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GREEN INNOVATIONS IN HEALTHCARE SECTOR IN NIGERIA

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Purpose: The purpose of this scientific article is to explore the concept of green innovations and responsible leadership in the healthcare sector in Nigeria. The study aims to examine the role of responsible leadership in promoting and implementing green innovations in healthcare facilities, assess the current state of green practices and technologies in Nigerian healthcare, and identify the potential benefits and challenges associated with integrating sustainable practices into the healthcare sector.

Design/methodology/approach: This article analyses the official statistics and reports about Healthcare, Green Growth, and Green Innovation (GI) in Nigeria. The selected documents were carefully reviewed, and key findings, trends, and recommendations related to green innovation in Nigeria were extracted and analyzed. The analysis aimed to understand the current state of green innovation in Nigeria, identify barriers and opportunities, and propose strategies for promoting and implementing green technologies and practices in various sectors of the economy.

Findings: The findings reveal the significance of responsible leadership in driving the adoption of green innovations in Nigerian healthcare facilities. Responsible leaders play a crucial role in setting a vision for sustainability, promoting ethical behavior, fostering stakeholder engagement, and creating a culture of environmental responsibility within healthcare organizations. The study identifies successful examples of green innovations in healthcare facilities, such as energy-efficient systems, waste management practices, and sustainable procurement strategies. It also highlights the positive impacts of green innovations on reducing carbon emissions, improving patient outcomes, and enhancing the overall sustainability of healthcare operations.

Research limitations/implications: the study focuses solely on the healthcare sector in Nigeria, and the findings may not be applicable to other countries or regions. The research relies on online available statistics, data and subjective perceptions of responsible leadership and green innovations, which may introduce biases or limitations in the findings. Future research should consider larger sample sizes and quantitative analysis to provide a more comprehensive understanding of the relationship between responsible leadership and green innovations in the healthcare sector. Additionally, investigating the barriers and facilitators of implementing green innovations would provide valuable insights for policymakers and healthcare leaders.

Practical implications: The study suggests that healthcare organizations should explore and adopt green innovations to enhance sustainability. By adopting green innovations, healthcare leaders can demonstrate their commitment to sustainable practices and set an example for others in the industry.
Originality/value: This scientific article contributes to the existing literature by examining the link between green innovations and responsible leadership in the Nigerian healthcare sector. It highlights the importance of responsible leadership in driving sustainable practices and promoting environmental responsibility in healthcare organizations. The study provides insights into the potential benefits of integrating green innovations, such as reducing environmental impact, improving resource efficiency, and enhancing patient satisfaction. The findings of this research can inform policymakers, healthcare administrators, and leaders in the sector about the value of responsible leadership in fostering a culture of sustainability and facilitating the adoption of green innovations in the Nigerian healthcare sector.

Keywords: Responsible Leadership, Green Innovation, Green Growth, Healthcare in Nigeria, employee wellbeing.

Category of the paper: Desk Research.

1. Introduction

The goal of this paper is to investigate the topic of green innovations and responsible leadership in Nigeria's healthcare industry. The study's objectives are to investigate the role of responsible leadership in promoting and implementing green innovations in healthcare facilities, to assess the current state of green practices and technologies in Nigerian healthcare, and to identify the potential benefits and challenges associated with incorporating sustainable practices into the healthcare sector. This article examines official statistics and reports from Nigeria on Healthcare, Green Growth, and Green Innovation (GI). Key findings, trends, and recommendations relating to green innovation in Nigeria were collected and examined from the selected documents.

According to Nigeria Health Sector – Market Study Report (Nigeria Health Sector…, 2022) issued in 2022, Nigeria is the largest economy in Africa, with a GDP exceeding $430 billion. It has a population of approximately 213 million people, with a median age of 18 years. The population is expected to more than double by 2050, which will put significant strain on the healthcare system. Currently, the country is facing challenges such as low economic growth and high inflation. Despite these macroeconomic difficulties, Nigeria remains one of the most important investment destinations in Africa.

Absa Africa Market Index (AFMI)[1] published in 2022, states that Nigeria is ranked as the third most attractive investment destination on the continent as shown in the picture below:

[1] Absa Africa Financial Markets Index 2022. Harnessing the power of African opportunity.

Rank		Country	Score		Comments
2022	2021		2022	2021	
1	1	South Africa	88	90	Strong performance but market sell-off and weak growth weigh on score
2	2	Mauritius	76	76	Robust financial market but lower reported pension assets
3	3	Nigeria	69	67	Better adoption of standard master agreements
4	6	Uganda	66	60	Improved ESG incentives and standards
5	5	Botswana	66	62	Strong macroeconomic fundamentals and transparency

Figure 1. Absa Africa Financial Markets Index 2022. Harnessing the power of African opportunity.

The index assesses six strategic pillars, including market depth, access to foreign exchange, market transparency, tax and regulatory environment, capacity of local investors, macroeconomic opportunities, and enforceability of standard master agreements.

Studies have found that a higher level of economic development can have a positive effect on the health of the society (Jahanshahi et al., 2020, Haque, 2020; Javed et al., 2020). However, the country Nigeria suffers from brain drain syndrome and find it difficult to innovate in technology. Hence, Nigerian health care system should address the subject of responsible leadership from the angle of why it is important to imbibe green innovation that will be beneficial to employees and society.

