



Musa Ibrahim  
Department of Economics,  
Faculty of Social Sciences  
Federal University of Lafia,  
Lafia Nasarawa State, Nigeria  
[mussbin13@gmail.com](mailto:mussbin13@gmail.com)

Mohammed Ishaka Gani  
Department of Economics,  
Faculty of Social Sciences  
Federal University of Lafia,  
Lafia Nasarawa State, Nigeria  
[gani.ishaq@yahoo.com](mailto:gani.ishaq@yahoo.com)

Sarah Ali Agara  
Department of Economics,  
Faculty of Social Sciences  
Federal University of Lafia,  
Lafia Nasarawa State, Nigeria  
[ali.sarah@socsci.fulafia.edu.ng](mailto:ali.sarah@socsci.fulafia.edu.ng)

**\*Corresponding Author:**  
Musa Ibrahim  
Department of Economics,  
Faculty of Social Sciences  
Federal University of Lafia,  
Lafia Nasarawa State, Nigeria  
[mussbin13@gmail.com](mailto:mussbin13@gmail.com)

## IMPACT OF INFRASTRUCTURAL SECTOR ON ECONOMIC GROWTH IN NIGERIA

### ABSTRACT

*This study examined the impact of infrastructural sector on economic growth in Nigeria. This study employed the use of trend analysis, descriptive statistics, Error Correction Model (ECM) of analysis, and granger causality test for analysis. The result of the analysis reveals that, the mean average values of the variables; RGDP, ESD, HSD and TSD are given as 54358.86, 81.30102, 11.67725 and 70.21210 billion Naira respectively while the standard deviation of the variables is given as 9.162022 Naira, 58462.68, 52.56622, 9.234883 and 35.54982 billion Naira respectively. Economic growth requires improvement in public expenditure on education and transportation. No evidence of granger causality either unidirectional or bidirectional causal relationship among the variables. The study therefore concluded that infrastructural development has a significant effect on economic growth in Nigeria and recommended that the government of Nigeria should ensure stringent result-oriented fiscal policy control measures are put in place to regulate public spending on educational sector development, health sector development and transport sector development.*

### 1. INTRODUCTION

Infrastructure is considered the backbone of any economy, facilitating the efficient movement of goods, services, and information. It encompasses various sectors, including transportation, energy, telecommunications, and water supply, among others. These infrastructural components are essential for promoting economic activities, attracting investments, and enhancing productivity and competitiveness (Abdullahi, 2024). Infrastructure development has been a critical factor in shaping economic growth and development across the globe. Throughout history, nations that invested in robust infrastructure systems, such as transportation networks, communication systems, and energy grids, have experienced significant economic progress (Calderón & Servén, 2004). The Industrial Revolution in the 18th and 19th centuries, for instance, was catalyzed by the construction of railways, canals, and roads, facilitating the movement of goods and people, and enabling the growth of industries (Rostow, 1959). Infrastructure development in Africa has deep historical roots in the colonial period, when transportation and communication systems were designed mainly to support colonial administration and the extraction of natural resources rather than broad-based economic development (Jedwab & Moradi, 2016).

Following independence, many African countries found it difficult to sustain and expand these inherited infrastructure systems due to limited financial capacity, weak institutions, and recurring political instability (Bello, 2020).

Globally, infrastructure development dates back to ancient civilizations, where early transport routes and communication systems supported trade, governance, and social organization (Bairoch, 1988). However, large-scale and systematic infrastructure expansion gained momentum during the nineteenth and twentieth centuries, driven by industrialization, rapid urban growth, and technological progress (Rodrigue, Comtois & Slack, 2017). In Nigeria, modern infrastructure development began under British colonial rule, with the construction of railways, roads, and ports primarily aimed at facilitating the export of agricultural produce and mineral resources (Akinwale, 2010). Since independence in 1960, successive governments have pursued infrastructure expansion with mixed results, often constrained by policy inconsistencies and implementation challenges (Sanusi, 2012).

Persistent infrastructure inadequacies have created inefficiencies across key sectors such as transportation, energy, telecommunications, and water supply. These weaknesses raise operating costs for firms, reduce productivity, and undermine competitiveness in both domestic and international markets (Ibrahim, 2023). Across Africa, infrastructure deficits remain a major barrier to economic growth. The African Development Bank (2018) estimates an annual infrastructure financing gap of about \$108 billion, a shortfall that continues to limit regional integration, intra-African trade, and economic competitiveness (Aschauer, 1989).

