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SUSTAINABLE RESOURCE MANAGEMENT AND ECONOMIC EFFICIENCY: FRAMEWORKS FOR RESOURCE ALLOCATION AND SUSTAINABLE INDUSTRY PRACTICES IN NIGERIA

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ABSTRACT

This paper investigates how sustainable resource management frameworks can be applied to support economic efficiency improvement in Nigerian industries with a view to optimizing resource utilization whilst attaining profitability purposes as well as sustainability goals. This article unpacks how; the circular economy, Lean Management, and Material Flow Cost Accounting (MFCA) work and their potential in optimising production processes, waste reduction, and better environmental results. These frameworks are in conformity with sustainability standards across the world, assist Nigerian industries in integrating the world market and encourage green investment. However, challenges such as regulatory disparities, financial limitations, and scarce technical capability prevent a broader implementation. This research established that it is the synthesis of an effective government policies, appropriate training within industries, and risks taken towards green technology that will ensure sustainable industrial growth in Nigeria. It is quite advantages because this approach is economic efficient at the same time it provides environmental sustainability to support more sustainability goals internationally.

Keywords: Sustainable resource management, Economic efficiency, Circular economy, Lean Management, Material Flow Cost Accounting (MFCA).

1. INTRODUCTION

Team Market rationality is now accepted as a nearly universal requirement since it enables efficient use of resources, and thus, distinct efficacious economic recycling of inputs entails high margins of sustainable development [13]. For example, new information shows that countries getting a 10% boost in resource productivity can obtain up to a 3% rise in GDP, implying a positive link between resource management and economic performance [30]. Streamlined resources, as well as environmental issues of the current generation, known as sustainability, makes the concept of economic efficiency facilitate the good resource allocation, which, in effect, helps reduce the negative impacts on the environment besides contributing enormously to stabilizing economy [12]. Besides, efficiency adds to revenue by removing dependencies—a priority for developed and developing societies facing escalating demands and environmental deterioration [17]. Adaptive research evidence depicts industries with successful resource management structures realizing a decrease in the production cost to as far as 30% and a decrease in the emissions level to up to 20% making industries more competitive across sectors and increasing the outlook for sustainable industrial development [16].

Economic efficiency issues are a significant concern for Nigerian industries since these have structural issues, resource misallocation, and infrastructural vices that make optimal production difficult and costly [20]. Specifically, manufacturing sector in Nigeria contributes about 40% of its production capacity annually to inefficiency arising from inadequate physical infrastructure and erratic power supply [1]. This inefficiency includes agriculture and energy; these sectors suffer from limited technological advancement and weak infrastructure that weakens resource utilization while escalating environmental pollution from waste products and excessive resource exploitation [22].

Combined with the poor legal systems and corruption, these shortcomings cause the resources that should create value to be often siphoned off to unproductive uses, thus producing economic and environmental losses [15].

As a result, a number of efficiency issues have been developed by many stakeholders, including the Nigerian government, international organizations, and private sector actors. The Nigerian government has recently launched both the Economic Recovery and Growth Plan (ERGP) and the Presidential Enabling Business Environment Council (PEBEC) to improve industrial efficiency through infrastructure development, bureaucratic de-bottlenecking, and private sector capital for renewable energy supplies [14]. In order to fund and support projects that increase industrial productivity while decreasing the negative impact certain industries can impose on the environment, international organizations like the World Bank and the IFC are investing in Nigerian industries [27]. Moreover, activities that embrace change in the private sector for efficiency in energy consumption and waste disposal show dynamism in the adoption of sustainable initiatives [5]. However, through the sustained prevalence of economic inefficiency it becomes apparent that there is long-standing structural issues which cannot be addressed solely with these endeavours.

The sustained occurrence of economic inefficiency in Nigerian industries after repeated interventions, therefore, underscores persistent structural features. Structural disadvantages including lack of qualified personnel, corruption and lack of coherence in enforcement of policies all contributed to slow the increment of industrial efficiency [8]. In addition, [25] opines that the stringent legal framework and bureaucratic factors pose a problem to private sector sustainability strategies and the overall macroeconomic performance. While these efficiency enhancing policies are introduced from time to time, their effectiveness is often compromised due to poor political will leading to compromise coordination amongst the government departments and the private sector. It is thus evident that efficiency and sustainability require policy coherence, adequate capacities, and technological progress in selected Nigerian industries.

