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Historical Evolution and Evaluation of China's Aid to Nigeria's Rail System

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Abstract

This study explored the historical evolution and effect evaluation of China's economic aid to Africa, thereby considering Nigeria in particular. The level of development can be measured on functionality of the rail system. The development plan for the railway transportation system was examined employing a SWOT matrix approach. Despite the activeness of China in the railway sector in recent years, the sector was neglected and inefficient. The tracks and trains were deteriorating, and the necessary finances were never forthcoming. This study found that the country's economy depends on the modernization of the inefficient tracks and the creation of new links. It also found that despite the negative effects of rail transportation on human health and the environment (such as air and noise pollution, destruction of forests and wildlife habitat, land degradation due to soil erosion of drainage systems and geological formations associated with railway construction), railways continue to play an important role in the development of African and Nigerian economies by transporting freight and passengers at low costs and enabling the growth of mining and agriculture. It is crucial to note that, despite the increased importance of railways in the nation's growth and Chinese engagement in railway infrastructure investment, the challenges are outnumbering the benefits. Therefore, governments at all levels should promote the enabling environment that will drive more investment, security, and channel it the rail to enhance regional complementarity of

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trade. Nigeria must develop policies that strengthen their ability to monitor and enforce labor, safety, and environmental protections by ensuring that Chinese companies involved in the construction of railways in Africa adhere to global standards and the international labour organization's rules.

Keywords: ***Africa, Chinese, Nigeria, Privatization, Railway***

1. Introduction

Transport is a crucial sector in the Nigerian economy because it enhances firms' and consumers' access to products and services while also allowing emerging nations to incorporate into the global economy (Adeniran, 2016; Adeniran & Gbadamosi, 2017; Adeniran & Fadare, 2018). In their study, Amba and Danladi (2013) found that transportation is one of the indices used to assess a country's economic development. Lingaitiene (2006), Adeniran and Yusuf (2016), Adeniran, Olorunfemi and Njoku (2022), Olorunfemi and Adeniran (2024) also pointed out that any country's progress is dependent on the development of its transportation system.

Rail transport helps to Africa's socioeconomic growth by facilitating access to markets, jobs, health care, education, and recreational activities. It positively affects family communication by shaping how often relatives meet in person (Akinloye, 2024; Dare, 2024; Akinloye 2025), how much time commuters have for daily check-ins, and how families coordinate during travel. Rail transportation, according to Olievschi (2013), has played a critical role in economic development since it facilitates low-cost freight and passenger travel and contributes to the expansion of mining and agriculture. Rail transport is safe and it is revealed in the context and application of Agnew's general strain theory (Omigbodun & Akinloye, 2026). The establishment of a railway system that fulfils society's transportation demands

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without harming people's quality of life in the near or far future is characterized as railway sustainability.

“If you want to get wealthy, build a road,” is a common Chinese aphorism that has been represented in China's domestic experience, where infrastructure investment has been a fundamental growth strategy. This idea is part of a larger Chinese worldview that links poverty alleviation to peace and stability, and sees economic expansion as a means of achieving both. At the 2015 Forum on China-Africa Cooperation, President Xi reaffirmed China's commitment to boosting Nigerian ability to promote development and expand infrastructure: "Poverty is the root cause of disorder, while peace is the guarantee for growth," Xi stated.

Infrastructure investment is known to be a significant aspect of bilateral collaboration; within it, railway building is a vivid reminder of China’s presence on the country Nigeria. Because it offers the physical networks and services that a society relies on, sustainable transportation systems link economic progress with social and environmental concerns. The government's objective is to promote sustainable rail transportation that serves the mobility and access needs of Nigerian people and enterprises while also reducing or eliminating greenhouse gas emissions. The continuous upgrading of Nigeria's railway infrastructure would enable the transit of commodities and raw resources, stimulate tourism, improve trade, and overall improve the population's level of living.

Inefficient and insufficient train transportation contributes to the continent's high cost of doing business and stifles long-term growth. A variety of causes contribute to the Nigerian rail system's inability to match developed-country standards, including the government's strong emphasis for road transportation, inadequate financial resources, a shortage of excellent railway experts, political disputes, and natural catastrophes.

Chinese rail projects are crisscrossing Africa, with funding from the Export-Import Bank of China and construction by Chinese state-owned businesses, mainly in Nigeria, thirty years after the first Chinese-built cross-border railway from Tanzania

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to Zambia (SOEs). The Belt and Road Initiative (BRI), which was launched by President Xi Jinping in the fall of 2013, has resulted in significant construction in Ethiopia and Kenya. Nigeria is no exception, being the world's most populated country. The financing from China will go a great way toward solving Nigeria's vast infrastructure gaps, but it will also have far-reaching ramifications for regional peace-building.

In the long run, railway infrastructure in Nigeria might result in major economic advantages, such as job creation, skill training, and trade promotion. In the northeast and south, where chronic poverty has led to insecurity and instability, these would be especially beneficial. However, the same studies are prone to both security issues and domestic political problems, which might jeopardize the projects' economic sustainability and deepen regional inequities within the country.

When it comes to railway transportation, Nigeria has experienced hurdles in terms of developing sustainable and equitable transportation infrastructure. Despite the lack of a robust political and economic infrastructure, the continent's growth has been hampered by a lack of cheap services. The goal for the Nigerian government is to build a long-term rail infrastructure that meets the transportation demands of individual businesses and society while also safeguarding future generations' quality of life.

Transportation is a critical factor in determining a society's social, economic, commercial, and industrial development. As a result, providing an effective transportation infrastructure to facilitate free movement of people and products as a means of promoting and enhancing a nation's economy should be a top priority for any responsible government across the world (Adeniran, Kanyio & Owoeye, 2018; Adeniran, Muraina & Ngonadi, 2023; Adeniran, Njoku & Stephens, 2023). Due to its economic worth as well as the degree of safety of people and products traveling via it, railway transit is the safest solution to meet this transportation necessity. Despite the fact that railway transit is the most cost-effective mode of transportation in Nigeria, the government has shown little interest in it. The Nigerian Railway

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Corporation (NRC), the government agency in charge of rail transportation in Nigeria, has had several setbacks as a result of inadequate budget and negligence.

Inadequate and outdated infrastructure, obsolete equipment and machines, insufficient maintenance tools, and acute bends and dangerous grades are just a few of the NRC's many issues. Other factors include the high cost of installation and construction, the growing popularity of automobiles, the use of an outdated 1067mm narrow gauge, which necessitates the use of a slow train, and finally, competition from other modes of transportation (road, air) that are much faster, more comfortable, and flexible.

The existing and growing multidimensional difficulties in Nigeria's railway infrastructure necessitate the development of new and maintenance procedures; simply put, the current ones are old and insufficient. The main disadvantage of current techniques is that they all presume certain predefined circumstances. The truth is more complicated; situations are usually unfavorable, necessitating a different strategy. Unfavorable circumstances for railway networks can be attributed to both natural and operational reasons. Under the case of a natural disaster, the train infrastructures work in severe conditions, notably in extreme temperatures, primarily in Nigeria's northern region. Other difficulties include periodic assaults on railway infrastructure, which frequently result in economic losses and interminable delays. There are new criteria for railway operations, which encourages constant renovations and improvements to the current rail tracks.

