Optimizing Sustainability: Aligning Environmental Management Systems with Green Supply Chain Management

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ABSTRACT

The amalgamation of Environmental Management Systems (EMS) and Green Supply Chain Management (GSCM) is a crucial approach for attaining sustainability across many sectors. This study examines the interaction between EMS and GSCM, highlighting how their alignment may improve operational efficiency, diminish environmental impact, and bolster organizational resilience amid increasing environmental and regulatory concerns. The report used a content analytical technique using secondary sources to conduct a case analysis of certain sectors within the Nigerian business ecosystem. Grounded in Elinor Ostrom's Social-Ecological Systems (SES) framework, this paper concludes that the implementation of Environmental Management Systems (EMS) and Green Supply Chain Management (GSCM) practices in Nigeria reflects a growing commitment among organizations to adhere to global sustainability standards. It was also advised, among other things, that the environmental regulatory framework be reinforced, alongside the deployment of technology, community participation, and the promotion of teamwork.

Keywords: Sustainability, Environmental Management System, Green Supply Chain.

INTRODUCTION

The pressing problem of climate change has compelled people, businesses, and governments to enhance their understanding of environmental practices to safeguard the environment from unsustainable and detrimental actions by individuals and corporations. Climate change activism has successfully categorized certain environmental activities, such as deforestation, as unsustainable and detrimental, while promoting ecologically friendly or green alternatives. Climate change denotes the prolonged warming of the globe, mostly attributed to the rising concentrations of greenhouse gases in the Earth's atmosphere. Gases like carbon dioxide and methane capture solar heat and inhibit its release into space, resulting in an increase in global temperatures. Climate change encompasses more than increasing temperatures; it also involves phenomena such as extreme weather events, including storms and hurricanes, droughts, wildfires, rising sea levels, coastal flooding, and alterations in the distribution of flora and fauna, all of which have profound implications for public health, organizations, and society as a whole (WHO, 2018).

To alleviate a scenario that jeopardizes the ecosystem and the environment, companies are adopting methods and tactics that enhance environmental sustainability and diminish detrimental behaviors. The entirety of these methodologies is referred to as an Environmental Management System (EMS) (Coglianese and Nash, cited in Darnalla, Henriques, and Sadorsky, 2008), which encompasses the internal policies, evaluations, strategies, and execution measures of an organization aimed at enhancing environmental sustainability. The need to restructure supply chain procedures and practices inside enterprises to enhance operational efficiency is prompted by the rise in greenhouse gas emissions, environmental pollution, and global warming caused by companies.

Dalnar and Khandare (2024) assert that the incorporation of sustainable principles into the manufacturing process has become a crucial strategy for enterprises globally. The rise in greenhouse gas emissions and environmental pollution compelled enterprises to restructure their supply chain activities, resulting in the conservation of limited resources. Sustainable Supply Chain Management Practices (SSCMPs) are regarded as a crucial organizational concept for achieving a company's profit and market share goals. This results in reduced

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environmental risks and consequences, while simultaneously enhancing the ecological efficiency of these enterprises and their supply chain partners. The integration of environmental considerations with supply chain management is a significant worldwide problem that enterprises cannot overlook. Increases in environmental emissions and concerns need reductions in pollution resulting from industrial expansion and supply chain management.

In response to the challenges of climate change, resource depletion, and regulatory pressures, the notion of eco-friendly Supply Chain Management (SCM), or Green Supply Chain Management (GSCM), has become increasingly significant for promoting environmentally responsible practices across the supply chain lifecycle. The incorporation of sustainability into supply chain operations not only mitigates environmental issues but also offers prospects for cost savings, improved brand image, and enduring resilience. The pursuit of economic development and competitiveness is now closely linked to the need of environmental stewardship. This circumstance necessitates an examination of how firms enhance environmental sustainability by integrating Environmental Management Systems with Green Supply Chain Management.

