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GREEN AND SUSTAINABLE PUBLIC PROCUREMENT, APPROACH AND PRACTICES IN CEMENT MANUFACTURING INDUSTRIES IN NIGERIA.

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Abstract

This paper examines the methods and current practices of Green and Sustainable Public Procurement within the Cement Manufacturing sector in Nigeria.

The objective is to investigate the different strategies presently employed in the cement manufacturing industry that adhere to the standards of Green and Sustainable Public Procurement, while also proposing new methods where necessary to promote more environmentally friendly procurement. This will take into account the social, cultural, and economic aspects of Green and Sustainable Public Procurement practices specifically in Nigeria's Cement Manufacturing sector. Furthermore, the theoretical frameworks of Triple Bottom Line and Stakeholders Theory have been selected for this paper. The Triple Bottom Line focuses on addressing the People (Community), Planet (Environment), and Profit (Values), while Stakeholders Theory examines the various efforts and collaborations of stakeholders to enhance the effectiveness and efficiency of Green and Sustainable Public Procurement practices.

In conclusion, the paper summarises its findings and provides relevant recommendations where applicable.

Keywords: Green Public Procurement, Stakeholders, Triple Bottom Line, Bio-based Public Procurement, Sustainability, Standard, Manufacturing, Circular Economy, Innovation-Oriented Public Procurement, Social Return on Investment, Internal Social Criteria.

Introduction

Cement manufacturing entails various chemical emissions that are detrimental to the environment and pose significant hazards to the ecosystem. These emissions include dust, plant smoke, engine oils, fuel, and gas emissions that occur daily. Establishing a cement manufacturing company in any location necessitates careful planning of green and sustainable public procurement practices to ensure that the environment and the community are not adversely affected while pursuing profit.

According to Czarnezki (2019), green procurement is a facet of procurement that takes into account the environmental impact associated with the procurement of goods and services. Greater emphasis is placed on services, which can also be referred to as work. Furthermore, the services or works that follow the procurement practice must be in harmony with environmental considerations throughout their lifecycle, including the waste generated from those goods or materials, resource consumption, pollution, and the ecological footprint of the products or services.

Czarnezki (2019) further elaborates that green public procurement (GPP) signifies that when public institutions procure goods and services, they consider the environmental costs and benefits throughout a product's life cycle, aiming to promote sustainable consumption and production. A product's life cycle encompasses the extraction of raw materials, production and manufacturing, packaging, distribution, usage, and disposal. Externalities emerge during a product's life cycle that current purchase prices do not adequately reflect. Purchase prices overlook indirect supply chain costs, such as environmental externalities. Therefore, life-cycle costing (LCC), in its most comprehensive form, seeks to measure and assign monetary value to these externalities. The European Commission emphasises sustainable public procurement as another approach for public

authorities to balance social, economic, and environmentally sustainable development during various stages of the procurement of goods and services, and they further analyse six distinct aspects of sustainable practices.

Statement of the Problem

The critical concern regarding casualties in Nigeria's cement manufacturing sector arises from prevalent environmental hazards and carbon gas emissions, which are highly detrimental to health (Shraddha et al, 2014). These hazards include cement dust, smoke, oil, and various malfunctioning equipment. Insider information indicates that a significant number of fatalities occur daily as a result of the aforementioned carbon gas emissions in the cement industry, particularly in the Northern region of Nigeria, where hot climatic conditions are common.

Methods: The data collection for this paper involves secondary data, with a primary emphasis on reviewing relevant literature**.**

Conceptual Review:

Green Public Procurement

Public Procurement was established to link the government with the acquisition of goods, services, and infrastructure within the country, with Nigeria serving as a prime example. (Fourie et al, 2020; Otieno et al., 2025) This initiative was implemented across all levels of government, including National, Regional, and Local Levels. NIKITCHENKO et al (2016) emphasize that Public Procurement involves the acquisition of goods, works, and services by the procuring entity in accordance with the procedures mandated by law. Furthermore, NIKITCHENKO et al (2016) elaborate on the Public Procurement processes in relation to sustainability in Ukraine, stating that "The procedure for sustainable procurement of goods, works, and services must adhere to the overarching principles and regulations established by the pertinent legislation of Ukraine. The awarding of

public procurement contracts is rigorously governed by laws designed to safeguard both the procuring entity and the bidder." Meanwhile, Czarnezki (2019) contends that the concept of Green Public Procurement gained prominence as a response to the urgent need to mitigate pollution in the environment, particularly within industries such as cement manufacturing, which have been significant contributors to environmental degradation through the release of dust, gas, smoke, and other harmful chemicals that pose serious risks to human health and the surrounding environment where cement manufacturing facilities are located.