These issues are the reasons why Nigerian railway transportation has failed to meet the NRC's citizens' objectives. Surface scraping will not solve the Nigerian railway system's difficulties. This is why the federal government's intention to reinvigorate the whole railway system is a positive step forward. A contract is signed between the Federal Government and the People's Republic of China as part of the plan to, among other things, realign existing railway tracks, deliver modern locomotive wagons and coaches, and improve railway technical standards.

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When this is accomplished, the NRC will be as efficient and vigorous as it was during the "good old days of Nigerian railway" in the mid-twentieth century. Nigeria will experience an environment of various economic, social, and political activities, accompanied by mass movement of people and products, in the near future, as a result of the fresh breath of life and freedom brought about by re-democratization. As a result, a low-cost, efficient, and safe mode of transportation will be required to connect the main cities (including Enugu) that will play an active role in the nation's economic growth.

The bulk of Nigeria's railroads, including Nigeria's, are in bad condition, according to the African Development Bank, and require billions of dollars in expenditures to maintain rail lines and signaling systems. During colonial times, the bulk of Africa's railways were built to connect mines and other natural resources to seaports. Africa would require $50 billion to create 4,000 kilometers of additional railway lines in order to efficiently harness its iron riches, according to Deutsche Bank (Africa Development Report, 2014).

Unsuitable national policies, limited implementation of national, sub-regional, and regional agreements, poorly built and maintained railway networks, insufficient human and institutional capacity, negative environmental effects, and poor railway safety are just a few of the major challenges that African governments and their development partners face as they seek to secure adequate, safe, and affordable railway systems (as noted in the Africa Review Report on Transport, 2009). Environmental and labor concerns were included as one of the major problems confronting State-Owned Enterprises (SOE) in Africa by Chintu and Williamson (2013), a choice based on observations of lax enforcement of environmental standards, concerns about weak environmental standards, and poor labor relations in China.

Such operationally generated situations are obviously detrimental to the aging track system: they will exacerbate Rolling Contact Fatigue (RCF) issues and accelerate the deterioration of the track infrastructure (Lewis and Olofsson 2009). Bruneau et al. (2003), Hollnagel, Woods, and Levenson (2006), and Steen and Aven (2011) are

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examples of resilient studies; they were undertaken to increase the ability of rail infrastructure to tolerate shocks produced by numerous uncertainties. As previously stated, research on uncertainty has thus far focused on severe events. However, unfavourable conditions created by nature and by operations that are obviously not catastrophic occurrences must also be investigated. This highlights a big gap in uncertainty research.

Furthermore, research on infrastructure resilience is often separated into two perspectives: speed and robustness. However, the robustness of infrastructure must be investigated in the context of adverse situations. In railway systems, robustness studies have mostly focused on schedule management to deal with system delays. It comes as no surprise that the robustness of railway infrastructure is now piquing the interest of both business and government. There is a lack of a holistic methodology and a quantitative approach to developing and measuring railway infrastructure robustness, life assurance, and sustainability. This focus of this study, therefore, is to assess the level of Chinese railway projects in Nigeria.

The aim of this study is to explore the historical evolution and effect evaluation of China's economic aid to Africa, thereby considering Nigeria in particular. The objectives are to: examine the extent of Chinese engage with Nigeria in the railway sector; and to examine the effect of railway transport infrastructure on transport good circulation for freight, passengers, staff and locomotives.

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2. Literature Review

China's motivation to infrastructural investment in Africa

The international system is made up of many countries that pursue their national interests in the global arena while taking into account the advantages they stand to earn from such interactions (Ampiah & Sanusha, 2015). The rapid expansion of China's economic interests in Africa, which is part of the above-mentioned persistent global connections, is a significant trend in the continent's foreign policy

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arena. Because of its significant investments in the continent, which are primarily backed by China's Investible Export financial assistance of $150 billion to its multinational firms, China has surpassed the United States as Africa's biggest trade partner since 2010 (Brautigam, 2009). China's exports to Africa increased from $4.4 billion to $56.3 billion between 2001 and 2011.

Despite the fact that China is still classified as a third-world country, it has the world's second-largest economy. China has maintained links with Nigeria through commerce, assistance, and investments throughout the years, while Nigeria has also looked into economic prospects in China. The Sino-Nigeria relationship is also founded on the exploration of their economic comparative advantages for mutual gain. China's developing economy demands more raw material resources from Nigeria, notably crude oil, to fuel its industries, hence Sino-Nigeria trade has expanded. China is also utilizing Nigeria's massive population, believed to be approximately 150 million people (Nigeria Population Census, 2006), to create extraterritorial markets for Chinese manufactured goods.

Because of its large population and natural resources, Chinese investments in Nigeria have become a trending issue in the twenty-first century, with more than 200 Chinese companies currently operating in the country, making Nigeria the largest recipient of Chinese Foreign Direct Investment (FDI) – about $15 billion out of China's $26.5 billion in Africa as of 2016. Despite the functional link between Nigeria and China, researchers and experts have expressed varying viewpoints on the advantages of the two nations' socioeconomic cooperation, with Chinese investments in Nigeria attracting hostility and criticism.

Concerns have been expressed in particular about the impact of Chinese investments on Nigeria's economic security, which has been harmed by the dumping of inferior Chinese industrial products into the country, a lack of technology transfer from China to Nigeria, fewer opportunities for Nigerian investments to survive in China, and visa and employment restrictions on Nigerians seeking to explore business opportunities in the country (Ogunsanwo, 2018). Enuka (2010) also contends that Chinese FDI has increased Nigeria's reliance on the Chinese economy, putting the country's economic security at risk.

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The People's Republic of China has been providing help to African countries since the early 1950s, beginning with a $2 million loan to Egypt in 1956, and China has also supplied aid packages to most African countries who respect the 'One-China' policy, according to Pease (2010). Since the Chinese government launched the "Go global" strategy in 1998 to capture global markets through both public and private Chinese enterprises (Ogunrinu, 2017), China's FDI has been increasing in Africa through its investment strategies in the continent, which center on building the necessary infrastructure to explore African oil and gas for China's industrial growth.

Contrary to the implication that Chinese FDI has not contributed to Africa's development, Mthembu (2009) contends that much of such investment has remained a catalyst for promoting infrastructure development, job creation, and revenue generation in the continent through tax payments by Chinese industries operating in Africa, as well as contributing to the continent's aggregated Gross Domestic Product. According to the author, Nigeria has gained $15.42 billion in net Chinese investments as a result of economic linkages between China and Africa. A closer look at this trade link indicates a trade imbalance in favor of African countries, who sell their low-value-added products for industrial products from China, which provide higher foreign exchange profits at cheaper rates.

Ian (2006) highlighted the primary objectives of China-Nigeria relations in the areas of commerce and industry, where Nigeria made considerable concessions to the Chinese in order for them to build industries in the nation. The current drivers of the two nations' relationship, which focus upon Nigeria's oil in exchange for Chinese subsidies. Despite Ian's efforts to document crucial events in Nigeria-China ties, his work did not cover other important aspects of the bilateral relationship, such as the working conditions of Nigerians in Chinese enterprises, among other things. According to Jiang (2009), the most significant part of Nigeria-China ties is the economic domain, which has prepared the door for massive Chinese investments in Nigeria.

