

**THE ENVIRONMENTAL ASPECT ANALYSIS OF
MARITIME TRANSPORT, ENVIRONMENTAL
POLLUTION, AND ECONOMIC GROWTH IN
NIGERIA**

**A THESIS SUBMITTED TO THE GRADUATE
SCHOOL OF APPLIED SCIENCES OF
UNIVERSITY OF KYRENIA**

**By
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**In Partial Fulfillment of the Requirements for the Degree
of Master of Science In
Maritime Transportation Management Engineering**

KYRENIA, 2019

**Ovuakporoye Emmanuel CLARKE: THE ENVIRONMENTAL ASPECT
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AND ECONOMIC GROWTH IN NIGERIA**

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ACKNOWLEDGEMENT

I would first like to thank my thesis supervisor Assoc. Prof. Dr. Mehmet Fatih Huseyinoglu of the University of Kyrenia, Marine Faculty. The door to the office of Assoc. Prof. Dr. Mehmet Fatih Huseyinoglu was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this Thesis to be my own work and steered me in the right direction whenever he thought I needed it.

I would also like to acknowledge my dear friends Fidelis Ejah Abba of Institute of Social Science at Okan University Istanbul and Arhyel Ishaku Bassi of Aviation Management at the University of Kyrenia, as the second readers of this Thesis. I am gratefully indebted to their very valuable comments on this Thesis.

Finally, I must express my very profound gratitude to my parents Sir and Lady Clarke, for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this Thesis. This accomplishment would not have been possible without them. Thank you.

ABSTRACT

The influence of maritime transport in the economic development of any country cannot be over-emphasized. Meanwhile, the consequence of the maritime activities on the environment has been a concern, and the consequent effect on the economy. Nigeria is a developing country and could as well be describe as an import-oriented country, and as a result of that characteristic, the country rely heavily on maritime transport for the importation of goods.

This study aimed at examining the relationship between the maritime environmental pollution, maritime transport and economic growth in Nigeria. Time series data that spanned from the year 2000 to 2018 was utilized and Auto regressive distributive lag (ARDL) model was employed for the analysis.

The findings from this study reveal a long-run relationship running from marine environmental pollution to economic growth. It was also found from this study that a significant short-run relationship exists between maritime transport and environmental pollution. Moreover, s significant long-run causal impact of maritime transport was found on the economic growth of Nigeria. Further analysis from the study shows a long-run unidirectional relationship between environmental pollution and economic growth; and trade and economic growth, while bi-directional causal relationship was found between maritime transport and economic growth.

The study therefore suggests that Nigeria should improve both environmentally and economically, because its negative role in environmental quality is more dominant than its benefits in the economic growth.

Keywords: Maritime transport; economic growth; maritime environmental pollution; ARDL; Nigeria.

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LIST OF ABBREVIATIONS

ADF:	Augmented Dickey-Fuller
ARDL:	Autoregressive Distributed Lag
COW:	Crude Oil Washing Structure
ECM:	Error Correction Model
EKC:	Environmental Kuznets Curve
EPA:	Environmental Protection Agency
FEPA:	Federal Environmental Protection Agency
FME:	Federal Ministry of Environment
GHG:	Greenhouse Gas
GOP:	Gross Ocean Product
GVA:	Gross Value Added
IMO:	International Maritime Organization
Intertanko:	International Association of Independent Tanker Owners
IPCC:	Intergovernmental Panel on Climate Change
LOT:	Load on Top System
LSCI:	Liner Shipping Connectivity Index
MSFD:	Marine Strategy Framework Directive
NAFTA:	North American Free Trade Agreement
NEPDR:	Nigerian Environmental Protection and Department of Petroleum Resources
NIMASA:	Nigeria Maritime Administration and Safety Agency
NMVOC:	Non-methane Volatile Organic Compound
NOSDRA:	National Oil Spill Detection and Response Agency
NPA:	Nigeria Ports Authority
OECD:	Organization for Economic Cooperation and Development
OLS:	Ordinary Least Square
OSPAR:	The Convention for the Protection of the Marine Environment of the North East Atlantic

SILENV: Ships Oriented Innovative Solution to Reduce Noise and Vibrations
TBT: Tributyltin
ULSD: Ultra-low Sulfur Diesel
UNCLOS: United Nations Convention on the Law of the Sea
UNCTAD: United Nations Conference on Trade and Development
WMU: World Maritime University

CHAPTER 1

INTRODUCTION

The influence of maritime transportation in the social, economic, political, and recorded improvement of countries either developed or developing is in no doubt, a significant one. Indeed, the history and advancement of countries are interlaced firmly with the level of improvement of their maritime transport framework where they exist. The instance of Nigeria cannot be an exemption. At the economy level, a sufficient and proficient maritime transport framework assumes a vital role in the improvement of a nation's economy, particularly in universal exchange by changing nearby markets into national, provincial, and worldwide center points. It grants economies of scale in zones that have promising similar preferred standpoint with associative age of large business openings.

Seas possess 71% of the world's all out surface zone and contain assorted normal fortunes (Ofiara, 2015). The essentialness of seas is progressively clear since land assets have turned out to be progressively constrained. Due to the inborn preferred standpoint of having a tremendous coastline, Nigeria's marine economy has turned out to be progressively noticeable in its overall economic growth. As ordinarily known, Nigeria is not the leading nation that profits by its marine economic exercises. A few investigations center around maritime transport, and its influence on the national economic growth has been entrenched in created nations.

1.1 Human Activities and Environment

The degree of human exercises is expanding with the populace, and changes in the native habitat and the utilization of assets are additionally expanding. People are an essential part of

the earth; in this manner, human exercises ought to be a particular segment of the earth. Be that as it may, there is an expanded worry over the negative impacts of human exercises in open discussion and enactment. Rather than different species, people have created perspectives that contrast in nature, for example, the substantial scale utilization of apparatuses, the making of ancient rarities, and the advancement of a culture with a trade of data and considerations, including moral and religious angles (Lindgren, Granhag, and Svensson, 2016).

These advancements have not just had the potential effect on the typical habitat from human activities, yet have likewise empowered the development of perspectives on agreeableness as far as environmental effects and asset use. The discourse of adverse effects on nature is not new, even though it has been expanding since World War II, with extensive open discussions and enactments showing up in numerous spots far and wide. The early talks on environmental issues primarily were identified with the land condition, freshwater frameworks, for example, lakes and streams, and dangers to human wellbeing. For quite a while, the sea was seen as a spot for dumping waste and a situation that was flexible to human effect. The main concern was over oil slicks, which could affect feathered ocean creatures and sully shorelines. The potential effect "under the surface" was less known or watched (Lindgren, Granhag, and Svensson, 2016).

Throughout the decades, when the U.S. Agency of Economic Analysis originally suggested an idea of Gross Ocean Product (GOP), researchers have kept on attempted to examine the influence of marine business in developed nations, for example, the U.S. (Colgan, 2007; Kildow et al., 2009;), Canada (Pinfold, 2009), the United Kingdom (Pugh, 2008), Australia (Allen Consulting, 2004), and France (Kalaydjian, 2008). In any case, because of the broad spotlight on marine economy, Kildow et al., 2009, understood that the conventional appraisal technique for marine economic esteem has not been able to meet the prerequisites of feasible advancement. Since antagonistic impacts are not seen promptly and are far out (Ofiara, 2015), it is hard to measure the environmental effect of the externality of marine economic exercises.

It has been opined in the literature that the effect of the marine economy on the marine condition could ascribe to continuous human activities, for example, overfishing, flood due to oil and gas misuse, beachfront environmental pollution, land-based wellsprings of pollution, and sea environmental change (Byrnes et al., 2016). The sea biological system is profoundly affected by unsustainable human exercises (Halpern et al., 2008). In particular, in the ongoing decades, changes in innovation and industry have extraordinarily quickened the human capacity to acquire sea assets, and the effect on the maritime condition. In the long run, this alters the sea environment through pollution, the decimation of territories, and intrusion of extraordinary species (IPCC, 2007). Mostofa et al. (2013) outlined the key issues in marine biological systems brought about by expanding requests from human exercises and the impact of a worldwide temperature alteration.

Marine biological harm brought about by maritime economic exercises, for example, sea warming and sea fermentation will like this influence the sound advancement of the economy and the way of life of the nearby populace (Novo-Corti et al., 2015). At present, regardless of whether the economic and environmental effects of green assembling taken by marine undertakings can accomplish a successful circumstance which requires further examination. Against this foundation, a few researchers and organizations started to advocate the foundation of a marine economy with the practical advancement of the biological condition and its broad prospects (Jane, 2009). Thus, exploration of the connection between the marine economy and condition ended up broad. Ofiara, (2001) combined marine economy and environmental pollution in a single framework to evaluate the nature of marine economic growth and suitable arrangements from a progressively complete point of view, turning it into a mainstream channel in which marine economics inquire.

Subsequently, investigating the advancement pattern of the connection between the growth of Nigeria's marine economy and its marine pollution is additionally a down to earth reference for executing and assessing an approach of maritime maintainable improvement. Albeit building up a biological and supportable marine economy has been generally proposed and the

examination of the connection between Nigeria's marine condition and marine economic growth has additionally escalated, most research as yet is restricted to hypothetical findings. Studies utilizing quantitative investigation to address this issue are not many (Alege and Ogunidipe, 2015). In particular, Akpan and Chuku (2011) utilized econometric strategies to examine the presence of the marine Environmental Kuznets Curve (EKC) in Nigeria, however with unimportant outcomes. Iduk and Samson (2015) assembled board information that demonstrates dependence on the EKC and presumed that the general pattern of the economy and condition in beachfront regions in Nigeria showed an N-formed relationship.

Onwuegbuchunam et al. (2017) exactly broke down the coordination degree between the marine condition and marine economy in Nigeria by utilizing the entropy change condition and found that, by and large, there is a composed connection between them. As per past research discoveries, consider ends are distinctive, notwithstanding the utilization of a similar technique. To some degree, without considering the different consequences of the model examination brought about by choice of markers, utilizing just a single quantitative technique is neither thorough nor persuading. On the one hand, the targets of the unique strategies are different. Some go for a particular number of changes, others at the overall measure of changes over a period. Consolidating unique techniques can keep away from an uneven end, and the outcomes are correlative to a limited degree. Then again, the consequences of the estimation will, in the long run, fill in as control strategy direction.

In any case, a few techniques may misinterpret the defining moment from "problem" to "twofold successes," which will misdirect us into executing the control system inefficaciously (Sheng et al., 2015). As of now, the connection between the marine condition and economic growth is confounded and can shift via ocean region. Be that as it may, there is an absence of explicit examination and forecast on the environmental part of maritime transportation, environmental pollution, and economic growth in Nigeria. Appropriately, to fill the holes in the ebb and flow, this paper breaks down the connection between marine environmental pollution and economic growth by consolidating the EKC display and economic growth show

1.2 Background of the Study

In the maritime sector, maritime transport, which is comparatively water imagined transport is one of the philosophies for the transport of goods or conceivably individuals, others being air, road, rail ropeway transport. Maritime transport is the path to the right errand of any country's transport and a key bit of a nation's transport structure. A former minister of transport of the Federal Republic of Nigeria was once insinuated have said that transport is to the Nigerian economy as a vein to the circulatory blood plan of the body. Without marine transport, Nigeria would have been landlocked. Additionally, its economy would not have been making, instead it will remain stable in different locale and therefore marine transport is of pressing centrality to and unfathomably impacts the improvement movement and progress of the Nigerian economy in two or three indisputable ways: It is an essential space in the Nigerian economy (Akaso, Bariweni, Abowei, 2011).

By definition, marine transport is the system of passing on or affreightment of goods or individuals by water, paying little respect to inland water conductors, including streams and oceans. It might be private (inland or waterfront) proceeded with cargo pontoons, ships, shoreline front vessels of under 500 gross tonnages (gross tonnage is a nonlinear measure of a ship's overall internal volume) or ocean transport with massive vessels of over 500gt in size and types which supports everything contemplated trade. Over 96% of transportation of Nigeria's trade is by maritime transport. The development of water transport in Nigeria has diverse positive conditions among which are the headway of trade and business, time of payment, the help of international business, improvement of related economic activities, work creation, and institutional advancement; they are some economic and common central explanations behind maritime transportation in Nigeria.

The improvement of waterborne transport in Nigeria activated and kept up not just by its geophysical features wherein there lay tied down inland courses and direct access to the Atlantic Ocean. Its economy is likewise, as it has been said, subordinate upon the exportation

of the agrarian thing and grungy oil, and the importation of mechanical social event, gear, and uncouth materials for its undertakings and finished stock for it is by far most of the populated buyers. Hence, if Nigeria has been without maritime transport and was a landlocked state, it will have been abrading and over the top for its inhabitants to explore worldwide, and private trade, and this would have generally affected its economy. Nigeria unequivocally relies upon external trade to develop its local economy through importation of finished materials and machineries; exportation of its crude oil, and agricultural produce. The cargo transportation which the maritime transport offers does not simply make the landing cost of these cargoes lower; it makes it possible to move a large tonnage of goods to and from Nigeria. This cargo movement diminishes the cost of imported things since transportation cost is one of the fundamental costs of creation. Maritime transport, furthermore, meets the variable needs of shippers and swashbucklers and ship-owners and plays out the endeavor that is basic to the sustenance and progress of the Nigerian economy and its general trade.

1.3 Globalisation, Transport, and the Environment

Shipping activity has extended in a general sense for the main residual century and currently addresses an exceptional promise to the overall releases of toxins and ozone hurting substances. Late examinations demonstrate that the outpourings of CO₂, NO_x, and SO₂ by ship identify with about 2% to 3% (possibly 4%), 10% to 15%, and 4% to 9% of the worldwide anthropogenic transmissions, independently (Kohler, 2104). Ship releases of NO₂, CO, NMVOCs and SO₂, and primary particles cause issues in shoreline front zone harbors with much traffic and high pollution levels because of their impacts on human prosperity and materials (Shahbaz et al., (2016), with a subsequent effect on the economic growth.

The impact of conveyance can be positive or negative; either way, the practical outcome far surpasses the negative impact. On the positive side, shipping gives a large gathering of budgetary points of interest like occupation game plan, supporting toll headway, helping in

widening the economy, broadening market open entryways for outside trade by giving centered organizations, growing remote exchange benefits, opening approaches to outside test. Trade and the ability to battle in abroad markets are liable to a beneficial, secure, and reliable maritime structure. United Nations Conference on Trade and Development (UNCTAD, 2008); Usoro (2008) requested that transportation should be seen as the essential overall industry speaking to about 90% of the World Seaborne trade. Notwithstanding, the enormous beneficial outcome made negative impacts in like manner studies.