Step by Step of Cement Manufacturing

The primary materials needed in substantial amounts for cement production are Limestone and clay, which are combined to create clinker. Consequently, the availability of Limestone and clay in significant quantities is a crucial factor when establishing a cement manufacturing plant. Limestone yields CaCO3, with the required constituents of Limestone for cement production ranging from 75% to 90%, while the remainder consists of MgCO3 and impurities. The necessary quantities of raw materials for production will be extracted through mining and quarrying, followed by a series of processes including drilling, blasting, excavating, handling, loading, hauling, crushing, screening, stockpiling, and storing. A specific composition of the raw materials is crushed and milled into a raw meal to ensure the quality and uniformity of the cement. This raw meal is then blended in silos and pre-heated to break down carbonate into calcium oxide and carbon dioxide. The raw meal is introduced at the upper end of the pre-heater tower and subsequently moves through the rotary kiln. The kiln rotates, allowing the ground raw material to descend toward the flame, which can be generated from fuel sources such as coal, petroleum coke, natural gas, oil, biomass, industrial waste, and recycled materials. A series of chemical reactions occurs, resulting in the melting and fusion of the raw material to create clinker. The clinker is expelled from the kiln at approximately 1500°C in a red-hot state and

is then passed through coolers to recover excess heat. Typically, clinker cooling is conducted using a grate cooler, a tube (rotary) cooler, or a planetary cooler, which can recover up to 30% of the kiln system heat and redirect it back to the pre-heater units. Ultimately, the clinker is ground together with additives (such as fly ash, blast furnace slag, pozzolana, gypsum, and anhydrite) in a cement mill to regulate the properties of the cement. Various milling techniques, including ball mills, roller mills, or roller presses, are frequently employed to grind the clinker with additives in the cement mill.

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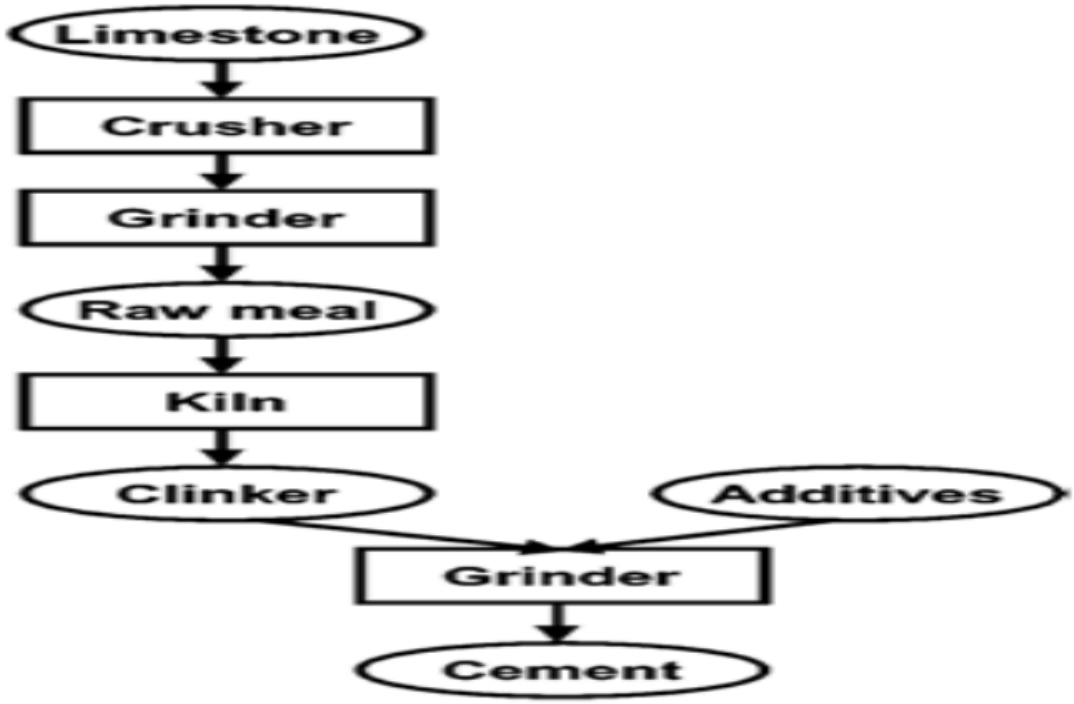