From 1999 to 2007, Oniku and Gbadamosi (2009) looked at the growth of commercial and diplomatic connections between major African nations, including the one between Nigeria and China. Their study indicated that China has gained more from bilateral relations with Nigeria, repatriating more than $84 billion from the

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country between 1997 and 2007, whereas Nigeria's non-state actors repatriated less than $10 billion earnings from China during the same period. Aside from that, there's the issue of trade imbalances and massive Chinese loans, which are slowly dragging Nigeria into a financial hole.

Finally, the Chinese desire for oil and gas appears to be a driving force for the present resumption of engagement. As a result, the current surge of social unrest in Nigeria's Niger Delta, which is home to the country's oil and gas deposits, has affected Chinese citizens. Militants pushing for a more equitable distribution of the country's resources have abducted some Chinese oil workers. Despite the limitations noted in the previous works on Nigeria, they are useful in acquiring a complete understanding of the origins, nature, and scope of bilateral relations between Nigeria and China.

Strategic importance of the Nigeria-China Relations

Nigeria and China have eight primary goals in their bilateral relationship (Lan, 2006). A guaranteed supply of raw mineral and agricultural materials for China in exchange for increased foreign exchange earnings for Nigeria, the creation of a market for both Chinese and Nigerian products in each other's markets, the acquisition of land for agricultural purposes, and gaining Nigeria's diplomatic support for China's interests in international affairs in exchange for technical assistance and loan facilities are among them. China's responsibility to present a credible alternative to the Western development model through foreign direct investment, teaching China's development models to Nigeria, which largely rely on middle-range technologies, and unrestricted migration of Chinese people to Nigeria and vice versa are other areas of focus in China-Africa relations.

Through conferences, talks, and other discussion forums, another essential part of the China-Nigeria connection is the exchange of optimal information about prospective investment opportunities in both nations, as well as how to take advantage of such opportunities. The strategic significance of Nigerian-Chinese ties for both countries cannot be emphasized. China now possesses the world's second largest economy, which she has successfully used to lift about 400 million Chinese people out of poverty. This achievement has sparked Nigeria's interest in learning

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from China's social protection achievements in order to deploy its own poverty-eradication initiatives in order to lift around 80 million Nigerians out of poverty.

Nigeria has one of the biggest natural resource endowments in Africa, which might aid China's industrial growth. China is the world's most populous country, and its economy has grown at an annual rate of 10% over the past three decades, converting it into a global economic powerhouse. Its economy has grown to be greater than Japan's or the EU's combined. Nigeria might take a lesson from China's economic success and apply it to their own country. Nigeria is Africa's most populous country, with massive oil and gas reserves, but it need China's financial and technical aid to transform these main raw resources into value-added goods that may earn Nigeria more foreign cash on international markets.

Nigerian oil and gas are critical to China's burgeoning industry, and Nigeria is the continent's largest market for Chinese industrial exports, accounting for more than a third of China's total trade with West Africa. The US and other Western nations' expanding diversification policies from oil exploration to gas and other energy options, which might damage Nigeria's oil sales to those countries, have required diversification of Nigerian oil exports to China. Due to the significant expansion of its core sectors, which will continue to demand Nigerian oil, China has a higher potential for continued patronage.

Increased Chinese demand for Nigerian oil has also compensated for a drop in US consumption for Nigerian oil, with China alone accounting for almost 40% of Nigeria's worldwide oil demand in 2017. As a result, better economic cooperation between Nigeria and China is critical for Nigerian oil sales. Nigeria is also looking for attractive external markets for its produced products and services, which China, with its population of over a billion people, may be able to deliver. In contrast to Nigeria, which is still overly reliant on oil as the driving force of its economy and a weak source of foreign trade earnings, China's economy is highly diversified, with a large capacity to export a wide range of value-added products to a wide range of countries and generate significant foreign exchange.

Nigeria's economic diversification efforts might be modeled after those of China. Nigeria is the world's most populous country and is located on the African continent, whereas China is the de facto leader of the developing world. China may offer

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money and in-kind assistance to poor countries. Nigeria, like many other African countries, is continually looking for fresh opportunities. In comparison to the strict lending standards, China's help comes with a softer credit conditionality. Conditions of lending in Western countries. China is well-known for its proclivity for lending money. Many of Nigeria's traditional European allies have refused to engage in Nigerian development initiatives, which are frequently unfunded.

Despite the advantages of bilateral relations between Nigeria and China, as well as their strategic importance to both countries, there is concern and anxiety about the scale of China's activities in Nigeria, especially its appetite for energy resources, which is hampered by its poor environmental record at home. Environmentalists in Nigeria are concerned about the impact of Chinese investments on the country's environmental safety, fearing that Chinese businesses may cause environmental damage. As a result, Chinese investment in Nigeria is viewed as a potential threat as well as an opportunity.

China's engagement with Africa in the railway sector

China has a long history of investing in Africa. However, Mohan and Power (2008) noted that the China-Africa connection was created out of supply and demand factors rather than political and economic affinities. The African desire for Chinese products and markets was mirrored by the Chinese desire for African resources and markets (Zeleza, 2014). The Chinese desire for resources prompted them to invest in Africa (Bohlund, & Orlik, 2015).

The construction sector, which is the backbone of the Chinese economy, has traditionally been dominated by state-owned enterprises. However, the recent emergence of private businesses and greater privatization of some state-owned industries has diversified the market (Center for Chinese Studies, 2006). According to a research by the Centre for Chinese Studies, Chinese companies have become a major role in Africa's building industry. The completion of the Tanzania-Zambia railway in the 1970s marked China's entry into the African market, and also signified China's commitment to Africa's economic progress (Corkin, Burke & Davies, 2008).

By the end of 2006, it was projected that 800 Chinese companies were operating on the African continent, largely in the building and infrastructure sectors (Corkin et al.).

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According to the German journal Der Spiegel, there are over 2,000 Chinese companies operating in Africa, the bulk of which are engaged in road and rail construction. A US$9 billion deal for the development of rail and road networks in the Democratic Republic of Congo (DRC) was signed by two Chinese construction corporations and a copper mining firm, all of which are state-owned (Nirit, 2014). Large private enterprises with close links to the government, State Owned Enterprises (SOEs), Small and Medium Enterprises (SMEs), and Independent Chinese Entrepreneurs are the four economic sectors in which China invests in Africa (Zeleza, 2014).

According to China's Import Bank, roughly 800 Chinese companies were operating in Africa in 2006, with about 85% of them being privately held. In 2009, that number had risen to 2000, and by 2011, there were around 4,600 Chinese companies operating in Africa (Shinn &Eisenman, 2012). Finance (20%), building (16%), manufacturing (15%), business and financing services (5%), and other industries (13%), were all represented by Chinese investments in Africa by 2004. (Zeleza, 2014). By 2007, the value of Chinese building projects in Africa had reached $30 billion (Dent, 2011).