The use of sustainable resource management that is informed by conceptual models with an emphasis on economic rationality provides a workable response to most of these issues. Theories such as the circular economy and the material flow cost accounting (MFCA) are oriented at the reuse of resources, minimisation of waste and energy conservation, all of which tackle resource scarcity and environmental challenges which Nigeria faces [10]. The implementation of circular economy strategies makes it easier for industries provide means to elongate natural's resource usage hence reducing on raw material usage and cost [2]. MFCA assists an organization in identifying wasteful flows and mapping for better management of resources within the organization. The application of these frameworks enables a transition from traditional product-oriented production systems to improved sustainable systems in relation to economic and environmental goals [14].

Secondly, the Leonid Severin's triple bottom line, or TBL, that encompasses social, economic, and environmental objectives, improves the principle of the materiality of sustainability within industrial operations. TBL nudges industries into adopting sustainability in the management of materials and its relationship with growth showing that business growth should not be at the detriment of environmental quality and people's rights [29]. Promoting responsibility to the environment as much as economic goals leaves low ecological impact, and a positive impact increases firm attractiveness and competitiveness [19]. More often than not, sustainable practices entail energy-efficient methods of production, reduction in waste, among others that in the long run may lead to emulation of overall economic costs cutting down on operating costs [24].

These frameworks promote key stakeholder engagement that is requisite because structural and regulatory impediments in Nigeria compromise efficiency. Resource management for the public emphasis the use of PPPs and the involvement of stakeholders, establishing the framework for cooperation among the governmental organizations, non-governmental organizations as well as private sectors and civil society, which is likely to facilitate the implementation of policies and enhancement of infrastructures [27]. Infrastructural deficiencies can be rectified by cooperation because they often involve financing and support in placement of proper equipment for sustainable management. Regarding resource conservation, such frameworks can address problems such as unstable power supply and inadequate waste disposal in Nigeria and prepare industries for a resource-scarce economy [6]. Thus, this study seeks to consider conceptual frameworks in more detail and assert that they can become a tool for radical change in the economic and ecological nets of the Nigerian industrial sectors in the long term, ligating waste reduction and resource conservation. Implementing these frameworks encourages a shift from linear production models to sustainable practices, aligning industrial activities with economic and environmental objectives [14].

Additionally, the triple bottom line (TBL) framework, which promotes a balance between social, economic, and environmental goals, can enhance economic efficiency by embedding sustainability within industrial operations. TBL encourages industries to integrate sustainable

resource management with profitability, ensuring that growth does not compromise environmental health or social equity [29]. Prioritizing environmental stewardship alongside economic objectives not only reduces ecological footprints but enhances corporate reputations, attracting investment and increasing competitiveness [19]. Sustainable practices, like energy-efficient production and waste reduction, frequently result in long-term savings and lower operating expenses, thereby improving overall economic efficiency [23].

These frameworks foster essential stakeholder collaboration, which is crucial for overcoming the structural and regulatory barriers inhibiting efficiency in Nigeria. Through public-private partnerships (PPPs) and stakeholder engagement, sustainable resource management promotes coordinated efforts among government agencies, private entities, and NGOs, creating an environment conducive to policy implementation and infrastructure improvement [28]. Partnerships can address infrastructural challenges by offering funding and technical expertise necessary for effective sustainable practices. By prioritizing resource conservation, such frameworks can mitigate issues like inconsistent power supply and ineffective waste management, equipping industries to become more resilient and adaptable in Nigeria's resource-limited economy [6].

This study aims to explore conceptual frameworks in greater depth, underscoring their potential to drive meaningful economic and environmental transformation in Nigeria's industrial sectors, which is vital for long-term growth and sustainable development.

2. LITERATURE REVIEW

This part covers the conceptual, theoretical framework, case study and the challenges in Nigerian Industries.

i. Define Sustainable Resource Management and Economic Efficiency

Resource management as a concept in Nigeria is the careful and efficient use of the resource human, capital and natural reserves so as to satisfy the present industrial needs without jeopardizing the ability of the future generations to meet the same needs. By economic efficiency in this case is meant the extent to which various ways of producing and managing resources yields the highest possible level of profitability with as little wastage as possible. All these goals are related through the source allocation, efficiency and sustainability. Optimal resource management verifies that resources are utilised where they generate the highest value or return while at the same time preserving them in the long-run [24].