Nigeria's infrastructure challenges reflect these broader continental trends. Despite its abundant natural resources and position as a major oil-producing economy, the country has struggled to build and maintain infrastructure capable of supporting sustained growth. Transportation infrastructure—covering roads, railways, airports, and seaports—faces serious challenges. Roads, which carry the bulk of passenger and freight traffic, are often poorly maintained, congested, and inadequate for growing demand. Meanwhile, the rail system, once central to national transport, has declined significantly due to prolonged under-investment (Akuru & Okolo, 2019). Port infrastructure also suffers from congestion, operational inefficiencies, and inadequate facilities, raising logistics costs and constraining trade flows (Okoh & Eiya, 2019).

Energy infrastructure presents another critical constraint. Reliable and affordable electricity is essential for industrial growth and economic development, yet Nigeria's power sector continues to struggle with insufficient generation capacity, weak transmission networks, and inefficient distribution systems. Frequent power outages have forced households and businesses to rely heavily on costly and environmentally harmful alternatives such as diesel generators (Oyedepo, 2012). These inefficiencies have resulted in significant productivity losses and slowed industrial expansion.

Nigeria's telecommunications sector has recorded notable progress following liberalization and the entry of private operators. Access to mobile and internet services has improved considerably, contributing to digital inclusion and economic activity. However, broadband penetration remains low, and service quality is uneven, especially in rural and underfunded areas (Ogbuagu & Ewubare, 2021). Given the growing importance of digital technologies, a robust telecommunications system is vital for e-commerce, innovation, and participation in the global digital economy.

Access to clean water and adequate sanitation is equally fundamental to public health and economic productivity. In Nigeria, however, water supply and sanitation infrastructure remain inadequate, particularly in urban and peri-urban areas (Bom & Ligthart, 2016). Poor water and sanitation systems contribute to higher healthcare costs, lower labor productivity, and disruptions to economic activities. In addition, limited access to water adversely affects agricultural production, a sector that remains central to Nigeria's economy.

As Africa's largest economy, Nigeria has long acknowledged the role of infrastructure as a catalyst for growth. To address existing gaps, the government has introduced policy initiatives such as the National Integrated Infrastructure Master Plan (NIIMP) and the Presidential Infrastructure Development Fund (PIDF) (Federal Republic of Nigeria, 2015). Despite these efforts, weak and poorly maintained infrastructure—particularly in transportation, energy, and communications—continues to limit productivity, trade, and investment (Sanusi, 2012).

Since 2014, Nigeria's economic growth has been further constrained by structural and regional challenges, including deteriorating road networks and widespread infrastructure decay. Health shocks, most notably the COVID-19 movement restrictions in 2020, also disrupted economic activity and slowed growth (Adhari & Khoirunurrofik, 2024). A growing body of empirical research consistently demonstrates that infrastructure investment has a positive and significant impact on economic growth. Studies by Amarachi (2024), Timilsina, Stern and Das (2024), Sibali and Jainuddin (2024), and Abdillahi (2024) highlight the critical role of electricity, telecommunications, transportation, and sanitation in driving development.

Despite these findings, access to basic infrastructure remains limited. Globally, about 675 million people lacked access to electricity in 2022, with Nigeria accounting for a substantial share of this deficit (Ibrahim, 2023). Abdullahi (2024) further shows that electricity consumption and telecommunications infrastructure exert a strong and statistically significant influence on Nigeria's economic growth.

Against this backdrop, the present study examines the relationship between infrastructure development and economic growth in Nigeria. Specifically, it investigates the impact of electricity sector development, evaluates the role of health sector development, and assesses the contribution of transport infrastructure to economic growth.

## **2. LITERATURE REVIEW**

### **2.1 Conceptual Clarification**

#### **Infrastructure Development**

Infrastructure development broadly refers to the construction, maintenance, and upgrading of physical and organizational systems that support economic activity and improve social welfare (Fourie, 2006). It includes transportation networks, energy systems, water and sanitation facilities, telecommunications, and social infrastructure such as schools, hospitals, and housing (Calderón & Servén, 2010). Infrastructure is widely recognized as a key determinant of economic growth because it enhances productivity, reduces transaction costs, and facilitates efficient market functioning (Fedderke & Garlick, 2008). Nigeria's experience illustrates how inadequate infrastructure can constrain economic

performance and broader socio-economic development, even in resource-rich economies (Calderón & Servén, 2010).

## **Economic Growth**

Economic growth is commonly defined as a sustained increase in real gross domestic product (GDP), reflecting an expansion in productive capacity and improvements in living standards (Mankiw, 2015; Todaro & Smith, 2015). It involves rising per capita income and improved welfare outcomes, forming a core component of economic development (Sen, 1983; Ughulu, 2021). In this study, economic growth is measured using the annual percentage change in Nigeria's real GDP at constant 2010 prices, capturing year-on-year progress across key sectors such as agriculture, manufacturing, oil and gas, and telecommunications (World Bank, 2022).