More so, the companies need to be more open in how they approach and manage green environmental challenges related to the execution of their supply base due to the increased knowledge and demand from stakeholders and the general public. In order to create and maintain Green Innovation (GI) skills and practice, it is crucial to concentrate on stakeholders' perspectives inside a company.

2. Literature Review

2.1. Responsible Leadership and Green Innovation

As underlines Nkrumah (Omede, 2018), Africa should first seek the political kingdom and afterwards everything else will follow. Leadership and governance in health systems, known as stewardship, are crucial components of any healthcare system. According to Ezeoha et al. (2012), it involves the government's role in overseeing and guiding the entire health system to protect the public interest. Inadequate stewardship in low- to middle-income countries like Nigeria contributes to the failure of their health systems. The Nigerian government faces challenges such as poorly defined roles, lack of management tools and policies, limited collaboration, weak policy implementation, insufficient private sector involvement, budgeting and planning issues, and inadequate funding.

Effective leadership requires inclusive policies, realistic resource utilization, and a focus on achieving systemic goals. The health workforce plays a pivotal role, and their sufficiency is vital for health-related development goals. The WHO highlights the positive correlation between the density of health workers, service coverage, system performance, and health outcomes. Addressing leadership and governance challenges is essential for improving healthcare delivery and outcomes overall (Ezeoha, 2012).

Throughout history, the role of leadership has been to facilitate development and progress in societies, communities, and organizations. The primary objective of leadership is transformation. Effective leadership has the ability to transform individuals, societies, communities, and institutions by providing role models to emulate (Omede et al., 2018). Responsible and stakeholder leadership are closely intertwined concepts, as suggested by Bass and Steidlmeier (1999). Responsible leadership offers a compelling perspective on connecting leadership with stakeholder theory by focusing on the responsibilities that leaders have towards various stakeholder groups.

Responsible Leadership (RL), as defined by Maak and Pless (2006), is a sustainable and relational phenomenon that arises from interactions with individuals who are influenced by leadership and have a vested interest in achieving positive outcomes. RL entails the responsibility to create progressive systems that benefit various stakeholders. When a leader behaves ethically, it fosters a positive and beneficial relationship between employees and society as a whole.

Schneider (2002) emphasizes that the context of organizations and the significant changes they undergo, such as becoming flatter, less bureaucratic, and more decentralized, add complexity to the leadership process and present new implications for what constitutes effective leadership. According to Trevino et al. (2000) responsible leadership emphasizes the leader as a positive role model who exhibits virtuous behavior, adheres to ethical standards, ensures ethical and pro-social conduct in the workplace, and utilizes moral reasoning principles to make decisions.

Additionally, the link between responsible leadership and green innovation has led to investigate the leadership style and the environmental and society outcome. For example, Liao and Zhang (2020) carried out a study of how responsible leadership has a positive relationship with environmental performance through innovation, while Zhao & Zhou (2020) carried out a study of how RL has a strong relationship with Organizational Citizenship Behavior for the Environment (OCBE) through leader identification. Moreover, a current review on the responsible leadership influence on employee well-being (EWB) and social well-being (SWB) through green innovation is few (Liao and Zhang, 2020). Therefore, in attempting to advance this research, the author offers to explain why and how responsible leadership drives EWB and SWB through green innovation.

Management must practice some normative guidelines or rules to demonstrate proper behaviour of the employees (Linderberg, 2002; Pache, Santos, 2015). The manager has procedures that surround the environmental management action of reducing pollution during manufacturing process of product and services (Carmona-Moreno et al., 2004). Present research has revealed how some contextual factors have influenced green behaviour management in the workplace (Javed et al., 2020; Norton et al., 2015). Also, there are other factors that influence the management practice and leadership of the green work place.

Leadership has faced some negative consequences of meeting profit while paying attention to the environmental issues (Abbas, Sagsan, 2019). RL constitutes dimensions that cover effectiveness, ethics and sustainability. The effectiveness involves the managers and employees benefit from responsible behaviour and the outcome involves enhanced business performance and reputation in the organisation (Javed et al., 2020) and trust in management (Akhtar et al., 2020). The ethics by RL involves the exemplary leadership that encourages employees to do the right thing in business practice (Voegtlin, 2011).

A study by Voegtlin (2011) discovered that RL can reduce the unethical behaviour of employees. Therefore, this paper claims that RL should incorporate green innovation strategies for the organisation to overcome the brain drain situation because of the following justification. Firstly, researchers have recommended that RL provides social conditions for talented employees who are one of the important stakeholders of the organisation so as to motivate and maintain their wellbeing in the organisation (Enwereuzor et al., 2020). Hence, this paper notes that integrating RL with green innovation may improve the employees wellbeing because of this personal perspective to overcome the brain drain situation.

Secondly, from the society perspective, RL can identify and respond proactively to the demand of sociocultural problems in the society which has to do with difference in lifestyle and cultural structure of the country, addressing also the socio-economic challenges so that organisation can respond effectively (Maak, Pless, 2006). Therefore, the green innovation strategy in health care services in alignment with responsible leadership will lead to sustainability in social wellbeing to eliminate brain drain syndrome.