In 2007, the Chinese government established the China-Africa Development Fund (CADF) and established institutions such as the China Development Bank, China Export Import Bank, and China Agricultural Bank in order to boost investment in Africa. Although Chinese SOEs have undertaken a number of projects in their connections with Africa, the focus of this literature analysis will be on the long-term viability of the Chinese railway project. China has made significant contributions to Africa's economic growth in recent years, both through trade and large-scale infrastructure projects (e.g., the rehabilitation of the 840-mile Benguela railway line connecting Angola's Atlantic Coast to the Democratic Republic of Congo and Zambia (Eigen, 2012) and the expansion of the East Africa railway connecting Kenya, Uganda, Rwanda, and South Sudan).

In 2008, Libya awarded the China Railway Construction Corporation (CRCC) two contracts totaling US$2.6 billion for the construction of a rail line connecting the country's east and west. In January 2009, the Libyan government signed a deal with China Civil Engineering Corporation to construct 172 kilometers of railway lines in

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the North African country. In September 2012, the China Railway Construction Corp. (CRC) signed a US$1.5 billion deal to restore Nigeria's railway infrastructure (Cottie, 2014). The majority of Africa's rail lines date from the early twentieth century, when European colonial powers constructed them to help military mobility as well as the delivery of mining and agricultural supplies (Africa Development Bank, 2018). The railway networks were dismantled after the proclamation of independence.

The Africa Development Bank (2015) report highlighted major drivers of railway development in Africa:

i. The need for robust, efficient integrated logistics;

ii. Increased transportation demand as Africa's economies expand;

iii. The need for new urban mass transit;

iv. The need to create high-capacity infrastructure which has the capacity to handle mining in bulk proportions; and

v. The requirement for reliable and capacious access to the sea.

Strengths that contribute to Africa's railway development (Africa Development Bank, 2015)

i. Increased African integrated commerce;

ii. Increased environmental and social awareness;

iii. Direct and indirect employment creation;

iv. Better urbanization control;

v. Increasing the attractiveness of freight transportation.

Other advantages of taking the train include fewer road fatalities and associated expenses, significantly less air pollution than other modes, and far less noise pollution than vehicle modes. According to Chintu and Williamson (2013), there have been worries regarding Chinese enterprises' operations in Africa in terms of environmental and labor issues.

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These issues were attributed to China's lax environmental standards and the lack of effective labor legislation in the hosting nations. Chinese companies are known to employ more of their own people than residents of their host nations in some cases. Schneidman, on the other hand, proposed the much-welcomed development (2014, n.p.) "Chinese authorities are realizing the need of being more involved in the African areas where they invest. While corporate social responsibility is still a relatively new idea for many Chinese businesses, the Chinese Academy of International Trade and Economic Cooperation (CAITECH) produced a report on China-Africa trade in 2013."

China's engagement with Nigeria in the railway sector

The expanding commercial partnership between China and Nigeria demonstrates that the two nations' economies are complementary (Foster Butterfield, Chen & Pushak, 2008; Oyeranti, Babatunde & Ogunkola, 2011). Nigeria is a resource-rich country with outdated technology and infrastructure, while China is in desperate need of raw materials to support its industries. Primary items are relocated to China, while completed products are imported to Nigeria, particularly finished commodities that Nigeria lacks the technological know-how to make (Akongbowa, 2008). The attitudes to Sino-Nigeria ties are varied (Zelesa, 2014).

Some regard the connection as a new form of colonialism in Africa, characterized by exploitation without transparency or good corporate governance (Chintu& Williamson, 2013). The British colonial period left much of Nigeria's railway infrastructure in place. This is a narrow-gauge network with three main north-south trunk lines terminating at Lagos, Warri, and Port Harcourt on the coast. Historically, these lines were used for extractive reasons, linking port cities to inland agricultural and mineral riches, which were subsequently sold to colonial metropoles. However, after independence, the network progressively fell into disrepair due to rising bureaucratic and corruption costs, as well as the waning significance of agricultural exports in the post-oil boom era.

Because high transportation costs reduce the competitiveness of Nigerian goods, poor transportation infrastructure has been a key economic obstacle to the growth of its industries and exports. The administration of President Olusegun Obasanjo commissioned a twenty-five-year strategic vision to upgrade the railway network in

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2002, following decades of neglect; this vision was updated and confirmed again in 2012. The plan planned to repair and transfer existing rail routes to higher-capacity standard-gauge rails, as well as to build new railway networks to connect all 36 main states and economic regions (see Figure 1).

