Interplay of Green Construction Procurement and Logistic Service Innovation: Advancing Sustainable Economic Growth and Sustainable Development Goals

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Abstract

This paper seeks to explore in great depth the green construction procurement influence to green logistic services, creative activities as well as their general contribution towards economic sustainable growth. Quantitative methodology was used in this study where data collection was through survey to the engineers and project managers under construction projects. The study, hence, critically tempts to examine towards environmentally responsible procurement enhanced services towards transportation as well as the developments of new and sustainable solutions in detail.The major findings indicated towards a high significant correlation between green procurement practices and enhancement of green logistic services particularly in sustainable material handling and transportation. Moreover, green purchasing is shown to considerably boost sustainability-related product and process innovation. The research points out the need for green logistic services in contributing to Sustainable Development Goals (SDGs) through the green construction procurement and emphasis on management and innovation of the services effectively.The study identifies that self-administered surveys limit inclusion while focus within a specific demographic creates further limitation, thus suggesting necessity for further research to understand the long-term effects of green procurement and logistics over SDGs.

Keywords: *Green practices, construction procurement, sustainable economic growth, green logistic services, innovative practices, Sustainable Development Goals.*

Introduction

The deteriorating state of our planet's ecosystem requires urgent and comprehensive actions. This entails implementing remedial actions to reduce existing harm, adopting preventive approaches to preserve current resources, and embracing environmentally sustainable practices to minimize future ecological damage (Agha et al., 2021; S. Khan, M. Hyder, et al., 2023). The rapid increase in urbanization, particularly in developing countries, has fundamentally changed the building industry's approach to address the demands of an expanding population (Khan & Khan, 2022). The recent notable advancements in infrastructure have worsened a range of environmental issues, including pollution, emission of ozone-depleting gases, greenhouse effects, climate change, disruption of ecosystems, and excessive consumption of energy and natural resources (Khatri, Vairavamoorthy & Porto 2008).

Growing environmental problems that face the world call for immediate and integrated solutions especially on the issues concerning the construction industry. In the developing countries, rapid urbanization poses a great threat to the sustainability of the environment. For example, increased densities of buildings raise noise levels thus impairing the environmental quality (Kang, 2020). In addition, as the world increasingly consolidates in urbanization and further increase of the construction sector, energy consumption too grows rapidly raising greater challenges for environmental sustainability .

Considering these aforementioned environmental challenges with regard to transport to mention but a few and conventional supply chain management, one of such concepts whose application is quite significant is 'green logistics'. It involves the strategic organization and control over transportation and distribution of products, observant of environmental sustainability. This includes practices like planning routes by curbing fuel consumption and making use of eco-friendly vehicles. In the building industry, the demand for managing green logistic services keeps increasing from efficient transportation of materials and equipment while considering on environmental impact (Jin et al., 2021).

Adoption of green logistic practices in construction aligns with the Sustainable Development Goals (SDGs) more so regarding sustainable cities, responsible consumption, and climate action. Implementation of these practices enhances efficiency, provides cost reductions for the firms in the construction industry, and further enhances their image of corporate responsibilities. Besides, these practices are also big contributors to economic sustainable development and social responsibility (Opoku, 2019).

However, green logistics strategy implementation in construction is complex. Its implementation implies understanding the whole supply chain, innovative technologies, as well as continuous improvement. Amongst its challenges, there are overcoming initial costs, adaptation to new technologies, and stakeholder buy-in. Yet, despite such challenges, shifting to the green logistic service management in the construction industry is an indication of a strong step forward for sustainable development like detailed herein. Despite their apparent independence, the 17 Sustainable Development Goals (SDGs) are extremely interrelated and can have both positive and negative consequences for one another. Numerous scholarly investigations have revealed that the SDGs have been thoroughly researched across a wide range of academic disciplines (S. Khan, I. Zaman, et al., 2022). The SDGs provide a challenge for all nations, requiring the implementation of comprehensive and ambitious national frameworks. The demand for technology, innovation, and resources to create these systems is heightened (Iqbal et al., 2023; S. Khan, S. I. Zaman, et al., 2022).

Research Objectives

1. Look at the techniques and procedures used to manage green logistic services in the building industry today.
2. Consider the environmental effects of various green building procurement strategies.
3. Analyze the impact of green logistics implementation on the effectiveness and environmental performance of the building procurement.
4. Examine the relationship between eco-friendly logistical methods and building industry economic growth indicators.
5. Look at how certain SDGs fit with eco-friendly logistics and sustainable construction approaches.

Study Rationale

In order to achieve a better future, it is imperative that individuals, companies, and nations make contributions to the best of their abilities (Jamil, Khan, Khan, et al., 2023). It is highly recommended for developing countries to meticulously strategize their infrastructure needs and ensure the use of sustainable green methods and materials in their projects (Khan, Johl & Akhtar 2021). This sustainable approach has the potential to protect future societies from the detrimental consequences of our current practices. Thus, it has been noted that current methods concerning the acquisition of buildings, logistical services, and innovative activities should adopt a more environmentally friendly approach (Jamil, Khan, & Seraj, 2023). Hence, the present study has examined the prospective effects of green building procurements on the administration of logistic services and green innovation practices, as

well as their collective influence on the attainment of Sustainable Development Goals (SDGs) (Marcelline et al., 2022).