Thirdly, RL can also go beyond establishing relationship between the leaders (strategic head) of the organisation with the macro and micro (tactical and low level managers) level members of the organisation to stop brain drain syndrome. The decision of the health care service organisation to apply RL with green innovation can go beyond the employees' and social wellbeing. For example, foreign medical personnel from other countries seeking interest in Nigeria health care sector to curb the brain drain syndrome.

2.2. The concept of Green Innovation in an organization

Technology encompasses skills, knowledge, systems, processes, and techniques used to achieve organizational goals. When technology is applied to address environmental concerns, it is referred to as green or sustainable technology. Green technology aims to use technological resources efficiently and ecologically to improve organizational performance and productivity, leading to a sustainable competitive advantage in the industry (Murugesan in Issa, Jabbouri, 2022).

The concept of green innovation was established in the 20th century (Unsworth et al., 2021). GI with regards to organisations are the innovative activities of organisation adopting the software and hardware that is related to green goods, services and processes which include prevention of toxic waste, conservation of energy and protecting the environment through recycling waste materials and responsible management of the environment. GI does not only focus on protecting the environment but deals with technological innovation and design of environmental management of products.

Therefore, a simplified definition of GI is green technology and green product innovation. GI is regarded as a business strategy that deals with the core competence of the orgnisation. Green innovation takes into consideration the environmental benefits and adds the society concern in the entire business process (Ghisetti, Pontoni, 2015). The improvement in the society dimension will result in customer satisfaction and increase in market share (Dangelico, 2010).

Green growth is a policy framework that integrates environmental and economic aspects to promote economic growth, reduce poverty, create green and clean jobs, and enhance the well-being of citizens. It involves developing management policies to regulate activities within the environment. Fay (2012) highlights that green growth is crucial for sustainable development in developing countries by alleviating poverty and raising public awareness of environmental issues. The proper adoption of green growth brings numerous benefits. To achieve this, African countries need to prioritize innovation and remove barriers to the diffusion of green growth products and technologies.

The World Bank defines green growth as inclusive growth that efficiently utilizes natural resources, minimizes pollution, considers natural hazards, and acknowledges the role of environmental management and natural capital in preventing disasters. The OECD refers to green growth as a strategy that ensures economic growth and development without harming the ecosystem, while also promoting social welfare (Oyebanji et al., 2017). Green investment and innovations play a crucial role in achieving sustainable growth and development. Bowen sees the green growth framework as a comprehensive economic progress that creates a sustainable environment by reducing carbon emissions and pollution, fostering a business-friendly environment, boosting productivity, and improving people's welfare (Oyebanji et al., 2017).

GI obviously requires adopting new technologies. The fact that customers can buy products that are less harmful to the environment can assist firm in increasing their sales and generating profit. In meeting functional value, GI can fulfill the psychological need of the society with regards to addressing the wellbeing and protection of the environment (Pujari, 2006). Organization which has a brand image that is linked with ecofriendly concept will thrive better in the market place than other competitors.

The job of GI is not to improve income but to pay better attention to the social image and achieve environmental sustainability. The adoption of GI does not directly lead to economic performance, instead it is the societal performance of GI that allows the organization to improve its economic performance. Therefore, the influence of GI on economic performance is indirectly through the improvement of the societal performance. There are 4 dimensions of GI namely green technology innovation, green product innovation, green institutional innovation and green environment innovation. A report by BusinessWire in 2019 predicts that the Green Technology and Sustainability Market will reach $28.9 billion by 2024 (https://www.businesswire.com/…).

Green Technology Innovation (GTI) will assist in replacing the traditional technologies with modern technologies that can provide environmental benefits such as adopting recyclable processes which can reduce the emission of toxic materials. Green product innovation according to the European Commission is the product that reduces negative impact and risk to the environment. Green Institutional Innovation (GII) refers to the support system of an organisation to provide guidance and guarantee for organisational green behaviour. Global Enterprise Innovation (GEI) is the dimension of organisational green innovation that emphasizes the external forces from the performance of the organisation green innovation and focuses on the benefit of the environment and society.

This paper includes GI into the conceptual model for the following reasons. First, the dimension of GTI will motivate the medical personnel to adopt GTI by using clean energy in reducing air pollution to contribute to sustainability for the growth of the economy. The usage of technological innovation will lead to an increase of the organisation efficiency.

Secondly, the dimension of the GPI will enable the organisation to increase their profitability in the long run because customers will prefer a company's product to contribute to the competitiveness of the organisation. The dimension of GII will promote the efficacy of the healthcare organisation in proper policy formulation that focuses on total environmental quality management, while GEI dimension will assist the organisation in paying attention to the environmental issues that can harm the society and also promote a positive image for the society.

2.3. Linking Green Innovation and Responsible Leadership to employee wellbeing

In 2021, a world economic forum study showed that 60% of employees leave their jobs to join organization that aligns with their values. This is reason to believe that sustainability is an important concern for many medical personnel brain drain. In 2021, IBM study found that majority of employees' view an organization that is environmental sustainable as an attractive employer. The findings have suggested that making sustainability part of the business values may not only be good for the environment but also good for the employee well-being and business opportunities. Employees want and need work for their organization that embraces their values which is inclusive of sustainability. Given the evidence that taking action in green innovation is a part of solution rather than a problem will assist in mitigating ecological anxiety and the organization that accepts sustainability will contribute to reducing employee stress and anxiety levels.