## **2.2 Theoretical Framework**

The theoretical foundation of this study draws from **endogenous growth theory**, developed by Romer and Lucas in the late 1980s. Unlike **neoclassical models** that treat technological progress as exogenous, endogenous growth theory emphasizes innovation, human capital, and knowledge as internally generated drivers of long-term growth (Romer, 1986; Lucas, 1988). Investments in education, skills, and research generate positive spillovers that raise productivity economy-wide. Subsequent contributions by Rebelo (1991), Aghion and Howitt (1998), Grossman and Helpman (1991), and Acemoglu (2009) further highlight the **roles of policy, institutions, competition, and trade** in shaping growth trajectories.

Although endogenous growth theory has been criticized for its empirical challenges and simplifying assumptions, it remains influential for understanding the role of infrastructure, human capital, and innovation in sustaining economic growth. Complementing this perspective, the **New Economic Geography (NEG) theory** explains how increasing returns, transport costs, and agglomeration forces shape the spatial distribution of economic activity (Krugman & Fujita, 1998). Despite criticisms regarding its assumptions and applicability to developing economies, subsequent extensions have improved its relevance for analyzing regional development and infrastructure-led growth (Ottaviano, 2018).

Behrens (2015) examined how market size and the distinction between traded and non-traded goods influence the spatial organization of economic activities. In subsequent work, Behrens further extended the New Economic Geography (NEG) framework by incorporating firm heterogeneity and selection effects, demonstrating how differences in firm productivity shape agglomeration patterns. Similarly, Redding (2016) provided an extensive review of the theoretical underpinnings of agglomeration economies and their relevance for spatial economic outcomes. Beyond theory, Redding also introduced a quantitative framework that enables empirical evaluation and policy analysis of spatial economic models within the NEG tradition. Ghironi (2006, 2018) contributed to this literature by linking agglomeration forces and NEG insights to macroeconomic dynamics and business cycle fluctuations. In particular, his later work, **Spatial Frictions and Macroeconomic Dynamics** (2018), emphasized the role of spatial frictions in influencing macroeconomic performance and outcomes.

This study is anchored in **Endogenous Growth Theory** as developed by Romer and Lucas (1986). Romer challenged the traditional assumption of diminishing returns to capital by introducing

endogenous technological change as a key driver of long-term growth. The theory posits that sustained economic growth arises from deliberate investments in research and development (R&D) and human capital accumulation, which generate positive externalities and increasing returns to scale. Central to this framework is the idea that innovation and knowledge creation are intentional economic activities that depend heavily on human capital allocation.

### **2.3 Empirical Review**

A growing body of empirical literature has examined the relationship between infrastructure development and economic growth across different contexts. Sibali and Jainuddin (2024), focusing on Indonesia, investigated maritime infrastructure development and found that investments in ports and related facilities significantly reduce logistics costs, improve delivery efficiency, and enhance inter-island connectivity, thereby supporting national and regional economic growth. They emphasized the importance of sustainable financing mechanisms, private sector participation through public–private partnerships (PPPs), and consistent regulatory frameworks.

In Djibouti, Abdillahi (2024) analyzed the impact of infrastructure development on economic growth using multiple regression techniques. The findings revealed that mobile telecommunications, healthcare services, industrial activity, and services exert a positive and significant influence on economic growth. The study recommended strengthening electricity infrastructure and supporting key productive sectors such as agriculture, forestry, and fisheries to ensure sustainable growth.

For Indonesia, Adhari and Khoirunurrofik (2024) assessed the roles of physical, social, and financial infrastructure between 2016 and 2020 using a Panel Corrected Standard Error approach. Their results indicated that all three forms of infrastructure significantly promote economic growth, underscoring the need for balanced infrastructure development, with particular attention to strengthening financial infrastructure.

Several studies have focused specifically on Nigeria, providing extensive evidence on the growth-enhancing role of infrastructure. Abdullahi (2024) examined infrastructure development and healthcare access, finding that improvements in roads, electricity, and water and sanitation significantly enhance healthcare accessibility and public health outcomes. Similarly, Saibu (2023) established a long-run co-integrating relationship between infrastructure development and economic growth in Nigeria, emphasizing the importance of sustained public investment and private sector participation.

Ibrahim (2023) explored infrastructure development in the context of sustainable urbanization and smart city initiatives, showing that investments in transportation, ICT, and energy infrastructure are critical for managing rapid urban growth and enabling smart city development. Zhang and Cheng (2023), as well as Umar (2022), reinforced these findings by demonstrating the long-run positive effects of transport and urban infrastructure on economic growth and industrialization in Nigeria.

