Reform

At the heart of sustainable procurement reform is people and process readiness - a function directly shaped by capacity development. Recent capacity-building programs in Kenya, such as those offered by MacSkills and ASPM, emphasize systems thinking, environmental law, and green logistics as key areas of training (MacSkills, 2025; ASPM, 2025). These programs ensure that procurement officers understand not just the "what" but the "how" and "why" of sustainable procurement, enabling them to embed green criteria into technical specifications and evaluation processes. Capacity development also supports the transition from policy to practice. While many countries have green procurement policies, implementation gaps persist due to inadequate expertise, misaligned incentives, or weak monitoring systems. Kenya's Public Procurement and Asset Disposal Act (2015) includes provisions for sustainability, but its enforcement has been sporadic. Counties that have invested in procurement officer training and inter-agency collaboration (e.g., Kisumu, Nyeri) show markedly higher compliance with green procurement standards (Njoroge et al., 2024).

Additionally, international agencies such as UNEP and the World Bank are supporting "capacity-for-results" models, where training outcomes are linked to procurement performance metrics. These include supplier diversity, environmental impact reduction, and contract sustainability audits (UNEP, 2024). This approach shifts training from being a one-time event to a continuous performance improvement mechanism - deepening the interplay between capacity and results.

From a global perspective, countries like South Korea and Finland have adopted national green procurement training strategies that embed sustainability in public sector hiring and promotion frameworks (OECD, 2023). Such institutionalized approaches ensure that sustainability is not a function of individual motivation but embedded in public service culture. Kenya can emulate these models by mainstreaming green procurement competencies in the public service curriculum via the Kenya School of Government. In summary, capacity development does more than prepare people -it prepares systems. When linked with organizational reforms, regulatory frameworks, and digital procurement tools, it creates the conditions for green procurement to thrive and deliver sustainability. Without it, policies remain aspirational and fragmented.

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Sustainability as the Outcome of Capacity and Procurement Synergies

Sustainability is not achieved through policy declarations alone - it results from deliberate operational choices grounded in trained personnel and green procurement systems. A well-documented outcome of capacity-procurement synergy is the shift toward life-cycle thinking, where products and services are evaluated not just by upfront costs but by total environmental and social costs across their lifespan (UNEP, 2023). This requires procurement professionals who are trained, resourced, and institutionally supported.

Empirical data confirms the correlation between procurement capacity and sustainability outcomes. For example, a 2024 study by Stütz et al. analyzing 40 public agencies across Africa found that agencies with trained procurement officers and sustainability committees were 65% more likely to source energy-efficient equipment, eco-labelled products, and services with verified environmental impact reports (Stütz et al., 2024). This reinforces the idea that sustainability is not spontaneous - it is curated through capability.

Furthermore, the integration of digital tools into sustainable procurement processes reflects the modern face of the capacity-sustainability nexus. Kenya's e-GP platform, which incorporates ESG compliance checks and real-time reporting, was only successfully adopted after months of digital literacy training and back-end restructuring (PPRA, 2024). Without this preparation, digital tools fail to deliver intended transparency or impact. It is also critical to consider equity in sustainability. Sustainable procurement, when driven by capacity and accountability, can advance gender inclusion, local content development, and ethical supply chains. Kenya’s Access to Government Procurement Opportunities (AGPO) program, though focused on economic inclusion, can be strengthened to include environmental criteria - ensuring that sustainability is both green and inclusive (Treasury Kenya, 2023). Ultimately, the interplay among capacity development, green procurement, and sustainability generates lasting structural change. When capacity investments lead to sophisticated procurement practices, and when those practices are designed to meet environmental, social, and economic sustainability targets, the result is a procurement system that not only buys goods - but builds futures.

Impacts on Cost Management: Estimation, Lifecycle and ROI

The primary concern regarding GP is its perceived cost premium. Numerous studies, including Ahmed et al. (2022), indicate that initial capital costs for green materials and technologies can be 10–20% higher than conventional alternatives. In developing countries like Ghana, Kenya, and Pakistan, these cost differentials are magnified due to limited local green supply chains (Khan et al., 2023). Consequently, cost is frequently cited as a major barrier to GP adoption. However, life cycle costing (LCC) reveals that sustainable options often yield higher returns in the long run. As supported by Delmas and Pekovic (2021), LCC considers operational savings, reduced maintenance, and end-of-life recovery - cost elements that traditional budgeting often ignores. In Italy, Basso et al. (2022) found that natural infrastructure projects like constructed wetlands achieved cost-benefit ratios exceeding 4:1 when ecosystem services were monetized.

Infrastructure projects integrating Most Economically Advantageous Tendering (MEAT) methods demonstrate the practical feasibility of balancing cost with sustainability. For instance, the A16 Rotterdam project achieved nearly 47% energy reduction and 90% carbon emissions reduction by embedding sustainability into the tender criteria (Hoekstra & Wilms, 2023). These outcomes underscore how strategic procurement can enhance both environmental and financial performance.