The environmental issues are so far, giving the world enough of a headache. The real common impacts are reflected in air quality, burrowing, risked and bargained life species, oil pollution, and solid waste cleared up and sought after:

a) **Air Quality** - Vessels transmit terrible toxic substances to the air, for instance, hydrocarbons, nitrogen oxides (NO_x, SO_x). Different wellsprings of air tainting from transportation join the entry of xylene, toluene, xylene, and distinctive toxins from fuel vapor in the midst of stacking and exhausting of marine tank vessels (Prasad, 2010). According to the United States Environmental Protection Agency (EPA), impacts of these toxic substances may consolidate troublesome prosperity impacts, for instance, respiratory and cardiovascular diseases, lung hurt, learning prevention, and even destruction. Depletion of the ozone layer, mischief to cultivating resources, and the development in a destructive storm are other negative results (Donovan, 2006).

b) **Dredging** - To guard up course profundities, many harbor channels must be burrowed irregularly. The residue contains contaminants that, when released, act as certified threats to the organic framework, mainly through bioaccumulation in the unique lifestyle (Bellefontaine, 2010).

c) **Oil Pollution** - Oil released into the natural framework is a significant biological issue related to the conveyance business. Large spills occur during transportation through tanker setbacks and spills in stacking and off-stacking. Wastewater from tank washing, discharge from bilges and engine upkeep are essential explanations behind humbler spills. These are

perilous to individuals and nature through bioaccumulation of toxic substances and the developed lifestyle. Additionally, oil tainting spoils a typical shoreline front environment, covering tidal pools, and executing swamp grass (Bellefontaine, 2010).

d) **Solid Waste** - All pontoons produce solid wastes during voyages. A significant bit of these wastes can be legally masterminded and controlled, as long as they release them at a detachment from the shore. Plastics must be singed aground, while solid waste from transportation enters the earth when cargo is lost haplessly or unexpectedly released while stacking and discharging (Ekpo, 2012).

It is not a repudiating that marine transport is viewed as one of the crucial pay related advancement parts in any nation. A large piece of the world's exchange and totally 75% of it is transported by maritime transport. That is in light of the way by which marine transport has assembled focal centers wandered from different systems of transportation, for example, incredibly far and spurned costs (Vidal, 2009). These central spotlights have expanded the reliance on marine transport and, as need be, expanded the compensation of hard cash. Fittingly, we perceive how marine transport can serve in improving the conventionality of these nations, offering occupations to the jobless and making urban structures (Ward-Geiger et al.; 2005). With the execution of marine errands, for example, building ports, docks, or beginning marine affiliations, these things lead by and large to opening sections for open work and working up the urban structures where the activities will be executed (Watson, 2004). The centrality of marine transport in Nigeria lies in its long coast accomplice for more than 1500 miles, paying little regard to comprehend that 95-90% of the country imports and areas are transported through the ocean (Ward-Geiger et al., 2005).

1.4 Overview on the Maritime Transport and Environment

New research prescribes that the effect of transport on the natural changes has been altogether considered and that the business is beginning at now making ozone-harming substances

(Vidal, 2007). Transportation as a colossal supporter of headway, its encouraging is practical to the point that the demolishing it makes is about half or higher to the trademark tainting. Ocean radiations are correspondingly set to impact by 75% in 2020. The International Maritime Organization, the U.N. body, set up to control shipping, has set up a working gathering as a result of reports this year (Simpson et al., 2010). Research seen by the social event handles past checks, which put the aggregate at around 600 million tons and are comprehensively short. The veritable figure is set to be more than one billion tons, as conferred by an oversight report showed up by the IMO by Intertanko, the International Association of Independent Tanker Owners (Ward-Geiger et al., 2005). In the examination, flying makes an average of 650 million tons. The old figures depended upon 2001 examinations, which was about 4.5% underneath the present estimation. While isolating undertakings have yielded by far most of their showings, shipping has so far gotten away. Bill Box, from Intertanko, said the business reviews that it has been moderate to react (Vidal, 2007).

Transport has not yet been enabled, and for government aces, it is the last low hanging standard thing, Mr. Box said (Simpson et al., 2010). In California, the Attorney General has impacted an interest gone for inciting the Environmental Protection Agency to control fragments of customary change gases from transportation in U.S. waters. In the U.K., the lawmaking body is experiencing strain to join passing on in discharge structures for the Climate Change Bill one month from now. Additionally, new E.U. rules come into power in November to urge pass on proprietors to utilize cleaner fuel in shoreline front transportation ways all through domain waters (Watson, 2004). Transportation is a damaged industry (Abowei, Akaso, and Bariweni, 2011). Ports are far from individuals focuses, and different individuals do not see a ship starting with one year then onto the going with. The business serves more than 90 percent of all-around exchange, and as the trade has developed, so has the improvement gathering (Vanderlaan and Taggart, 2007).

At present, it is admirably gifted to send a holder from Beijing to London than it is to transport it 100km by the street. The world social gathering of ocean vessels remains at 90,000, says Oceana, a US-based ocean security association that is somewhat an organization of regular gatherings that has found the California request (Simpson et al.; 2010). The interest guarantees that the social event makes discharges showing up differently in association within every commonsense sense 190 million vehicles, most of the vehicles in the U.S. Michael Woods, co-seat of the U.K. Specially based Law Association's standard change working social gathering, said government watch-outs for sullyng were coming sooner than the business gets it. He said that transport could solidify into the European Emissions Trading Scheme (Vidal, 2007).

1.5 Significance of the Study

The pivotal motivation driving this examination is to survey the sea transportation flexibility of environmental pollution and the economy of Nigeria in the short-run and long-run trying raced to discover the relationship between sea transportation from one point of view, ecological contamination, and budgetary improvement. These relationships in short-run and long-run give the policymakers the more comprehensive viewpoint on their systems concerning their periods, short-and entire arrangement plans. For this condition, they are likely proposed to grow generally specific strategies inside different time-ranges.

1.6 Structure of the Thesis

This thesis is organized into five chapters. The first chapter states the overall introduction of the study, the background to study, the significance of the study, and the theoretical and empirical literature review on the maritime transport, environmental pollution, and their relationships. The second chapter presents the problem statement, research objectives, research questions, and hypotheses to be tested in this study. The third chapter outlines the

analysis methodology. The fourth chapter contains the analysis results. The fifth and final chapter attracts conclusions and implications and then ends up the report by recommending future analysis areas.

1.7 Literature Review

1.7.1 Sources of Maritime Pollution

Maritime transport through the ocean solidifies another wellspring of marine corruption. Maritime traffic joins the progression of dry mass vessels and unmistakable oil tankers, which analyze inland and along beachfront waters. Oil tanker vessels' cleaning advancement makes a smooth mix that may find its way into the ocean. Different strategies have, in any case, been made to lessen debasing through these sources; clear ones being the use of withdrawn weight tanks, slop tank, Load on Top System (LOT), and Crude Oil Washing structure (COW). Intensely related to maritime transport, an abundance of sullyng is antagonistic to fouling paints related to shipping bodies. Paints always contain critical biocides; for instance, Tributyltin (TBT). Biocides rot the encroachment of marine life pursues on the ship's structure. Regardless, these substances additionally channel into the marine condition and may inimically affect a couple of non-target creature demands.

The impacts of transport on the marine condition, in any case, can be amassed. In the future, as showed up by Ware (2009): contaminating by oil and perilous or lethal substances from unrehearsed, operational and unlawful discharges; air sullyng through floods and particulate issue from engine vapor gases and cargo tanks which may be proceeded with expanded groups; segment of operational wastes from vessels, including arriving of grungy sewage and garbage (litter); getting together of risky organized mixes used in fouling paints and keeping of overpowering metals from anodes; the introduction of non-indigenous life shapes through channel vessels correspondence water and related improvement, and fouling on vessels'

structures; undermining and physical impact through loss of scows and payload; physical and certain impacts interlacing turmoil and crash with warm-blooded marine creatures.

The effect of these is generally distinguishable in made up for lost time with transportation ways and harbors influence in or close to usually sensitive regions or may be progressively fundamental in waterfront locales (Donau, 2010). As necessities seem to be dispatch delivered wastewater gathered by three primary sorts: Bilge wastewater, Black wastewater (on occasion Gray wastewater is consolidated to depict wastewater free from human waste), and Ballast wastewater (Onwuegbuchunam et al..2017).

1.7.2 Exhaust Emissions

Smoke radiations from watercraft saw as a significant wellspring of air pollution, with 18 to 30 percent of all nitrogen oxide and 9 percent of sulfur oxide sully. The 15 biggest watercraft, release about as much sulfur oxide ruining as all vehicles joined. "By 2010, up to 40 percent of air degradation over land could move out of vessels." Sulfur distinguishable all around makes a ruinous whirlwind, which damages accumulate and structures (Schmidt and Olicker, 2004). Unequivocally, taken in the sulfur is known to cause respiratory issues and even expand the danger of coronary infection. As conveyed by Irene Blooming, a star for the European Union opined that the fuel used in oil tankers and holder's vessels is high in sulfur and progressively moderate to buy, showed up irrefutably in association with the fuel used for neighborhood land use. "A ship lets out on various events more sulfur than a lorry for every metric ton of payload passed on." Cities in the U.S. like Long Beach, Los Angeles, Houston, Galveston, and Pittsburgh see undeniably the most enormous transportation traffic in the nation and have left neighboring bosses quickly trying to clean up the air (Meinesz, 2003). Making trade between the U.S. Moreover, China is stirring up the degree of vessels examining the Pacific and raising an expansive number of earnest issues. To keep up the section of the movement, China is starting to encounter this test, as heaps of grains are being transported to

China by the watercraft load. The degrees of voyages are required to continue making (Ward-Geiger et al., 2005).

Transportation makes 3.5 to 4 percent of all run of the mill change outpourings. Air debasement from voyage boats made by diesel engines that gobble up high sulfur substance fuel oil, generally, called asylum oil, passing on sulfur dioxide, nitrogen oxide, and particulate, paying little respect to carbon monoxide, carbon dioxide, and hydrocarbons (Huettel, 2004). EPA has referenced diesel vapor as clear as being perilous to human improvement. EPA sees that these outpourings from marine diesel engines add to ozone and carbon monoxide nonattainment (i.e., irrelevance to fulfill air quality guidelines), in like path as ghastly prospering impacts related with including blends of the particulate issue and obvious quality, mist, harming introduction, and eutrophication and nitrification of water (Meinesz, 2003). EPA assesses that general marine diesel engines tended to about 1.6 percent of preservationist source nitrogen oxide releases, and 2.8 percent of versatile source particulate spreads in the United States in 2000. Duties of marine diesel engines can be higher on a port-express reason. Ultra-low-sulfur diesel (ULSD) is a term used to depict a standard for delineating diesel fuel with a straightforward estimation gap down the sulfur substance. Beginning in 2006, all around that issues most of the oil-based diesel fuel open in Europe and North America is of a ULSD type (Vidal, 2009). As one of way to deal with figuring out how to diminish the impact of ozone-hurting substance spreads from transport, checking office Right Ship has developed an online "GHG Emissions Rating" as a specific course for the business to disengage a ship's CO₂ floods with assistant vessels of a neighboring size and type. Using higher reviewed watercraft can pass on normally lower CO₂ spreads over the voyage length (Vidal, 2007; Abowei, Akaso, and Bariweni, 2011).

1.8 Existing Legal Framework for Controlling Maritime Pollution

The International lawful framework for paying unique personality to vessel source pollution was spread out by the United Nations Convention on the Law of the Sea (UNCLOS). UNCLOS gives that the regulatory and fundamental ward of a state over a particular vessel move, contingent on whether the state is a standard, shoreline front or port state. The convention has made a uniform system that attempts to shield the open gateway undeniably and the imperativeness of waterfront states in guaranteeing and confirming the marine condition inside their ward (Liu and Maes, 2011). Notwithstanding UNCLOS, vessel source dirtying controlled by the specific conventions gotten by the International Maritime Organization (IMO). The general solicitation of the IMO saw in UNCLOS through the verbalization "able everything considered affiliation." The IMO is responsible for setting the models at the wide estimation to envision vessel source pollution. These circuit discharge and flooding rules; improvement, plan, gear, paying unique personality to models, and navigational measures. Human issues to all IMO traditions are under confirmation to tame the courses of action of the conventions in their national laws. It can additionally be anticipated that those huge government working environments or doled out affiliations are set up to keep up consistency to these laws.

In Nigeria, the dimension of the legal structure set up generally covers altering improvement of oil pollution in the oil piece. Conventional occasions of these laws/demonstrations are Mineral Oil Safety Regulation 1963, Oil in Navigable Waters Regulation 1968, Petroleum Regulations 1967, Petroleum (Drilling and Production) Regulation 1973, and Petroleum Refining Regulation 1974 (Kadafa, Zakaria and Ottoman, 2012). Other conclusive measures relating to sully control can be gotten from the solicitation of a section of the Nigerian government parastatals made to direct oil contamination. Models interweave the Federal Environmental Protection Agency (FEPA) after a short time subsumed under Federal Ministry of Environment (FME), which issues standards for water, air, land quality, and oil associations assignments. The Nigeria Environmental Protection and Department of Petroleum Resources

(NEPDPR), which issue standard standards and benchmarks for the oil section in Nigeria and National Oil Spill Detection and Response Agency (NOSDRA), which solicitation is to help and understand the national oil spill crisis approach.

The Nigeria Ports Authority (NPA), as the controller of Nigeria ports, has an institutional solicitation to give squander social occasion workplaces. The Authority keeps up a sullyng watching unit notwithstanding the way by which that it has contracted out its waste organization concentrated on an independent business. Nevertheless, the Nigeria Maritime Administration and Safety Agency (NIMASA), by the affirmation making it, shows up is the standard parastatal with express solicitation to ensure annihilating changing improvement and control in the marine condition through the utilization of sorted out all out maritime (IMO) traditions. Along these lines, the real structure set okay with controlling sullyng in Nigeria portrays covering components of the parastatals included and addressed a potential wellspring of question.

1.9 Theory of Environment and Economic Growth

The world economy moved from the post-war recuperation regiment into a progression period since the 1950s, notwithstanding, the standard crisis sanctioned by lively budgetary improvement, industrialization, and urbanization in western nations faces expulsion. There have been two or three certifiable continuous corruption occasions at this stage, which stifled the world in light of the capricious condition of money related improvement, through a progression of environmental issues earlier joined into made nations. Everything considered, theoretical research concentrated on monetary improvement, and western specialists invigorated the earth. Close to the beginning of the discussion, the weight was whether economic improvement has limits. In 1972, monetary specialists Meadows et al., (1972) gathered by Chen et al., (2017) from the Roman Club appropriated a report, titled *The Limits to Growth*. In light of 1900–1970 information, the report showed a dynamic model

concentrating on five factors that impact economic improvement: rigid people, industrialization, pollution, sustenance age, and resource depletion. The makers expected to research the probability of a reasonable investigation configuration achieved by changing progression structures among the five factors under three conditions (Victor and Rosenbluth, 2007). This report made a discussion on the issue of motivations behind the control of budgetary progression, making two sporadic shows among administrators: watchfulness and positive reasoning (Ayres, 1999; Cleveland and Ruth, 1997).

Notwithstanding, paying little notice to whether the cutoff reasons for economic progression are seen or not, clearly money-related activities sway the earth. Along these lines, related speculations were made. Since the 1970s, money related investigators began using the models of monetary improvement theory to examine the conditions for the made progression out of the economy and condition. Bosses (Solow, 1974) suggested in Victor and Rosenbluth, (2007) used the neoclassical improvement, to ponder the exogenous components of inventive progression and people progression, to disengage the dedication of mechanical progress to the supportable of the economy and judge whether available money related improvement is conceivable. Amidst the 1980s, Romer (1986) recommended in Chen et al., (2017) put forth the theory of endogenous progression, which included unavoidable pollution into the model and saw key features making conceivable improvement. In theoretical research, the prerequisite for conveying environmental components into the economic-related improvement theory has appeared. Nevertheless, theoretical research can give an exceptional bearing to valuable assignments. Exploration of the association between related economic progression and the environment requires further investigation.