Energy infrastructure has also received considerable attention. Studies by Nwankwo (2022), Obademi (2020), and Nwokorie (2018) consistently found that reliable electricity supply and energy infrastructure are crucial for industrial development, manufacturing performance, and overall economic growth. Conversely, infrastructure deficits—particularly in power and transport—have been shown to constrain manufacturing and service sector output (Ogvanorue, 2022; Obasi, 2018).

Beyond growth, infrastructure development has been linked to broader development outcomes. Research by Adebayo (2021, 2020) highlighted the positive role of ICT and green infrastructure in fostering economic growth, environmental sustainability, and digital transformation. Bello (2020) demonstrated that improvements in electricity and telecommunications infrastructure significantly attract foreign direct investment, while Adebisi (2021) emphasized the importance of transport infrastructure for regional trade integration.

Infrastructure has also been shown to support agriculture, tourism, and poverty reduction. Jibrin (2019) and Usman (2018) found that rural infrastructure—such as roads, irrigation, and electrification—enhances agricultural productivity and reduces poverty. Suleiman (2019) showed that transportation and tourism-related infrastructure promote tourism development and economic diversification.

Finally, several studies underscore the institutional dimension of infrastructure development. Olawale (2019) and Nwosu (2019) highlighted the potential of public–private partnerships and public investment in addressing Nigeria’s infrastructure gap, while stressing the need for strong legal, regulatory, and institutional frameworks to maximize their effectiveness. Overall, the literature consistently demonstrates that infrastructure development plays a central role in promoting economic growth, structural transformation, and inclusive development, particularly in developing economies such as Nigeria.

While several studies have explored the relationship between infrastructure development and economic growth in various regions, there is a need for more comprehensive and up-to-date research focusing specifically on the Nigerian context. Additionally, many existing studies have focused on specific sectors of infrastructure, such as transportation or energy, while a holistic approach considering the interplay of various infrastructure systems is needed. This study aims to address these gaps by providing a comprehensive analysis of the impact of infrastructure development on economic growth in Nigeria, covering multiple sectors and utilizing recent data.

### 3. METHODOLOGY

The study employed a range of data sources to ensure the reliability and validity of the findings. The secondary data sources include National Bureau of Statistics (NBS), Central Bank of Nigeria (CBN) spanning from 1991 to 2023.

#### *Model specification*

Model specification for this study was according to ‘Endogenous Growth Theory’ by Paul Romer (1986). According to him, investment in research and development (R&D) and human capital accumulation (HCA) could generate positive externalities, leading to increasing returns to scale and sustained economic growth (RGDP). This was then stated in both functional and mathematical forms as

$$RGDP = f(R\&D, HCA) \dots\dots\dots 3.1$$

$$RGDP = b_0 + b_1R\&D + b_2HCA + u \dots\dots\dots 3.2$$

Where, RGDP = Economic Growth (Real GDP), R&D = Investment in Research and Development, HCA = Human Capital Accumulation

$u$  = Error Term,

Thus, the model for this study was then stated both functionally and mathematically as

$$RGDP = f(ESD, HSD, TSD) \dots \dots \dots 3.3$$

$$RGDP_t = b_0 + b_1ESD_t + b_2HSD_t + b_3TSD_t + u_t \dots \dots \dots 3.4$$

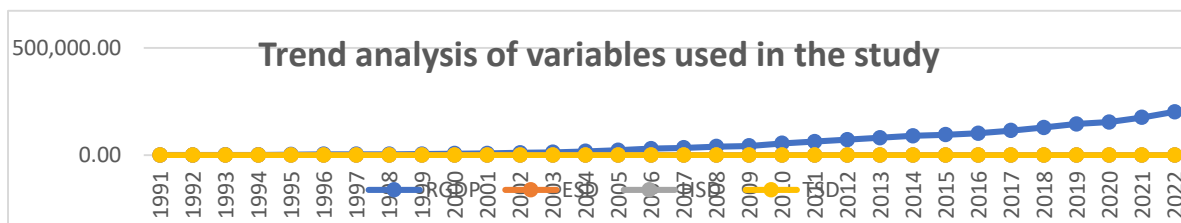
Where, RGDP = Economic Growth (Real GDP); ESD = Investment in Electricity Sector Development; HSD = Investment in Health Sector Development; TSD = Investment in Transport Sector Development and  $u$  = Error Term

**Method of Data Analysis**

The study employed a range of data analysis techniques in investigating the relationship between infrastructure development and economic growth in Nigeria. The main techniques for the analysis of this data was Vector Autoregression (VAR) models and Vector Error Correction models (VECMs). Others include descriptive statistics and correlation analysis.