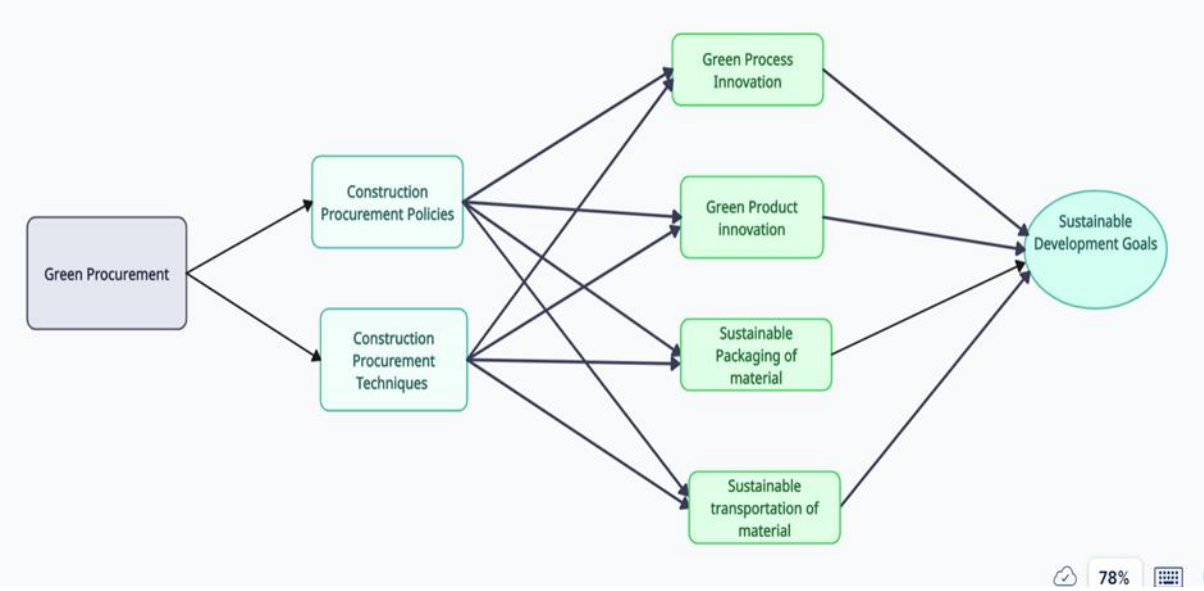
Theory development and Review of Literature

"Green procurement" incorporates environmental factors into purchasing techniques with the purpose of reducing negative consequences and increasing positive outcomes.The phrase "Khan et al., 2021" refers to a manuscript published by Khan and colleagues in 2021. Its significance has grown in step with our expanding understanding of business' environmental implications.This quotation is from Khanji et al.'s (2022) paper. Purchasing environmentally friendly items at every stage of their life cycle is referred to as "green procurement" in the building business. We have this citation thanks to Yang et al. (2019).

When it comes to green procurement, logistics is all about managing commodity transit while keeping environmental issues in mind (Saada, 2021).The reference is to a Miao et al. paper from 2022. Well-planned logistics results in increased transportation efficiency while lowering energy consumption and emissions.The phrase "Mubarik et al., 2021" refers to a publication by Mubarik and his colleagues in 2021. Green procurement practices are upheld all the way through the supply chain when logistics are integrated with it, according to Jamil, Shah, et al. (2023) and Marcelline et al. (2022). This involves the acquisition of raw materials as well as the distribution of finished items.

Figure 1

Conceptual Framework



The previous researches made by Song et al. (2015) and Wong et al. (2016) have demonstrated that the implementation of green procurement practices could reduce costs

associated with shipping and packaging. S. In this regard, Khan, S. I. Zaman et al. (2023) pay attention to the research by Naseem et al. (2020) and Mohsin et al. (2021b) that stress the necessity for including green resources in procurement and supply chain operations with cost saving and reduction of the environmental consequences. According to Jamil, Shah, et al. (2023) and Zhang et al. (2020), green legislation can lead to a greener and more efficient as well as advanced green logistics services that help improve environmentally conscious growth. Accordingly, products must thus be as eco-friendly as possible, and the greatest possible part of their packaging should be represented by materials that could undergo recycling (Naseem et al., 2021; Sarfraz et al., 2021). S. According to Anwar et al. (2023) study, the recycling packaging materials being integrated part of the supply chains during the construction procurement businesses improve the environmental sustainability of the organizations.