As organization face tremendous environmental changes, this changes have led an organization to adopt green innovation to achieve a sustainable performance. GI is a strategy for fighting the excessive burden in the environment (Singh et al, 2020). In the bid to reduce ecological footprint, the organization have learnt to redesign their strategies in an innovatively beneficial way that can strengthen the employees well-being (Yusliza et al., 2020). The stimulation of green innovation can improve the firms' production process and lead to reduction of pollution effect on the operations of the business organization (Singh et al., 2020).

Grigore and Kifor (2021) state that employees' green innovation can play a critical role in minimizing the environmental impact and achieve sustainability goals, as the awareness of people in the environmental sustainability has grown, the company has motivated their employees in adopting green innovation to improve their quality of life. Cultivating green innovation practice will help the employee to be efficient, competitive and profitable. The fact that employees are the actors that drive the organisation activities means that they are the leaders whose action must meet the society expectations.

Present research has suggested that green innovation is inclusive of team members and practice of good leadership will significantly affect employees wellbeing (Van Bogaert et al., 2014), work schedule and job satisfaction (Mafini, 2016). The research has shown a positive association between green innovation and employee wellbeing (Yusliza et al., 2020; Unsworth et al., 2021).

However, there is a need to explore team member relationship on responsible leadership at the micro level of team member (Singh et al., 2020; Unsworth et al., 2021). Several researchers have suggested that green innovation directs the leaders of the organization to select, recruit, train, develop and reward the practice of the employees so as to increase their wellbeing (Haque, 2018; Mafini, 2016). When responsible leaders enable green innovation in the health care service organization, it can assist in employee retention and wellbeing thereby eliminating the brain drain mindset (Pless, 2007).

Leadership practices have revealed an important relationship with employee motivation (Cornell, 2020). However, responsible leaders should not ignore this brain drain situation. Researchers suggest that the increase of green innovation can enable responsible behaviour of the managers or executives in their roles as leaders to be able to improve the performance and wellbeing of employees (Marifini, 2016; Haque et al., 2019).

Several studies have mentioned the relevance of healthcare service organization and green innovation as a drive to increase a higher level of employee wellbeing (Harley, 2007). Hence, scare literature exist in explaining the combination of green innovation and responsible leadership (Haque et al., 2019). Therefore, it is important to explore the combined influence of RL and GI on employees wellbeing to meet the challenges of brain drain syndrome in Nigeria.

2.4. Green innovation integrates with responsible leadership to influence society wellbeing

The society wellbeing for health care service organization is challenging due to lack of adoption of green innovation and includes the culture of responsible leaders to establish a continuous improvement of health care system and solve problems of the brain drain (Aarons et al., 2014). Researchers have suggested that green innovation of an organization depends on the employee shared perception in exhibiting behaviour and practicing green innovation actions to ensure good leadership for the betterment of society. How an organization adopts GI in alignment with RL to implement social sustainability will address their success in accomplishing a competitive advantage (Aarons et al., 2014).

Employees innovative action play a role in ensuring the development of sustainable health care products (Turi, Sarfraz, 2022). Numerous organisations are adopting green innovation for the survival of their business. GI is a sustainable way to achieve ecofriendly products which influences society wellbeing (Zhang et al., 2021). When responsible leadership aligns with green innovation, it will essentially make the health care service organization to overcome brain drain situation and the organization will work towards the health and safety of the employees and society.

The healthcare service organization requires the combination of the social and environmental factors in adopting the green innovation to maintain or deliver society wellbeing. Combining RL with GI will enable healthcare service organization to survive in the most profitable way as they generate ethical values that will increase the contribution of society and build a healthy community (Cornell, 2020; Aarons et al., 2014).

RL does not only engage in the commitment of managing the business of the health care service organization but they also develop and adopt a green innovation with the positive consequences for employees and society. Moreover, RL can address the changes in the organization that is needed for the brain drain crisis and negotiate with different society groups such as government, suppliers, distributors, local community and patients on why and how the problems can be solved to benefit these group of people (Haque et al., 2020). Researchers claim

that RL play an important role in aligning GI for competitive advantage and for profitable benefit of the society (Singh et al., 2020). Therefore, this paper notes that there is a positive influence between GI integrating with RL to promote the society wellbeing.

2.5. Moderating role of GI in alignment with RL

Researchers have suggested that GI and RL have a simple effect on motivating employee and improving society well-being (Haque et al., 2019). According to Arici et al. (2022) organisation moderates the effect of leadership role and outcome of the employee. The conceptual model suggests that GI integrating RL can influence and reduce the impact of employee well-being and society well-being. The moderating role of GI in this paper includes the following points. First, GI integrated to RL may improve and increase the quality of life outcome of the medical personnel and society. Several theories have justified the relationship and positive influence of RL on employee motivation, job satisfaction, prosperity, general well-being and that it directly improves social well-being.