REVIEW OF RELATED LITERATURE

Environmental Management Systems: Environmental Management Systems (EMS) pertain to the procedures and processes established to assist companies in systematically addressing environmental concerns via a planned plan of action, implementation, monitoring, and assessment methodologies. The adoption of EMS in enterprises is influenced by regulatory compliance, organizational efficiency, stakeholder expectations, and alignment with environmental strategies. Public and corporate entities often use Environmental Management Systems (EMS) to augment their environmental accountability and reputation while optimizing operational efficiency (Darnalla, Jolley & Handfield, 2008). There are two internationally acknowledged standards for Environmental Management Systems (EMS): ISO 14001 and the European Union's Eco-Management and Audit Scheme (EMAS).

The International Organization for Standardization (ISO) was established in 1946 and is headquartered in Geneva, Switzerland (ISO, 2021). The ISO now has 165 members from diverse nations, with one designated "national standards competent body" for each country. Technical committees formulate and reevaluate diverse standards pertinent to critical facets of industry and society (ISO, 2021), and conferences are convened for the aim of reassessment and dissemination. In 1971, the first technical committees were established to address air and water quality concerns, followed by committees focusing on environmental management, soil, energy, sustainability, and sustainable design. The 1987 ISO 9000 standards on Quality Management Systems facilitated the creation of further management systems, including the EMS.

An Environmental Management System (EMS) comprises a set of internal policies, evaluations, strategies, and implementation measures (Coglianese& Nash, 2001) that influence the whole company and its interactions with the natural environment. Despite the variability in institutional characteristics of Environmental Management Systems (EMSs) among organizations, all EMSs encompass the formulation of an environmental policy or plan; conducting internal evaluations of the organization's environmental impacts (including the quantification of these impacts and their temporal changes); establishing measurable objectives to mitigate environmental impacts, allocating resources, and training personnel; monitoring implementation progress through systematic audits to verify goal achievement; rectifying discrepancies in goal attainment, and engaging in management review (Coglianese and Nash, 2001). They aim to assist firms in integrating environmental practices into their operational frameworks, ensuring that environmental protection is a fundamental component of their entire business strategy (Shireman, 2003). Consequently, EMSs are progressively acknowledged as methodical and complete frameworks for enhancing environmental and company performance.

Green Supply Chain Management:

The supply chain encompasses all entities engaged in satisfying a consumer request, including suppliers, transporters, warehouses, retailers, and the customers themselves (Cox, quoted in Darnalla, Jolley, and Handfield, 2008). Green Supply Chain Management (GSCM) involves the incorporation of environmental factors into the supply chain process. The objective of GSCM is to mitigate the environmental effect of the

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supply chain while preserving efficiency. Common GSCM practices include organizations evaluating the environmental performance of their suppliers, mandating suppliers to implement measures that guarantee the environmental quality of their products, and assessing the costs associated with waste in their operational systems (Handfield, Sroufe, & Walton, 2004). GSCM procedures include the full value chain, from supplier to consumer, as firms educate purchasers on how to mitigate their environmental effect (Handfield, Sroufe, & Walton, 2004). Each of these activities may mitigate the direct and indirect environmental implications of an organization's ultimate output.

Green Supply Chain Management (GSCM) has become an essential strategy for companies to include environmental considerations into their supply chain activities. Research by Rajeev, Pati, and Padhi (2019) indicates that the incorporation of sustainable practices in supply chain planning enhances environmental results and positively impacts financial performance, hence providing a competitive edge. Although intra-organizational actions such as sustainable packaging, design, and logistics may initially entail elevated expenses, research by Hollos, Blome, and Foerstl (2012) and Zubedi et al. (2018) indicates substantial long-term cost reductions. Nonetheless, the precise correlation between GSCM techniques in supply chain planning and economic consequences continues to be a subject of active investigation, characterized by considerable uncertainty.