1.10 Overview of Environment Kuznets Curve

Since decades back, observational research on the authenticity, congruity, and estimation of the Environmental Kuznets Curve (EKC) has been annoying, this searches for, after the

central works of Grossman and Krueger (1991), Shafik and Bandypadhyay (1992), Panayotou (1993) and Selden and Song (1994) suggested in Akpan and Chuku (2011). Grossman and Krueger first pointed out the changed U-formed association between common savage substances and per capita pay in their examination of the environmental impacts of the North American Free Trade Agreement (NAFTA). Panayotou last settled this U-fused relationship as the Environment Kuznets Curve. The turn name is in light of the way by which it mirrors an all-around that matters, not a well-characterized association between pay uniqueness and per capita pay starting late hypothesized by Kuznets (1955). Conclusive proof on the EKC hypothesis is, inside and out best situation mixed. While a few examinations find a straight association between environmental corruption and improvement (Akbostanci et al., 2009, Fodha and Zaughdoud, 2010), others have demanded a reasonable U-framed relationship as per the EKC hypothesis (Galeolti et al., 2006, Jalil and Mahmud, 2009). Either way, others have found an N-confined relationship (Martinez-Zarzoso and Bengochea-Maranco, 2004), which recommends that any delinking of normal degradation from money related progression is only short (He and Richard, 2010). The results demonstrating the veracity of the closeness of an EKC-type relationship lead a bit of the maker to construe that nation could on a noteworthy dimension make out of stock issues (Akpan and Chuku, 2011). The speedier progression could fill in as a key bit of the response for the general radiation inconvenience (Fodha and Zaughdoud) no under 2010 mindfully that economic improvement could be huge with standard overhauls if appropriate technique responses were taken (Akbostanci et al., 2009).

Notwithstanding, uncommon incongruities about the critical occasion at which the delinking happens to exist among makers who find a fixed U-surrounded EKC (He and Richard, 2010). Different makers have kept an eye on central basic occasions running from \$8,000 to \$ 60,000. While Cole (2004) found a fundamental essential occasion of \$62,700 with a log-direct model and at \$25,100 with levels information for the U.S., Wang et al., (1998) had earlier gotten a fundamental intersection for the U.S. at \$23,000 for assessed risk of perilous introduction. For including centralizations of SO₂, Grossman and Krueger (1995) deduced in Akbostanci et al.,

(2009) measure the essential basic occasion to lie someplace in the dimension of \$4000 and \$5000 per capita (in 1985 dollars). Such vacillates attribution to a few components, for instance, the commonsense sort of the model used, the consolidation of additional control factors adjacent to the compensation factors, among others. For instance, Suri and Chapman (1998), using a basic board information address, contemplated the turning the monstrous occasion for enormity utilization to lie at \$ 55,000 – an estimation that they portrayed as questionable for any nation to achieve in the closest future. In their second model used to confine the effect of everything considered exchange on centrality use, the significant intersection was generously raised to \$224,000 when the exchange variable has appeared. In what ways can related economic advancement prompts improve standard quality over the long haul, the response to this solicitation has made a couple of instinctual colleague explanations in the run of the mill organization.

Considerably more officially, Grossman and Krueger (1991), as consolidated into Akpan and Chuku (2011) argued that economic improvement could affect the earth through three express channels: scale impact, structure impact, and methodology impact. The scale effect happens as contamination increases with the dimension of the economy. The illumination is that paying little regard to whether the structure of the economy and progression does not change, an expansion in the dimension of money related improvement (age) will provoke addition in contamination and normal corruption. The course of action impact, then once more, gathers the modification in the guideline structure of an economy from making based on industry and association-based, which results in the re-undertaking of central center interests. As need be, at first occasions of advancement process, contamination moves as business structure changes from making to more assets ensured overwhelming gathering associations.

At long last, the point of view effect gets revives in the procedure for creation and change of cleaner incites and therefore, a reduction in contamination, subordinate upon the general criticalness of the three impacts, a dull, a U-shape, a bothered U-shape or in conviction any viewpoint among pay and standard quality (Wagner, 2008). Akbostanci et al. (2009) clear up

that while the scale effect is relied on to control certain repercussions for the rising dimension of the EKC, synthesis and structure impacts are required to overwhelm the scale impact at the declining range.

In Panayotou's (1993) referred to in Akpan and Chuku (2011), at logically critical proportions of progression, key change towards information raised associations, united with expanded trademark care, essential of characteristic standards, better headway, and higher run of the mill uses would at last short a leveling off and moderate decrease in common corruption. The common supposition is that despondent individuals have little vitality for cleaner conditions and have an obligation by their present use needs to break down their condition. Given this, it is standard that as the general masses contort up continuously liberal, the compensation adaptability of its sort for an enduring and strong condition will rise and in which case the controlling body might be called upon to drive truly stringent trademark controls. With everything considered, strengthen that cleaner condition is a liberal standard. Regardless, this proposed instrument of getting strongly unrestrained as a reenactment for individuals to check for conventional overhauls has gotten examination in the creation.

Then again, it has been contended that exchange can instigate an improvement in trademark quality through the affiliation or a potential system impact: as an exchange raise pay, trademark protection laws and standard are fixed to the point that it urges degradation diminishing progression (Ciegis et al. 2007). The sully from the outline of certain dirtying amassed things decrease in a single nation as it increases in another nation through general exchange. The affiliation impact of exchange credits two related speculations: Displacement hypothesis; which demands that exchange advancement or responsiveness is connected with making sully discharges particularly in affecting nations by morals of the vivacious progression of debasing concentrated undertakings as made nations to help astonishing regular standards, and Pollution Haven Hypothesis; which suggests the likelihood that general firms, especially those that occupied with astoundingly dirtying exercises, move to make nations with less prohibitive common benchmarks. In setting on the starting late referenced,

contemplates like Halicioglu (2009), Ang (2009), and Jalil and Mahmud (2009) joined the exchange variable their EKC estimation. A positive relationship between remote exchange and CO₂ discharges has been found by Ang (2009) for China and Machado (2000) for Brazil.

1.11 Maritime Transport and Economy

Basic number of spotlights concentrated on the Gross Value Added (GVA) and business made by either the conveyance zone when in doubt or sub-portions of ocean transport, in a general sense port's exercises, at national or regional estimation (Coppens et al., 2007; Deng et al., 2013; O'Merk, 2014). By studies concentrating on the conveyance zone, there are titanic research papers in which the centrality of the part could be disconnected through the general evaluation of all divisions wrapping the economy. Here, the examinations of Colgan (2013), who concentrated the responsibility of ocean and shoreline front uses the US economy and the report of Ecorys (2012) to EU, which appears in detail the monstrosity of marine uses to the European economy should be joined. In the examination of Colgan (2013), foundations, GDP, work, and wages are used as markers of evaluation, while in the examination of Ecorys (2012), the GVA and business structure the principal pointers of examination. In both of the examinations, maritime transport keeps an eye on the second most fundamental portion, both in work and GDP age.

Additionally, close undertakings could be found in the examinations of Vuik et al. (2010), who reviewed the criticalness of marine and shoreline front uses to the Dutch economy and of Morissey et al. (2011), who concentrated the additional estimation of Irish marine economy. Vuik et al. (2010), in context on the information of national records, assessed that ocean transport conveys the most astounding number of occupations among the firm uses made in the Dutch Sea and the second most staggering GVA after oil and gas misuse works out. In addition, Morissey et al. (2011), in context on Input-Output tables regulated marine divisions to three critical classes: Services, Manufacturing, and Resources. The maritime piece, which

joins into organizations class, saw to be the second most fundamental zone after sea the progress business concerning GVA and work age.

1.12 Studies on Maritime Transport and Environment

Other than the related economic significance of ocean transport advances, overall making has likewise analyzed the improvement's trademark impacts. Researchers either centered at the examination of express environmental stores of ocean transport or assess the typical impact of the utilization in a reasonable, careful framework. The Marine Strategy Framework Directive (MSFD) (EU, 2008) gives a concentrated setting in order to see and evaluate the stacks made by the division inside the sea. The basic evaluation of the utilization of MSFD in UK seas (Department for Environment, Food and Rural Affairs of UK, 2012) revealed that ocean transport pollutes the marine with their litters, which are detriment to the ocean species. In addition, a general technique of OSPAR Commission (2009) to study loads of maritime uses in the North-East Atlantic region revealed that these stores are giving off an impression of being upward points of view.

An astonishing exertion has furthermore been made in order to check express portions of conventional burdens achieved by strategies for ocean transport. The third report of IMO concerning primary releases (Smith et al., 2014) expected that for the period 2007–2012, maritime transport conveyed a commonplace of around 938 million tons of CO₂ watching out for 3.1% of yearly, for the most part, CO₂ outpourings. Regardless of the way where that release is commonly high, it should see that, both in all-around terms and in relative measures, the connectivity of ocean transport presents a decreasing game-plan.

In addition, Miola et al. (2009) gave an immovable structure to manage the unquestionable verification and estimation of environmental heaps of ports and to convey handles considering express sorts of unavoidable perils of the crucial exercises. The researchers saw all the

potential stores of ocean transport and proposed an evaluation framework in order to check the outside costs related to air harms. This framework was then related to a close estimation in Venice. Essentially more unquestionably makers concentrated on the maritime transport advancement found in Venice to get settled with the achievement impacts in context on ship traffic and the full-scale outside costs for the region. The above endeavor concluded that externalities of maritime transport in light of floods are open, yet the conspicuous attribution of flourishing effects to ocean transport and unequivocal sources would require rationally accurate information and cautious research. Concerning the pollution made by weight waters, evaluation is that, through the high action of maritime transport in Europe, more than 1000 non-indigenous species have been recorded at the shoreline front region (David and Gollasch, 2008). This positions threats to the social, monetary, and ordinary region of Europe as the costs of marine recuperation to pre-get quality and the perils to animals' and people flourishing are too endeavoring to try and consider attempting and consider having an evaluation (IMO, 2015).

Additionally, the report of Ships Oriented Innovative Solution to Reduce Noise & Vibrations 'SILENV' (2010) spots three principal risks related to isolate sorts of dissent sullyng conveyed by pontoons. The first relates to the irritation of explorers and gathering, which can actuate therapeutic issues, the second to the perils against untamed marine life starting from submerged change and the third to the stacks on occupants of port-urban frameworks constrained by the airborne particle. As such, oil spills related to shipping troubles have furthermore pulled in light of a veritable worry for individual researchers (Garza-Gil et al., 2006; Loureiro et al., 2006; Miola et al., 2009). Liu and Wirtz (2006) have made the costs out of oil spills into five guideline classes: money related inconveniences, clean up costs, standard damage, separate costs, and unequivocal costs related overwhelmingly to hard to achieve cases.

In order to understand the conceded consequences of an oil spill it should be seen that the scene of Prestige worked out precisely true to format the releasing of 38,000 tons of oil

influencing a coastline of around 3000 km and in excess of 200 thousand winged creatures in conclusion, novel warm-blooded animals and sea turtles were butchered (Liu and Wirtz, 2006). The money related wickedness of the cataclysm overall affected the fisheries section as the landings of inshore learning and shellfish gets after the scene has diminished by 50.58% in entire and by 69.77% in regard terms (Loureiro et al., 2006).

CHAPTER 2

STATEMENT OF THE PROBLEM AND RESEARCH OBJECTIVES

2.1 Statement of the Problem

The dangerous atmospheric deviation, which is a result of human activities, is an important sign to warn everybody about environmental pollution risks, living on the Earth, including environmentalists, academics, lawmakers, and religious individuals (Taghvaei and Parsa, 2015). "No one on the planet is going to be untouched by the impacts of climate change," said Rajendra K. Pachauri, the administrator of the Intergovernmental Panel on Climate Change (IPCC) in a public interview in Japan in 2014 after the gathering on the IPCC report. In the next year, Carol and Duffy formed the resulting sonnet "What have you done, with what was given to you; what have you done with the blue, beautiful world?" (Duffy, 2015). Around the same time, Francis said "This sister presently shouts out to us on account of the mischief we have exacted on her by our reckless use and maltreatment of the merchandise with which God has blessed her," and he referenced "a seedbed of aggregate childishness" to the dangerous atmospheric deviation (Francis, 2015). Also, Barak Obama, the US previous president, opined that "no challenge poses a greater threat to future generations than climate change" (Obama, 2015). This incredible danger is profoundly established in economic activities, for example, maritime transportation.

Maritime transportation assumes an essential job in both environmental pollution and financial development, particularly in the developing and oil-trading economies, connected to the vast ocean like Nigeria. This transportation mode transmits a high rate of Carbon Dioxide (CO₂), although it gives a successful channel to lead worldwide trade (Taghvaei et al. 2017). Many opined that ships increase the CO₂ emanations since they convey the immense and more significant part of payloads, which requires a considerable measure of vitality, prompting

ozone-harming substance discharges (Taghvaei and Hajiani, 2015). Notwithstanding, the others guarantee that ocean transportation diminishes the CO₂ discharges attributable to its higher capacity of conveying mass freights, contrasted, and the other transportation modes. The heading and force of the relationship between maritime transportation, environmental pollution, and financial development assume an accommodating job in the environmental and monetary arrangement make.

From one viewpoint, maritime transportation grows CO₂ emanations. Numerous investigations trust that the vessels are considered as the primary hotspot for CO₂ outflows (European Sea Ports Organization, 2010; Gibbs et al., 2014; Taghvaei et al. 2017). Compared to other transportation modes, ships convey large measures of load, which need to consume an abnormal amount of fuel, prompting the emanation of a significant rate of CO₂ discharges (Taghvaei and Hajiani, 2016). Also, maritime transportation is the cause of about 2.2% CO₂ emanations made by human exercises on the planet in 2012 (International Maritime Organization, 2016). Given the Pollution Haven Hypothesis, exchange receptiveness increases environmental pollution in creating nations like Nigeria (Tang, 2015; Almulali and Tang, 2013).

Since maritime transportation is a channel through which worldwide trade directs towards Nigeria in a roundabout way elevating the environmental pollution in the nation. Then again, maritime transportation brings down CO₂ discharges. Although ships consume much energy, which causes CO₂ discharges, they are transporting the most significant volume of payloads, among other sorts of vehicles. From energy utilization viewpoint, it infers the high productivity of the maritime transportation mode (United Nations Framework Convention on Climate Change, 2016). Which relationship is the ruled one in Nigeria? The previously mentioned issues dispatch more grounded difficulties in developing and oil-trading economies, connected to the untamed ocean like Nigeria. Due to the more undermining status of developing nations in the environmental and financial issues, this test needs more consideration in Nigeria (Taghvaei et al., 2016; Taghvaei and Shirazi, 2014).

Moreover, the economy of Nigeria depends on the environmentally dirtying industry of petroleum products like oil and gas, requiring supertankers to convey. It disjoins the connection between maritime transportation, environmental pollution, and financial development in Nigeria. Hence, the heading and power estimations of the relationship among the environmental part of maritime transportation, environmental pollution, and financial development would manage the environmentalists and business analysts through strategy making in the maritime transportation of Nigeria.