SET theory of leadership (Fuller et al., 2006) is the most influential conceptual paradigm in organisational behaviour. SET postulates that an employee enters a professional relationship to acquire valuable resources including salaries, social appreciation and trust (Blau, 1964). Therefore, it requires the action of each member of the organisation to influence each other's communicative interaction. Employees can receive support from their organisation in the form of physical reward from colleagues when they cooperate and collaborate to accomplish several activities in the organisation. The understanding of these relationship have a positive outcome on employee engagement and social commitment.

In the study, RL is accountable to ensure the employee health, safety and wellbeing and also make them to be committed to society welfare to address the brain drain syndrome (Shan, Tang, 2020). Similarly, the social contract theory of leadership is the contract of association where the contract of individuals within the company make decisions in a way that is acceptable to everybody. This can have a significant impact on employee wellbeing if they take a positive decision to adopt GI (Shan, Tang, 2020). The decision of the organisation to adopt GI will lead to positive outcome from both internal and external stakeholders (Shan, Tang, 2020).

Therefore, employee wellbeing and knowledge, health safety can lead to an improvement of organisation and directly link society wellbeing (Shan & Tang, 2020). This is in agreement with the study of Singh et al. (2020) that demonstrates a positive link between GI and society wellbeing through the increase of employee green innovation. Scholars have recommended a focus on employee motivation for the betterment of society to overcome brain drain syndrome.

Secondly, the proposed model expects that the integration of RL and GI will reinforce the positive outcome of employee quality of life in the organisation especially at the current state of brain drain. This is because allowing a responsible leader to adopt the GI will assist members of the organisation to avert the brain drain syndrome. For example, the management and

government of the healthcare service organisation should provide meaningful and conductive work environment that will promote higher level of employee wellbeing.

Following the stakeholders theory (Freeman, 2002, 2004, 2011) medical personnel serve as a stakeholder through their patient and provide the role of the health care service organisational responsible leaders to their communities. These ideas from the medical personnel can create positive reputation through RL for healthcare service organisation and increase their sustainability performance (Freeman et al., 2004). Knowing about this brain drain syndrome, the Nigerian society expect a more responsible support from the medical personnel and the leadership of the organisations. Hence, the contribution of RL in alignment to GI would improve the wellbeing of medical personnel and can increase trust, social appreciation and ethical relationship among employees, leaders and society. Therefore, this paper claims that GI integration with RL may moderate both the level of medical personnel wellbeing and society wellbeing.

3. Methodology

This article analyses the official statistics and reports about Healthcare, Green Growth, and Green Innovation (GI) in Nigeria. The selected documents are as follows: Nigeria Health Sector – Market Study Report; Green Growth and Developing Countries; Long-Term Vision for Nigeria (LTV-2050) - Towards the Development of Nigeria's Long-Term Low Emissions Development Strategy (LT-LEDS); Diffusion Strategy of Green Technology And Green Industry in Africa. A Study of Renewable Energy Technology Market and Energy Efficiency Adoption in Maize and Cassava Processing Industries in Kenya and Nigeria.

The above mentioned documents were carefully reviewed, and key findings, trends, and recommendations related to green innovation in Nigeria were extracted and analyzed. The analysis aimed to understand the current state of green innovation in Nigeria, identify barriers and opportunities, and propose strategies for promoting and implementing green technologies and practices in various sectors of the economy.

4. Healthcare sector in Nigeria

According to Nigeria Health Sector – Market Study Report released in 2022, Nigeria, with a GDP exceeding US$430 billion, holds the position of the largest economy in Africa. Its population of approximately 213 million people, with a median age of 18 years, is expected to more than double by 2050, posing challenges to the healthcare system. Despite facing

macroeconomic difficulties such as low growth and high inflation, Nigeria remains an important investment destination in Africa. According to the Absa Africa Market Index (AFMI) for 2021, Nigeria ranks as the third most attractive investment destination on the continent. The index considers factors such as market depth, access to foreign exchange, market transparency, tax and regulatory environment, capacity of local investors, macroeconomic opportunities, and enforceability of standard agreements.

As stated in the report, the healthcare sector in Nigeria is inadequately developed and fails to meet the needs of the local population. Access to healthcare is significantly skewed towards urban areas, with people living in cities having four times more access than those in rural areas. The private health sector is dominant but highly fragmented, consisting of numerous small privately-owned medical facilities with limited resources.

According to the Health Facility Registry (HFR) of the Federal Ministry of Health, there were approximately 39,983 hospitals and clinics in Nigeria in 2019, with over 70% being government-owned. Primary healthcare centers make up the majority (85.2%) of these facilities, while secondary and tertiary healthcare facilities account for 14.4% and 0.4%, respectively. The country has an estimated 154 tertiary health facilities, including both public and private institutions.

In 2014, Nigeria had an estimated 134,000 hospital beds, equivalent to 0.8 beds per thousand population, which is below the average for the African region. Although the number of hospital beds has shown some growth, it has been insufficient to significantly impact the population-to-bed ratio.

The demand for healthcare services in Nigeria is projected to increase from US$15 billion in 2018 to over US$18 billion in 2023 over a five-year period. The health sector contributes around 4% to the country's Real GDP, with a significant portion (over 74%) of healthcare expenses being covered by out-of-pocket payments.