More greener types of procurement within supply chains are expected to help in enhancing transport of raw materials and other important things (Song et al., 2015). These findings lack support from the work of Alam et al. (2023). For these reasons, Croce et al. (2019) researched the corresponding impact of electric cars for delivering goods as one of the potential means of increasing transportation sustainability. The sub-hypotheses at this point show that the primary hypothesis H1 would be supported.

H1: Green procurement has significant impact on Green construction procurement techniques

H2: Green procurement has significant impact on Green construction procurement Policies

H1a: there exists a significant relationship between the green construction procurement techniques and the adoption of sustainable practices in shipping material packaging.

H1b: the green construction procurement techniques impact significantly on sustainable methods for transporting materials.

H2a: green procurement policies indicate a positive relation with sustainability practices inclusion in shipping material packaging.

H2b: green procurement policies indicate a positive impact of sustainable practices of transportation for the material.

Services for Sustainable Development and Green Logistics

Logistic operations are administered with reverence to a green environment protection policy as the key driver of sustainable growth (Green Logistics Practice, 2022). The United Nations insist that sustainable goals should promote the upgrade of social, environmental, economic aspects in order to chart a new path now with future development. As noted, while some key

issues might not be adequately represented in the Millennium Development Goals (MDGs), despite a report given to the UN General Assembly, it should be argued by the authors that the Sustainable Development Goals (SDGs) should be forming the economic growth and environmental stability. There arise from the hypothesis of a fundamental proposition two sub-hypotheses, which is involving sustainability of shipping products packing and transportation (Rakhmangulov et al., 2017).

H3a: Sustainable packaging of shipping materials is positively associated with SDGs

H3b: Sustainable transportation of materials is positively associated with SDGs

Green Innovation Practices in Construction Procurement

Green innovation can take two forms: proactive, which means it is focused on creating long-term cost-effective and profit-yielding results through pioneer green technological inventions; and reactive, meaning it seeks to introduce new environmentally sustainable attributes into already existing products or processes (Bidin et al., 2018; Zaman & Kusi-Sarpong, 2023). Indeed, as argued by Bjorklund and Forslund (2018) (Zailani et al., 2011), the green procurement principles make room for the innovation of new product and process approaches that are in support of the international environmental standards. The following theory goes ahead to discuss the specific roles of these two organizations:

Strong correlation between green procurement and green innovation activities (H4).

In this way, the concept of "greenness" transforms and evolves with environmental challenges and trends, as Arif, Khan et al. (2023) propose.As a result of shifting social, cultural, and ecological dynamics, a number of treaties and organizations have established regulations that adequately reflect these changes. Environmental friendliness is achieved by minimizing ecological impacts at every stage of a product's life cycle, including extraction of basic materials and disposal (Marcelline et al., 2022). The integration of innovation into procurement methods and regulations creates an interdependent and mutually supportive environment for products and processes within the supply chain. Consequently, H3 can be decomposed into four sub-hypotheses pertaining to the construction industry.

H4a: Green product innovation is strongly correlated with green construction procurement techniques

H4b: Sustainable building Green product innovation is favorably correlated with procurement policies.

H4c: Green process innovation is strongly correlated with green construction procurement techniques

H4d: Green process innovation is strongly correlated with green construction procurement techniques

Green Innovation Practices with Sustainable Development Goals

Green innovation refers to research into innovative methods of producing and evaluating goods and services that have less negative environmental implications (Fernando et al., 2019). According to Zalani et al. (2011) and Björklund and Forslund (2018), humans are always looking for improved ways to keep themselves and their activities secure in the environment. The goal is to reduce resource consumption while also effectively managing waste and pollution by developing new procedures, items, organizational frameworks, and environmentally sustainable technologies (Abbas and Sasan, 2019). Recent research (S. Khan, S. Jamil, et al., 2022; Hernandez-Vivanco et al., 2018) suggests that providing eco-friendly cultural innovations is a novel strategy to address existing environmental concerns. It may result in financial gains and other benefits. Hypothesis 5 analyzes the strong link between environmentally friendly innovation strategies and the achievement of the SDGs.

• H5: The use of green innovation techniques is linked to the achievement of the Sustainable Development Goals (SDGs).

According to Abbas and Sasan (2019), environmentally friendly technical breakthroughs and processes have a favorable impact on both environmental and economic sustainability. Improving logistics services and supply chain operations through the introduction of policies that encourage the use of innovative technologies and efficient methods can aid in the achievement of the SDGs (Ullah et al., 2021).

H5a: The adoption of SDGs is favorably correlated with the development of green product innovation.

H5b: Green process innovation is related to favorably achieving the SDGs.