The primary motivation behind this investigation is to assess the maritime transportation versatility of environmental pollution and the economy of Nigeria in the short-run and long-run to discover the connection between maritime transportation from one perspective, and environmental pollution and economic growth then again. These connections in short- and long-run give the strategy producers a more extensive viewpoint on their systems concerning their periods, short- and long haul plans. For this situation, they are likely proposed to grow moderately particular arrangements inside different time-ranges.

2.2 Research Objectives

- i. To examine the status of maritime transportation in Nigeria
- ii. To examine the nature of environmental pollution from maritime transportation
- iii. To examine the relationship between environmental pollution and economic growth in Nigeria
- iv. To determine the influence of maritime transportation on Nigeria economic growth
- v. To analyze the relationship between maritime transportation and environmental pollution in Nigeria
- vi. To make a recommendation(s) that will enhance the understanding of the Nigeria policymakers on policy formulation for maritime transportation and environmental pollution without compromising economic growth.

2.3 Research Questions

Going by the stated aim and objectives, the study will answer the following central and sub analytical research questions:

- i. Can economic growth be witnessed without deterioration in the quality of the environment?
- ii. Does economic growth enhance maritime transport in Nigeria?
- iii. What is the impact of maritime transport pollution on the economic growth of Nigeria?
- iv. Does maritime transportation contribute to environmental pollution in Nigeria?
- v. What is the direction of the relationship between maritime transport pollution and Nigeria's economic growth?

2.4 Research Hypotheses

H1: There is a relationship between maritime environmental pollution and the Nigerian economy.

H2: There is a relationship between maritime transportation and environmental pollution.

H3: There is a significant impact of maritime transport on the Nigerian economy.

CHAPTER 3

METHOD

3.1 Data: Type and Sources

This study employed secondary data. Theoretically, this study considers four possible variables; the variables are carbon dioxide emissions (CO₂), economic growth (GDP), marine transport (proxy with Liner Shipping Connectivity Index, LSCI), and trade openness (TR). CO₂, GDP, and LSCI are considered to be a vector. The choice of CO₂ emissions as the proxy for environmental pollution is in line with some previous studies (see European Sea Ports Organization, 2010; Gibbs et al., 2014; International Maritime Organization, 2016). CO₂ measures as those emissions stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring. The data is measured in metric tons per capita and sourced from the World Bank development indicator (2019).

In the study of Almulali & Tang, 2013; Tang 2015, two possible variables were considered playing the role of an endogenous variable for GDP as the dependent variable; maritime transportation and trade volume. In this study, GDP per capita (constant 2010 US\$) considered a proxy for economic growth. Gross domestic product per capita (GDP) is gross domestic product partitioned by the midyear population. Gross domestic product is the entire gross worth included by each and every inhabitant creator in the economy in addition to any product charges and shorts any sponsorship ousted in the estimation of the products. It is settled without making deductions for depreciation of made assets or depletion and degradation of standard resources. Information is in constant 2010 U.S. dollars.

Concerning maritime transport, UNCTAD (2018) used the Liner Shipping Connectivity Index (LSCI) as a marker of maritime transport. The LSCI is a marker of a nation's position inside

the general liner conveyance structures. It is settled from information on the world's container dispatch sending: the quantity of vessels, their container conveying limit, the quantity of administrations and organizations, and the size of the best ship. The contention for the LSCI by UNCTAD (2018) is that first, there is a clear linkage between trade costs and connectivity. Transport connectivity, together with coordination execution, are crucial determinants of trade costs and, therefore, of economic separations of making nations from business parts. Secondly, developing nations' regional and interregional trades are generally conveyed by techniques for sea. Therefore, in this study, LSCI was employed as a proxy for maritime transportation.

In this study, trade was introduced as a control variable. It determines those variables, which have a causal relationship with environmental pollution and those, which have a causal relationship with economic growth (see Farhani et al., 2014; Greene, 2012; Gujarati, 2004; Omri et al., 2015). Its definition is the sum of exports and imports of goods and services measured as a share of gross domestic product and measured as the percentage of GDP. CO₂, GDP, and TR were sourced from World Bank development indicators, while LSCI retrieved from UNCTAD. Moreover, the data are annual time series data set for the period 2000 – 2018.

3.2 Model Specification

Economic examination underwrites that there is a long-run relationship between variables under idea as stipulated by speculation, recommending that the long-run relationship properties are immaculate. Allegorically, the systems and separations are predictable and not expose to timetable. Tireless upgrades in econometrics have, regardless, revealed that as often as could be normal considering the present situation, most time technique is not stationary as was commonly suspected. Thus, a particular time approach may not indicate commensurate features. Henceforth, it is possible to see some time procedure that shows the fragment of detaching a long course from their mean after some time while others may meet to their mean as time goes on. Time blueprint that breezes a long way from their mean after some time is

said to be non-stationary. Along these lines, the customary estimation of variables with this relationship most events gives deluding enlistments or phony fall far from the confidence. To beat this issue of non-stationarity and prior confinements on the lag structure of a model, an econometric examination of time technique data has tenaciously moved towards the issue of cointegration. The reason being that cointegration is a groundbreaking approach for perceiving the closeness of suffering state concordance between variables. Cointegration has changed into a disavowing essential for any economic model using non-stationary time technique data. In case the variables do not cointegrate, by then, we have the issues of false fall far from the confidence, and the results in that become all around that truly matter vain. If the variables do cointegrate, by then we have cointegration.

This examination considered Autoregressive Distributed Lag (ARDL) cointegration framework or bound groundwork of cointegration (Pesaran et al. 2001), which have changed into the response for picking the long-run relationship between a strategy that is non-stationary, similarly as re-parameterization of them to the Error Correction Model (ECM). The re-parameterized result gives the short-run dynamics and the long-run relationship of the secured variables. Regardless, given the flexibility of the cointegration structure in studying the relationship between non-stationary variables and fulfilling the short-run dynamics with long-run balance, most experts still get the standard procedure for estimation regardless of when it is glaring to test for cointegration among the variables under thought.

A non-stationary time series is a stochastic strategy with unit-roots or aide breaks. Regardless, unit-roots are basic wellsprings of non-stationarity. The closeness of a unit root prescribes that a period strategy under thought is non-stationary while its nonattendance incorporates that a period course of action is stationary. This delineates unit root is one of the wellsprings of non-stationarity. Precisely when such non-stationary time strategy, utilized in estimation of an econometric model, the Ordinary Least Square (OLS) standard informative bits of learning for examination of the genuineness of the model checks, for example, coefficient of affirmation (R²), Fisher's Ratio(F-Statistic), Durbin-Watson(DW-Stat), t-estimation, and so on become

fundamentally dubious and risky concerning supposition and framework. In such a strategy, the mean, difference, covariance, and autocorrelation cutoff points change after some time and affect the long-run improvement of the approach. The closeness of unit root in these approaches prompts the infringement of suppositions of unflinching procedures and differences of OLS.

As clarified above, many time game-plan variables are stationary essentially in the wake of differencing. In this manner, utilizing differenced variables for breaks faith accumulate loss of fitting long-run properties or data of the understanding relationship between the variables under thought. This proposes we need to devise a strategy for holding the significant long-run data of the variables. Cointegration makes it conceivable to recover the huge long-run data of the relationship between the considered variables that had been lost on differencing. That is, it joins short-run dynamics with long-run balance. This is the reason behind getting sensible examinations of a model, which is the driver of vital theory and strategy execution.

Cointegration is worried over the examination of long-run relations between joined variables and reparameterizing the relationship between the considered variables into an Error Correction Model (ECM). Under the standard Granger (1981) and Engle and Granger (1987), cointegration examination is not material in instances of variables that are made out of various sales (i.e., $I(0)$ and $I(1)$) while it is relevant in ARDL cointegration method. The ARDL cointegration system is utilized in picking the long-run relationship between strategy with a substitute sales of union (Pesaran et al. 2001). The reparameterized result gives the short-run dynamics and the long-run relationship of the thought regarding variables regardless of the way that ARDL cointegration strategy does not require pre-testing for unit roots, to keep up an imperative division from ARDL model incident inside observing a melded stochastic case of $I(2)$, this examination directs the unit root test to know the measure of unit develops in the arrangement under consideration.

3.2.1 Unit Root Stochastic Process

A stochastic strategy Y_t is perceived to have a unit root issue if its first division, $(Y_t - Y_{t-1})$ is stationary. At last, the region of the unit root shows that the time strategy under idea is non-stationary, aside from if the pivot is the condition. On the other hand, a strategy with unit root does not will everything considered return to the long-run deterministic way, and the qualification in the course of action is time-subordinate. A procedure with unit root encounters enduring effects sporadic paralyzes; along these lines, search for after a discretionary walk. That is, using (despondent and free) time methodology that contains unit root in fall far from the confidence examination, the old-style potential aftereffects of the lose the confidence may astound. Regardless, $I(1)$ variables that display a sporadic walk around buoy may have a suggest that is predictable as time goes on, the run of the factory estimation of zero and, with inclining unpredictability; in like way making the game-arrangement with unit root to will when all is said in done return to a long-run course in the wake of evacuating deterministic model.

There are various systems for testing unit-roots. They join together; Durbin-Watson (DW) test, Dickey-Fuller test (1979) (DF), Augmented Dickey-Fuller (1981)(ADF) test, Philip-Perron (1988) (PP) test, among others. The most standard system for testing the stationarity property of a single time course of action joins using the Dickey-Fuller or Augmented Dickey-Fuller test, autonomously. The choice of the right tests depends on the set up of the issue, which is fundamental to the expert. It is difficult to search for after the latest advances or to understand the issues between using various tests. Looking results from changed test structures are the right technique for testing the affectability of our results. Along these lines, the unit-roots test is required to get to know the events a variable/approach must be differenced to achieve stationarity. From this comes the monstrosity of blend: A variable Y is said to be empowered of offers d , $I(d)$ if it achieved stationarity resulting in differencing the occasions.

3.2.2 The Augmented Dickey-Fuller (ADF) Tests for Unit Root

$$ADF Model: \Delta Y_t = \alpha_0 + P_1 Y_{t-1} + \alpha_2 T + \sum_{i=1}^k \alpha_i \Delta Y_{t-i} + u_t \dots\dots\dots (3.1)$$

ut is a pure white noise error term and $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$. The number of lagged difference terms to include is often determined empirically, the reason being to include enough terms so that the error term in the Dickey-Fuller model:

$$\Delta Y_t = P_1 Y_{t-1} + u_t \dots\dots\dots (3.2)$$

is serially uncorrelated. k is the lagged values of ΔY , to control for higher-order correlation. In ADF, $p=0$ is still tested and follows the asymptotic distribution as DF statistic. $H_0: p1 = 0(p1 \sim I(1))$, against $H_a : p1 < 0(p1 \sim I(0))$. A tremendous shortcoming of the primary Dickey-Fuller test is that it does not overview conceivable autocorrelation in the error framework ut. If μ_t is autocorrelated, the OLS evaluations of the conditions and its assortments are wasteful. In this manner, the central strategy is to apply ADF by utilizing the refinement lagged subordinate variable as illustrative variables to deal with the autocorrelation. The Augmented Dickey-Fuller (ADF) test is viewed as unavoidable in context on its inescapability and wide application. Since the ADF test alters the DF test to oversee conceivable autocorrelation in the error terms by including the lagged contrast term of the needy variable.

3.2.3 Cointegration Test

Johansen and Juselius (1990) cointegration procedure can't be related when one cointegrating vector exists, therefore, it winds up major to explore Pesaran, and Shin (1995) and Pesaran et al. (1996b) who proposed Autoregressive Distributed Lag (ARDL) approach to manage supervise cointegration or set out procedure toward a long-run relationship, irrespective of whether the covered variables are I(0), I(1) or a mix of both. In such a condition, the use of the ARDL approach to managing administer cointegration will give realistic and viable appraisals. Rather than the Johansen and Juselius (1990) cointegration procedure, Autoregressive Distributed Lag (ARDL) approach to managing direct cointegration helps in recognizing the cointegrating vector(s). That is, most of the pressing variables remain as a specific long-run

relationship condition. If one cointegrating vector (i.e., the hidden condition) is recognized, the ARDL model of the cointegrating vector is reparameterized into ECM. The reparameterized result gives short-run dynamics (i.e., regular ARDL) and the long-run relationship of the variables of a single model. The re-parameterization is possible in light of how the ARDL is a dynamic single model condition and of an identical structure with the ECM. Distributed lag Model philosophies the wire of unrestricted lag of the regressors in regression work. This cointegration testing procedure unequivocally makes us know whether the foremost variables in the model are cointegrated or not, given the endogenous variable.

3.2.4 Requirements for the Application of Autoregressive Distributed Lag Model (ARDL) Approach to Cointegration Testing

Irrespective of whether the hidden variables are $I(0)$ or $I(1)$ or a mix of both, the ARDL framework can be related. This avoids the pretesting issues related to standard cointegration examination, which requires the get-together of the variables into $I(0)$ and $I(1)$. This proposes the bound cointegration testing procedure does not require the pre-testing of the variables joined into the model for unit roots and is solid when there is a lone long-run relationship between the critical variables,

- a) If the F-statistics (Wald test) sets up that there is a specific long-run relationship, and the precedent data size is nothing or constrained, the ARDL error correction representation ends up being relatively more fit.

- b) If they look for after or Maximal eigenvalue or the F-measurements sets up that there is a single long-run relationship, ARDL approach can be related as opposed to applying Johansen and Juselius approach.

- c) If the F-measurements (Wald test) develops that there are different long-run relations, the ARDL approach cannot be related. In this manner, an elective procedure, as Johansen and

Juselius (1990), can be related. That is, if the different single expression/state of the basic individual variable as reliant variable shows an examination impact (different long-run relationships) between the variables, by then a multivariate procedure ought to be used.

3.2.5 Merits of ARDL Model

a) Since the majority of the significant variables remain as a particular condition, endogeneity is, to a lesser degree, an issue in the ARDL procedure since it is free of residual correlation (i.e., all variables are recognized endogenous). In like way, it empowers us to analyze the reference model.

b) The enormous great position of this procedure lies in its recognizable affirmation of the cointegrating vectors, where there are different cointegrating vectors.

c) When there is a solitary long-run relationship, the ARDL procedure can recognize poor and helpful variables. That is, the ARDL approach expects that solitary alone reduced structure condition relationship exists between the reliant variable and the exogenous variables (Pesaran, Smith, and Shin, 2001).

d) The Error Correction Model (ECM) can be gotten from ARDL model through an unmistakable direct change, which orchestrates short-run alterations with long-run balance without losing long-run data. The related ECM model takes an agreeable number of lags to capture the information creating process when all is said in done to unequivocal modeling structures.

3.2.6 The Procedure of the ARDL Cointegration Approach

Step 1: Certification of the Existence of the Long Run Relationship of the Variables

At the standard mastermind, the presence of the long-run relation between the variables under investigation is endeavored by registering the Bound F-measurement (set out test toward cointegration) to develop a long-run relationship among the variables. This bound F-measurement is done on most of the variables as they remain as an endogenous variable while others are ordinary as exogenous variables. Inside and out that matters, testing the relationship between the influencing variable(s) in the ARDL model prompts hypothesis testing of the long-run relationship among the basic variables. In doing this, the current estimations of the basic variable(s) are stayed away from the ARDL model approach to manage supervise Cointegration.