Interestingly, during the COVID-19 pandemic, the health sector outperformed the overall economy in terms of real GDP growth. This growth can be attributed to increased investments from both the public and private sectors, aimed at curbing the pandemic and addressing other healthcare needs in the market.

According to data from the US Department of Trade in 2015, Nigeria's population was estimated to be 200 million by the end of 2018, growing at a rate of 3.2% per year. The population is predominantly young, with 63% below the age of 25. Urbanization has been on the rise, reaching 48.5% in 2016, which has put pressure on urban social services, including healthcare. Infectious and parasitic diseases are the primary contributors to the disease burden in Nigeria, with maternal, neonatal, and nutritional factors, HIV, tuberculosis, malaria, and respiratory infections being the leading causes. These factors account for a significant portion of years of life lost. As a result, there is a need for increased services in reproductive, maternal, newborn, child, and adolescent health (RMNCAH). The government is prioritizing

RMNCAH services, particularly in primary care, and there are investment opportunities in both public-private partnerships (PPPs) and the private sector in this area.

The following table from the report demonstrates the indices of the situation in Nigeria in terms of health and human capital.

S/N		HEALTH, ECONOMIC & HUMAN CAPITAL INDICES AND VARIABLES	VALUES
1	1.1	Estimated Number of Doctors Trained in Nigeria (2014)	65,000
	1.2	Number of Doctors practicing in Nigeria (2014)	25,000
2	2.1	Estimated Number of Doctors Trained in Nigeria (2016)	72,000
	2.2	Number of Doctors that Travelled abroad (2016)	20,000
Health And Economic Indicators Based on Disease Burden (2015)			
3	3.1	Under 5 Mortality Rate	117
4	4.1	Maternal Mortality Rate	560.0
5	5.1	Prevalence of HIV	3.10%
6	6.1	Estimated Proportion of Cardiovascular Disease Mortality	12.00%
7	7.1	Estimated Diabetes Prevalence	4.04%
8	8.1	Public Hospitals Per Million People	87.8
9	9.1	Private Hospitals Per Million People	53.8
10	10.1	Primary Health Centres Percentage of Health Facilities	85.60%
11	11.1	Secondary Hospitals Percentage of Health Facilities	14.00%
12	12.1	Tertiary Hospitals Percentage of Health Facilities	0.20%
Increasing Burden and gap of Non Communicable Diseases			
13	13.1	Population (2020 est.)	206 mil.
14	14.1	Consultant Oncologist	25
15	15.1	Neurologist	50
16	16.1	Neuro Surgeons	40
17	17.1	Consultant Paediatricians	600
18	18.1	Population of Children In Nigeria	70.0 mil.
19	19.1	Estimated Spending on Medical Tourism annually in Nigeria	US$1bn
20	20.1	Health Insurance Coverage In 2013	5.00%
Average Hospital Beds Per 10, 000			
21	21.1	Sub Saharan Africa	12.0
22	22.1	Europe and Central Asia	56.0
23	23.1	East Asia And Pacific	36.0
24	24.1	Nigeria	5.0
25	25.1	Global Average	26.0
Other Indices			
26	26.1	Life Expectancy at Birth (Male and Female)	34 years
27	27.1	Global Average of Life Expectancy at Birth (Male and Female)	70 years
28	28.1	Under Five Mortality Rate (Per 100, 000 Live Birth)	560
29	29.1	Global Average of under 5 Mortality Rate (Per 100, 000 Live Birth)	201
30	30.1	Nigeria's Rank on Proportion of GDP spent on health	109/191

Figure 2. Health & Human Capital Indices in Nigeria.

Source: Market Study Report…, 2022.

When it comes to clinics and hospitals in Nigeria, the report states that there are 34,076 Primary Healthcare Centers (PHCs), which make up 85.3% of the total number of hospitals and clinics in the country. However, it is estimated that only 20% of these PHCs are fully operational. Many of these centers face challenges such as insufficient staff, inadequate equipment, poor infrastructure, and a lack of essential drugs. According to the World Health Organization (WHO), only a quarter of PHCs have more than 25% of the necessary equipment. Additionally, only around 20% of PHCs have the capacity to provide basic emergency obstetrics services.

On the other hand, in Nigeria, there are 5,753 secondary healthcare facilities and 154 tertiary healthcare facilities. From 2010 to 2017, secondary facilities accounted for an average of 61% of total provider expenditure receipts, while tertiary facilities accounted for 21%. As a result,

a significant amount of funding, approximately N1.95 trillion (US$5.4 billion), which represents 84% of primary healthcare expenditures, was allocated to non-primary healthcare facilities, specifically secondary and tertiary care facilities, in 2017. The numbers are based on the National Health Account (NHA) and were presented in the following table in the Nigeria Health Sector – Market Study Report:

Healthcare Providers	NGN'Billion							
	2010	2011	2012	2013	2014	2015	2016	2017
Tertiary hospital	143	145	207	207	255	229	241	372
Secondary hospital	404	479	574	625	675	695	783	970
Primary Health Centres	130	131	165	178	176	190	223	370
Total Expenditure Received (NGN'Billion)	**677**	**755**	**946**	**1,010**	**1,105**	**1,114**	**1,247**	**1,712**
Avg. FX Rate (NGN:US$)	122.26	155.94	158.8	159.3	165.2	197.88	257.66	333.71
Total Expenditure Received (US$'Billion)	5.54	4.84	5.96	6.34	6.69	5.63	4.84	5.13

Tertiary hospital	21%	19%	22%	20%	23%	21%	19%	22%	21%
Secondary hospital	60%	64%	61%	62%	61%	62%	63%	57%	61%
Primary Health Centres	19%	17%	17%	18%	16%	17%	18%	22%	18%

Figure 3. Nigeria Health Provider Expenditure Receipts.