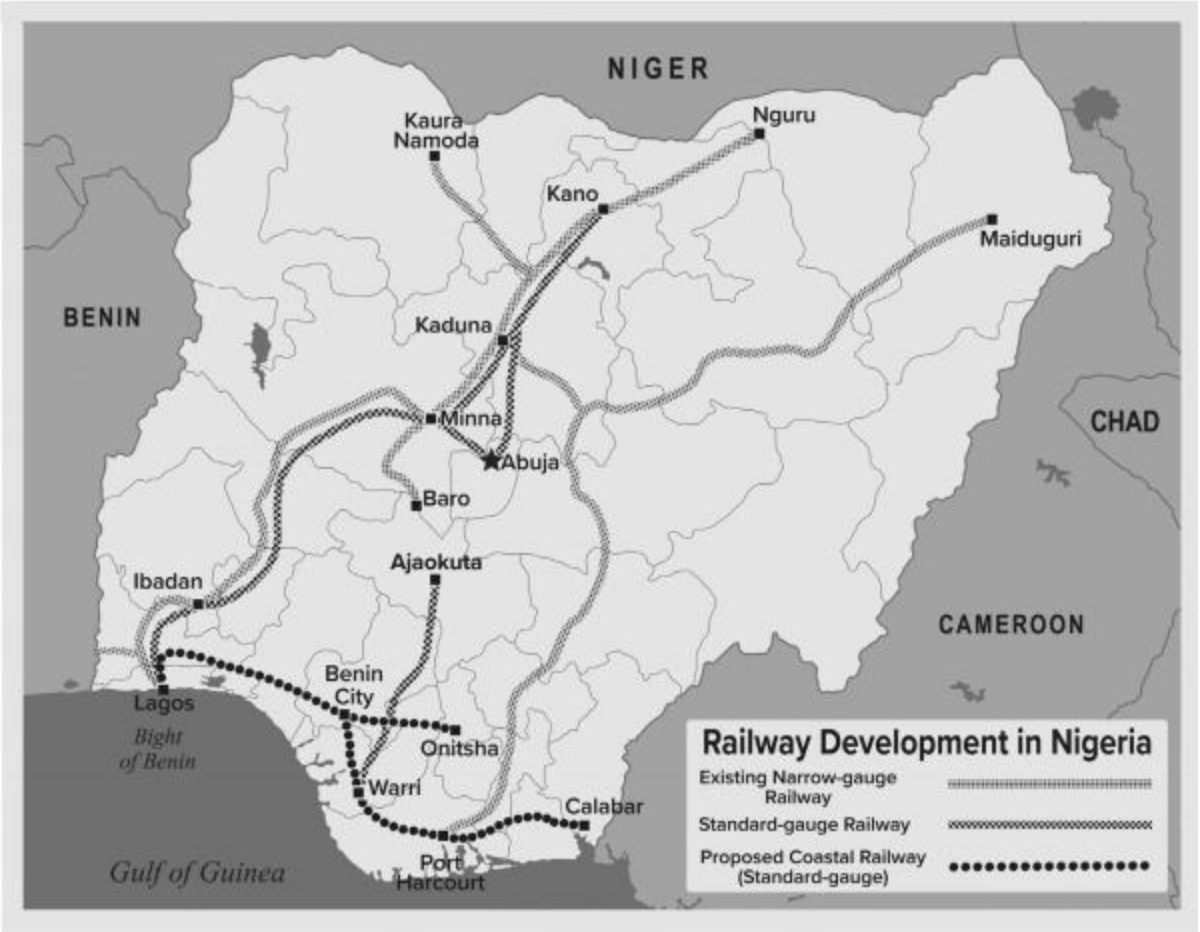


Figure 1: Map of railways in Nigeria

Source: Nigerian Rail Commission, Department of Transport, and CCECC

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In actuality, however, the opposite is true, as China's foreign policy is built on socialism, which believes in equal justice for everyone. According to Mohan and Power (2008), China's relationship with Africa is focused on supply and demand factors rather than imposing political and economic conditions on the continent. In other words, China's African contractors are unconcerned with ideology and place a premium on political risk and stability in their host nations (Oyeranti et al., 2011).

China has participated in "resources for infrastructure" in its drive for resources and bilateral connections with African countries. This refers to the supply of infrastructure such as roads, bridges, and trains in exchange for African resources. This plan has elicited a variety of responses. In the case of Nigeria, for example, an investigation into the 2007 oil block auctions revealed that the Nigerian government opposed the oil for infrastructure approach because it was aware that some of China's State-Owned Enterprises (SOEs) had failed to deliver on previously promised infrastructure projects (Egbula&Zheng, 2011).

The China Civil Engineering Construction Company (CCECC) is Nigeria's dominant railway construction company, with contracts awarded for the rejuvenation of Nigeria's rail systems (Ogunkola, 2008), as well as the modernization of Nigeria's one-track rail line to a standard gauge rail project (Siaka, 2009). Notably, the Nigerian government announced a US$2.5 billion loan agreement with China in October 2006, with a large amount of the proceeds going toward the renovation of the railway infrastructure (Emeje, 2006).

The 1,215-kilometer double track standard gauge railway from Lagos (southwest) to Kano (northwest), with branches at Minna and Abuja, was the first phase of the contract (Rindap, 2015). The railway renovation and extension project is planned to have the ability to run 36 trains per day from Lagos to Kano once completed (Rindap, 2015). As a result, it may be stated that China has expressed a significant financial commitment to Nigeria's rail industry, particularly the Lagos-Kano restoration project and the Abuja Rail Mass Transit System, among other projects (Oyeranti et al., 2008).

Two large standard-gauge rail (SGR) projects are being backed by Chinese funding in the railway sector. The first is the replacement of the colonial track by an improvement of the Western trunk line from Lagos to Kano. The route was initially

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contracted in 2006, but the project was halted due to the Nigerian government's inability to raise its share of the funds; the line was then subdivided and built in instalments (Yunnan, 2018). The 187-kilometer (116-mile) Abuja-Kaduna single-track SGR (Chen, 2018), which cost $874 million to build, was the first of the planned lines to be completed in 2014 (Gaal, Osman &Nol, 2017). Following the Abuja-Kaduna line, CCECC is working on the 312-kilometer (194-mile) Lagos-Ibadan segment, which was approved in 2014 after the Abuja-Kaduna line was finished, at a cost of $1.2 billion; money for the $1.1 billion Kano-Kaduna stretch is still being worked out (George, 2017). The interest rate and financing conditions for these SGR projects are not made public, unlike light rail and other infrastructure projects that are financed through concessions (Olasunkanmi, 2012).

The development of a new coastal railway connecting Lagos and Calabar through Warri and Port Harcourt, with branch lines to Benin City and Onitsha, is a second major project. Although it was not part of the original twenty-five-year plan (Gaal, Osman,&Nol, 2017), CCECC advocated it as one of three east-west routes that would cross the colonial major lines. Only the southern coastline option gained attention from politicians and had a possibility of being funded (Olasunkanmi, 2012). The deal for the project, which was inked in 2016 with CCECC, is reported to be worth $11 billion (Kimairis, 2016). In April 2017, the Nigerian senate authorized a loan request to China's Exim Bank for $3.5 billion for the coast project, signaling that the route will be split like the Lagos-Kano line, with the eastern leg from Port Harcourt to Calabar being completed first (Kimairis, 2016). The Exim Bank funding agreement is still being completed.

Economic benefits of railway investment

Railway construction is part of China's larger Belt and Road Initiative, which spans Eurasia and East Africa (Dina &Raji, 2016). Beijing highlights the BRI's role to peace in Eurasia, as it does in Africa, by fostering the growth and prosperity that comes from economic connectedness. Railways play a crucial role in this equation. Railways have inherent benefits over road networks in terms of economies of scale (Rousseau, 2017): they require less regular maintenance and have superior speed and efficiency across long-distance routes, making them a very beneficial low-cost freight option with enormous potential for trade development. Connecting Nigeria's

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poor but resource-rich interior areas to the country's wealthier coastal consumer markets and port towns would clearly benefit the country (Powell, 2016).

Improving Nigerian enterprises' competitiveness against international imports and perhaps promoting the export and trade of Nigerian goods would be possible if inland transportation costs, which are a big concern for agriculture (Popova, 2017) and industrial industries, were reduced. New railway hubs may also assist in attracting investment and migration to previously undeveloped areas (Dina & Raji, 2016). Railway growth also provides good spill-over benefits for complementary businesses in upstream manufacturing supply chains, such as steel and building materials, as well as generating demand for retail and services, all of which help to create jobs (Rousseau, 2017). In the middle-belt and plateau states, a central trunk route would open up agricultural and mining sectors. Similarly, the western Lagos-Kano corridor will boost northern cattle and leather sectors, which are now at a disadvantage versus low-cost imports due to transportation expenses (George, 2016).

Low-cost transportation also facilitates mobility and migration across regions, since existing road networks are generally in poor condition, crowded, and hazardous. The influence of this social mobility might also help to integrate areas and linguistic and ethnic groupings. Before its demise, colonial railways helped connect rural populations to coastal centres and fostered rural-urban migration, despite their exploitative objective (Olasunkanmi, 2012). New trains would promote comparable mobility, promote greater cultural and economic integration, and provide safe and economical transportation for migrants in search of work and economic possibilities. These advantages can already be seen in the finished Abuja-Kaduna line, which has seen high demand from commuters, not just for its efficiency but also for the added protection it provides over road travel.

Economic grievances and perceptions of exploitation have long been an underlying factor in regional conflict and insecurity, threatening Chinese investments and personnel, as well as the economic opportunities that a coastal railway brings, could contribute to peace building and post-conflict reconstruction efforts in the oil-producing Delta. Better infrastructure can help the region attract non–oil investment and stimulate more industrial agglomeration. The Nigerian government recognizes

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this: under President Umaru Musa Yar'Adua's amnesty deals, trains were committed as part of a package of infrastructure projects as part of the Niger Delta Regional Development Master Plan (Hassan, 2017). These designs now appear to be parallel to the proposed coastline line.