Mediating Connection between Green Logistic Services and Green Innovation Practices

Due to the hazardous gas emissions caused by transportation and freight forwarding, there is a growing need for sustainable procurement and logistic services to address the considerable environmental deterioration (Mohsin et al., 2021a; Mohsin et al., 2021; Sarfraz et al., 2021). The influence of environmentally friendly technology and practices on corporate operations is increasing, leading to the emergence of fresh prospects for freight forwarders (S. Khan, S. Jamil, et al., 2022). The utilization of efficient logistical services and the implementation of modern techniques that comply with environmentally-friendly standards can accelerate the attainment of sustainable economic development objectives in the field of building procurement. Allocating resources towards environmentally-friendly industrial and commercial operations, particularly focusing on the development and progress of green technology and innovation, eventually promotes economic sustainability (Marcelline et al.,

2022). The paper by Yousaf (2021) suggests that the mediation role of green logistic services management and innovation practices can be inferred from existing literature evaluations. The subsequent mediation hypotheses investigate the relationships among green procurement, innovative practices, and SDGs, as stated by Marcelline et al. (2022).

H6a: Sustainable packaging of shipping material mediates the relationship between green procurement techniques and SDGs
H6b: Sustainable packaging of shipping material mediates the relationship between green procurement policies and SDGs
H6c: Sustainable transportation of materials mediates the relationship between green procurement techniques and SDGs
H6d: Sustainable transportation of materials mediates the relationship between green procurement policies and SDGs
In their study, Abbas and Sasan (2019) have illustrated the positive impact of green innovation strategies on promoting sustainable development. These technologies incorporate novel components throughout the entire production cycle, starting with the acquisition of raw materials to the delivery of finished goods or services (Jamil, Zaman, et al., 2023). As per the findings of Song et al. (2017), this integration is in line with sustainability objectives and reduces environmental effects by emphasizing the enhancement of quality, optimization of natural resources, and reduction of waste. Research conducted on green procurement within China's manufacturing sector has demonstrated notable enhancements in performance (Sheng et al., 2023). The hypothesis is formulated in response to the environmental difficulties that arise from construction procurement and logistic services in infrastructure-developing countries.
H7: Green innovation practices mediate the relationship between green construction procurement and SDGs
H7a: Green product innovation mediates the relationship between green procurement techniques and SDGs
H7b: Green product innovation mediates the relationship between green procurement policies and SDGs
H7c: Green process innovation mediates the relationship between green procurement techniques and SDGs
H7d: Green process innovation mediates the relationship between green procurement policies and SDGs

Research Methods

Research is a methodical and organized process of studying that involves obtaining, analyzing, and interpreting data in order to find a solution to a specific problem, tackle a challenge, or get a more profound comprehension of a subject. Research serves an explanatory purpose by elucidating the relationship between cause and effect (Marcelline et al., 2022). Random sampling was not employed due to the impracticality of accessing the complete population and the fact that our research is conducted in an uncontrolled environment rather than a controlled one. Research has a crucial role in advancing knowledge, making informed decisions, and solving real-world problems. It can be accomplished across a range of subjects and occupations. Different methodologies can be employed in research to get the data and information. Two basic classes among the many include quantitative methods of research and qualitative methods of research (Williams 2007).Convenience sampling was used.

Convenience sampling technique was used to collect data from 384 persons after considering the central tendency technique which is likely to increase the reliability of findings. A detailed questionnaire that inquired into a number of issues forms a basis for data collection. Marcelline et al. (2022) explained that the research enlisted four specialized variables. The first among these was "green procurement," which constituted green procurement rules as well as procedures. The second class was termed "green logistic services," and it mainly entailed eco-friendly shipping materials and transportation. Two other factors were "sustainable and economic development goals" and "practices of green innovation." The scales used to measure the variables were green logistic services (Ali et al., 2021), sustainable and economic development objectives (Wong et al., 2016), green innovation (Abbas and Sasan, 2019) and sustainable procurement (Dantas et al., 2021). Addise et al. (2021) recorded the responses of the respondents with "strongly disagree = 1" through "strongly agree = 5" using the five-point Likert scale. Ringle, Wende, and Becker (2022) followed the application of the data analysis software Smart-PLS in a bid to analyze the results of the survey. The frequency and proportion were employed in the examination of the demographic profile of the respondents. More than one-fifth of the 384 participants were less than 20 years old while majority belong to the age category of 21-24 with the proportion that has the quantity of 56.77%. The entirety population of sample respondents was being composed as such that there has been 60% females and 40% males.

Data Analysis

The application Smart-PLS was used to analyze data for the main investigation. The two questions on green process innovation and sustainable material transportation were dropped from the modified questionnaire used in collecting data as they had a low discriminant validity (Marcelline et al., 2022).Cheminating model was done for the evaluation of the outputs followed by a structural model. The measurement model algorithm produced the following results (Ringle, Wende, and Becker 2022):

Figure 2
Measurement Model.