While efficiency can be defined as output per input, the lowest input is the environmental concern in sustainable management. Sustainability means a resource use process which does not harm the availability and quality of ecosystem as well as promotes the social wellbeing, which creates the right harmony required for sustainable industrial development in Nigeria [10].

ii. Analyze framework for resource Allocation

It is about Lean Management and Material Flow Cost Accounting (MFCA) that plays a crucial role in achieving the rational utilisation of economic resources. Lean Management that originated from Toyota is a concept that focuses on waste elimination and improvement of customer value at different levels of production, and resource utilization [26]. This model has the capacity of been implemented in Nigeria industries because of the inefficiencies that is associated with a traditional system that is being practiced and the high operational cost. For instance, by managing manufacturing processes under lean principles is possible to decrease the wastage of material resources, decrease the cost of production while increasing the throughput rate. Another tool for analyzing material flow efficiency within an organization, MFCA is also beneficial in tracking resource use and waste production at Nigerian companies, cut operating expenses for those companies and enhance their environmental performance [3]. When implemented, MFCA will enable firms to have the right information for decision making hence enhance the right use of resources in improving the relevant processes.

iii. Integrate Sustainable Practices into Industry Frameworks

When implemented into Nigerian industries, sustainable practices, including efficient energy use, waste management, and water savings greatly transform the economic-performance levels and environment. For example, those firms that adopt use of efficient equipments and energy sources control electricity expenses, which are high because, Nigeria has one of the most unpredictable power supplies [21]. Waste recycling and circular practice means that industries should try to use waste by-products in their processes as inputs to cut on their raw material costs which are ideas supported under circular economy. Conserving water is very important especially in Nigerian institutions where water suppliers are scarce helping to reduce cost of production and damaging effects to the environment. A model that can be adopted in Nigeria for example can be being able to set up the sustainable resources for a certain sector depending with the fact the resources needed in that sectors may defer of course like the agricultural sector or manufacturing sector. It could enhance the practical performances, decrease expenses, and enhance corporate

revenues, all of which is a more effective way to determine an organization's sustainable development [11].

iv. Innovative Management Approach

There is need for identification of new methods in management that are suitable for Nigeria's economic and environmental situations for improvement of sustainable resource management. Particularly, reference to public-private partnerships (PPPs) as a way of organizing investment in infrastructure can be seen as a significant practice for overcoming the latter's deficits and enhancing the availability of the technology. Thus, for implementing the renewable energy technologies and sustainable infrastructure projects, by entering into the PPPs the government and private sectors can share human and other resources including knowledge [27]. The involvement of stakeholder also should be highly prioritized because local communities, environmental organizations and governmental institutions are highly involved in the management of resources creating greater obsessive outlooks of the business and making the environment for sustainable practices highly supportive. That way they use renewable energy which is solar and wind energy, the two are consistent with Nigeria's resource endowment and breaks the over reliance on fossil energy sources. By harnessing these novel strategies, the Nigerian industries can fashion a framework for sustainable development for the optimum economic benefits compatible with the environmental and social goals [18].

v. Existing Theories and Frameworks

Conceptual tools and tools such as the circular economy, the resource-based view (RBV), and the triple bottom line (TBL) are the tools that support the development of sustainable resource management and efficiency of economic processes in the global industry. That is why the linear model of take-make-dispose may be replaced with circular economy model, which focuses on reuse of materials [11]. This model is more appropriate for industries in Nigeria given the problem of resource constraint and management of wastes. Via recycling and upcycling, the circular economy model also brings down the costs, denies negative effects on environment, and ensures resource efficiency. On the same note, the resource-based view (RBV) focuses on leveraging distinct assets to exact competitive advantage and requisite levels of efficiency. RBV enhances sustainability management through asserting that every firm manages several resources, such as technological, material, and human resources that can be leveraged to boost the productivity of a business. Lastly, the triple bottom line (TBL) framework which states that the company should pursue social, economic and environmental objectives at the same time insisting that profitability should not exclude sustainability [7]. It is useful for Nigerian industries since it calls for attention to be paid on the effects of such businesses on the environment and the society, as well as the tangible economic benefit.

vi. Case Studies and Examples

This discussion will employ several examples to support how industries in Nigeria and globally have been able to incorporate effective sustainability for improved economic gains. For instance, Unilever Nigeria's implementation of the circular economy in areas of sustainable packaging and waste management reduce production cost hence enhancing brand image [4]. Likewise the Dangote Group applies TBL on their business framework whereby environmental preservation and social responsibility in addition to profitability. Today, Dangote has cut on expenses for some operations such as through investment in the efficiency of power from alternative sources of energy and invested in water conservation that meets set environmental laws [18]. Globally and more visibly in the automobile manufacturing industry, Japan's Toyota has created competitive circular economy initiatives most notably through lean production, which focuses on reduction of wastage, while increasing quality and productivity. These examples explain the changes of sustainable frameworks, illustrating possibilities of the Nigerian industrial sectors cutting its resources, decreasing the impacts of harms on the external environment, improving competitiveness [26]. But these frameworks can only work well if there is appropriate technological and infrastructural reinforcement, which might differ in Nigerian context to industrialized counterparts.