(Sourced: Shraddha et al, 2014)

Internal Social Criteria

Sustainable procurement highlights its essential function in fostering environmental stewardship and social responsibility throughout global supply chains.

Sustainable procurement, often referred to as green procurement or responsible sourcing, entails the incorporation of environmental, social, and economic criteria into purchasing decisions and supplier relationships (Seuring & Müller, 2008; Cooper, 2024).

Socially oriented procurement refers to the acquisition of products and services aimed at promoting, either directly or indirectly, favourable social outcomes (Furneaux et al, 2014; Hafsa et al, 2022).

Stakeholders Engagement

Bal et al. (2013) state that stakeholders are individuals, organizations, or institutions that have a vested interest in a project and can influence its outcome in various ways. They are categorised into two types: internal and external stakeholders. Internal stakeholders include clients, contractors, manufacturers, sub-contractors, and consultants, while external stakeholders encompass local and national government authorities, social organizations, political entities, local communities, the public, environmentalists, trade and industry representatives, the media, traditional authorities, and worshippers. This classification is supported by El-Gohary et al. (2006) and Harris (2010). The primary objective of engaging the public during the planning and design phases of projects, particularly in cement manufacturing plants, is to inform stakeholders and gather their feedback on the most appropriate project design, which is a two-way process (El-Gohary et al.,2006). Effective management of stakeholders can significantly enhance procurement performance in any public-private partnership projects (El-Gohary et al., 2006). The significance of stakeholders in projects, especially in cement manufacturing operations, is substantial, particularly concerning external stakeholders, which include local communities and environmental authorities, as well as local and national government authorities. These stakeholders are involved in various sustainable regulations that govern the daily operations of the plant (Miller et al., 2020). The contribution of stakeholders to the successful completion of projects is always evident; when stakeholders withdraw

their involvement from any project, particularly in cement manufacturing, failure is often unavoidable (Zarewa, 2018).

Social Return on Investment

A method through which organizations fulfill their requirements for goods and services operates in a manner that ensures value for money over the entire lifecycle, generating advantages not only for the organisation but also for society and the economy, while reducing harm to the environment, can be referred to as a social return on investment in sustainable public procurement. (Harrison, 2026) Public procurement can be strategically utilized to advance social and environmental sustainability as well as economic development objectives (Harland et al. 2019).

Circular economy

The principles of a circular economy in sustainable public procurement are designed to reduce waste and pollution while enhancing the value derived from materials and resources. Czarnezki (2019). This methodology promotes the design, production, sale, reuse, and recycling of products to ascertain how to extract the utmost value from them, both during their usage and at the conclusion of their lifecycle. According to Czarnezki (2019), public procurement processes can be modified to incorporate circular economy criteria, which may involve the acquisition of products and services that support the circular economy, including buildings, public transportation, furniture, food, and packaging. By collaborating with potential suppliers throughout the procurement process, municipal governments can motivate businesses to embrace more circular economy practices. This engagement can result in a reallocation of public finances towards broader circular economy implementation and facilitate the transition to a circular economy. The path to circular public procurement necessitates a cultural transformation within public institutions, shifting from a risk-averse, price-centric purchasing approach to a value-focused, innovation-driven investment strategy.