Despite popular belief that Chinese businesses import their own labor, the CCECC's localization strategy mandates a ten-to-one ratio of local to Chinese employees. According to the company, the construction of the Abuja-Kaduna line alone provided 4,000 local jobs, and the railway now employs roughly 500 Nigerians. Despite this, Chinese management in management and maintenance must continue owing to a shortage of local engineering ability. Local engineers have benefited from the company's proactive training initiatives and technology transfer centers, which include courses on railway maintenance, signals, and communications systems. Department of Transportation personnel have also traveled to China for training on railway network management. Technology and skills transfer, on the other hand, demands a long-term, consistent investment in strengthening local capability, which entails the continued participation of Chinese companies.

Trend analysis of rail passenger traffic

From the Table 1, it can be deduced that there was a continuous increase in the demand for passenger train for 2011, 2012, 2013 and 2014 at 3,493,443, 4,155,988, 4,328,787 and 4,685,570 passengers respectively. These increases were attributed to the Chinese involvement in the railway infrastructural development in Nigeria. For instance, the Abuja-Kaduna section of 186.5km modern project with a larger standard gauge in the year 2010; 1,313km standard gauge from Lagos to Kano. Furthermore, there was a sharp fall in 2020 with 1,020,368; which can be attributed to the COVID-19 lockdown in 2020, and the passenger throughputs continue to increase since 2021 till 2025.

It is important to note that the passenger traffic seems to be fluctuating; which implies that the policies and nations' economy seems to be fluctuating. From the same table, it could be deduced that the more passengers are travelling by rail, the better the economic policies and initiatives surrounding the rail transportation.

Table 1. Rail Passenger Traffic in Nigeria

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Year	Passengers
Yr 2011	3,493,443
Yr 2012	4,155,988
Yr 2013	4,328,787
Yr 2014	4,685,570
Yr 2015	2,581,046
Yr 2016	3,158,785
Yr 2017	2,593,744
Yr 2018	3,019,689
Yr 2019	2,890,111
Yr 2020	1,020,368
Yr 2021	2,71,686
Yr 2022	3,212,948
Yr 2023	2,182,388
Yr 2024	3,140,000
Yr 2025	3.890,000

Source: Nigeria Bureau of Statistics (2026); Authors' compilation

3. Empirical Review

According to Dennis (2020), the Pew Research Center employed geospatial research method to evaluate the railway investments by Chinese to Nigeria using

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the Standard Gauge Railway. The study revealed that the majority of the Chinese railway projects that commenced before 2014 were near completion in 2015 and 2016 representing an average of 62% and 71% respectively.

Between 2013 and 2019, railroad infrastructure accounted for the majority of Belt and Road construction spending in Nigeria, according to the American Enterprise Institute's China Investment Tracker. The study's portion began construction in 2013 and was finished in 2016. Because it broke ground in 2017 and has been delayed many times subsequently, a piece under construction near Lagos was left off. According to the report, China is helping to expand the Nigerian economy, and railway investment is beneficial since it produces employment in the nation.

China has been very active in the railway sector in recent years (Mthembu-Salter, 2009; Howard, Simmons & Flowers, 2019). Nigeria's rail network remains the greatest in Western Africa, but it is also neglected and inefficient (Nissanke & Söderberg, 2011). There were no renovation projects after independence, and the railway facilities were abandoned (Adunbi & Stein, 2019). The cost of modernisation and adequate maintenance was a deterrent. The matter has been postponed by successive administrations (Mthembu-Salter, 2009). The tracks and trains were deteriorating, and the necessary finances were never forthcoming (Howard, Simmons & Flowers, 2019).

President Obasanjo launched a programme to modernize Nigeria's railways in 2006 (Chen, 2018). The plan has always been intertwined with China (Foster and Pushak, 2011). China Exim Bank was scheduled to pay the $8.3 billion contract given to China Civil Engineering Construction Company (CCECC) (Nissanke & Söderberg, 2011). The proposal called for the reactivation of existing lines as well as the establishment of new ones. The network would then connect all of Nigeria's states, improve the capital's connectivity, and update the Western line (Mthembu-Salter, 2009). The Lagos-Kano (Western) line was expected to get the most attention.

The new standard gauge lines were to run alongside to the existing ones, which were erected by the British in the twentieth century. After then, the new tracks would take the place of the old ones. There were also plans to add a few more branches (Oyesiku, Adegbemi & Folawewo, 2013). The line would not only reach the Niger

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border in the north, but it would also link to Abuja, Nigeria's capital (Adunbi & Stein, 2019). The remodeling project was also in response to the demand for increased East-West connectivity (Mthembu-Salter, 2009). Due to the British Empire's economic demands, the bulk of rail routes were now aligned north to south (Chen, 2018). Nigeria, on the other hand, should have more diverse linkages as a country growing multiple fields of industry (Nissanke & Söderberg, 2011).

A new Lagos-Calabar railway would make a significant contribution to the problem (Odeh, 2014). The line will run down the Nigerian coast, connecting Lagos and Port Harcourt, two significant ports. A few routes will be discussed in this section, as well as Chinese involvement in them. Lagos-Kano, Lagos-Calabar, Abuja-Kaduna, and Ajaokuta-Warri are some of the routes (Oyesiku, Adegbemi & Folawewo, 2013). Those have been picked based on their importance, expense, and media attention. All of them have had Chinese corporations or banks engaged in the building process (Odeh, 2014). The two most ambitious transportation investments are those related to Lagos. Lagos, being the country's most major port and metropolis, is also a significant communication and transportation hub (Nissanke & Söderberg, 2011).

Developing ties with this metropolis is important not only for Lagos, but for the entire country. The country's economy depends on the modernization of the inefficient Lagos-Kano tracks and the creation of new links (Oyesiku, Adegbemi & Folawewo, 2013). As previously stated, the Lagos-Kano line and its expansions were built on a small gauge, which is much too sluggish for a major country's principal transit route. The line will be used to transport internal export cargo, but it will also be used as part of an international route connecting Lagos to Nigeria's neighbors. Despite the fact that the line's name implies that it ends in those two cities, the expansions extend north to the Niger's border and west to Benin (Adunbi & Stein, 2019).

One of the first phases in the initiative to integrate Africa through transportation infrastructure would be to connect Nigeria with its neighbors by standard gauge rail. The African Union has often emphasized the need of this strategy for Africa's rapid growth and collaboration. In East Africa, several inter-country standard gauge rail projects are being built, such as the Tanzania-Zambia line or proposed standard gauge rail expansions in Kenya (Howard, Simmons & Flowers, 2019). In North

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Africa, the Algerian National Railway Transport Company presented a project to create a high-speed standard gauge railway connecting Morocco, Algeria, and Tunisia in 2015, however it was not taken into consideration by the governments of those countries (Adunbi& Stein, 2019).