This approach is illustrated by using an ARDL (p, q) regression with an I(d) regressor,

$$y_t = \Phi_1 y_{t-1} + \dots + \Phi_p y_{t-p} + \theta_0 x_t + \theta_1 x_{t-1} \dots + q_1 x_{t-p} + u_{1t} \dots \dots \dots (3.3)$$

For convenience, the deterministic regressors such as constant and linear time trend are not included. Where Φ , θ_0 and θ_1 are unknown parameters, and x_t is an I(d) process generated by; $x_t = x_{t-1} + \epsilon_t$; u_t and ϵ_t are uncorrelated for all lags such that x_t is strictly exogenous concerning u_t . ϵ_t is a general linear stationary process.

(Cointegration/stability Condition) $|\Phi| < 1$, so the model is dynamically stable. This supposition that resembles the stationarity condition for an AR(1) process and proposes that there exists a stable long-run relationship among y_t and x_t . If $\Phi = 1$, by then, there would be no long-run relationship. In practice, this can also be denoted as follows: The ARDL (p,q1,q2.....qk) model approach to Cointegration testing;

$$\Delta X_t = \delta_0 + \sum_{i=1}^k \alpha_1 \Delta X_{t-i} + \sum_{i=1}^k \alpha_2 \Delta Y_{t-i} + \delta_1 X_{t-1} + \delta_2 Y_{t-1} + V_{1t} \dots \dots \dots (3.4)$$

k is the ARDL model maximum lag order and chosen by the user. The F-statistic is carried out on the joint null hypothesis that the coefficients of the lagged variables ($\delta_1 X_{t-1}$) are zero. ($\delta_1 - \delta_2$) correspond to the long-run relationship, while $(\alpha_1 - \alpha_2)$ represent the short-run dynamics of the model.

The hypothesis that the coefficients of the lag level variables are zero should go through testing. The null of the non-existence of the long-run relationship is defined by;

H₀: $\delta_1 = \delta_2 = 0$ (null, i.e. the long-run relationship does not exist)

H₁: $\delta_1 \neq \delta_2 \neq 0$ (Alternative, i.e., the long-run relationship exists)

This is tested in each of the models as specified by the number of variables.

This can also be denoted as follows:

$$FX(X_1/Y_1, \dots, Y_k) \dots\dots\dots (3.5)$$

$$Fy(Y_1/X_1, \dots, X_k) \dots\dots\dots (3.6)$$

The hypothesis is tested using the F- statistic (Wald test) in equation 3.5 and 3.6, respectively. The distribution of this F-statistics is non-standard, irrespective of whether the variables in the system are I(0) or I(1). The critical values of the F-statistics for a different number of variables (K), and whether the ARDL model contains an intercept and trend are available in Pesaran et al. (2001). The study gives two procedures of fundamental characteristics. One set, expecting that most of the variables are I(0) (i.e., lower essential bound which recognize most of the variables are I(0), recommending that there is no cointegration among the covered variables). Another is expecting that most of the variables in the ARDL model are I(1) (i.e., fundamental upper bound which recognize most of the variables are I(1), gathering that there is cointegration among the covered variables). If the relevant figured F-measurement for the joint centrality of the measurement variables in most of the conditions (4), δ_1 , and δ_2 falls outside this band, a persuading decision can be made, without the need to know whether the essential variables are I(0) or I(1), or to a restricted degree dealt with. That is, the time when the prepared F-measurement is higher than the upper bound head worth, by then the H₀ is rejected (the variables are cointegrated). If the F-measurement is underneath the lower bound significantly worth, by then the H₀ cannot be rejected (there is no cointegration among the variables). In case the figured measurement falls inside (between the lower and upper bound) the essential worth band, the result of the inference is imperfect and relies upon whether the fundamental variables are I(0) or I(1). It is at this stage in the examination that the virtuoso may need to do unit root tests on the variables.

Step 2: Selecting appropriate Lag Length for the ARDL Model/ Estimation of the Long Run Estimates of the Selected ARDL Model

The issue of finding the reasonable lag length for most of the huge variables in the ARDL model is central since we need Gaussian error terms (i.e., standard run of the production line error terms that do not encounter the noxious impacts of non-normality, autocorrelation, heteroskedasticity). To pick a reasonable model of the crucial long-run condition, it is fundamental to pick the perfect lag length(k) by using fitting model request decision criteria, for instance, the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC) or Hannan-Quinn Criterion (HQC). The ARDL model checks the given variables in their measurements (non-differenced data) structure. The lags of the variables should trade, model re-considered and compared. Model certification criteria-The model with the tiniest AIC, SBC examinations, or immaterial standard errors and high R2 performs relatively better. The evaluations from the best performed become the long-run coefficients. This is reasonable to set out if it is satisfied that there is a long-run relationship between the basic variables to keep up a key separation from false regression.

In each reasonable sense, this can similarly be inferred as follows:

The selected ARDL (k) model long-run equation;

$$Y_t = \delta_0 + \sum_{i=1}^k \alpha_1 X_{1t} + \sum_{i=1}^k \alpha_2 X_{2t} + \sum_{i=1}^k \alpha_3 X_{3t} + \sum_{i=1}^k \alpha_n X_{nt} + V_{1t} \dots\dots\dots (3.7)$$

X_s ($X_{1t}, X_{2t}, X_{3t} \dots X_{nt}$) are the explanatory or the long run forcing variables, k is the number of optimum lag order. The best-performed model provides estimates of the associated Error Correction Model (ECM).

Step 3: Re-parameterization of ARDL Model into Error Correction Model

In a situation where non-stationary variables regress in a model, we may get false results. One procedure for resolving this is to difference the data to achieve stationarity of the variables. For this circumstance, the examinations of the parameters from the regression model may be correct, and the deceptive condition issue resolved. Regardless, the regression condition gives us the short-run relationship between the variables. It does not give any information about the long-run direct of the parameters in the model. This incorporates an issue since researchers are

normally interested in long-run relationships between the variables under the idea, along these lines as to resolve this, the probability of cointegration and the ECM wraps up a target. With the assertion of ECM, we presently have both long-run, and short-run information joined.

The term ECT as the speed of progress parameter or information effect is resolved as the error term from the cointegration models. The ECT exhibits the measure of the disequilibrium is being corrected, that is, the degree to which any disequilibrium in the previous period is being adjusted in it. A positive coefficient shows a difference, while a negative coefficient shows blending. If the measure of $ECT = 1$, by the 100% of the modification occurs inside the period, or the change is enthusiastic and full, if the check of $ECT = 0.5$, by the half of the alteration, happens each period/year. $ECT = 0$ shows that there is no change, and to ensure that there is a long-run relationship does not look great anymore.

3.3 Method for the Study

This study first proposed a single equation with four-time series Y_t, X_t, K_t, Z_t as follows:

$$Y_t = c + \alpha X_t + \beta k_t + \delta z_t + \varepsilon_t \quad (3.8)$$

In line with the ARDL bounds test as proposed by Pesaran et al. (2001), we first ensured that none of the series employed in this study is I(2). Therefore, the stationarity test was done using the Augmented Dickey-Fuller test and Philip Peron Test. The ARDL model with the Bound Test method predicated on Ordinary Least Square (OLS) estimation, which used a conditional free error correction model for determining cointegration among the variables employed. This is to ensure whether there is a long-run relationship between the variables. According to Pesaran et al. (2001) cited in Cai, Sam and Chang (2018), ARDL for this study could be written as follows:

$$Y_t = \gamma_0 + \sum_{i=1}^p \delta_i Y_{t-i} + \sum_{i=0}^q \beta_i X_{t-i} + \varepsilon_{it} \quad (3.9)$$

Where Y_t is a vector and the variables in (X_t) are allowed to be purely $I(0)$ or $I(1)$ or cointegrated; β and δ are coefficients; γ is the constant; $I = 1, \dots, k$; p, q are optimal lag orders; ε_{it} is a vector of the error terms.

However, where there is cointegration, according to Pesaran et al., (2001), the model could be written as follows:

$$Y_t = \gamma_0 + \sum_{i=1}^p \delta_i Y_{t-i} + \sum_{i=0}^q \beta_i X_{t-i} + \lambda ECT_{t-1} + \varepsilon_{it} \quad (3.10)$$

The lag order is necessary to avoid over-parameterization of the model. In line with Goh et al. (2017), the Breusch-Godfrey Serial Correlation LM test was employed to test for serial correlation in each equation, while Breusch Pagan-Godfrey Heteroskedasticity was also used to determine that the model is free from the heteroskedasticity problem. Jarque-Bera test was however employed for normality tests. As for the stability of the model, this study followed the work of Thao and Hua (2016), which cited the work of Narayan and Smyth (2005), that cumulative sum of recursive residuals (CUSUM) should be applied in determining the stability of ARDL model.

To analyze the parameters corresponding to variables of interest from the data under consideration, we employed ARDL bounds test for the cointegration approach, which we found appropriate for the estimate of both long and short-run causal relationships between our dependent variable and independent variables in the study model. In line with Pesaran et al. (2001), ARDL model with the bound test was employed; this approach based on the Ordinary Least Square (OLS) estimation of a conditional free error correction model for cointegration analysis. This is in pursuance to the aim of this paper that seeks to test for the existence of a long-run relationship and to estimate the long and short-run causality of the independent variables on the dependent variable.

Thao & Hua (2016) cited Bannerjee et al. 1993 that the ARDL model shows that a dynamic error correction model (ECM) follows a simple linear transformation where the ECM embedded the short-run dynamic with long-run equilibrium without having any information

lost. Inconsistency with Pesaran and Pesaran (1997) and Pesaran and Shin (2001) cited in Thao & Hua (2016), the augmented ARDL (p, q1, q2 ... qk) obtained by rewriting equation 2 in terms of the lagged levels and the first difference of $Y_t \dots X_{it} \dots X_{2t} \dots X_{kt}$ and w_t as follows:

$$\Delta Y_t = \delta_0 + \delta_{1t} + \pi_{yx} Z_{t-1} + \sum_{i=1}^{p-1} \alpha_i \Delta Y_{t-i} + \sum_{i=0}^{q-1} \alpha_i \Delta X_{t-i} + \gamma_t w_t + \varepsilon_t \dots \dots (3.11)$$

Where Δ is the first difference operator, t is the trend, the coefficient of α_i represents the short-run dynamics of the model, and π_{yx} and Z_{t+1} are long-run multipliers that show the convergence of the model to equilibrium, while w_t is a vector of the exogenous component.

Hence for this study, the model can be written as follows:

$$\Delta LNGDP = \beta_0 + \sum_{i=1}^{p-1} \beta_{1i} \Delta LNGDP_{t-i} + \sum_{i=0}^{q-1} \beta_{2i} \Delta CO_{2t-i} + \sum_{i=0}^{q-1} \beta_{3i} \Delta LSCI_{t-i} + \sum_{i=0}^{q-1} \beta_{4i} \Delta TR_{t-i} + \varphi ECT_{t-1} + \varepsilon_t \dots (3.12)$$

The choice of ARDL Bound test approach for this study based on the argument of Pesaran and Pesaran (1997) cited in Thao & Hua (2016) that the method performs significantly in case of small size. It also contradicts the conventional way of determining a long-run relationship, which failed to estimate the ARDL method system of equation, rather only estimate a single equation. Moreover, the ability to accommodate different variables in a model with different optimal lag. Lastly, Pesaran et al. (2001) argued that in a situation where the nature of the stationarity of the data is confusing, the application of the ARDL bounds test is useful.

CHAPTER 4

RESULTS AND DISCUSSION

This section comprises of different steps involved in the analysis of the data, the findings, and discussions. This section starts with a descriptive analysis of the data. In this section, the characteristics of the variables included in the analysis were described; this is done to ensure the understanding of the data. In subsequent sections, the unit root analysis conducted for the variable, this is to ascertain that none of the variables employed in the study is of order (2), so as not to contravene the assumption of autoregressive distributive lag (ARDL), which allowed the combination of variables integrated on order (0) and (1), but not order (2). After ascertaining the stationary properties of the variables, we proceeded to a selection of appropriate lag length for the model, after which the cointegration analysis of the variables was carried out using bound test and subsequently, a short and long-run analysis was carried out.

Lastly, a residual diagnostic test was conducted. The test is essential in ensuring that the results from the analysis are free from an analytical problem and suitable for prediction.

4.1 Descriptive Analysis of Variables

The descriptive analysis of the variables was undertaken to understand the characteristics of the variables that were employed in the study. In the first place, because of the period under observation which spanned between 2000 and 2018 (i.e., 19 years of observations), this is considered to be a low frequency, and in order to enhance the frequency, the variables were converted from annual data to quarterly data. The high-frequency data is believed to have more accuracy than the low frequency. The conversion was done using the quadratic function

in the Eviews package to achieve accuracy of the conversion. After the conversion, the descriptive analysis was performed, and the summary of the results presented in Table 1.

The result, as presented in Table 1 reveals that carbon dioxide emissions in Nigeria during the period observed have a mean value of 0.65 metric tons per capita, while the maximum and minimum values for emissions during the period are 0.78 and 0.49, respectively. Meanwhile, the standard deviation value of 0.09 indicates that the year has a minimal deviation from the mean value during the period observed. Moreso, out of the 76 observations, 60 observations were available for CO₂ emissions. According to UNCTAD Handbook of Statistics (2018), South Africa was considered to be the Africa best-connected economy connected to global liner connectivity based on the LSCI. The trend of CO₂ emission within the period under study as depicted in Figure 4.1 indicates that the CO₂ emission of Nigeria is about one metric tonne per capita annually in comparison to South Africa, which averages annually above nine metric tonnes per capita.

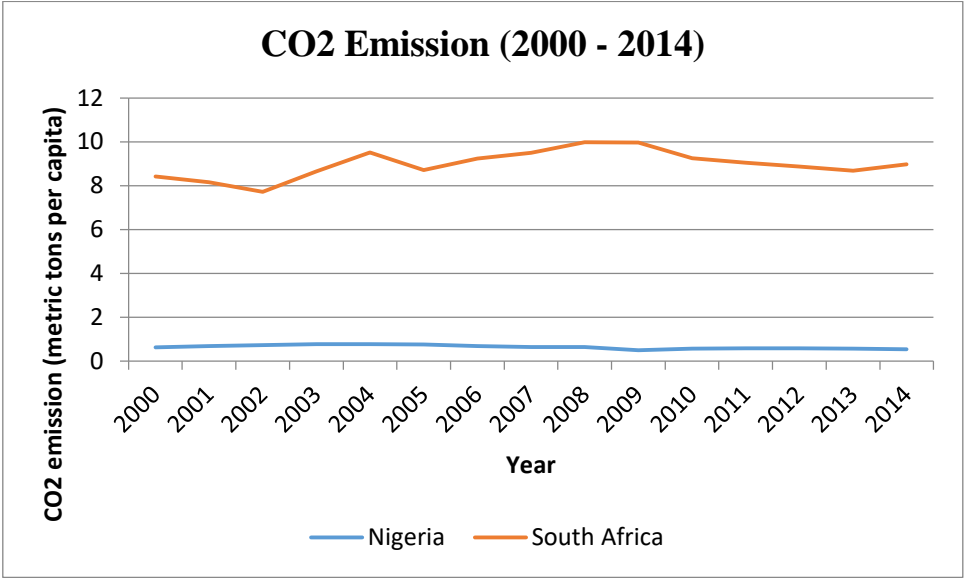


Figure 4.1: CO₂ emissions (2000 – 2014) of Nigeria and South Africa

The descriptive analysis of the GDP reveals that the mean value is 7.62, while the maximum and minimum values are 7.86 and 7.23, respectively. The low standard deviation value of 0.20

signifies that the values for the GDP across the years under observation are close to the mean value. In other words, the variation of the values from the mean value is minimal. Meanwhile, out of the 76 observations, 72 observations were made. Even though Nigeria is found to have less CO₂ emission in comparison to South Africa, the trend of economic growth, as depicts in Figure 4.2 shows that Nigeria's economic growth is in better form than South Africa's neighboring country. The trend of economic growth in Nigeria about CO₂ emission violates some assumptions in the literature that the higher the economic growth, the higher the CO₂ emission.