Green supply chain management (GSCM) strategies have significant advantages for the environment. Firstly, pursuing supply chain sustainability via reduced energy use reduces carbon dioxide (CO2) emissions and other airborne pollutants. Furthermore, sustainable supply chain strategies diminish waste and preserve nonrenewable resources. For example, when companies choose for recycled paper goods over plastic, they prevent waste from entering landfills and delicate ecosystems while simultaneously reducing their dependence on petroleum-derived materials. By optimizing truck loading and implementing stringent regulations on driving speed and idle, fuel consumption is reduced. By adhering to the principles of sustainable agriculture and forestry, they preserve resources for future generations. In summary, the implementation of GSCM principles is essential not just for the well-being of our ecosystem. It is essential for the continued viability of enterprises and communities in the future.

CLIMATE CHANGE AND ENVIRONMENTAL SUSTAINABILITY

The Earth's climate has undergone alterations throughout history. climatic change is a prolonged alteration in global climatic patterns, resulting in an increase in world temperature. Climate change constitutes a prolonged alteration in meteorological data. The Intergovernmental Panel on Climate Change (IPCC, 2007) offered a widely accepted definition of climate change, asserting that it is a modification in the climate's state identifiable through statistical analysis of alterations in the mean and variability of its characteristics, enduring for an extended duration, typically decades or longer. Climate changes transpire over extensive durations, spanning from decades (often 30 years and more) to millions of years. Alterations in the climate system (atmosphere) manifest via fluctuations in the average world temperature. These alterations are validated by comprehensive statistical analysis of meteorological data, and their effects are evaluated via impact studies.

Climate change and environmental sustainability are tightly interwoven, with climate change offering substantial hurdles to attaining environmental sustainability globally. Climate change and its environmental repercussions are urgent challenges confronting mankind today. The scientific agreement is unequivocal: human actions, especially the combustion of fossil fuels, mining, and deforestation, have substantially contributed to the warming of the Earth's climate (Ilevbare, 2019). The interaction between humans and the environment results in effects, including the release of substantial quantities of greenhouse gases into the atmosphere, which erode the ozone layer, and actions that diminish the carbon absorption capacity of the atmosphere. All of them entail the following consequences for the environment:

Global Warming: The average temperature of the Earth has increased around 1.2 degrees Celsius (2.2 degrees Fahrenheit) since the late 19th century. The warming trend is chiefly ascribed to the rise in greenhouse gases, including carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), in the atmosphere resulting from human activities such as fossil fuel combustion for energy and transportation (Nerem, Beckley, Fasullo, Hamlington, Masters, and Mitchum, 2018).

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Extreme Weather Events: Climate change is exacerbating severe meteorological phenomena, including heat waves, storms, floods, and droughts. These occurrences have catastrophic repercussions for ecosystems, agriculture, infrastructure, and human health (IPCC, 2007).

Melting Ice and Rising Sea Levels: Increasing temperatures are resulting in the faster melting of glaciers and ice caps, thereby contributing to increasing sea levels. This phenomena endangers coastal people, wildlife, and infrastructure, increasing the risk of floods and saltwater intrusion into freshwater resources.

Loss of Biodiversity: Climate change is a significant catalyst for species extinction and habitat degradation. Alterations in temperature and precipitation patterns disturb ecosystems, influencing the distribution and quantity of flora and fauna. Coral reefs, woodlands, and Arctic ecosystems are especially susceptible to the effects of climate change.

Ocean Acidification: The uptake of surplus CO2 by the seas is resulting in ocean acidification, endangering marine organisms, such as coral reefs, shellfish, and plankton. Acidification may compromise shells and bones, disturb food webs, and adversely affect the general health of marine ecosystems.

Impacts on Agriculture and Food Security: Climate change impacts agricultural production by altering temperature, precipitation, and the frequency of severe weather events. Alterations in growing seasons, modifications in pest and disease dynamics, and water shortages might diminish agricultural yields and jeopardize global food security.