However, in 2019, the plan was revived, this time by the Arab Maghreb Union's secretariat, which declared that it was seeking investors for the project. The rebuilt Lagos-Kano rail line would be Western Africa's first standard gauge railway with worldwide potential (Adunbi& Stein, 2019). The complete modernisation of the Lagos-Kano line, in conjunction with the development of ports and coastal links, might solidify Nigeria's position in the area as a commercial and communication center, particularly for landlocked neighbors (Howard, Simmons & Flowers, 2019). Obasanjo suggested the project in 2006, naming it after the Lagos-Kano reactivation, emphasizing the importance of this one line. It is now Nigeria's most major transportation project.

The Lagos-Kano line has been slowed considerably once more due to a shortage of money (Nissanke & Söderberg, 2011). The works are separated into six divisions, each of which is specified by a station. Each one is around 150 kilometers long. The total length of the line would be at least 1124 kilometers, with prospective expansions and links to the Eastern Line (Port Harcourt-Mandaguari) as well as other connections to the capital. The Abuja-Kaduna extension, the first phase of the Lagos-Kano line, was completed in 2014. Construction on the second phase, Lagos Ibadan, commenced in 2017. The portion alone is expected to cost $1.5 billion and is being built by CCECC with funding from Nigeria and China.

In many ways, the Abuja-Kaduna stretch is significant. The first stretch of the Nigerian capital's Standard Gauge Railway Modernization Projects connected Abuja with Kaduna (Adunbi& Stein, 2019). A contemporary, standard gauge track connects the capital with the Lagos Kano line on the Abuja-Kaduna line (Dina &Raji, 2016). Abuja has lately gained new connections (Nissanke&Soderberg, 2011). This year, the initiative to connect the capital to the Itakpe Warri line was revealed. The Itakpe-Warri railway was Nigeria's first standard gauge railway. It was originally designed to carry iron from Itakpe to the Warri port in 1987. It's modern and might

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be used for different things. A Chinese business that had been working on the Itakpe-Warri segment since 2017 finally finished it this year.

It may form part of the Lagos Kano extension once it is connected to Abuja, strengthening the upgraded railway network. Another significant section of railway upgrading is planned for the seashore. The Lagos-Calabar line, like the Lagos-Kano line, will be developed in stages (Dina &Raji, 2016). The first phase, officially dubbed Warri-Port-Harcourt, will link the country's two main lines, the Lagos-Kano and Port Harcourt-Maiduguri. The Nigerian coast will acquire a contemporary, high-speed connectivity between all of its ports, as well as perhaps with its coastal neighbors, if the line is completed.

The line's construction has been entrusted to a Chinese business, and the first phase's help was arranged at China Exim Bank for $11 billion. The plans to reinvigorate the Eastern line, which runs from Port Harcourt to Maiduguri, are still in the planning stages. The administration is debating whether it is appropriate to take out another loan to fully modernize another track or if it is better to wait (Popova, 2017). Due to a shortage of money, a small rejuvenation of the narrow gauge without replacing it with a standard gauge has been proposed (Dina &Raji, 2016). However, given that the majority of tracks are already standard gauge, it may be prudent to postpone construction on the Eastern line and update it in the same manner as the other lines (Powell, 2016).

The construction of light rail lines in Lagos and Abuja has also been entrusted to Chinese firms (Olasunkanmi, 2012). The first parts of the lines are expected to be completed within the next several years. One of the first light rail systems in Western Africa will be built here. Additional modes of transportation that bypass congested roadways might be another way to relieve congestion in cities. The Chinese aid policy has been discussed, as well as the most substantial transportation investments. The world's attention was drawn to China's surprise increase in engagement in Africa (Powell, 2016). In the previous two decades, a large number of works on China-Nigeria ties have been produced (Adunbi & Stein, 2019).

The majority of authors feel that modernizing transportation infrastructure is helpful to the country's overall growth (Rousseau, 2017). Positively impacts people's well-

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being, encourages employment, education, and internal cohesion, helps industry and trade, creates jobs, and attracts foreign investment. The norms of China-Nigeria ties, as well as China's "no strings attached" approach, remain a point of contention (Dina & Raji, 2016). Nigerian security is one of the most pressing challenges that has arisen as a result of the work on China-Nigeria ties. Loans from the China Exim Bank are frequently criticized in terms of economics. Critics argue that the low-interest loans are too costly and are being given out too freely, with no guarantee of repayment.

According to certain studies, a significant debt poses a hazard to the future growth path (Popova, 2017; Powell, 2016). If the loan is not paid, China will gain a competitive advantage in future negotiations or force the debtor to repay the loan in natural resources or industrial shares (Powell, 2016). Because project developments are dynamic and the media may respond quickly, many comments emerge from the press. Some argue that infrastructure improvements would pay off in the long term, but that profits will be spread out throughout many businesses, making it difficult for the government to repay the debt (Olasunkanmi, 2012).

Furthermore, to keep the updated rails working, they will need to be maintained on a regular basis. Apart from the societal benefits, the standard gauge will continue to be a financial burden for the government. Partnership with China encompasses not just huge infrastructure projects, but also commerce and modest, private investments (Rousseau, 2017; Popova, 2017; Powell, 2016). Although both markets are open to each other, the Chinese market has far more opportunities to enter the Nigerian market than the other way around. The Obasanjo government has already taken note of Nigeria's poor trade and investment index (Dina & Raji, 2016).

Transportation infrastructure, as discussed in earlier sections, draws both local and international investment (Rousseau, 2017). The issue of tiny Chinese enterprises driving local businesses out of business has gotten a lot of attention (Chen, 2018; Gaal, Osman & Nol, 2017; Olasunkanmi, 2012). The similar charge a charge has been lodged at the import of low-cost Chinese goods, which are said to be displacing domestic industry (Popova, 2017; Powell, 2016). Nigeria's internal conflicts and organized crime are another security concern (Dina & Raji, 2016). Many acts of violence occur in areas with abundant natural resources. Chen (2018),

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among others, cautions that China's influence in certain regions may exacerbate instability.

Generation of SWOT factors

Strengths

Internal and positive traits that generate or contribute to the organization's growth are called strengths (Brabec, Pilko & Martin, 2011). As previously stated, Nigeria's railway transportation sector plays a critical economic role. Despite the system's initial steep traffic fall, it is capable of transporting massive amounts of goods and people across vast distances (Bayane, Yanjun & Bekhzad, 2020). The railway, when appropriately linked with other forms of transportation, can offer effective services for homogenous traffic flows and high-density. Unlike other forms of transportation, the railway has undeniable benefits in terms of environmental protection, cost, traffic safety, and energy consumption (Kangas et al., 2001).

During the festival seasons, a considerable development in the railway transport corridor is observed in the south and north zones, particularly along the Abuja-Kaduna and Lagos-other southern states lines. The NRC manages dozens of routes with the purpose of enhancing traffic flow on interstates while ensuring a limited-stop optimal and guarantee utilization of the production tool without disrupting the load. The principal railroads in states with seaports are the primary lines that serve to open up and link the interior with the coastal areas in terms of freight. At the regional level, a strategic railway project is now being developed with the goal of uniting the existing isolated and fragmented lines.

The internal and external indices of the railway system can be abridged as depicted in Figure 2 below.