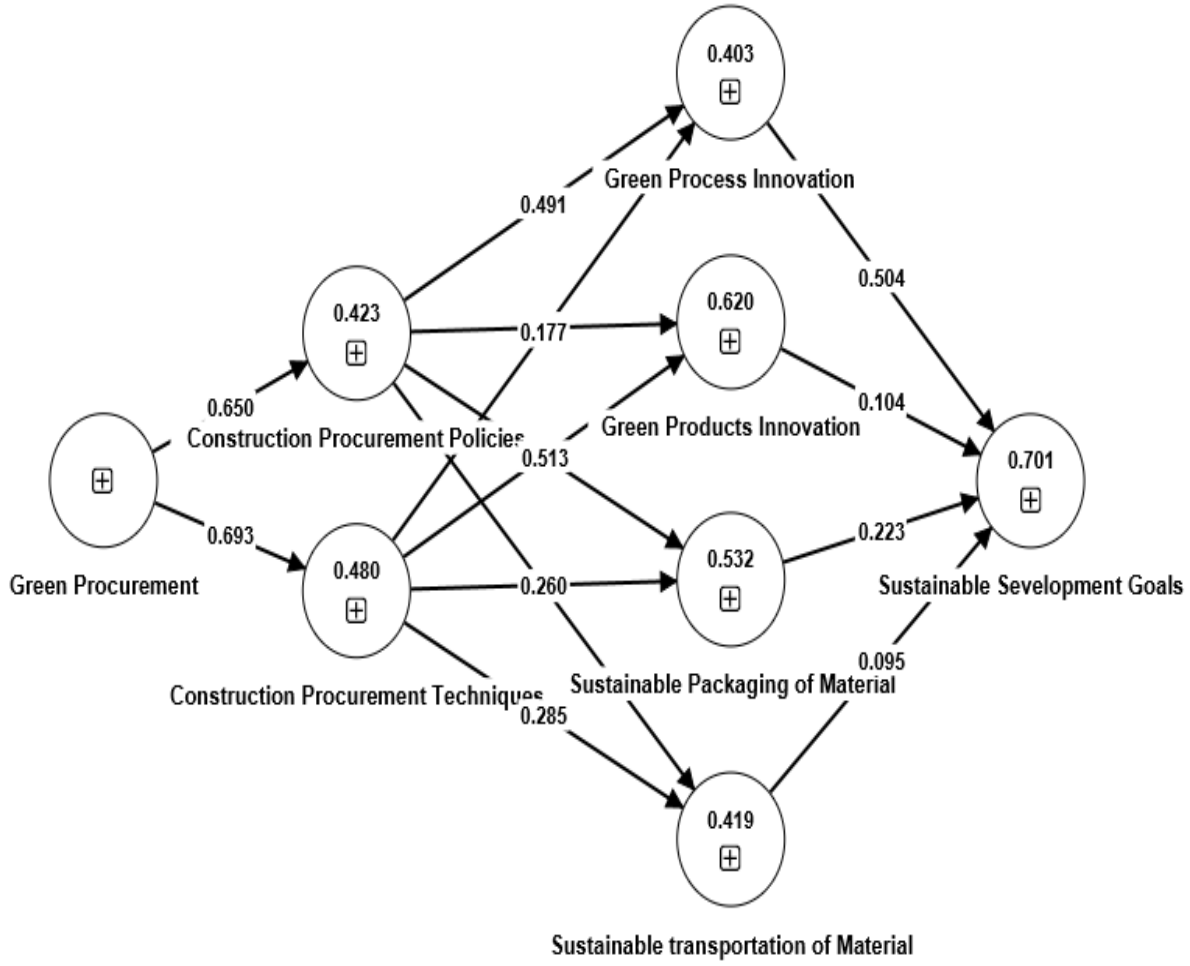
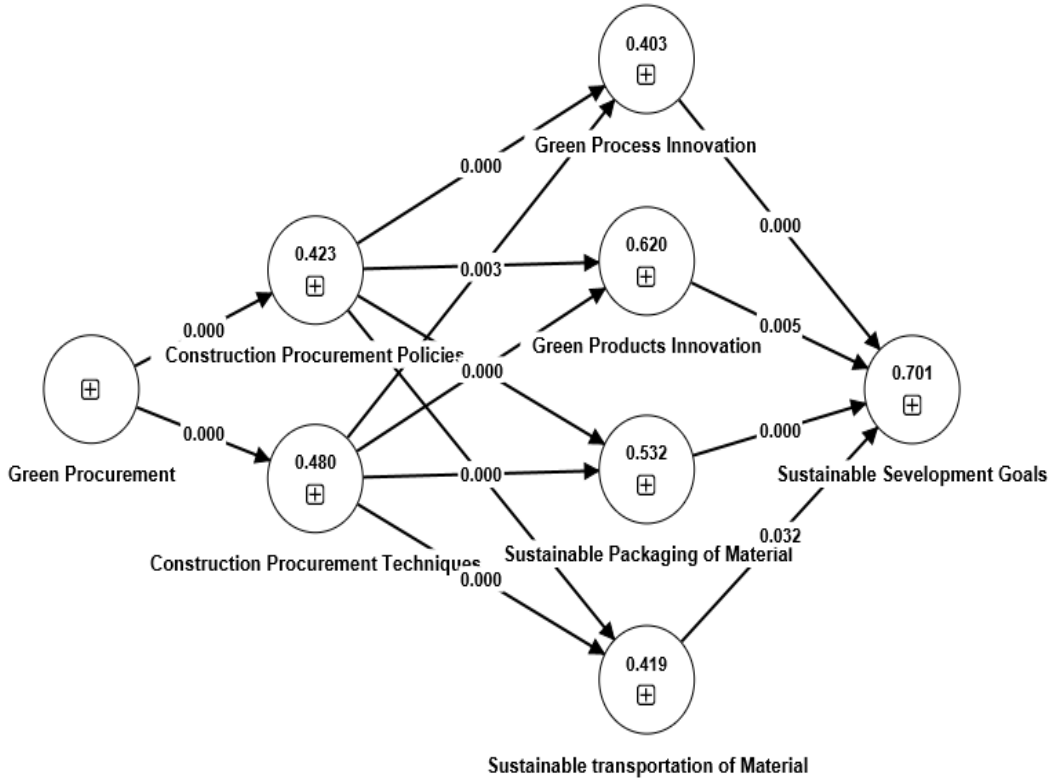