**4. RESULTS AND DISCUSSION**

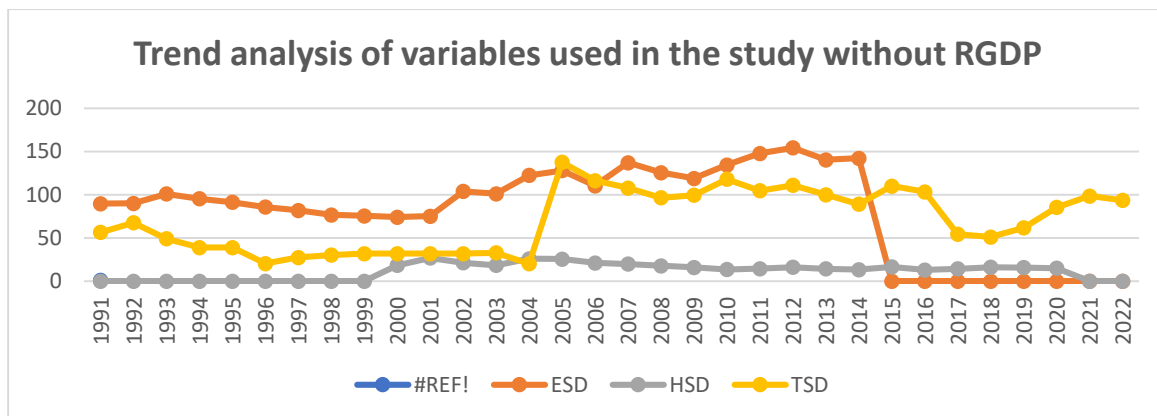
Figure 1 Trend analysis of variables used in the study



Source: Authors computation 2024

From figure 1, real gross domestic product (RGDP) shows an upward trend while ESD, HSD and TSD have shown a stable trend over the period of 1991 to 2022. This is seen in the continuous increase in annual growth rate of the Nigeria’s real gross domestic product. This suggests the testing for stationarity since the variables depicted an upward trend to avoid spurious regression result. The Augmented Dickey-Fuller test of unit root is suitable here to ascertain the stationarity status of the data series.

Figure 2 Trend analysis of variables used in the study



Source: Authors computation 2024

From figure 2, while ESD, HSD and TSD have shown unstable and irregular trend when real gross domestic product (RGDP) has shown an irregular trend over the period of 1991 to 2022.

This also suggests the testing for stationarity since the variables depicted a mixed trend to avoid spurious regression result. The Augmented Dickey-Fuller test of unit root was carried out to ascertain the stationarity status of the data series.

**Table 1: Descriptive Statistics**

	RGDP	ESD	HSD	TSD
Mean	54358.86	81.30102	11.67725	70.21210
Median	32525.56	90.66098	14.36959	64.63125
Maximum	202365.0	154.1723	26.89141	137.4596
Minimum	590.0597	0.000000	0.000000	20.16828
Std. Dev.	58462.68	52.56622	9.234883	35.54982
Skewness	0.985969	-0.564191	-0.196844	0.095443
Kurtosis	2.866587	1.985771	1.674394	1.549774
Jarque-Bera	5.208448	3.069209	2.549628	2.852792
Probability	0.073961	0.215541	0.279483	0.240173
Observations	32	32	32	32

*Source: Authors computation 2024*

Table 1 contains the descriptive analyses of all the variables included in the research model. The above result reveals an important characteristic of the time series. Firstly, the mean average values of the variables; RGDP, ESD, HSD and TSD are given as 54358.86, 81.30102, 11.67725 and 70.21210 billion Naira respectively. The standard deviation of RGDP, ESD, HSD and TSD is given as 9.162022 Naira, 58462.68, 52.56622, 9.234883 and 35.54982 billion Naira respectively depicting increase or positive deviation from their mean values over the researching period. The descriptive analysis also reveals that RGDP, ESD, HSD and TSD are normally skewed and platykurtic (below 3.000000) relative to the normal, meaning the variables produce fewer and less extreme outliers than does the normal distributed. The study shows that RGDP, ESD, HSD and TSD are normally distributed having an insignificant probability value of 0.073961, 0.215541, 0.279483 and 0.240173 respectively. Therefore, we do not reject the null hypothesis at 5% level of significance.

**Johannson System Co-Integration Test**

The stationarity test has subjected the adoption of Johannson system co-integration test to ascertain the long-run relationship between the variables in the model. Johannson system co-integration test, probability values are used to determine whether the variables are co-integrated in the long-run. The Johannson system co-integration test result is presented in Table 2 below.