Source: Nigeria Health Sector – Market Study Report, 2022.

The Nigeria Health Sector – Market Study Report 2022 presents also the number of personnel and their distribution per Million population based on Bukunmi M.I., Tolulope A.O., "The Journal of Global Radiology", 2020. The professions that are mentioned in the statistics are: radiologists, radiographers, medical physicists, biomedical engineers, X-Ray ("Dark Room") and Technicians. The data was gathered between 2015-2018 as can be observed in the following table:

Personnel	Year estimate was made	Estimated No. of Personnel	Personnel per Million population
Radiologists	2015	300	1.5
Radiographers	2016	1,318	6.7
Medical Physicists	2019	100	0.57
Biomedical Engineers	2017	280	1.4
X-Ray ("Dark Room") Technicians	2018	1,111	5.63

Figure 4. Nigeria Diagnostic Imaging Personnel Distribution.

Source: Nigeria Health Sector – Market Study Report, 2022.

5. Green Innovation (GI) in Nigeria

In the document "Green Growth and Developing Countries" issued by OECD in 2012 there is a broad outline of the green growth concept in developing countries in general, however Nigeria counts to developing countries, this is why the information included in the report refers also to this African country.

According to the definition by OECD, green growth is an approach that aims to achieve sustainable development by focusing on the interface between the economy and the environment. It is not a replacement for sustainable development but rather a means to attain it. Green growth emphasizes creating the necessary conditions for innovation, investment, and competition to foster new sources of economic growth while maintaining resilient ecosystems.

Implementing green growth strategies requires specific attention to social issues and equity concerns that may arise from transitioning to a greener economy. These strategies should be implemented alongside initiatives that address the broader social aspects of sustainable development.

For developing economies, the goal is to achieve diversified and sustainable growth, leading to poverty reduction, improved well-being, and a higher quality of life for their citizens. This involves recognizing the value of natural capital and its role in economic growth. A green growth model promotes cost-effective and resource-efficient approaches to guide sustainable production and consumption choices, ultimately helping developing countries achieve sustainable development.

Implementing green growth strategies in developing countries poses unique challenges. Policy choices need to consider the environmental costs of expanding agricultural land versus the high levels of rural poverty. Exploring ways to increase productivity on existing cultivated land can be a potential solution. Payment for ecosystem services, sustainable resource extraction, and promoting sectoral sustainability have shown economic opportunities for developing countries.

In the short term, green growth policies can deliver local benefits such as improved environmental management, better access to water and energy, and enhanced health outcomes. However, these short-term benefits must be weighed against the immediate costs of implementing such policies. Trade-offs exist, and the scale of these trade-offs depends on the nature of the economy and the specific green growth measures implemented. In some cases, the poor may be adversely affected, and powerful actors may face disadvantages from deviating from current development plans. To mitigate these challenges, targeted social policies should accompany green growth measures.

In the long run, there is a need to address infrastructure deficits to support economic activities. However, there is potential for technology leapfrogging and climate-resilient implementation. Efficient energy and public transportation systems are needed to address electricity shortages and urbanization rates. Green growth initiatives also have the potential for job creation, particularly in rural areas, and can help preserve local livelihoods from the impacts of climate change.

According to the document 2050 Long-Term Vision for Nigeria (LTV-2050) - Towards the Development of Nigeria's Long-Term Low Emissions Development Strategy (LT-LEDS) (2050 Long-Term Vision…, 2021) issued in 2021 by the Department of Climate Change,

Federal Ministry of Environment in Nigeria, to achieve a low emission development future in Nigeria amidst population growth and economic expansion, emphasis must be placed on innovation. This includes technological, policy, governance, economic, and environmental innovation.

In terms of social innovation, there is a need for societal values to be reoriented to support the transition to a carbon-neutral future. This involves creating green cities that interact with nature in an equitable and sustainable manner. The transition to a green economy requires fundamental changes to macro and micro-economic conditions and institutions. Maintaining the status quo in economic policy is not viable, and new social innovations must be developed to meet future demands.

Nigeria's industrial policy, as outlined in the Nigeria Industrial Revolution Plan 2014 (as stated in 2050 Long-Term Vision for Nigeria (LTV-2050)), aims to revitalize the country's manufacturing industries to drive growth, job creation, and food security. However, the current reliance on natural gas and diesel for power generation in the industrial sector contributes to greenhouse gas (GHG) emissions. Without measures to improve energy efficiency, the sector's emissions are projected to increase from 4.2 Mt CO2e in 2010 to 14.8 Mt CO2e in 2030, according to the sectoral analysis of Nigeria's Nationally Determined Contributions (NDCs).