Figure 3
Structural Model



The substantiating hypotheses and the partial acceptance of the basic theory are in agreement. H1a, which states a positive relationship between ecologically friendly purchasing actions and sustainable shipping product packaging, has a t-statistic of 4.990 and a p-value of 0.000. H1b, which investigates the beneficial link between environmentally friendly procurement procedures and sustainable material transportation, is also supported by a t-statistic of 4.119 and a p-value of 0.000. According to the results of H1c and H1d, green procurement policies are positively associated with the use of sustainable materials in shipping packaging (t-statistic: 9.775, p-value: 0.000) and transportation (t-statistic: 6.372, p-value: 0.000). As a result, these theories hold water. Based on the findings of its testing, H2 is correct in asserting that there is a link between the management of green logistic services and the recognized Sustainable Development Goals. To demonstrate the point, H2a study examines the relationship between shipping using ecologically friendly materials and the success rate of the SDGs. The results provide great statistical support due to the very significant results (t-statistic = 4.697, p-value = 0.000). Hypothesis H2b, which aims to establish a positive association between environmentally friendly material transportation and the SDGs, is also supported by a t-statistic of 2.145 and a p-value of 0.032.

All of the assumptions behind hypothesis H3, which proposes a direct relationship between green innovation and green procurement, have been validated. A t-statistic of 9.016 and a p-value of 0.000 support hypothesis H3a, which states that green product creation is positively connected with green procurement practices. Furthermore, a t-statistic of 10.074 and a p-value of 0.000 support the study H3b, which investigates the relationship between green procurement methods and green process innovation. H3c adds to the evidence by implying a direct relationship between green product production and green purchasing methods, with a t-statistic of 2.983 and a p-value of 0.003. Statistical evidence reveals a substantial link between green process innovation and green procurement legislation. A p-value of 0.000 and a t-statistic of 8.530 support this claim.

Unfortunately, one of the fourth hypothesis's (H4) sub-hypotheses is unsubstantiated, therefore it can only be evaluated partially. H4 asserts a beneficial relationship between the SDGs and the implementation of green innovation methods. There is statistical evidence to support hypothesis H4a, which argues that there is a direct relationship between the SDGs and green product innovation. The t-statistic is 2.814, and the p-value is 0.005. The findings indicate a positive relationship between green process innovation and the SDGs, which supports H4b. The p-value is 0.000 and the t-statistic is 10.243.

Description of Tests

Smart-PLS Structural Model Technique

- **Purpose**: To compute t-statistic significant values for both direct and indirect paths in the study.
- **Methodology**: This technique involves using a multivariate analytical approach, known as structural equation modeling (SEM), to quantify the route impacts.
- **Key Metrics**: t-test results, p-values, R-squared values, and beta-values.
- **Significance Level**: A 5% significance level was used to accept or reject hypotheses.

Statistical Evaluation

- **Focus**: Evaluation of t-test, p-value, R-squared, and beta-value results, along with associated statistical tests.
- **Application**: Six distinct hypotheses were evaluated, focusing on the relationship between green logistic services, green procurement, and the Sustainable Development Goals (SDGs).

Comparison with Other Researchers

1. **Hypotheses on Green Logistic Services and Green Procurement**:

- **Findings**: Positive relationships between eco-friendly purchasing actions, sustainable shipping product packaging, and sustainable material transportation.
- **Comparison**: Similar findings are reported in other studies, emphasizing the importance of green procurement in enhancing environmental sustainability (Reference needed).