**Table 2: Johannson System Co-Integration Test**

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.697339	61.63274	47.85613	0.0015
At most 1	0.436048	25.77849	29.79707	0.1355
At most 2	0.185610	8.594936	15.49471	0.4042
At most 3	0.077974	2.435443	3.841465	0.1186

*Note: Trace test indicates 1 co-integrating eqn(s) at the 0.05 level*

The Johansson system co-integration test in table 2 has indicated the existence of 1 co-integration among the variables RGDP, ESD, HSD and TSD given the probability values of 0.0015 when restricted constant and no trend analysis was conducted. RGDP, ESD, HSD and TSD are all significant at 5% level of significance. Upon determining the presence of co-integration in the model, the Johansson system co-integration test has subjected the use of vector Error Correction model (ECM) to estimate the robust effect of infrastructural development on economic growth in Nigeria

**Table 3 Correlation Matrix of RGDP, ESD, HSD and TSD**

	RGDP	ESD	HSD	TSD
RGDP	1			
ESD	0.342569	1		
HSD	-0.484402	0.389737	1	
TSD	0.292022	0.287951	0.339932	1

source: Authors computation using EViews 12, 2024

Table 3 shows that ESD has a positive relationship with RGDP, HSD has a negative relationship with RGDP, TSD has a positive relationship with RGDP.

**Table 4: Stationarity Test Result**

Variables	Unit root at 1st difference		Unit root at 2nd difference		Order of integration
	Critical value	ADF value	Critical value	ADF value	
RGDP	-2.976263	2.1481	-2.9677**	-7.3143	I(2)
ESD	-2.9639**	-5.5720	-2.9677**	-9.8045	I(1), I(2)
HSD	-2.9639**	-4.5920	-2.9762**	-5.3803	I(1), I(2)
TSD	-2.9639**	-6.3473	-2.9810**	-5.1826	I(1), I(2)

Source: Authors computation using EViews 12

Table 4 shows the stationary test of all the variables of interest. The results reveal that the variables are not stationary, ESD, HSD and TSD are stationary both at 1<sup>st</sup> and 2<sup>nd</sup> difference at 5% level of significance while RGDP is stationary at 1<sup>st</sup> difference at 5% level of significance. This implies that the effect of a shock on the variables under consideration is not temporary and the system will not revert to equilibrium after a time lag while the effects of a shock on non-stationary variables is not short lasting. However, the stationarity test has subjected the use of Error Correction Model (ECM) to determine also the short run and long run effect of infrastructural development on economic growth since the result revealed a mixed order of integration other than level.

**Vector Error Correction Model**

The error correction model helps to measure both the short-run dynamics and the long-run equilibrium in variables of the model. It also measures the speed at which the variables make adjustment from the short run to long run equilibrium. To achieve the objective 1 of this study the Error Correction Model was employed to ascertain the effect of change in crude oil prices on

inflation rate. The empirical outcome of the ECM is presented thus: The ECM result as presented in the appendices shows that ESD have a negative and significant relationship with economic growth both in the short run but turned positive in the long run; (t-statistics values -0.50108, 2.30943 and 1.46162). A one Naira increase in ESD [ESD(-1)] is associated with a 36.40949 billion Naira decrease in RGDP [RGDP(-1)] on average ceteris parables in the short run. But a one Naira increase in D(ESD(-1)) is associated with a 65.18465 and 44.22578 billion Naira increase in D(RGDP(-1)) and D(RGDP(-2)) on average ceteris parables in the long-run.

HSD(-1) has a negative and significant relationship with economic growth both in the short-run and long-run but turned positive in one lag and turned negative in the two lag (t-statistics values -0.14609, 0.09745 and -0.05732). A one Naira increase in HSD [HSD(-1)] is associated with a 40.78847 billion Naira decrease in RGDP [RGDP(-1)], on average ceteris parables in the short run but turned to be 13.44652 billion Naira increase in RGDP [D(HSD(-1))] and 8.381357 billion Naira decrease in RGDP [D(HSD(-2))] on average ceteris parables in the long run. TSD has a positive and significant relationship with economic growth both in the short run and in the long run (t-statistics values 2.99415, 0.06057 and 0.05380). A one billion Naira increase in TSD [TSD(-1)] is associated with a 349.8083 billion Naira increase in economic growth [RGDP(-1)] on average ceteris parables in the short run. But a one billion naira increase in TSD [D(TSD(-1))] is associated with a 1.548874 billion Naira increase in economic growth [D(RGDP(-1))] in one lag and 1.274015 billion Naira increase in economic growth [D(RGDP(-2))] in two lag on average ceteris parables in the long run.

The result shows that in the short-run, TSD has the highest magnitude (349.8083) followed by HSD with (-40.78847) and lastly ESD with (-36.40949). However, in the long run, the result shows that ESD has the highest magnitude (65.18465, 44.22578) followed by HSD with (13.44652, -8.381357) and lastly TSD with (1.548874, - 1.274015).