Recognizing the need to address this issue, the government acknowledges the necessity of a coordinated shift towards low-emission production systems as the sector continues to grow. The adoption of green technology throughout the industrial process, from the development of factory facilities to the fabrication and installation of production equipment, can help reduce the demand for fossil fuels and enhance overall efficiency. This approach will not only mitigate GHG emissions but also ensure sustainable and efficient industrial development.

Economic innovation is crucial in overcoming the challenges faced in implementing climate action in Nigeria. While the country aspires to be a low carbon and climate-friendly economy, economic circumstances often limit the government's ability to pursue a low carbon development path. Efforts to diversify the economy and address the trade-offs between economic growth and environmental sustainability are necessary for long-term success.

Technological innovation plays a vital role in Nigeria's long-term vision. Advancements in technology are essential for mitigating climate change and achieving sustainable development. Innovation in energy generation, storage, efficiency, carbon capture, and renewable energy has shown promising results globally. Nigeria should invest in promoting these technologies, as well as indigenous technology innovations, to support its long-term low emission development strategy.

Environmental innovation focuses on implementing and driving organizational changes to protect the environment. It encompasses economic, social, and technological changes aimed at promoting environmental integrity. This includes sustainable production processes, equitable distribution of wealth, incorporation of environmental risks in economic frameworks, and strategic planning for sustainable development and poverty alleviation. Citizens should

have access to environmental information and be involved in decision-making processes. Overall, innovation in various aspects is crucial for Nigeria's transition to a low emission development future, and it encompasses social, economic, technological, and environmental dimensions.

According to the document "Diffusion Strategy of Green Technology And Green Industry in Africa. A Study of Renewable Energy Technology Market and Energy Efficiency Adoption in Maize and Cassava Processing Industries in Kenya and Nigeria" issued by United Nations University UNU-MERIT in 2014, Nigeria's renewable energy potential remains largely untapped, with only a few existing projects funded by international agencies and NGOs. The adoption of renewable energy technologies (RETs) in Nigeria is relatively recent compared to developed countries. Solar photovoltaic (PV) technology, in particular, is not well-developed in Nigeria, with limited local research and investment.

However, solar energy is being used for traffic systems, billboards, street lighting, and household appliances. Nigeria has a significant solar energy resource, with an average annual solar energy intensity that exceeds the projected energy demand for the country. Wind power is mainly used for water supply and has been revitalized in some northern states. Biomass, including agricultural crop residues and waste, is a major source of energy in Nigeria, but its full potential has not been realized. Hydropower contributes about 32% to Nigeria's electricity supply, with significant untapped hydropower potential. Despite the technical and economic prospects for renewables, renewable energy education is lacking in Nigeria's academic curriculum, limiting awareness and expertise in the field.

There are various documents and reports concerning Green Innovation in African countries and Nigeria, however there is lack of information about GI in the health sector.

6. Summary

Green innovation and responsible leadership creates a positive and psychologically safe environment for health care workers, green innovation and responsible leadership increases the standard of living among health personnel, green innovation and responsible leadership helps in creating a good relationship among employees, green innovation and responsible leadership helps employees to carry out good health care services are the ways green Innovation and responsible leadership positively enhance employee well-being.

The ways green innovation and responsible leadership positively enhance society well-being are green innovation and responsible leadership promotes high usage of health facilities in the society, green innovation and responsible leadership positively enhance the health life of citizens in the society, green innovation and responsible leadership promotes job opportunity for health workers in the society.

The ways green innovation in alignment with responsible leadership moderates the relationship among employees' and society well-being are green innovation in alignment with responsible leadership helps in promoting good health care services through the employees for society well-being, green innovation in alignment with responsible leadership improves transparency among employees for society well-being, green innovation in alignment with responsible leadership creates a positive environment among employees for society well-being.

The importance of this research lies in its identification of the limitations and weaknesses of the healthcare sector in Nigeria. It highlights the need for improved infrastructure, resources, and access to healthcare services, especially in rural areas. The information obtained can be further used to guide policymakers, investors, and healthcare providers in addressing these challenges and developing strategies to enhance the healthcare system in Nigeria. It also emphasizes the significance of prioritizing RMNCAH services and exploring opportunities for public-private partnerships to improve healthcare delivery.

The research on green innovation in Nigeria provides important aspects to the concept of green growth and its application in developing countries, including Nigeria. It emphasizes the importance of achieving sustainable development by balancing economic growth with environmental preservation.

On the one hand, the research highlights the challenges and trade-offs associated with implementing green growth strategies, including the need for social innovation, infrastructure development, and economic diversification. Moreover, it emphasizes the need for renewable energy education and awareness to fully harness the country's renewable energy potential.

On the other hand, it underscores the role of technological, policy, governance, economic, and environmental innovation in achieving a low emission development future. The research emphasizes the need for renewable energy education and awareness to fully harness the country's renewable energy potential.

While there is limited information about green innovation in the healthcare sector specifically, the study offers insightful information about the broader context of green growth and innovation in Nigeria. The lack of information highlights a potential research gap and the need for further exploration of green innovation opportunities in the healthcare sector to promote sustainability and environmental responsibility in healthcare delivery.

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