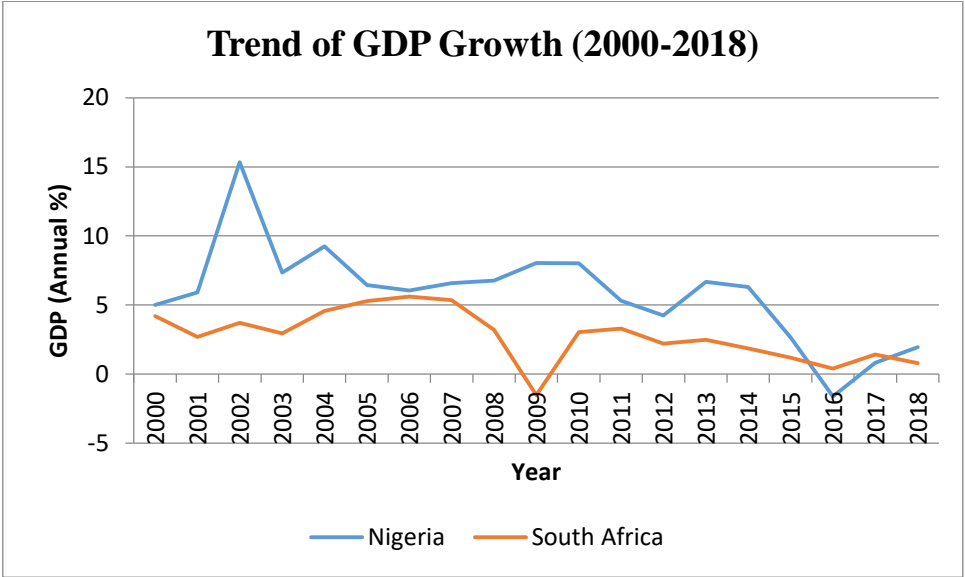


Figure 4.2: Trend of GDP growth (2000 – 2018) of Nigeria and South Africa

As for the marine transport which was proxy with the Liner Shipping Connectivity Index (LSCI), the descriptive analysis shows that though Nigeria’s connectivity index is still at lower value with the mean value that stood at 18.43% while the maximum and minimum index is 23.01% and 12.76% respectively. Meanwhile, the standard deviation is a bit high with a value of 3.50, which indicates that the indexes among the years under observation are at variance from the mean value.

The 60 observations recorded out of 76 observations were as a result of the period that the UNCTAD who computed the index commenced the compilation of the index, which was in the year 2004.

As for the Liner Shipping Connectivity Index, which is the proxy for maritime transport, the index, as Figure 4.3 depicted indicates Nigeria is less connected with maritime transport, which could be related to why having less CO₂ emissions in comparison to South Africa.

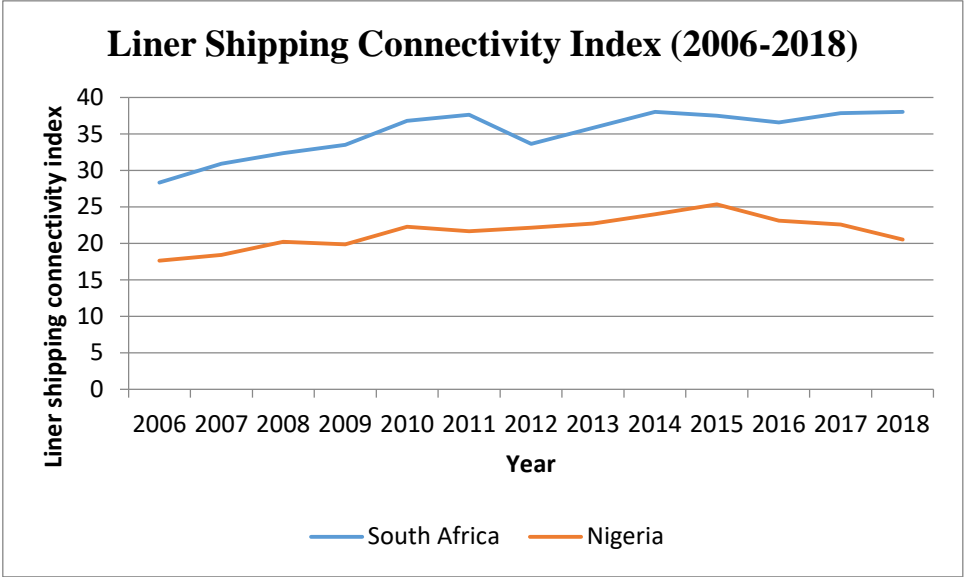


Figure 4.3: Liner Shipping Connectivity Index (2006 – 2018) of Nigeria and South Africa

Table 4.1: Descriptive Analysis of Variables

Statistics	CO ₂	LNGDP	LSCI	TR
Mean	0.65	7.62	18.43	37.96
Median	0.64	7.66	19.77	39.44
Maximum	0.78	7.86	23.01	53.94
Minimum	0.49	7.23	12.76	19.81
Std. iDev.	0.09	0.20	3.50	9.62
Observations	60	72	60	72

The trade value for Nigeria, as shown in Table 1, depicts significant trading activities in the country. During the period under observation, the analysis result, as shown in Table 4.1 reveals that the country recorded a trade mean value of 37.96%, the median value (39.44%),

while the maximum and minimum values are 53.94% and 19.81% respectively. The high value of 53.94%, which is the value of import and export as a percentage of GDP could ascribe to the economic development that is witnessing in the country in recent times. The standard deviation value is 9.62, which is not too high to suggest a high variation of the values from the mean value, and 72 observations were recorded out of the 76 observations. Even though it shows in Figure 4.2 that Nigeria economic growth is performing better than South Africa, the trade (as % of GDP) as depicted in Figure 4.4 reveals that Nigeria engages in less trade (international) which involves the use of maritime transport, compares to the trend of South Africa trade.

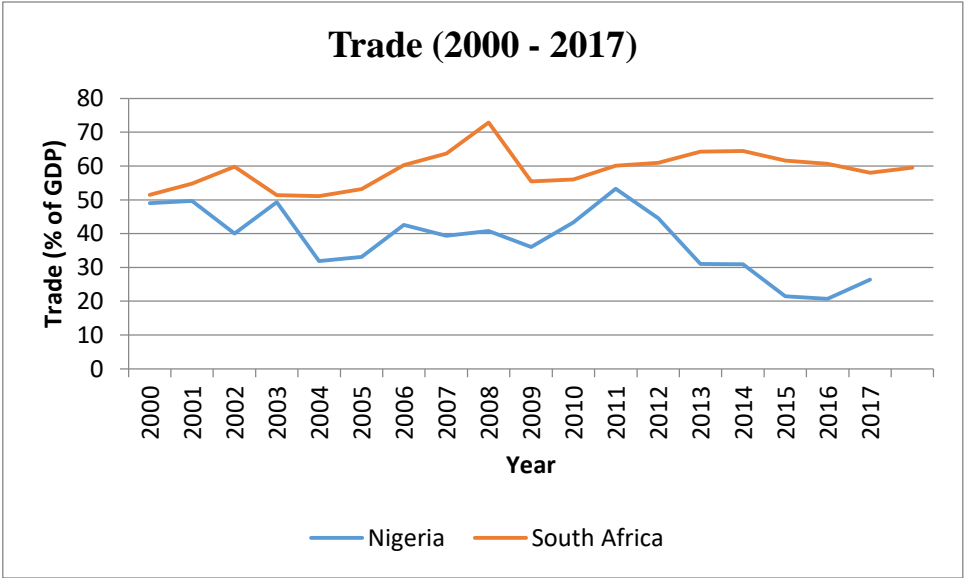


Figure 4.4: Trade (2000 – 2017) of Nigeria and South Africa

4.2 Unit Root Test

For the analysis of the unit root test, Augmented Dickey-Fuller (ADF) (1981) was employed. The test was applied based on its superiority, popularity, and full application over other tests for stationary properties of variables. Meanwhile, in order to test the sensitivity of the result

from the test, Philip-Peron (PP) (1988) was employed. It is believed that comparing different results from different test methods is a better way of testing the sensitivity of our results.

Table 4.2: Unit Root Test

Variable	ADF Test		PP Test		Order of Integration
	Level	1 st Difference	Level	1 st Difference	
CO ₂	-1.22	-1.71***	-0.99	-4.13*	I(1)
LNGDP	-3.38**	-	-2.82***	-3.34**	I(0)
LSCI	-2.26	-1.18	-3.62*	-	I(0)
TR	-2.13**	-	-1.82	-4.76*	I(0) & I(1)

Note: *, **, *** denotes 1%, 5% and 10% respectively

The analysis result, as presented in Table 4.2, reveals that CO₂ is non-stationary at level, but becomes stationary after first differencing. The PP-test confirmed the result from ADF, which makes it safe to conclude that CO₂ is an order (1) variable. However, LNGDP is found to be stationary at level. This is also revealed in the result of the PP-test. The case of LSCI is a little different, because out of the two tests, only PP-test confirmed its stationary property at order (0), while ADF could not determine its stationarity at both levels and first difference.

Lastly, the result for trade (TR) indicates that while the ADF test shows the variable to be integrated at order (0), PP-test indicates its stationarity after the first difference. The significant issue about the TR stationarity is that both tests confirmed that the variable is not an order (2) variable. In summary, it could be deduced from the summarized results, as presented in Table 2 that the four variables (CO₂, LNGDP, LSCI, TR) are all integrated at order (0) and (1), and none is an order (2) variable, which makes it safe for this study to proceed with the application of ARDL model for further analysis.

4.3 Bound Testing for Cointegration

In order to determine the cointegration among the variables, and the possibilities of existing long-run relationships, the bound test for cointegration was computed. This was done on each

of the variables by putting one of the variables as the endogenous variable and others as exogenous variables. By doing these, if the relevant computed f-statistic for the joint significance of the level variables in equation (3.4) is higher than the upper bound critical value (I(1)), then the H0 is rejected that the variables are cointegrated and there is the existence of a long-run relationship among the variables. However, we will fail to reject H0 if the computed f-statistic is less than the I(0) lower bound value and conclude that there is no cointegration among the variables. Moreover, in this case, the model will be reparameterized to determine the short-run and error correction model (ECM). The reparameterized model (equation 10) will enable us to show how much of the disequilibrium is being corrected. While a positive coefficient indicates divergence from the equilibrium, a negative coefficient indicates convergence to the equilibrium.

Table 4.3: Cointegration Test

	F-Stat.	I(0) Bound	I(1) Bound	Cointegration
Model i1	9.49	3.23	4.25	Yes
Model i2	1.39	3.23	4.25	No
Model i3	2.28	3.23	4.25	No
Model i4	2.98	3.23	4.25	No

Note: Model 1 = $LNGDP = f(CO_2, LSCI, TR)$, Model 2 = $CO_2 = f(LNGDP, LSCI, TR)$, Model 3 = $LSCI = f(LNGDP, CO_2, TR)$, Model 4 = $TR = f(CO_2, LNGDP, LSCI)$

The result from the analysis, as summarized in Table 4.3 indicates that in Model 1 when LNGDP is the dependent variable, the calculated f-statistic (9.49) is found to be higher than I(1) bound. As such, the H0 is rejected, and conclude that there is cointegration among LNGDP, CO₂, LSCI, and TR, which also signifies a possibility of long-run relationship running from CO₂, LSCI, and TR to LNGDP. Meanwhile, the result is different in Model 2, 3, and 4, when CO₂, LSCI, and TR are dependent variables, respectively. The bound test for cointegration in the two models reveals that the computed f-statistics are lower than the I(0) bound value. Therefore, we failed to reject the H0 and conclude that there is no cointegration among the variables when CO₂, LSCI, and TR are dependent variables, respectively.

Moreover, it also implies that there is a possibility of no long-run relationship running from other variables to CO₂, LSCI, or TR.

4.4 Variable Lag Order Selection

In order to have Gaussian error terms, i.e., the error terms that do not have an issue of non-normality, autocorrelation, heteroskedasticity, it is necessary to choose an appropriate lag length for each of the variables. ARDL model allows each of the variables to have different lag lengths. In doing these, the appropriate lag length is determined by using a proper model order selection criteria such as the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), Hannan-Quinn Information Criterion (HQ), Segmented Modified LR Test Statistic (LR) or Final Prediction Error (FPE). The variables were estimated using the unrestricted VAR method, and the information criterion with the small standard errors and high R² perform better.

The results as summarized and presented in Table 4.4 shows that the entire five information criterion selected lag (2) as the appropriate lag length for all the variables. If an appropriate lag length is selected, it will enable the analysis to be devoid of spurious regression.

Table 4.4: Variable Lag Order Selection

Variable	LR	FPE	AIC	SC	HQ
CO ₂	2	2	2	2	2
LNGDP	2	2	2	2	2
LSCI	2	2	2	2	2
TR	2	2	2	2	2

LR: Sequentially modified LR test statistic, FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

4.5 Analysis of Long-run Causality

In the ARDL model, it is possible to infer causality, relationship, and the direction of the relationship from the analysis. From the bound testing for Cointegration, model 1 shows the

variables are cointegrated, which is an indication that there is a possibility of a long-run relationship to be existing and the relationship running from the independent variables to the dependent variable. The result, as shown in Table 4.5, reveals that there is a long-run relationship running from CO₂ emissions to economic growth (GDP). The sign of the coefficient is negative (-), which implies that a percentage change in CO₂ emissions will lead to an adverse change in the economic growth of Nigeria in the long-run. The negative impact is found to be statistically significant at a 1% confidence level.

Meanwhile, maritime transport (LSCI) is found to have a positive influence on the economic growth (GDP) of Nigeria. The result in Table 5 indicates that there exists a positive long-run relationship between maritime transport and the economic growth of Nigeria. The result is found to be statistically significant at a 5% confidence level, which makes it safe to conclude that maritime transport has a positive impact on the economic growth of Nigeria.

As for the trade, the results, as summarized in Table 4.5, indicate that there is a negative and statistically significant long-run relationship running from trade (TR) to economic growth (GDP). The negative sign of the coefficient for trade could be as a result of the trade deficit of most of the developing countries, in which Nigeria is part. Nigeria is an import-oriented country, and the country export less compares to its import. This could hurt the economic growth, which could adduce to why the result of the long-run relationship running from trade to economic growth turned out to be negative. Moreover, from Table 4.5, it shows that there exists a positive and statistically significant long-run relationship running from GDP (economic growth) to maritime transport. In other words, economic growth has a positive influence on maritime transport in the long-run.

In summary, CO₂ and TR have a negative influence on GDP in the long-run, while maritime transport (LSCI) has a positive long-run relationship running to economic growth and vice-versa. In terms of the direction of relationship, it was found that there is a unidirectional long-run relationship between GDP and CO₂, GDP, and TR, while there is a bi-directional long-run relationship between economic growth and maritime transport. The bi-directional long-run

relationship between economic growth and maritime transport implies that economic growth influences maritime transport, while maritime transport also positively influences economic growth.