vii. Challenges in Nigerian Industries

Nevertheless there are several barriers that make sustainable resource management a challenging activity in Nigeria's industries. Lack of proper infrastructure principally in power supply and transport hampers manufacturing efficiency and the promotion of sustainability [3]. For example, frequent power blackouts mean that costs for energies for the manufacturers are high; thus, the advantages that accrue for energy conservation and management practices are limited. The regulatory faculties too pose challenges to sustainable management; some policies are old and other's implementation is unequal –they deter industries from long-term innovations towards sustainable management. In the absence of the governmental support, the firms may regard sustainable investment as expensive and unprofitable [9]. Furthermore, lack of capital hinders industries in Nigeria from attaining sustainable actions, because many industries in Nigeria do not have adequate finances to purchase efficient

technologies and renewable energy [21]. These challenges have called for collective endeavors of the government, formal companies and international institutions for environmental support and sustainability of resource management in the industrial sector in Nigeria.

3. METHODOLOGY

This paper therefore employs a conceptual research methodology involving a synthesised investigation of theoretical frameworks and recommended industry practices that can inform the possibility of sustainable resource management in industries in Nigeria. It is in this regard that the frameworks of the circular economy, Lean Management, and Material Flow Cost Accounting (MFCA) are chosen as they work effectively in similar contexts, including the emerging economies. These sources are academic papers, industry reports and papers and government papers on Nigerian industries to understand the current and future state of affairs and prospect of industries in Nigeria. The study brings into the examination of these frameworks with critical review of case studies from both local and international arenas by examining the feasibility and applicability of the sustainable management models into Nigeria's industrial social systems. As such, the methodology aims to provide sound recommendations that would be in concordance with Nigeria's economic and infrastructural contexts in order to enhance both economic rationality and sustainable environment.

4. DISCUSSION

The implementation of sustainable resource management frameworks presents a valuable opportunity to support the growth of Nigerian industries mainly in terms of their economic interactions and viability as well as in regard to the effects they have on the environment. Adoption of frameworks such as the circular economy, Lean Management and MFCA collectively holds the promise of rationalizing and optimizing the compositional, cyclical, and spatial patterns of production and resource use, thereby effecting notable cost imperatives [11]. This optimization can increase profitability; therefore, Nigerian company can foster competition domestically and internationally. Further, they make Nigerian industries to fit into acceptable world standards like the United Nation Sustainable Development Goals (UN-SDGs) and the International Organization for Standardization (ISO), the knowledge of which enhances their ability to attract conscious and responsible investors and collaborators [27]. Thus, fulfilling these standards improves industries' image and provides an opportunity to enter the foreign markets that require compliance with environmental requirements. In furtherance to this, these frameworks help the companies to foster innovations in renewable energy and resource efficiency hence supporting Nigeria's green economy transition and resource challenging issues.

However, the following challenges exist and these explain why sustainable resource management practices are not fully practiced in Nigeria. Regulatory issues are formidable; while measures towards sustainability may be politically beneficial, they may be poorly implemented or may not be implemented at all; besides some of the existing polices have no regulatory mechanisms to guide organized industries on how to go green [9]. Asthma implementation is also hampered by financial challenges, particularly in SMEs that cannot afford to pay for green technology acquisitions. In addition there is the major challenge of lack of technical know-how and experience of training because most of the industries in Nigeria lack the understanding of the methodologies that need to be used for resource management and control including MFCA and lean manufacturing.

5. CONCLUSION

In this paper, the importance of sustainable resource management for economic efficiency improvement within Nigerian industries will be explained with guidelines that the application of effective resource distribution management strategies and the consideration of sustainable approaches will bring about higher profitability and competitiveness and lesser pollution. The models and tools like the circular economy, Lean Management, and MFCA could enable~ Nigerian industries not only achieve better resource utilization but also create long-term industrial and environmental sustainability.

The use of these frameworks is relevant in ensuring that the Nigerian industrial practices meets the global sustainable trends that is important in the market and attracts concerned investors. In addition, the combination of these practices can help resolve problems of resource depletion, pollution, and waste production hence improving the environment in future for inhabitants. To get the most out of these benefits, incentive from government, industry training and acquisition of green technology is recommended. Lastly, sustainable resource management can be understood as the only possible way to guarantee Nigeria's progress by providing economic welfare and timely environmental efficiency as the key to success in the future.

Subsequent studies should quantitatively determine the applicability of the sustainable frameworks in particular sectors within Nigeria to contain the aforementioned difficulties. On the same note, more research into how

big organizations' optimization of assets such as AI and IoT can be achieved can help come up with new ideas. Finally, understanding how monetary incentives can improve SME use of green measures will provide recommendations regarding policy implementation for future research.

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