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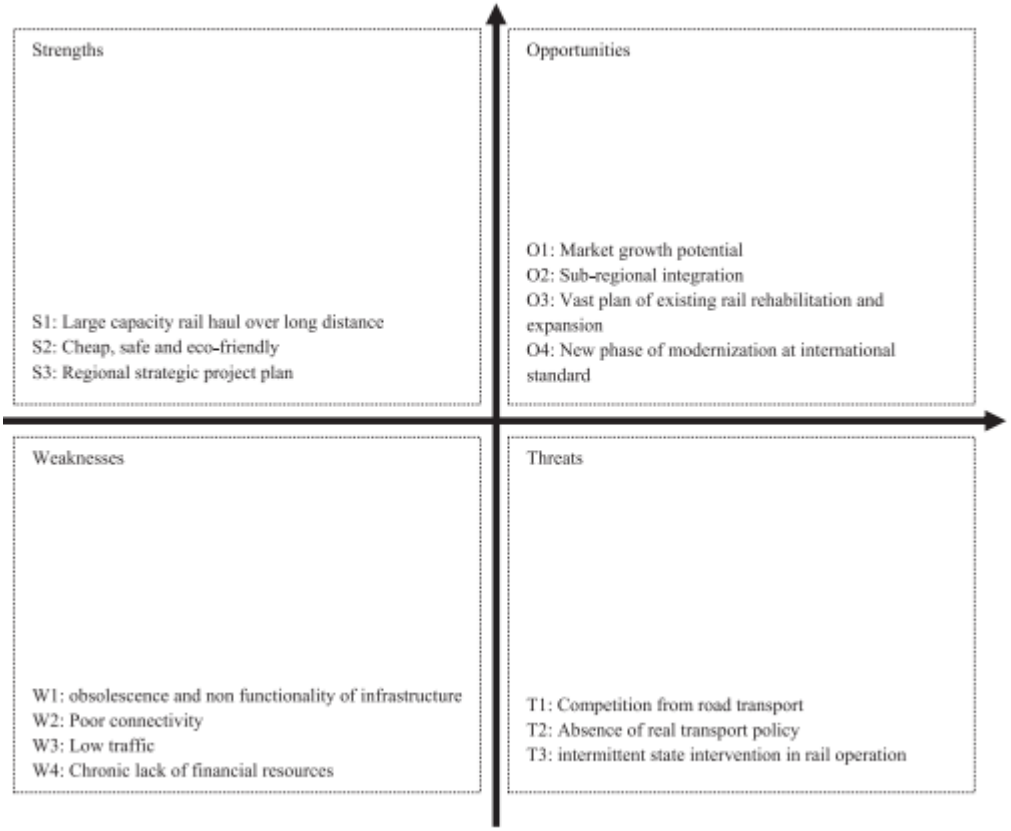


Figure 2: SWOT Analysis

Weaknesses

The flaws and weaknesses might be viewed as characteristics that could block or complicate the organization's development and progress (Bayane, Yanjun & Bekhzad, 2020). The majority of Nigeria's railway infrastructure is fragile, outdated, and unfit for contemporary traffic operations. Some of the structures have been standing for over a century. The failure to address future transit capacity and speed improvements during railway building has resulted in severe difficulties such as infrastructure obsolescence and non-functionality (Brabec, Pilko & Martin, 2011).

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Furthermore, decreasing connection, whether at the national or regional level, has resulted in a small proportion of the regional transportation sector (Brabec, Pilko & Martin, 2011). The majority of national railway networks had their heyday. Their traffic, however, has decreased as a result of the advent of modern road transportation (Brabec, Pilko & Martin, 2011). Another factor contributing to railway degradation is a chronic lack of financial resources for maintenance and rehabilitation (Brabec, Pilko, & Martin, 2011), as well as regular bandit and terrorist attacks in Nigeria.

Opportunities

The opportunities are interconnected aspects that every firm may use to advance and prosper (Brabec, Pilko & Martin, 2011). Although there is still a poor inter-state, inter-regional, and intra-regional commerce, the potential market expansion has been stated earlier. The heads of states and governments in Africa resolved to adopt sustainable initiatives to improve inter-regional and intra-regional transit through connection between nations after recognizing the enormity of gaps in railway transport as the major reason (regional integration). They've also agreed to repair and extend existing networks, allowing for an integrated rail-road transportation mode and lowering the rate of road accidents along the various routes. After recognizing the influence on economic growth, the governments at different levels are willing to put all railways through a new phase of upgrading to worldwide standards.

Threats

Threats are variables whose effect should be reduced or eliminated (Brabec, Pilko & Martin, 2011). In terms of long-distance travel, Nigeria's railways were the only viable option. For a long time, they have had complete control over the transportation industry. However, as a result of low investment compared to the road sector, their quality services began to rapidly decrease and have continued to do so to this day. It is only reasonable that, in contrast to road infrastructure, where investments are both sustainable and instantly usable, the railway industry requires significant investment. As a result, the government has given minimal assistance to the growth of railway transportation, resulting in fierce rivalry in the key corridors from road transport.

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The advancement of transportation technology in advanced nations is paralleled by the constant modifications and dynamism of transportation policy. The Nigerian government has failed to define a policy capable of promoting rail transportation. Despite the amount of measures done, the projected outcomes are still falling short of the goals. In addition, the sector's expansion has been hampered by periodic government intrusions in railway operations. The implications of previous governments have mostly been for political publicity and, in many cases, as a short-term move to gain favor for the current government. These factors contribute to the current state of railway infrastructure and its low performance.

4. Conclusion

This study assessed the impact Chinese Railway projects in Nigeria. The level of development can be measured on functionality of the rail system. The development plan for the railway transportation system has been examined in this study employing, a SWOT matrix approach. China has been very active in the railway sector in recent years, but it is also neglected and inefficient. Ineffective functional infrastructure and competition from road transport, and lack of financial resources are all major hindrances which represent weaknesses and threats to Nigeria's railway transportation system. Long-distance rail haulage and market expansion with substantial capacity are significant influencing factors.

There were no renovation projects after independence, and the railway facilities were abandoned. The cost of modernisation and adequate maintenance was a deterrent. The matter has been postponed by successive administrations. The tracks and trains were deteriorating, and the necessary finances were never forthcoming. This study found that the country's economy depends on the modernization of the inefficient tracks and the creation of new links. It also found that despite the negative effects of rail transportation on human health and the environment (such as air and noise pollution, destruction of forests and wildlife habitat, land degradation due to soil erosion of drainage systems and geological formations associated with railway construction), railways continue to play an

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important role in the development of African and Nigerian economies by transporting freight and passengers at low costs and enabling the growth of mining and agriculture.

It is crucial to note that, despite the increased importance of railways in the nation's growth and Chinese engagement in railway infrastructure investment, the challenges are outnumbering the benefits. Therefore, governments at all levels should promote the enabling environment that will drive more investment, security, and channel it the rail to enhance regional complementarity of trade. Nigeria must develop policies that strengthen their ability to monitor and enforce labor, safety, and environmental protections by ensuring that Chinese companies involved in the construction of railways in Africa adhere to global standards and the international labour organization's rules. The study found that practitioners should be absolutely involved in the construction and maintenance of railway projects to reduce the environmental impact.

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Conflicts of Interest

The author declare no conflict of interest.

Data Availability

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Author Responsibility Statement

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