Table 4.5: Long-run Causality Estimate

Dep. Variable	Independent Variable			
	Δ LNGDP	Δ CO ₂	Δ LSCI	Δ TR
Δ LNGDP	-	-0.66*(0.24)	0.01**(0.01)	-0.004**(0.002)
Δ CO ₂	1.22 (1031)	-	-0.05 (0.04)	0.001 (0.004)
Δ LSCI	32.58*(8.72)	2028 (12.11)	-	010 (0.09)
Δ TR	169.76 (166.39)	-192.52 (155.04)	-10.87 (8.02)	-

Note: *, **, *** denotes 1%, 5% and 10% respectively

4.6. Short-run Causality Estimate

The result for short-run causality estimates, as summarized and presented in Table 4.6 reveals that a short-run causality and relationship are running from trade to economic growth. The relationship is negative, which is similar to the result obtained for long-run relationship estimates. The result of short-run causality found running from trade to economic growth indicates that there is a strong causality of trade on economic growth. Meanwhile, the Error Correction Term (ECT) value of -0.05 which is statistically significant at 1% confidence level indicates that there is a joint causality of CO₂ emissions, maritime transport, and trade openness on the economic growth of Nigeria, and there will be a convergence at 5% speed of adjustment. In other words, in case of any external shock, the model will adjust back to the equilibrium at 5% speed of adjustment.

In line with the specification of ECT that if the coefficient is negative (-) and statistically significant, there will be a convergence in the model, but if it is positive (+), there will be a divergence from the model. Therefore, in model 1 where the economic growth is the dependent variable, and CO₂ emissions, maritime transport, and trade are predictors, it is safe to conclude that there will be convergence to the model in case of any shock at 5% speed of

adjustment. Moreover, other results, as summarized in Table 4.6, reveal that maritime transport has a negative causal effect on CO₂ emissions in the short-run, which is statistically significant at a 5% confidence level. Meanwhile, economic growth is found to have a positive causal effect on maritime transport in the short-run at 10% confidence level, while trade is found to have a positive causal effect on maritime transport, and it is statistically significant at 5% confidence level. Similar to Model 1 where the coefficient of the ECT is negative (-) and statistically significant, the ECT value is -0.17 which implies that the joint causal effect of economic growth, CO₂ emissions, and maritime transport on trade openness is statistically significant and there will be convergence to the model at the speed of 17% in case of any external shock to the model.

In summary, there is a unidirectional short-run causality running from trade openness to economic growth; unidirectional short-run causality running from maritime transport to marine pollution (CO₂), and unidirectional short-run causality running from trade openness to maritime transport. Moreover, lastly, the combination of marine pollution, maritime transport, and trade openness are found to have a joint influence on economic growth. Also, the combination of economic growth, emissions, and trade are found to have a joint short-run causality influence on maritime transport.

Table 4.6: Short-run Causality Estimate

Dep. Variable	Independent variable				
	Δ LNGDP	Δ CO ₂	Δ LSCI	Δ TR	ECT
Δ LNGDP	-	-0.66	0.001 (0.0004)	-0.0002*(0.0001)	-0.05*(0.01)
Δ CO ₂	0.12 (0.08)	-	-0.01**(0.002)	0.0001 (0.0004)	-0.10 (0.07)
Δ LSCI	50.06***(29.46)	-6.03 (3.62)	-	0.09**(0.04)	-0.17**(0.07)
Δ TR	13.22 (10.22)	25.78 (18.84)	0.89 (0.86)	-	-0.08 (0.05)

Note: *, **, *** denotes 1%, 5% and 10% respectively

4.7 Residual Diagnostics Test

The analysis result residuals were put to the test to ensure that the computed coefficients and statistics in this study are safe for making predictions and decision making. Four different

tests, namely normality, serial correlation, heteroskedasticity, and white noise (ARCH) test, were carried out. The results are summarized and presented in Table 4.7. From the results presented in Table 4.7, for the model 1 where GDP is the dependent variable, and CO₂, marine transport, and trade are independent variables, the residual diagnostic test reveals that out of the four tests conducted, the model failed only the normality test, and passed the serial correlation LM test, heteroskedasticity test and ARCH test. This is a good outcome as the computed coefficient from the model does not fare badly, and shows that the result from the analysis of model 1 is safe for making predictions and policy formulations; because the residual analysis has shown that the results are not spurious.

Similar to model 1, the residual analysis for model 2 suffers a setback in the normality test. However, the three (3) other tests that the model passed is considered to be suitable for accepting the results found from this model. The diagnostic test result for model 3 is not different from the previous two models, but model 4 residual diagnostic test result shows that the model passed all the four tests. In summary, the diagnostic test of the model results reveal that the results from the analysis are not spurious having passed the majority of the test, this has given credence to the validity of the computed coefficients and statistics, and it's safe to conclude that the results found in this study are appropriate and reliable for prediction and policymaking.

Table 4.7: Diagnostic Test

Model	Test			
	Normality <i>P-value</i>	Ser. Corr. LM Test <i>P-value</i>	Heterosc. Test <i>P-value</i>	ARCH <i>P-value</i>
1	0.01	0.17	0.38	0.45
2	0.00	0.64	0.28	0.82
3	0.00	0.11	0.57	0.68
4	0.21	0.68	0.37	0.70

4.8 Testing of Hypotheses

This study proposed three (3) hypotheses, which are all stated in the alternative hypothesis form as follows:

H1: There is a relationship between marine environmental pollution and the Nigerian economy.

H2: There is a relationship between marine transportation and environmental pollution.

H3: There is a significant impact on marine transport on the Nigerian economy.

4.8.1 HYPOTHESIS ONE

The inferences for the hypotheses were made from the analysis done, which has been interpreted in the preceding sections. Hypothesis 1 is to determine the relationship between marine environment pollution (which is proxy with CO₂ emissions in this study), and the Nigerian economy (GDP). The result, as summarized and presented in Table 4.5, shows that a long-run relationship exists and running from marine environmental pollution to economic growth. Since the coefficient of the marine environmental pollution is statistically significant at 1% confidence level, this study, therefore, rejects the null hypothesis and concludes that there is a relationship between marine transport pollution and the Nigerian economy. The result is consistent with the study of Akbostanci et al., 2009; Fodha and Zaughdoud, 2010, who found a straight connection between environmental pollution and economic growth. Similar studies by Chen et al., 2017 found pollution to be among the factors influencing economic growth. In the case of Nigeria, the result of this study is in agreement with the work of Iduk and Samson, 2015; Onwuegbuchunam et al., 2017 in their studies found marine pollution to have a relationship with Nigeria economic growth. However, the result is in contrast to the study of Akpan and Chuku (2011), who could not find an essential outcome in their study to examine the presence of the environmental Kuznets curve in Nigeria.

From the disclosures above, we can reason that there are approaches to manage environmental conditions, which are changes in the structure of the economy, chopping down the negative impact on the earth through scale impact and improvement in sea transportation. Regular activities are responsibilities for better environmental developments and improvement of traits

of environmental frameworks. The environmental pollution effect of economic development begins from two key pathways that have been generally considered in the creation, among which is the favorable position base expected to make a foundation to pass on crucial economic development results, for example, access to transport.

Inside development talk, there is an insistence that some environmental pollution will be an inevitable outcome of accomplishing other essential development wants, most beginning late adored in the United Nations' 17 SDGs up to the year 2030. In any case, the linkages and examination circles that exist between the separating of nature and other development results save the benefit of being considered as a complicated structure. The framework remains an essential direct determinant of environmental effects from economic development in absolute terms. Streets and other transport structures are the most all-around reviewed effect class in this field as it is viewed as a course for different sorts of pollution-elevated foundation development too. A fantastic bit of the examination on these effects have concentrated on woods range, land debasement, and biodiversity decay as critical markers of all-around environmental quality decreasing.

The Organization for Economic Cooperation and Development (OECD) facilitated the most thoroughly perceived by and large economic and environmental change models of entire arrangement development-condition linkages in their OECD Environmental Outlook 2030. The outcomes unmistakably show that economic development, which was likely going to happen up to 2030 by and large in making nations, would have ensured environmental ramifications. The general thought of the environmental effect of the development would increase in developing nations, especially concerning sulfur dioxide pollution from the non-reasonable power source, noteworthiness age, and impedance of channels. Accordingly, imagining models experience that further economic development in developing nations is undoubtedly going to inside and out rot pollution levels in an 'old news condition, and like this, pollution control parts would be required to relieve these effects.

In any case, despite this condition of a 'win-win' result bearing, some literature reviewed demonstrates that general pollution stacking, especially in channels, has been legitimately connected with economic development. Pollution, especially downstream from the polluter, can be a fantastic externality issue wherein the decreasing of the pollution to ensure those downstream or partition for pollution charges has an expedient expense on the polluter. Precisely, when the degraded asset is, by one way or another, ordinary as an advantage, the motivations for facilitated exertion on pollution control increment. Not at all like a 'disaster of the center,' where a compliment on the proportion of extraction prompts is usage, in a model where asset quality is the locus of premium, continuously observable venture conceivable. There is making confirmation of the negative effect of pollution on economic development, which this examination is conflicting with, and that we have to give unquestionably more idea to pointers of environmental damage, for example, the regular passing on the ability to avoid irreversible waywardness to unequivocal common structures that additionally continue with occupations. Regardless of speedy effects of environmental structures that can impact customary capital, which in this way impacts development, there is in like way, a basic episode in profitability accomplished by the thriving effects of pollution.

4.8.2 HYPOTHESIS TWO

The outcome of hypothesis 2, is to determine the relationship between marine transport and environmental pollution, as presented in Table 4.6. The results indicate that there is a short relationship between marine transport and environmental pollution, which is also found to be statistically significant at a 5% confidence level. Therefore, the study rejects the null hypothesis that there is no relationship between maritime transport and environmental pollution, and concludes that in Nigeria, there is a relationship between marine transport and environmental pollution. This study finding is similar to the work of Taghvaei, Omaraei, and Taghvaei, 2017; Smith et al., 2014, who, in their studies established a relationship between marine transport and environmental pollution. Even in the study of European Commission, EC

(2013), in their study carried out on European countries to determine factors contributing to the environmental pollution within the member countries, the outcome confirmed maritime transport as a determinant factor.

Marine transportation is responsible for moving billions of dollars of items reliably, addressing more basic than 90% (by weight) of overall trade. Regardless, the high volume of overall marine transportation is also related to negative environmental consequences for the marine condition. Marine transportation presents different repercussions for the earth as it appears in this examination result. Emanations produced using the transportation businesses are a basic supporter of the overall outpourings, and conditions for future exercises show a significant expansion in vitality use and discharges.

Relief degrees of those impacts are essential to check the earth, particularly the marine condition. Those moderation measures ought to be locked in at watching out for the environmental impacts of marine transportation. In light of audits of current practices of an environmental association in the movement business, the board answers for the territory that the environmental impacts of marine transportation ought to be in terms of; guidelines and enforcement; mechanical Solutions; neighborhood and International initiatives; prodding force and surrendering; and management.

Planning the movement business through request is one of the critical association approaches that are in the long run all around to dismiss the impacts of marine transportation on the earth, Nigeria ought not to be a one of a kind case. The foundation went for ensuring the earth is associated with the development and the leading group of port work environments and marine transportation affiliations. The approval is not the essential association answer for environmental pollution and marine transportation toward supportability. Specific strategies are required to refresh environmental stewardship. Several experts consider the transportation business as a pioneer in green development, and this industry can handle green advances. This industry now has access to some front line headways, for example, critically gainful motors, significance change frameworks, composite structure, LNG, a structure for equalization sans water task, scrubbers, sail sponsorship, or teammate control work environments. Regardless,

specific reactions for zero-discharge vessels and elective marine fills should be besides broken down to support the weight on the marine condition from transportation.

Concerning the adjacent by and large endeavors, it decreases the impacts of marine transportation on nature. Activities taken by the ESPO is a normal development that assisted different European port masters with updating port environmental execution, the Nigerian government can display a general course to these and go over the indistinguishable in Nigeria. For example, ESPO's EcoPorts mechanical congregations (e.g., SDM and PERS) are correctly now all around perceived, and different ports and holder terminals outside of EU have picked up the PERS explanation, and they are before long under the EcoPorts make. For instance, five ports in Mexico, three ports in Colombia, a port in Peru, a port in Chile, a compartment terminal in Jordan, a port in Cyprus, and seven ports in Taiwan are legitimately under the EcoPorts model (ECOSLC, 2017). Giving impelling force through lessening a port commitment to the barges similarly as yielding green vessels is another association answer for empowering dispatch proprietors toward sensible or green transportation.

Uncovering issues about maritime environmental standards, clean movements, best environmental association practices, and contemporary transport issues the world over is another basic association game-plan. Revealing issues is primary among the transport business to get a handle on the centrality of taking proactive measures to ensure the marine condition and envision forefront issues to be substantial. Planning and reaction gauges help in envisioning the impacts of the troublesome occasion and outstanding issues relating to marine transportation, which is an essential outcome of consideration stemming from which movement industry in Nigeria can be profited from confirming the marine condition in the nation.

4.8.3 HYPOTHESIS THREE

In the case of hypothesis 3 to determine the significant impact of marine transport on Nigeria's economy, the finding from this study as depicted in Table 4.5 suggests a long-run causal impact of maritime transport on the economic growth of Nigeria. As it is shown in Table 4.5, the coefficient of maritime transport on economic growth is found to be positive and statistically significant at 5% confidence level. Therefore, the study rejects the null hypothesis and concludes that there is a significant impact of maritime transport on the Nigeria economy. The finding from this study is not a deviation from previous studies which have found similar outcomes in their studies. Vuik et al. (2010) did similar studies on the Dutch economy and found maritime transport to influence the Dutch economy significantly.

Related to that is the study of Morrissey et al., 2011; and Colgan, 2013 who found similar results of the significant impact of maritime transport on economic growth. Moreover, the Ecorys (2012) study, which was conducted for the European Union countries to examine the influence of maritime transport on economic growth conducted in their study that maritime transport significantly impacted the economic growth of European Union countries.

The effect of transport can be positive or negative; in any case, the positive result far outperforms the adverse effect. On the positive side, shipping gives a huge general opportunity for economically ideal conditions like work game-plan, supporting charge progress, helping in redesigning the economy, creating business fragment open doors for remote trade by giving commanding associations, stretching out outside trade advantage, opening ways to deal with remote test. Trade and the capacity to compete in abroad markets are obligated to a feasible, secure, and stable maritime structure. Despite the massively productive result made, adverse effects likewise get it done. The environmental issues are, as of recently, giving the world enough of a headache. The significant environmental effects are reflected in air quality, tunneling, endangered and bartered life species, oil pollution, and strong waste.