In Nigeria, climate change is modifying precipitation patterns, leading to erratic and inconsistent rainfall. This instability often results in droughts and deserts in some areas (notably in the northern section of the nation), while causing floods in others, therefore impacting agricultural operations, water supply, and infrastructure. Land degradation and soil erosion pose substantial problems, diminishing agricultural production and livelihoods by lowering crop yields, causing animal losses, and increasing the prevalence of pests and diseases, so jeopardizing food security and livelihoods. Combating climate change and alleviating its effects on environmental sustainability necessitates international collaboration, ambitious emission reduction goals, sustainable land-use strategies, and investments in renewable energy and climate resilience initiatives to guarantee sustainability.
Environmental sustainability denotes the capacity to maintain a process or system without exhausting natural resources or inflicting damage on the environment. It involves the sustainable use of natural resources to satisfy current demands without jeopardizing the capacity of future generations to fulfill their own requirements. The concept of environmental sustainability encompasses three key dimensions:

Environmental protection: conserving natural resources, reducing pollution, and protecting ecosystems.

Social equity: ensuring fair access to resources and opportunities for all, and promoting social justice.

Economic viability: maintaining economic growth and development while minimizing environmental degradation and resource depletion.

THEORETICAL FRAMEWORK

The study was based on Elinor Ostrom's (2009) Social-Ecological Systems (SES) concept. The Socio-Ecological Systems Framework (SESF) is a conceptual model designed to elucidate and analyze the intricate connections between social and ecological elements in systems such as fisheries, forests, irrigation systems, and other common-pool resources. Ostrom, a Nobel Prize recipient in Economic Sciences, created this paradigm based on her comprehensive study on the sustainable management of shared resources by communities.

The SES idea has developed into a prominent study domain examining the interdependent connections between social and environmental change, and how these connections affect the attainment of sustainability objectives across many systems, levels, and sizes. Research on social-ecological systems concentrates on comprehending many aspects of system functionality, rendering it an interdisciplinary domain, while also emphasizing the

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formulation and execution of normative societal objectives, particularly those pertaining to sustainability. The key components of the theory include;

Resource System: This component refers to the ecological or natural resource being managed, such as a forest, fishery, or water basin. It encompasses the physical characteristics, productivity, and spatial distribution of the resource.

Resource Users: These are the individuals or groups who depend on and utilize the resource. Users may have diverse interests, motivations, and levels of influence within the system. Understanding their behavior and interactions is crucial for effective resource management.

Resource Governance Systems: Governance systems encompass the rules, institutions, and decision-making processes used by resource users to regulate access to and use of the resource. This includes both formal institutions (e.g., government regulations, property rights) and informal institutions (e.g., local norms, community-based rules).

Resource Dynamics: This component refers to the ecological processes and dynamics of the resource system, including factors such as resource abundance, regeneration rates, and ecological interdependencies. Changes in resource dynamics can influence the sustainability of resource use and the effectiveness of governance arrangements.

Feedback: Feedback loops represent the interactions between social and ecological components within the system. These feedbacks can be reinforcing (positive) or balancing (negative) and play a crucial role in shaping the long-term dynamics and resilience of the system.

Ostrom's SES framework highlights the significance of comprehending the interplay between social and ecological elements in determining resource management results. It challenges the conventional "tragedy of the commons" narrative by showcasing instances where communities effectively manage common-pool resources sustainably via collective action and adaptive governance strategies.

The SES framework has been extensively used in research and practice to evaluate and formulate governance and regulatory structures for diverse natural resource management scenarios. It offers a significant instrument for policymakers, resource managers, and communities aiming to promote sustainable resource use and resilience against environmental change.

CASE ANALYSIS: Environmental Management Systems (EMS) and Green Supply Chain Practices in selected Industries in Nigeria

Numerous Nigerian enterprises in diverse sectors have implemented Environmental Management Systems (EMS) and Green Supply Chain Management (GSCM) practices to conform to international sustainability requirements. The following are some of these sectors:

Oil and Gas Industry: Shell Petroleum Development Company of Nigeria (SPDC) - Shell Nigeria has established a comprehensive Environmental Management System in accordance with ISO 14001 standards. The firm emphasizes the reduction of flaring, the mitigation of greenhouse gas emissions, and the conservation of biodiversity in oil exploration areas. The organization integrates sustainable logistics, including environmentally friendly transportation methods and waste management procedures. They participate in supplier development initiatives to guarantee compliance with environmental regulations throughout the supply chain. These approaches have augmented adherence to environmental standards and bolstered Shell's reputation for corporate responsibility.

