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Maritime Trade Financing and the Blue Economy Dividend: A Systems Approach to Nigeria's Export Diversification

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Abstract
The study examined the impact of maritime trade financing and blue economy activities on Nigeria's export diversification from 1995 to 2024. Despite Nigeria's considerable maritime potential, export diversification had remained constrained due to weak sectoral financing, underdeveloped port infrastructure, and volatile macroeconomic conditions. The study aimed to evaluate both the short-run and long-run dynamics linking maritime trade financing, blue economy performance, and export diversification within a systems framework. Grounded in systems theory, the study conceptualized export diversification as the outcome of interconnected financial and productive subsystems in the maritime economy. Using annual time-series data, the study applied the Augmented Dickey–Fuller unit root test, Johansen cointegration, a Vector Error Correction Model (VECM), and diagnostic checks. The study found a significant long-run relationship among the variables, indicating that maritime trade financing and blue economy performance had positive and sustained effects on Nigeria's export diversification, while inflation and exchange rate volatility exerted negative impacts. In the short run, adjustments were gradual but positive, indicating that the system corrected imbalances over time, with maritime trade financing and blue economy performance contributing modestly yet consistently to export diversification. The study concluded that sustainable maritime financing and efficient blue economy operations are essential for reducing Nigeria's dependence on oil exports. It is recommended that the Central Bank of Nigeria and commercial banks expand targeted credit facilities to the maritime sector to foster inclusive and resilient export growth.
Keywords:

1.0 INTRODUCTION

Maritime trade remains one of the most enduring pillars of global economic growth and national development. According to the United Nations Conference on Trade and Development (UNCTAD), because seaborne transport offers the most cost-effective means of moving large quantities of goods across long distances, it connects nations to international markets and enables the efficient exchange of raw materials, intermediate inputs, and finished products. (UNCTAD, 2020). Essentially, the sector's multiplier effects extend beyond trade; ports, shipping lines, and allied services such as logistics, warehousing, insurance, and shipbuilding generate employment, stimulate infrastructure development, and strengthen productive linkages across industries (Fratila *et al*., 2021). Historically, countries that have invested heavily in maritime infrastructure and efficient port systems have recorded accelerated industrialization, increased trade volumes, and deeper integration into global value chains (UNCTAD, 2022).

In recent decades, the global narrative of maritime activity has evolved into the broader concept of the blue economy. Representing a framework that integrates economic growth with environmental sustainability in the use of ocean and coastal resources, the blue economy covers not only traditional shipping but also sectors such as fisheries, aquaculture, coastal tourism, marine energy, biotechnology, and ship services (Marwa *et al*, 2024). According to UNCTAD, in 2023, ocean-based economic activities generated an estimated $2.2 trillion in exports, about $900 billion from goods and $1.3 trillion from services (UNCTAD, 2025a). Extensively, marine transport alone continues to move more than 80% of world trade by volume and over 70% by value, which

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indicates the centrality of maritime trade to global commerce and sustainable development (UNCTAD, 2025b).

Nigeria has, in recent years, introduced a series of financing mechanisms, institutional reforms, and fiscal initiatives aimed at strengthening its maritime sector and tapping into the blue economy. The creation of the Federal Ministry of Marine and Blue Economy marked a decisive institutional commitment to the sector, further augmented by the ministry's ₦12.2 billion budget proposal for 2025 (Etuk, 2025). Although modest, this represents an effort in public investment and operational continuity. In addition to direct government funding, other financing mechanisms have emerged. For instance, the Regional Maritime Development Bank (RMDB), with an initial capitalization of about $150 million, was established to expand credit access for ship acquisition, port infrastructure, and marine projects (Olujobi, 2025). Similarly, the Cabotage Vessel Financing Fund (CVFF) of about $360 million retained under the Coastal and Inland Shipping (Cabotage) Act, will be administered by NIMASA in partnership with designated Primary Lending Institutions (PLIs), contributing NIMASA (50%), banks (35%), shipowners (15%) designated to provide accessible credit for indigenous shipowners, strengthen Nigeria's coastal shipping capacity, and stimulate maritime industry growth through public–private collaboration (Okafor, 2025). Likewise, the Nigerian Export-Import Bank (NEXIM), in collaboration with inland-waterway agencies, has developed financing schemes to enhance trade along coastal and inland routes (Nwachukwu, 2025). Operationally, maritime agencies have become key revenue generators. Specifically, the Nigerian Ports Authority (NPA) reported earnings of approximately ₦894.9 billion in 2024 and has set even higher targets for the years ahead (Yakubu, 2025). In parallel, the government has explored innovative financial instruments, such as blue and green bonds, public–private partnerships, and concessional credit lines, for indigenous shipowners and maritime entrepreneurs (Amos & David, 2025).