Bio-based Public Procurement

Public procurement in Europe accounts for approximately 16 per cent of the total GDP. This has been acknowledged by the European Commission and significant member state governments, indicating its substantial potential as a tool for fostering demand for innovative and environmentally sustainable products (European Commission, 2008). In this context, the significance of innovation-oriented and green public procurement has grown in recent years. The EU-funded initiative INNPROBIO collaborated with procurers and practitioners throughout Europe, encouraging discussions on public-sector acquisitions of bio-based products and services while addressing shared inquiries. (European Commission, 2008).

Innovation-Oriented Public Procurement.

Innovation-driven public procurement can be characterized as any public procurement initiative that seeks to encourage the creation, enhancement, adaptation, and dissemination of innovative solutions, whether technological or organizational. The fundamental reasoning behind this approach is that a heightened demand for innovative products will foster their commercialisation and/or reduce prices by facilitating the development of economies of scale. Consequently, it is anticipated that this will generate spill-over effects by promoting private demand and attracting private investment. (Aschhoff et al 2009; Edler et al 2007; Hollanders et al, 2007; Mazzucato, 2011) In the realm of environmental innovation, green and innovation-driven public procurement may be seen as intersecting concepts. In particular, regarding bio-based products, both innovation-driven and green public procurement could significantly influence public sector demand. (Peuckert et al, 2014)

Empirical Review:

Environmental Regulation and Green Procurement

The adoption of green procurement entails incorporating environmental factors into the procurement process, with the goal of reducing adverse environmental effects while fostering sustainability. A crucial element of green procurement is the choice of eco-friendly products and services, which emphasize sustainability criteria such as energy efficiency, recyclability, and a lower carbon footprint (Olsen et al, 2018, Ngubane, 2024).

Environmental sustainability is defined as the judicious use of natural resources and the preservation of ecological balance to satisfy the needs of both current and future generations. In developed nations like the USA, there have been notable advancements in environmental sustainability. For instance, from 2005 to 2019, the United States achieved a reduction of approximately 12% in greenhouse gas emissions, primarily due to enhanced energy efficiency, the adoption of renewable energy, and changes in industrial practices (U.S. Environmental Protection Agency, 2021). Furthermore, programs such as the Environmental Protection Agency's Clean Power Plan have aimed to lower carbon emissions from power plants, leading to a decrease in air pollutants and an enhancement in air quality throughout the country (U.S. Environmental Protection Agency, 2019; Ngubane, 2024).

Green and Sustainable Public Procurement

NIKITCHENKO et al. (2016) define Green Public Procurement as the acquisition of goods, services, and works while considering their effects on the environment and human health in comparison to traditional alternatives (preference is given to those with minimal or no negative impact). They further elaborate on Sustainable Public Procurement as the procurement of goods, services, and works that considers economic, environmental, and social factors in production and consumption during purchasing decisions. The primary objective of Green Procurement is to mitigate negative anthropogenic effects and environmental risks on human health and living organisms, while also considering price, quality, and functional specifications.

Conversely, Sustainable Procurement delves into broader aspects such as energy management, resource-efficient technologies, social responsibility of producers (e.g., working conditions for employees), support for domestic producers and manufacturers, and the creation of new job opportunities. Although Sustainable Procurement includes considerations beyond environmental factors, the primary emphasis of Sustainable Public Procurement remains on environmental or green procurement. Green Public Procurement can be characterized as a process through which public authorities aim to acquire goods, services, and works that exhibit a reduced environmental impact throughout their life cycle, in comparison to goods, services, and works with the same primary function that would otherwise be procured. Consequently, Green Public Procurement may directly enhance the environmental sustainability of public sector activities. Additionally, it may also fulfill the catalytic functions previously mentioned (Brammer et al, 2011). Green Public Procurement and Sustainable Public Procurement are often used interchangeably; however, the distinction lies in the factors considered when evaluating tender bids (Brammer et al, 2012).

Theoretical Review

Triple Bottom Line

The triple bottom-line theory, introduced by John Elkington in 1904, offers a sustainable framework that has been broadened from a conventional reporting structure to encompass social and environmental financial performance. The TBL approach asserts that businesses should commit to assessing their effects on both people and profits (Jääskeläinen, 2024). The goals of comprehensiveness and evaluation are to ensure that companies operate sustainably, balancing economic growth with environmental stewardship and social responsibility.