CointEq1 = 0.187645 from the above shows that, the previous period deviation from the long run equilibrium is corrected in the current period at a speed of 18.76 percent. R-squared = 0.844156, Adj. R-squared = 0.770335. This implies that the model is fit and has explained 77.03 percent of the variation in the dependent variable

**Table 5 VEC Residual Serial Correlation LM Test Result**

Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	14.92554	16	0.5301	0.933961	(16, 37.3)	0.5409
2	11.92611	16	0.7491	0.720199	(16, 37.3)	0.7563
3	6.902718	16	0.9751	0.393077	(16, 37.3)	0.9760
Null hypothesis: No serial correlation at lags 1 to h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	14.92554	16	0.5301	0.933961	(16, 37.3)	0.5409
2	24.80213	32	0.8140	0.692542	(32, 31.1)	0.8469
3	56.10057	48	0.1972	1.091486	(48, 17.4)	0.4379

Source: Authors Computation using EViews 12

Table 5 reveals the Serial Correlation LM Test with probability values of (0.5409, 0.7563 and 0.9760) and (0.5409, 0.8469 and 0.4379) at lag h and lag 1 – h. The rule states that, if probability

value given is less than the chosen level of significance (0.05), the null hypothesis should be rejected which implies the residuals are serially correlated but if otherwise, do not reject null hypothesis. Given the probability values (0.5409, 0.7563 and 0.9760) and (0.5409, 0.8469 and 0.4379) at lag h and lag 1 – h. we do reject null hypothesis. Therefore, the residuals are not serially correlated.

**Table 6 VEC Residual Heteroskedasticity Tests (Levels and Squares) Joint Test**

Chi-sq	Df	Prob.
167.7288	180	0.7346

Source: Authors Computation 2024

Table 6 reveals the heteroscedasticity test with Probability value = 0.7346. The rule states that, if probability value is less than the chosen level of significance (0.05), the null hypothesis should be rejected which implies the residuals have heteroscedasticity but if otherwise, do not reject null hypothesis. Given the 0.7346 probability value, we do not reject the null hypothesis. Therefore, the residuals are homoscedastic. The distribution of the error term has constant variance.

**Table 7: VEC Residual Normality Tests**

Null Hypothesis: Residuals are multivariate normal

Component	Skewness	Chi-sq	df	Prob.*
1	-0.286826	0.397633	1	0.5283
2	-2.530039	30.93863	1	0.0000
3	2.279163	25.10714	1	0.0000
4	1.491106	10.74642	1	0.0010
Joint		67.18983	4	0.0000
Component	Kurtosis	Chi-sq	df	Prob.
1	3.088040	0.009366	1	0.9229
2	12.78760	115.7548	1	0.0000
3	10.42751	66.66122	1	0.0000
4	5.797049	9.453378	1	0.0021
Joint		191.8788	4	0.0000
Component	Jarque-Bera	df	Prob.	
1	0.406999	2	0.8159	
2	146.6934	2	0.0000	
3	91.76836	2	0.0000	
4	20.19980	2	0.0000	
Joint	259.0686	8	0.0000	

Source: Authors computation using EViews 12

Result from table 7 reveals that RGDP, ESD, HSD and TSD are normally skewed and platykurtic (below 3.000000) relative to the normal meaning the variables produce fewer and less extreme outliers than does the normal distributed. The rule states that if the Jarque-Bera probability value is less than 0.05 the chosen level of significance, we do reject the null hypothesis. Jarque-Bera result shows that the variables; RGDP, ESD, HSD and TSD have insignificant p-value 0.8159 in the first component. Thus, we do not reject the null hypothesis. This implies that the variables are normally distributed. Effect of infrastructural development on economic growth in Nigeria cannot be over emphasized, to

underscore the pivotal and critical role the infrastructural development plays in Nigeria economy, the successive governments in Nigeria have continued to articulate policy measures to achieve infrastructural development. Yet nor meaningful success have been achieved. Thus, this study examined the effect of infrastructural development on economic growth in Nigeria with the view of informing policies aimed at economic stabilization in Nigeria. This study employed the use of trend analysis, descriptive statistics, unit root test, Error Correction Model (ECM) of analysis, granger causality test, test for serial correlation and heteroskedasticity test for analysis.