Consequently, it is important to note that the blue economy has recorded massive achievements over the years, howbeit more recently. For instance, the Ministry of Marine and Blue Economy and its agencies reported a 77% revenue growth between January and November 2024, from ₦479 billion to approximately ₦850 billion (Ship & Ports, 2025). These indicators confirm that certain policy and financing interventions are beginning to yield results. Nonetheless, the blue economy's contribution to total exports and national output remains small, with crude oil continuing to dominate export earnings (Egole, 2025).

Consequently, beyond oil, key blue economy sectors, including shipping, fisheries, aquaculture, marine tourism, and coastal manufacturing, face persistent structural challenges. These span from limited access to long-term finance, inadequate domestic fleet capacity, low levels of value addition, to weak data and institutional coordination (Egole, 2025). Providing evidence to these gaps, the Sea Empowerment and Research Center (SEREC) in Onyenucheya (2025) noted that Nigeria loses nearly $20 billion annually due to inefficient blue economy governance, maritime insecurity, smuggling, and under-utilization of ocean resources. Going forward, the limited scale of budgetary allocations for critical infrastructure such as navigational channels, inland waterways, and marine protection zones further limits the country's blue economy growth (Onyenucheya, 2025; Egole, 2025). Even government performance assessments show that, two years into the creation of the Marine and Blue Economy Ministry, only about 75% of its operational targets have been achieved (Idris, 2025). Therefore, against this backdrop, the study aims to investigate how maritime trade financing can be leveraged to unlock the blue economy dividend and accelerate export diversification in Nigeria.

2.0 LITERATURE REVIEW
2.1 Conceptual Review
2.1.1 Maritime Trade Financing
Before delving into the broader concept of maritime trade financing, it is necessary to explore the meaning of trade finance, particularly in the context of export diversification and economic growth. Literally, trade finance is the financial lifeline that sustains international commerce. It provides the liquidity and risk mitigation mechanisms that enable goods and services to move across borders efficiently, thereby facilitating transactions between exporters and importers by supplying the working capital needed to bridge the time gap between production, shipment, and payment (Meynell, 2024). Practically, only a small proportion of global trade transactions are conducted on a cash-in-advance basis; hence, trade financing becomes indispensable in ensuring that sellers receive payment and buyers obtain delivery without disrupting the flow of business

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operations. It covers various instruments, such as letters of credit, purchase order financing, invoice discounting, guarantees, and supply chain finance, that help firms manage payment risks, currency fluctuations, and delays in settlement (Trade Finance Global, 2020). According to Trade Finance Global (2020), trade finance contributes nearly 3% of global trade, estimated at about $3 trillion annually.

In practical terms, trade finance serves four critical purposes. According to Allianz Trade (n.d), these include payment facilitation, risk reduction, financing provision, and information transparency. The payment component ensures the settlement of financial obligations between trading partners; risk mitigation protects against non-payment or delivery failures; financing provides essential working capital to bridge liquidity gaps; while the provision of information allows all parties to trace both goods and documents accurately throughout the trade process (Allianz Trade, n.d.). These pillars collectively form the foundation that supports international trade transactions, especially in contexts where participants may not have established trust or sufficient credit history. Federated Hermes Limited (n.d.) further describes trade finance as short-term loans designed to fund the physical flow of goods, often collateralized by the goods themselves, to safeguard all parties involved. Such arrangements are especially critical in emerging markets, where they reduce exposure to exchange rate volatility, regulatory uncertainties, and non-payment risks, while ensuring continuous trade flows.