In terms of the economic dimension, TBL is well-known and relates to traditional financial metrics such as revenue, profit returns, return on

investment, and market share (Edelman, 2023). Within a TBL framework, economic performance includes a market share that motivates companies to look beyond short-term financial benefits, considering the long-term effects of their operations on the environmental aspects of TBL (Farooq et al., 2021).

In essence, ecological concerns involve organizational processes. This includes managing and reducing carbon dioxide emissions and optimizing waste and pollution. There are positive incentives for businesses to mitigate or eliminate negative environmental impacts while maximizing beneficial effects. The social dimension of TBL emphasises the influence of organizational activities on both individuals within the organisation and the broader community (Tseng et al., 2020). This encompasses protecting fair labour practices, engaging with the community, promoting employee well-being, and contributing to social equity (Tseng et al., 2020). Business entities are expected to consider another facet: the social impact of their operations and the decisions they make. This may involve providing daily wages to ensure workplace safety, advocating for diversity, earning the trust of companies to foster development, enhancing their image, and creating business environments that are more equitable for both men and women (Gómez-Prado et al., 2022).

Stakeholder Theory

The term "stakeholder" in the context of organisations is thought to have originated in the 1930s, when Harvard Law Professor E. Merrick Dodd proposed that businesses encompass at least four primary groups of stakeholders: shareowners, employees, customers, and the general public.1 Years later, with the growing interest in corporate social responsibility (CSR), one of the key components of the CSR movement has been the concept of "stakeholder theory." Maon et al. articulated this theory as highlighting that the survival and success of an organisation depend on its capacity to create adequate wealth, value, or satisfaction for all its primary stakeholders, rather than solely for shareholders. Stakeholder theory is founded on the idea that

businesses function within an ecosystem of diverse stakeholders, each of whom plays a role in the sustainability of the business and the firm's ability to generate value for any stakeholder group. For instance, although shareholder primacy has been a dominant principle for many years, it has become evident that sustainable shareholder value cannot be realized without fostering strong and constructive relationships with other stakeholders (such as customers, suppliers, employees, and communities), relationships that must be cultivated through engagement to ensure alignment across the ecosystem regarding goals and strategies.

Daft and Marcic characterised a stakeholder as "any person or group within or outside the organisation that has a stake in the organization's performance." The GIIRS clarified that the term "stakeholders" typically refers to any individual or group that, whether positively or negatively, influences or is influenced by the decisions and actions of an organization. Freeman was among the pioneers advocating for a stakeholder approach to strategic management, defining stakeholders as "any group or individual who can affect, or is affected by, the achievement of a firm's objectives." Additional definitions and conceptualizations of stakeholders include "those groups who have a stake in the organization's performance. All entities should maintain a "critical eye" towards corporate actors.

Conclusion: In conclusion, the cement manufacturing sector in Nigeria necessitates consistent monitoring of compliance with sustainability standards, primarily to ensure the favourable preservation of resource health; it should not focus solely on profit. All equipment, including the procurement of spare parts, must conform to green and sustainable processes and procedures to prevent avoidable hazards. Cement production demands a substantial workforce, and their health status will undoubtedly influence their productivity levels. Furthermore, goods and services within Nigeria's cement manufacturing industry should be more closely aligned with

sustainable public procurement practices, ultimately ensuring cost savings.

Recommendations: Following the above, the following recommendations will be advised so as to alleviate the incessant issues associated with inefficient practice of green and sustainable Public Procurement in cement manufacturing industries in Nigeria.

1. Proper Procurement Planning Policy: A proper procurement planning policy is advised to be deployed at every cement manufacturing plant to ensure sustainability at all stages of green and public procurement processes.

2. Deployment of low-carbon technology in cement manufacturing. The deployment of low–carbon technology in cement manufacturing, which involves several approaches, i.e. Carbon Capture systems, Sustainable practice which involves reuse and recycling of cement plant materials.

3. Encourage Sustainable Procurement: In cement manufacturing industries, involvement of a public procurement approach is vital to promoting sustainable practice. The public agencies should be more involved in green and sustainable Procurement practice and which most times results in a reduction in environmental impact, promotes supplier diversity and encourage long term cost savings.

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