Cement Industry: Lafarge Africa Plc - Lafarge employs an Environmental Management System (EMS) to assess and reduce its environmental impact, emphasizing emission reductions and waste recycling. The firm employs alternative fuels, such as biomass, in its manufacturing operations. Lafarge invests in sustainable sourcing and low-carbon transportation alternatives. Lafarge has decreased its carbon emissions and enhanced resource efficiency in accordance with global sustainability objectives via these projects.

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Food and Beverage: Nigerian Breweries Plc - The firm has used EMS frameworks to minimize water and energy usage while enhancing production efficiency. Nigerian Breweries integrates reverse logistics and sustainable packaging solutions while minimizing energy use in transportation and logistics. Their efforts have yielded substantial cost reductions, reduced environmental repercussions, and enhanced stakeholder confidence.

Telecommunications: MTN Nigeria –MTN Nigeria implements Environmental Management System (EMS) principles to mitigate the environmental implications of its operations, including the use of energy-efficient network equipment. The firm emphasizes sustainable technology sourcing and implements renewable energy solutions, including solar-powered cell sites. These approaches have improved energy efficiency and decreased operating expenses while promoting community-oriented sustainability initiatives.

FMCG Sector: Unilever Nigeria - Unilever Nigeria has used EMS frameworks to control water consumption, energy efficiency, and waste reduction. Their supply chain initiatives include sustainable raw material procurement, recyclable packaging use, and logistics optimization to minimize emissions. Unilever's procedures are consistent with its worldwide sustainability commitment, enhancing the company's market competitiveness and ecological performance.

CONCLUSION AND WAY FORWARD

The use of Environmental Management Systems (EMS) and Green Supply Chain Management (GSCM) techniques in Nigeria reflects the growing dedication of firms to conform to international sustainability standards. In sectors like oil and gas, fast-moving consumer goods, cement, and telecommunications, these approaches have augmented operational efficiency, bolstered adherence to environmental standards, and fortified business reputations. Corporations such as Shell, Nigerian Breweries, Lafarge, MTN, and Unilever exemplify the beneficial effects of sustainability initiatives on environmental and commercial performance. Nonetheless, obstacles such as elevated implementation costs, insufficient experience, and regulatory limitations persist in obstructing wider use. To this end, we recommend as follows;

Augmenting Regulatory Frameworks: The Nigerian government must fortify environmental legislations and guarantee rigorous enforcement. Providing financial incentives or subsidies to enterprises for implementing EMS and GSCM might enhance compliance.

Capacity Building and Training: Investing in worker training programs to augment technical proficiency in sustainable practices is essential. Public-private collaborations may enhance information exchange and the creation of sustainable supply chain frameworks.

Fostering Collaboration: Cooperation across companies, academics, and non-governmental groups may expedite the advancement and distribution of novel sustainable practices.

Embracing Technology: Organizations have to use new technologies such as blockchain, IoT, and AI to enhance transparency, traceability, and efficiency inside supply chains.

Community Engagement: Organizations have to include local communities in sustainability activities, including renewable energy projects and garbage recycling programs, to bolster societal acceptability and support.

Continuous Monitoring and Reporting: Implementing comprehensive monitoring and reporting systems facilitates progress tracking, highlights areas for improvement, and ensures compliance with international standards such as ISO 14001.

Support for Small and Medium Enterprises (SMEs): Emphasis must be placed on small and medium businesses by facilitating access to financing and technical assistance to incorporate sustainable practices into their operations.

These measures may assist Nigeria in establishing a robust framework for sustainable development, promoting economic growth while mitigating environmental consequences, and positioning Nigerian enterprises as

frontrunners in the shift towards a green economy, so contributing to global sustainability objectives.

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