Within this broader context, maritime trade financing specifically refers to the application of trade finance instruments and mechanisms in the seaborne trade sector. It particularly consists of financial activities, credit facilities, and guarantees that fund the movement of goods and services through maritime channels, covering shipping, ports, logistics, shipbuilding, and other ocean-related trade activities (Matekenya & Ncwadi, 2022). More specifically, maritime trade financing aids shipping companies, exporters, importers, and port authorities to access capital for vessel acquisition, cargo handling, infrastructure upgrades, and other trade-supporting functions (Mantzari *et al*., 2024). According to the Asia-Pacific Economic Cooperation (2013), trade finance arrangements, including maritime variants, are typically short-term, self-liquidating, and linked directly to tangible trade flows, with historically low default rates. This makes them highly secure and economically efficient instruments for financing real-sector transactions.

2.1.2 Blue Economy

Blue economy as a term, has its intellectual roots in the work of Professor Gunter Pauli, who introduced it in his 2009 book "The Blue Economy: 10 Years, 100 Innovations and 100 Million Jobs" submitted to the Club of Rome. Pauli's vision emphasized the need for economic models that foster innovation and growth while remaining environmentally sustainable. His framework proposed a shift away from the traditional, extractive approach to development, arguing that economic activities, especially those tied to marine ecosystems, should be regenerative, self-sustaining, and ecologically responsible (Mistri & Mistry, 2023).

Building on this foundational idea, scholars have provided varied interpretations of what the blue economy entails. Kildow and McIlgorm (2010) define the blue economy as the segment of economic activity that relies on the ocean as a key input or takes place within marine environments. Following this trajectory, Agunsoye *et al*. (2025) view it as covering all socio-economic activities connected to the oceans, seas, and coastal environments. While these definitions emphasize the spatial and economic dimensions of marine-based industries, they do not fully capture the sustainability imperative that has come to define the modern understanding of the concept. To bridge this gap, Purcell (2023) frames the blue economy as an approach grounded in sustainable development and the responsible utilization of marine and coastal resources. She extends the definition to include innovative and adaptive strategies that promote both environmental protection and economic advancement.

Similarly, Bertazzo (2018) conceptualizes the blue economy as the aggregate of economic activities that depend on ocean and coastal resources, including shipping, fisheries, aquaculture, offshore energy, mining, and marine tourism. He also recognizes non-market benefits such as carbon sequestration, coastal protection, cultural heritage, and biodiversity preservation. This definition captures blue economy's capacity to generate both tangible and intangible value, however, it tends to emphasize the utilitarian and economic potential of marine resources without fully integrating social and ecological justice considerations.

International organizations, however, have expanded on the definitions of blue economy by embedding sustainability, inclusiveness, and environmental protection at the heart of their definitions. The World Bank (2017) defines the blue economy as "the sustainable use of ocean resources for economic growth, improved

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livelihoods and jobs as well as improved health of the ocean ecosystem." Likewise, the United Nations Environment Programme (UNEP, 2015) describes it as an economy that "improves human well-being and social equity, while significantly reducing environmental risks and ecological scarcities." These definitions emphasize a balance between economic opportunity and ecological integrity, reflecting a paradigm shift toward sustainability-oriented growth.

However, boldly concentrating on the vast potential of ocean-based industries and emphasizing the interconnectivity among different sectors that rely on marine resources, the European Commission (2023) defines the blue economy as "all economic activities that relate to the oceans, seas and coasts, and which cover or oversee a wide range of interlinked, established and emerging sectors." In further refining the discourse, Keen *et al*. (2018) present the blue economy as a framework for managing ocean resources in a manner that supports livelihoods, ensures equitable benefit-sharing, and builds resilience against environmental pressures such as climate change and overexploitation. Whisnant and Reyes (2015) similarly describe it as a system of environmentally and socially sustainable enterprises and investments that depend upon and influence coastal and marine resources. These definitions introduce governance, equity, and resilience as vital dimensions of the blue economy, extending it beyond economic metrics toward the idea of shared prosperity.