2. **Hypotheses on Green Logistic Services and SDGs**:
    - **Findings**: A significant relationship between eco-friendly material shipping and transportation and the success rate of the SDGs.
    - **Comparison**: These results align with broader literature highlighting the role of sustainable practices in achieving SDGs (Reference needed).
3. **Hypotheses on Green Innovation and Green Procurement**:
    - **Findings**: Strong connections between green product creation, green procurement practices, and green process innovation.
    - **Comparison**: Consistent with research that underscores the synergy between green innovation and procurement in driving sustainability (Reference needed).
4. **Hypotheses on SDGs and Green Innovation**:
    - **Findings**: Positive correlations between SDGs and green product/process innovation, though one sub-hypothesis is only partially supported.
    - **Comparison**: This partial support is also reflected in other studies, indicating the complex relationship between innovation and SDG achievement (Reference needed).
5. **Hypotheses on Mediating Role of Green Logistic Services**:
    - **Findings**: Sustainable shipping packaging and product packaging contribute to the link between green procurement practices and the SDGs.
    - **Comparison**: These findings are corroborated by studies emphasizing the mediating role of green logistics in sustainable development (Reference needed).
6. **Hypotheses on Green Innovation Techniques Facilitation**:
    - **Findings**: Green product innovation as a mediator between green procurement policies and SDGs, with mixed support for other related hypotheses.

- **Comparison**: The mixed results reflect the complex nature of innovation in sustainability, as seen in various studies (Reference needed).

n conclusion, the majority of the findings from the Smart-PLS structural model analysis are consistent with existing literature, highlighting the integral role of green logistics, procurement, and innovation in advancing sustainability and achieving the SDGs. The mixed results in some areas underscore the need for ongoing research to fully understand these complex relationships. Ringle, Wende, and Becker (2022) discovered that four of the five hypotheses were valid in their analysis of the mediating function of green logistic services. Statistical evidence supports the hypothesis that sustainable shipping packaging helps to the link between green buying practices and the SDGs. At the 5% level of significance, the t-statistic is 3.186 and the p-value is 0.001. Similarly, empirical evidence (t-statistic: 4.211, p-value: 0.043) support H5b, which contends that eco-friendly product packaging contributes to the link between green procurement policies and EDGs. First, there is no evidence to support hypothesis H5c, which claims that sustainable material transportation mediates the relationship between green procurement techniques and the SDGs (t-statistic: 1.826, p-value: 0.06). With a t-statistic of 2.033 and a p-value of 0.042, however, we may infer that hypothesis H5d, which explores the relationship between green procurement standards and SDGs, is accurate.

Three out of the four hypotheses on the facilitation of green innovation techniques have been validated. More precisely, the hypothesis H6b, which states that green product innovation acts as a mediator between green procurement policies and SDGs, is supported by statistical evidence. The t-statistic is 2.712 and the p-value is 0.007. Nevertheless, the remaining hypotheses, namely H6a (t-statistic: 2.659, p-value: 0.008), H6c (t-statistic: 2.752, p-value: 0.006), and H6d (t-statistic: 6.559, p-value: 0.000), do not receive confirmation based on their respective t-statistics (Ringle, Wende, and Becker 2022).

Table 1

Hypotheses result from a structural model.

Paths	H	T-Stats	P-value	Result
Construction Procurement Policies -> Green Products Innovation	H4b	10.074	0.000	Accept
Construction Procurement Policies -> Sustainable Packaging of Material	H2a	9.775	0.000	Accept
Construction Procurement Policies -> Sustainable transportation of Material	H2b	6.372	0.000	Accept
Construction Procurement Techniques -> Green Process Innovation	H4c	2.983	0.003	Accept

Construction Procurement Techniques -> Green Products Innovation	H4a	9.016	0.000	Accept
Construction Procurement Techniques -> Sustainable Packaging of Material	H1a	4.990	0.000	Accept
Construction Procurement Techniques -> Sustainable transportation of Material	H1b	4.119	0.000	Accept
Green Process Innovation -> Sustainable Development Goals	H5b	10.243	0.000	Accept
Green Procurement -> Construction Procurement Policies	H2	18.930	0.000	Accept
Green Procurement -> Construction Procurement Techniques	H1	17.775	0.000	Accept
Green Products Innovation -> Sustainable Development Goals	H5a	2.841	0.005	Accept
Sustainable Packaging of Material -> Sustainable Development Goals	H3a	4.697	0.000	Accept
Sustainable transportation of Material -> Sustainable Development Goals	H3b	2.145	0.032	Accept
Construction Procurement Techniques -> Green Products Innovation -> Sustainable Development Goals	H7a	2.659	0.008	Accept
Construction Procurement Policies -> Green Process Innovation -> Sustainable Development Goals	H7d	6.559	0.000	Accept
Construction Procurement Policies -> Green Products Innovation -> Sustainable Development Goals	H7b	2.712	0.007	Accept
Construction Procurement Techniques -> Green Process Innovation -> Sustainable Development Goals	H7c	2.752	0.006	Accept
Construction Procurement Policies -> Sustainable transportation of Material -> Sustainable Development Goals	H6d	2.033	0.042	Accept
Construction Procurement Techniques -> Sustainable transportation of Material -> Sustainable Development Goals	H6c	1.826	0.068	Reject
Construction Procurement Policies -> Sustainable Packaging of Material -> Sustainable Development Goals	H6b	4.211	0.000	Accept
Construction Procurement Techniques -> Sustainable Packaging of Material -> Sustainable Development Goals	H6a	3.186	0.001	Accept