The Nigerian economy is driven by oil and gas examination, age, and game plans. Other immense donors are overall payload exchange, customs duties, direct commitments, and others. In the Nigerian maritime area, shipping is a principal part of the critical drivers of the

economy. The Nigerian economy is import-masterminded, also the best oil exporter in Africa. An anomalous province of Nigeria's overall payload exchange is empowered by methods for ocean carriage. As it will, all in all, be done up from the possible result of this examination that maritime transport impacts the Nigerian economy, the impact is predominantly from Oil and Gas Production and Exploration. Oil remains the backbone of the Nigerian economy, contributing to about 55% of the GDP, 95% of toll advantage, and about 70% of definitive compensation. Since an overwhelming level of Nigeria's oil is made in shallow or vast waters, getting to and keeping up proximity in these zones is bolstered by strong marine points, for example, supply freight ships, towing barges, and load ships. These centerpieces are rented dependably by the oil and gas industry.

The key tremendousness of the ocean transport to the Nigerian economy can in like manner be seen in going with zones of its dedication particularly: transportation; bit of breathing space of Trade and business; pay age and straightforwardness of money; progression of the improvement business; headway of related financial exercises; work and openings for work; update of mechanical headway and improvement; institutional headway; when all is said in done relations and quiet blend; socio-political concordance.

The progression of waterborne transport in Nigeria is impacted and kept up not just by its geophysical features wherein there are secured inland conductors and direct access to the Atlantic Ocean. In light of how its economy is exceptionally subject to the exportation of agrarian things and unrefined oil and the importation of hardware, mechanical get-together and grungy materials for its undertakings and finished thing for its exceedingly populated clients (200 million). Accordingly, if Nigeria has been without ocean transport like this a landlocked State, it will have been clumsy and incredible for its occupants to share in when in doubt trade relations, and this will have been elegantly influencing its economy. Nigeria relied upon outside trade to continue with its overall economy through importation of hurt materials and mechanical gathering, gear utilized by creators, and for the exportation of its unrefined oil and making and finished things. The stray bits of solid and unassuming structures for

transportation, which ocean transport offers does not just make the entry expenses of these cargoes lower at any rate. It makes it obliging for a surprising degree of tonnage to be reached out in long division and got together in Nigeria along these lines reducing the expense of the imported and finished things since transportation cost is one of the variable expenses of creation. It, in a similar way, watches out for the issues of shippers, voyagers, and ship-proprietors and plays out an errand that is indispensable to the sustenance and improvement of the Nigerian economy and its general trade.

Maritime transport is of principal noteworthiness to the Nigerian economy since it makes a ton of salary for the Federal and State Governments. The compensation rises out of expenses for the assurance of flatboats and their home credits, conventions commitments, port charges, and expenses seen by the Nigerian Ports Authority for the utilization of its work environments by the vessels that billet at Nigerian ports. Furthermore, corporate duty paid by transportation affiliations charges for permitting clearing and sending supervisors or payload forwarders and the choice of development affiliations. Besides, Maritime transport moves the development business in Nigeria as in guests can go in freight pontoons and waterfront vessels on the Atlantic sea, the Lagoon, and other inland waters and visit explicit trademark shorelines on the Nigerian coastline for motivations driving visiting and loosening up.

Maritime transport has caused the inducing up of new developments and development of money related exercises to help the maritime business by methodology for multiplier impacts. Shipbuilding and ship fix yards, for example, Nigerdock assembles shoreline vessels of not more than 300gt, pulls, flatboats, bolster pontoons for use in maritime transportation. They fix vessels in Nigeria, accordingly shortening the outside money that would have been spent in getting or fixing the vessels abroad.

The shipyards correspondingly help in making an exceptional inspiration driving impediment working in shipbuilding and ship fixes and draws in business and pay. Ship surveyors are there in light of the course that there are vessels to be explored. Banks also show force for financing the checking of vessels and in their help while assurance affiliations give differentiating

affirmation spreads to the payload, load, cargo pontoons, body and hardware, and other marine dangers. The development business, including the absolute surveyors, building coordinators are occupied with the development, extension, and fixes and tunneling of ports and inland conductors. Data technologists are affirmed to supply and oversee PCs, marine radio correspondence, and radar structures for the ensured course, pilots and salvors are checked where basic while load forwarders, shipping specialists, shipping pros, genuine maritime supporters make to supply the required relationship for the maritime part. The far-reaching turnover of those occupied with affiliations identifying with maritime transport adds to the inflexible national yield and expanded fiscal exercises

Maritime transport is furthermore fundamental to the Nigerian economy since it makes business open passages for Nigerians fittingly guaranteeing the obligation of specialists and decreasing social issues affected by work. The shipbuilding and fixes industry uses executives to meet its different needs, seafarers/mariners, masters, engineers, are utilized to satisfy the necessities of the ship-proprietors, and guide experts for the endeavor and paying one of a kind character to of the vessels. The business made open by maritime transport to the isolating maritime transport-related Nigerian ace's prompts the basic for the managing and responsiveness of unequivocal workforce and work to support the maritime business. The openwork in the maritime business impacts the development of other budgetary exercises like weight sending, dock working, stevedoring tries, towage, pilotage, warehousing, maritime security, banking, invigorated warehousing and payload managing all of which rely on the maritime zone for survival. It has other than influenced budgetary exercises in the obliging zone, for example, superfluous exchanging, selling, and sustenance dealers, which are all of the basic interfaces with Nigerians. Without the work and openings for work made by maritime transport, the joblessness condition in Nigeria would have expanded like these inciting expanded loathsome practices in Nigeria, which would have overburdened its economy. The causal impact could, in like way, be felt in mechanical development in Nigeria. Industrialists like to make dealings with plants, experiences and make open seaports over the state, to diminish transportation costs, particularly by uprightness of those affiliations that

depend energetically on imported raw materials and contraption to make finished merchandise for the flanking and outside business parts. This decreasing transport costs, in a way, lessen the expenses of their finished things, which in this way develop the contemplations of their things, prompts high yearly turnovers, and improves their development.

A couple of foundations have been set up to assistance the maritime region and have been making a liberal certification to the Nigerian economy in light of maritime transport. An area of these foundations is identified with the framework and course of work assets, including seafarers and managers for the maritime part and alliance Maritime Academy, Oron, Nigerian Institute of Transport Technology, Lagos. Various affiliations are Nigerian Shippers' Council for guarding, ensuring the interests of the Nigerian shippers and empowering transportation administrators as appeared to be hard and fast standards, National Maritime Authority for dealing with and finishing Nigeria's development structure and matters with no intending to it. Others are Nigerian Ports Authority and its related relationship to spread, store up, and the development of ports and foundation, Nigerian Navy for the security of neighborhood Nigerian waters and guaranteeing any outside strike and National Cargo Handling Company Limited. Without maritime transport, there would not have been these foundations, and the Nigerian maritime industry and economy would not have profited by their embodiment; everything considered a little while later doing.

Nigeria is today an individual from worldwide and official maritime affiliations including International Maritime Organization (IMO), United Nations Environmental Program, Maritime Organization of West and the Central African States from which it has been interpreting major central focuses, in light of maritime transport. Without maritime transport, Nigeria would have been holding only a bystander status in them. Through its centrality of these affiliations, Nigeria makes and keeps satisfying relations with co-individuals from them, and Nigeria brains with them in issues of the thriving of maritime transport and approval and ensuring of the marine condition to the upside of its economy. There have been events among private, and everything pondered social affiliations, including seafarers of different

nationalities, drove on Nigerian vessels or foreign vessels inside close to Nigerian waters in view of the area of maritime transport. This has related to the solidarity of the specific ethnic nationalities in Nigeria and kept up socio-political concordance. Untouchables and remote seafarers passing on their social mentalities to Nigerian ports had also braced social trades in light of the closeness of ports and maritime transport.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

While it is not a gainsaying that the influence of maritime transport in the social, economic, and political development of Nigeria cannot be over-emphasized, the attendant implication witnessed in the environmental condition changes in Nigeria.

This study aims at examining the maritime transportation pollution and Nigerian economic growth, both in the long and short-run to discover the relationship between maritime transport and economic growth on one side, and maritime transport pollution, and economic growth on another side. In dealing with the aim of the study, the thesis is posed to provide the answer(s) to the following questions; can economic growth be witnessed without deterioration in the quality of the environment?; does economic growth enhances maritime transport in Nigeria?; What is the impact of maritime transport pollution on the economic growth of Nigeria?; does maritime transportation contributes to environmental pollution in Nigeria?; and what is the direction of the relationship between maritime transport pollution and Nigeria's economic growth.

To this end, this study utilized cross-sectional data of time series variables that spanned between the year 2000 and 2018. Economic growth was proxies with GDP, CO₂ for maritime environmental pollution, LSCI for maritime transport, and trade (TR) for trade openness. The data sourced from the World Bank development indicator and UNCTAD. Meanwhile, in order to increase the frequency of the variable, the data was converted from low frequency to high frequency (annual to quarterly data) using quadratic equation functions in Eviews.

For the analysis, the study employed ARDL Bond testing for cointegration. This was chosen based on the mixed order of integration of the variables that were employed in the study. Subsequently, the unit root test for the variables was carried out using the ADF test, and PP-test was employed to compare the results in order to determine the sensitivity of the variables. The unit root test established that the variables are integrated in the order $I(1)$ and $I(0)$, and confirmed to be statistically significant at 1% and 5% confidence level, respectively.

Furthermore, bound testing for cointegration was employed to determine the existence of a long-run relationship among the variables. The result of the cointegration shows that long-run relationship exists only in model 1, which implies that there is cointegration among economic growth, maritime transport, environmental pollution, and trade. In order to avoid spurious regression, the lag selection was carried out to choose the best lag options for the variables. The selection was made by estimating VAR and then used the lag selection criterion in choosing the best options for the variables. However, as presented in the table, two lags were found to be appropriate for all the variables.

Moreover, the long-run causality was estimated, and the result shows that there is a long-run causal relationship running from environmental pollution, maritime transport, and trade to economic growth, while the long-run causal relationship found between economic growth and maritime transport. As for the direction of relationship, a long-run unidirectional relationship was found between environmental pollution and economic growth, and trade and economic growth, while a bi-directional causal relationship was found between maritime transport and economic growth.

In the short-run causality estimate, the results, as shown in Table 6 reveals that trade has a short-run causal relationship with economic growth. Similarly, maritime transport has a short-run causal relationship with environmental pollution, while economic growth and trade also has a short-run causal relationship with maritime transport. Moreover, the error correction term (ECT) of each of the vectors was established. The ECT coefficient was found to be

negative and statistically significant when economic growth and maritime transport were dependent variables, respectively. The result implies that there is a joint causal impact of environmental pollution, maritime transport, and trade on economic growth, and in case of an external shock, the model will return to equilibrium at 5% speed of adjustment. In a similar vein, joint causal impact of economic growth, environmental pollution, and trade were found on maritime transport, and the convergence to equilibrium will occur at the speed of 17%.

Meanwhile, in order to ensure the validity of the computed coefficients and statistics, a diagnostic test was carried out on the residuals. The results, as presented in Table 7 accede that the residuals satisfy the classical econometric assumptions and give credence to the fact that the explanatory variables can explain the dependent variable well enough.

In a follow-up to the above, the three hypotheses formulated in this study were tested and discussed. The null hypothesis for hypothesis 1 was rejected, and a conclusion was made that there is a relationship between marine environmental pollution and Nigeria's economy. Similarly, the relationship between marine transport and environmental pollution was found to be statistically significant, thereby rejecting the null hypothesis and accept the alternative hypothesis to conclude that in Nigeria, there is a relationship between marine transport and environmental pollution. The outcome for hypothesis 3 is similar to the other two hypotheses. A significant impact of maritime transport was found in Nigeria. Therefore, we conclude that maritime transport has a significant impact on the Nigerian economy.

In summary, it infers from the analysis that in Nigeria, it might not be feasible to witness economic growth without the deterioration of the environment. This is evident from the analysis result which shows that as there an increase in economic growth, so there will be an increase in the environmental deterioration, while an increase in environmental deterioration will impact negatively on the economic growth. Therefore, there is a need for policymakers in the maritime sector to formulate a policy that will ensure a cleaner environment without jeopardizing the economic growth of the country.

The impact of economic growth on maritime transport in Nigeria is found to be symbiotic. This study found a bi-directional relationship between maritime transport and economic growth. While maritime transport is found to have a positive influence on economic growth in Nigeria, economic growth is also found to have a positive influence on maritime transport. Meanwhile, a strong causal influence of economic growth is found in maritime transport. This is a result of long and short-run causal relationships found running from economic growth to maritime transport. As for the impact of maritime transport pollution on the economic growth of Nigeria, the study found that in the long-run, environmental pollution will hurt the economic growth of Nigeria. The impact is found to be significant at a 1% confidence level, which makes it a critical point of concern for all the stakeholders in the maritime sector to address the challenge.

Furthermore, this study found maritime transport as a contributor to environmental pollution in Nigeria. Nigeria is an oil-producing country that exports its crude oil through shipping, and also is an import-oriented country. This is an indication that there are lots of activities being carried out with maritime transport, and having established maritime transport as a source of environmental pollution, Nigeria is no exemption.

The direction of the relationship between maritime transport pollution and Nigeria's economic growth was examined; it is found that a unidirectional long-run relationship exists between maritime transport pollution and Nigeria's economic growth. This implies that environmental pollution could impede economic growth in Nigeria in the long-run, and the reverse is not the case.

Based on the environmental coefficient in the table, the coefficient of environmental pollution is negative. Increment of maritime transportation or GDP increases the level of CO₂ emissions supporting the Pollution Haven Hypothesis for Nigeria as a developing country. Although the CO₂ emissions have a relationship with economic growth in the long-run and short-run to maritime transport, it responds to the changes in the maritime transportation better than the GDP, necessitating the more stringently environmental policy development in the economic infrastructure. So the long-run perspective for the environment is more influential, and the

implementation of environmental policies needs sufficient time to exert the entirely possible effects.

Considering the critically of the maritime transport response to economic growth and CO₂, while maritime transport is responding to economic growth in the long-run, maritime transport is responding to CO₂ in the short-run. It implies that maritime transportation in Nigeria is more effective in polluting the environment than in growing the economy.

The disclosures of this examination bear several strategy suggestions for Nigeria. Economy related development is all around related to expanded basic degradation in Nigeria both in the short run and the long run. How Nigeria's case is exemplified by a contrary N-shape as opposed to the speculated changed U-encircled remuneration discharge heading instigates that any choice to neglect ecological affirmation in Nigeria by requital on expanding pay levels to unravel its basic pollution could accomplish pulverizing ramifications for the country.

5.2 Recommendations

Drawing from the findings in this thesis, the following recommendations are put forward:

- It is imperative for the stakeholders in the maritime transport to ensure adequate control of the emission coming from the ships on the sea, which contributes to the sea pollution, and the eventual negative influence on the economic growth.
- The policymakers should develop a policy that will enhance the development of maritime transport, to aid economic development without being detriment to the environment.
- The non-significance of the ECT coefficient of the joint influence of economic growth, maritime transport and trade on the environmental pollution is an indication that there will be a divergent to the equilibrium of the model in case there is an external shock to the system. Therefore, policymakers and other stakeholders in the maritime industry should protect the system with a policy to avoid chaotic environmental pollution in case of any shock to the system.
- Lastly, the result from this study should be interpreted with caution, as the CO₂ emission was employed for the proxy of pollution coming from maritime transport, and also the utilization of liner shipping connectivity index for maritime transport indicator. Thus, it is recommended that future studies should employ other forms of emission coming from maritime transport, and possibly other maritime transport indicators (such as container port throughput, liner shipping bilateral connectivity index and port call and performance statistics) as suggested by UNCTAD.

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