From figure 1, real GDP at time shows an upward trend while ESD, HSD and TSD have shown a stable trend over the period of 1991 to 2023. From figure 2 where RGDP is excluded ESD, HSD and TSD shows an unstable and irregular trend over the period of 1991 to 2023. Table 1 contains the descriptive analyses of all the variables included in the research model. The above result reveals an important characteristic of the time series. Firstly, the mean average values of the variables; RGDP, ESD, HSD and TSD are given as 54358.86, 81.30102, 11.67725 and 70.21210 billion Naira respectively. The standard deviation of RGDP, ESD, HSD and TSD is given as 9.162022 Naira, 58462.68, 52.56622, 9.234883 and 35.54982 billion Naira respectively depicting increase or positive deviation from their mean values over the researching period. The descriptive analysis also reveals that RGDP, ESD, HSD and TSD are normally skewed and platykurtic (below 3.000000) relative to the normal, meaning the variables produce fewer and less extreme outliers than does the normal distributed. The study shows that RGDP, ESD, HSD and TSD are normally distributed having an insignificant probability value of 0.073961, 0.215541, 0.279483 and 0.240173 respectively. Therefore, we do not reject the null hypothesis at 5% level of significance.

The error correction model helps to measure both the short run dynamics and the long run equilibrium in variables of the model. It also measures the speed at which the variables make adjustment from the short run to long run equilibrium. To achieve the objective 1 of this study the Error Correction Model was employed to ascertain the effect of change in crude oil prices on inflation rate. The empirical outcome of the ECM is presented thus:

The ECM result as presented in the appendices shows that ESD have a negative and significant relationship with economic growth both in the short-run and long-run but turned positive in the long-run; (t-statistics values -0.50108, 2.30943 and 1.46162). A one Naira increase in ESD [ESD(-1)] is associated with a 36.40949 billion Naira decrease in RGDP [RGDP(-1)] on average ceteris parables in the short run. But a one Naira increase in D(ESD(-1)) is associated with a 65.18465 and 44.22578 billion Naira increase in D(RGDP(-1)) and D(RGDP(-2)) on average ceteris parables in the long-run. HSD(-1) has a negative and significant relationship with economic growth both in the short-run and long-run but turned positive in one lag and turned negative in the two lag (t-statistics values -0.14609, 0.09745 and -0.05732). A one Naira increase in HSD [HSD(-1)] is associated with a 40.78847 billion Naira decrease in RGDP [RGDP(-1)], on average ceteris parables in the short run but turned to be 13.44652 billion Naira increase in RGDP [D(HSD(-1))] and 8.381357 billion Naira decrease in RGDP [D(HSD(-2))] on average ceteris parables in the long run.

TSD has a positive and significant relationship with economic growth both in the short-run and in the long-run (t-statistics values 2.99415, 0.06057 and 0.05380). A one billion Naira increase in TSD [TSD(-1)] is associated with an 349.8083 billion Naira increase in economic growth [RGDP(-1)] on average ceteris parables in the short run. But a one billion Naira increase in TSD [D(TSD(-1))] is

associated with a 1.548874 billion Naira increase in economic growth [D(RGDP(-1))] in one lag and 1.274015 billion Naira increase in economic growth [D(RGDP(-2))] in two lag on average ceteris parables in the long run. Details are contained in appendix. The result shows that in the short-run, TSD has the highest magnitude (349.8083) followed by HSD with (-40.78847) and lastly ESD with (-36.40949). However, in the long run, the result shows that ESD has the highest magnitude (65.18465, 44.22578) followed by HSD with (13.44652, -8.381357) and lastly TSD with (1.548874, -1.274015).

CointEq1 = 0.187645 from the above shows that, the previous period deviation from the long run equilibrium is corrected in the current period at a speed of 18.76 percent. R-squared = 0.844156, Adj. R-squared = 0.770335. This implies that the model is fit and has explained 77.03 percent of the variation in the dependent variable while table 5 shows no evidence of either unidirectional or bidirectional causal relationship among the variables.

## 5. CONCLUSION AND RECOMMENDATIONS

As Investment in Electricity Sector Development (ESD) have a negative and significant relationship with economic growth, Investment in Health Sector Development (HSD) has a negative and significant relationship with economic growth and Investment in Transport Sector Development (TSD) has a positive and significant relationship with economic growth, the study concludes that infrastructural development has a significant influence on economic growth in Nigeria. This indicates that infrastructural development strongly has positive effect on inflation rate in the country.

Based on the empirical evidence this study recommended that the government of Nigeria should:

- i. Ensure stringent result-oriented fiscal policy control measures are put in place to regulate public spending on educational sector development, health sector development and transport sector development in Nigeria.
- ii. The government should invest more in the health sector by providing infrastructures, equipment and also providing good and standard educational system that can equip students with the standard health skills to compete with the global society.
- iii. The government should also provide good transportation network by constructing standard roads, provision of modern rail transport, modern airport and seaport in other to enable rapid economic growth within the country.
- iv. The citizens, investors, entrepreneurs, producers among others within the country should also contribute their quota by forming a community based development programme and working towards providing a solution to some basic amenities within their communities such as bridges, roads, water and alike.

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