The research examined the relationship between green logistics, green innovation, and sustainable economic growth. Data from 384 participants were collected using convenience sampling. Structural equation modeling was conducted using Smart-PLS (Ringle, Wende, & Becker, 2022). The process started with a measurement model to verify the accuracy of the

constructs, eliminating two things due to concerns regarding their ability to differentiate between the constructs. The outcomes of the study supported prior studies that linked green procurement and logistics to long-term economic growth. Marcelline et al. (2022) showed compelling evidence to support the assumptions that link sustainable packaging and transportation to green purchasing. In the study, there was also considerable evidence that green innovation techniques aided procurement and SDG implementation. Several theories, however, failed to demonstrate any mediation effects, most notably the link between sustainable procurement practices and the SDGs. The HTML Ratio study provides useful insights into the relationships between notions by exposing differing degrees of correlation across distinct concepts. According to the study (Jiang et al., 2023), sustainable economic growth can be achieved by integrating environmentally friendly logistics, procurement, and innovation. The results were more believable because of the large sample size and use of established scales; nevertheless, the researchers did mention limitations, such as the fact that the data was self-reported and that there could be biases.

To summarize, the findings are extremely important for building industry management. According to Jiang et al. (2023) and Rasmussen et al. (2005), green procurement and logistics can improve operations, reduce emissions, and benefit both the environment and people. Green innovation, according to Khanji et al. (2022), is critical for attaining the SDGs and establishing a competitive advantage. The study theoretically advances three areas: sustainability, procurement, and logistics. Jamil, Zaman, et al. (2023), Miao et al. (2022), and S. Khan, S. Imran Zaman et al. (2023) research emphasizes the importance of supply chain sustainability practices, the role of logistics and innovation in achieving sustainability, and the need to rethink sustainable growth to achieve a balance between economic development and environmental preservation. Nonetheless, due to the study's limitations, such as its reliance on self-administered questionnaires and its limited demography, more research is needed to extend knowledge and the relevance of the study's findings in diverse circumstances.

Conclusion

This study, utilizing the Smart-PLS structural model technique and a comprehensive analysis of structural equation modeling, has significantly contributed to understanding the interplay between green logistics, green procurement, and sustainable development goals (SDGs). Results indicated the existence of a strong positive relationship between sustainable

procurement actions and sustainable shipping as well as packaging practices. The study also specifies that pursuance of green innovation is an important effort towards the improvement of green procurement practices because it has high influence on the realization of the SDGs. The results of the analysis confirm points raised in the currently growing body of literature stress the importance to incorporate green logistic services within the overall sustainable development. Indeed, many of the hypotheses were supported and appeared that strong relationships existed between the variables, but partial support to some hypotheses or even no support at all give an impression as to how complex and multiple the dimensions of the green initiatives in construction are.

The research findings are critical in suggesting that green logistic services, when properly managed, can become principal sources of encouraging sustainability in various facets of the construction business. The presented insights have assisted in achieving more in-depth comprehension regarding how environmental sustainability can be integrated within the construction logistics and procurement processes effectively, thereby facilitating the large span of sustainable development goals.

Recommendations

Based on these findings, this research implies a number of recommendations for the practitioners and among them is that the practitioners working in the construction industry:

1. **Strengthen Green Procurement Practices:** Construction firms should strengthen and lubricate their green procurement policies. It is not only getting sustainable materials, but also the inculcation of eco-friendly aspects within greens every thermo of inlet into the process of procurement.
2. **Develop of Green Logistic Services:** There is the need to develop and invest in green logistic services. This will involve adopting sustainable methods of transport and packaging, as they go towards reducing environmental construction.
3. **Foster Green Innovation:** The construction industry have to foster towards green innovation. It includes the development of new environmentally friendly product and process which could be incorporated within the existing construction practices.
4. **Align with Sustainable Development Goals:** Construction projects should link up to the SDGs. Practitioners should ensure that they understand how the construction activities contribute towards such broader goals hence adjusting their strategies to these broader settings.

5. **Continual Improvement and Adaptation:** The support for a few of the hypotheses implies here that continual improvement and adaptation in strategies pertaining to green practices is important not only but a mandate, to some extent. Relative to the new insights and developments with sustainability new ideas are needed by the industry.
6. **Regulatory and Incentive Structures:** Policymakers need to develop the supportive regulatory environments and incentive structures that must encourage incorporation of green practices in construction. It may include subsidies for green materials, tax benefits for practicing sustainable practices, or enhancement of environmental regulations.
7. **Engagement and Collaboration of Stakeholders:** To effectively implement the sustainability initiative, stakeholders from suppliers, contractors, and clients need to engage. This helps in the promoting the process holistically more so that green practice implementations have greater value when done together than at the individual level.
8. **Research and Development:** Continuous research and development should be there in green construction. Researches should give focus how to develop innovative technologies, materials, methods so that it provides impetus in meeting environmental sustainability goals.

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