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Additionally, innovations in Triple Bottom Line Cost–Benefit Analysis (TBL-CBA) and Sustainable Return on Investment (S-ROI) methodologies offer more comprehensive valuation tools. According to Wong and Zhang (2022), these models incorporate social value, such as job creation and community resilience, into financial appraisals. However, quantifying intangible benefits remains a methodological challenge. Therefore, traditional cost estimation must evolve. Integrating environmental externalities, lifecycle costing, and non-market values into budgeting processes offers a more accurate reflection of infrastructure costs. As Montalbán-Domingo et al. (2022) suggest, doing so shifts procurement decisions from cost-centric to value-centric frameworks.

Conclusion

The findings of this study underscore that green procurement is no longer an optional add-on to infrastructure projects but a critical dimension of sustainable development policy and practice. Anchored in Resource-Based Theory, Dynamic Capability Theory, and Institutional Theory, green procurement emerges as a multi-faceted instrument that combines strategic resource deployment, organizational adaptability, and institutional legitimacy. The evidence clearly illustrates that projects which systematically integrate sustainability considerations into procurement not only reduce environmental harm but also achieve superior cost efficiency and stakeholder trust. By embedding life-cycle costing, eco-labeling, and sustainability performance benchmarks into procurement frameworks, infrastructure delivery transcends the narrow confines of cost and time efficiency to embrace long-term resilience and innovation. Nevertheless, the study reveals that the path to full adoption remains fraught with challenges. High initial costs, knowledge and technical capacity gaps, and fragmented regulatory frameworks continue to inhibit widespread uptake, particularly in developing economies. The Kenyan context illustrates that, although policy frameworks exist, their implementation is hindered by weak institutional enforcement, limited supplier readiness, and entrenched resistance from traditional procurement actors. Without robust systemic reforms, green procurement risks being reduced to symbolic compliance rather than a transformative driver of sustainability. Thus, the conclusion emphasizes the need for a paradigm shift from perceiving GP as a regulatory burden to recognizing it as a strategic lever for innovation, competitiveness, and long-term cost savings.

Importantly, the EcoVadis model emerges as a credible instrument for operationalizing sustainability in procurement. Its standardized scoring of suppliers against ESG benchmarks provides a transparent, accountable, and comparable method for ensuring supply chain sustainability. While uptake remains constrained in resource-limited contexts, the framework offers a roadmap for integrating global standards into local practices. Localized adaptations, capacity support, and government facilitation are essential to make such tools inclusive and scalable in developing economies.

Ultimately, green procurement is both a moral imperative - given the urgency of climate change and ecological degradation - and a strategic necessity for building future-ready infrastructure. It fosters not only environmental stewardship but also social inclusivity and economic resilience. Its transformative power lies in moving beyond rhetorical commitment to being embedded into the DNA of procurement culture, governance frameworks, and performance systems. For developing countries, the alignment of green procurement with national visions and global sustainability frameworks represents a pathway to equitable and resilient development.

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Recommendation

In light of these findings, several recommendations emerge to strengthen the integration of green procurement in infrastructure projects. First, policy and regulatory frameworks must be harmonized with international standards such as ISO 20400, ensuring enforceable sustainability provisions in all public procurement processes. Governments should not only legislate but also provide incentives, such as tax breaks or subsidies, for contractors adopting green-certified materials and processes.

Second, capacity development must be prioritized. Procurement officers, contractors, and suppliers require structured training in sustainability principles, life-cycle costing, and ESG performance evaluation. Embedding these elements into national procurement curricula and professional certification schemes will institutionalize green procurement as a professional norm rather than a discretionary choice. Third, technological integration should be expanded. Digital procurement platforms, AI-enabled sustainability scoring, and blockchain traceability systems can enhance transparency and prevent greenwashing. Governments must pair these technologies with digital literacy programs to maximize their effectiveness, especially in developing contexts.

Fourth, supplier engagement is essential for broadening the reach of sustainable procurement. SMEs, which dominate construction and supply markets in developing economies, must be supported through capacity-building programs, financial incentives, and preferential contracting schemes that encourage investment in green innovation. By strengthening local supply chains, procurement systems can simultaneously promote sustainability and economic inclusion.

Finally, collaborative governance should be institutionalized. Governments, private sector actors, civil society, and development partners must co-create platforms for procurement reform. Such multi-stakeholder arrangements enhance accountability, align diverse interests, and ensure that sustainability commitments are inclusive and resilient. In doing so, green procurement becomes not merely a compliance exercise but a shared societal project that contributes directly to climate resilience, social equity, and long-term economic prosperity. In conclusion, the pursuit of sustainable infrastructure through green procurement requires integrated reforms, capacity-building, and collaborative commitment. With deliberate action, green procurement can evolve from a nascent policy instrument into a cornerstone of sustainable development in Kenya and globally.

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