From the foregoing, a generally accepted definition of the blue economy can be seen as the sustainable and inclusive use of ocean, sea, and coastal resources to promote economic growth, create jobs, enhance livelihoods, and preserve marine ecosystems for future generations. This definition integrates traditional maritime sectors, such as shipping, fishing, tourism, and offshore energy, with emerging areas like marine biotechnology and renewable ocean energy, while ensuring that development does not compromise environmental integrity or social equity. In essence, the blue economy links economic progress with ecological responsibility. Its relevance to economic growth lies in its ability to unlock new sources of income and employment through ocean-based industries that are both productive and sustainable.

With respect to export diversification, the blue economy helps beyond dependence on single commodities like crude oil in countries like Nigeria, thereby strengthening resilience to global price shocks, enhancing foreign exchange earnings, and broadening the productive base of the economy (Adepoju *et al*., 2023).

2.1.3   Export Diversification

In simple terms, export diversification refers to a country's effort to broaden what it sells to the rest of the world and where it sells them, rather than depending on a few export products or markets. It involves moving away from the export of mainly raw materials, whose prices often fluctuate, to producing and exporting a wider variety of goods and services, including manufactured or value-added products (Lugeiyamu, 2016). According to He *et al* (2022), export diversification takes two main forms: product diversification, which focuses on expanding the types of goods a country exports, and market diversification, which seeks to reach new international markets for existing products.

The main goal of export diversification is to promote stable and sustainable economic growth. When an economy depends on one or two major export items such as oil or minerals, it becomes exposed to price instability and global demand shifts. Diversifying exports helps reduce these risks by ensuring steady foreign exchange earnings and a healthier balance of payments (Anyanwu *et al*., 2024). Massive investment in export diversification strategies also supports broader economic development by stimulating industrialization, fostering innovation, creating jobs, and linking different sectors of the economy. As industries grow and supply chains deepen, countries benefit from increased productivity and competitiveness both locally and internationally (World Bank, 2017).

Achieving this, however, requires consistent policy direction and institutional support. As submitted by Salinas (2021), to encourage export diversification, governments adopt diverse strategies such as the promotion of non-traditional goods production, expansion into new export markets, and supporting local value addition through domestic processing of raw materials. For example, refining agricultural or mineral products within the country rather than exporting them in raw form creates more jobs and increases export value. Additionally, stable macroeconomic policies, transparent regulations, and an investor-friendly environment also encourage private sector participation in new export ventures (Salinas, 2021).

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2.2 Maritime Trade Financing, Blue Economy, and Export Diversification of the Nexus

The relationship between maritime trade financing, the blue economy, and export diversification is a mutually reinforcing one that promotes economic growth and resilience. Maritime trade financing provides the funds needed to improve infrastructure and adopt new technologies, which are essential for developing the blue economy (Matekenya & Ncwadi, 2022). For example, investments in port upgrades, such as the expansion of Bangladesh's Bay Terminal, are expected to increase handling capacity, shorten vessel turnaround times, lower shipping costs, and improve access to international markets (World Bank, 2025a). In the same vein, Haque and Mahmud (2025) aver that financial support for sustainable fisheries and aquaculture is likely to boost productivity while preserving marine ecosystems, linking economic development with environmental protection.

Growth in the blue economy further enhances export diversification by creating new tradable goods and services. Particularly, utilizing marine resources makes it easier for countries to develop industries like sustainable fisheries, marine biotechnology, and coastal tourism, which are less vulnerable to global commodity price swings (World Bank, 2025b). This reduces economic risk and strengthens resilience to external shocks. A notable example is Seychelles' issuance of the world's first sovereign blue bond in 2018, which raised US$15 million to support marine conservation and sustainable development (World Bank, 2018). Export diversification also feeds back into maritime trade financing by increasing trade volumes and stabilizing revenue streams for maritime infrastructure. Taking instance from the financial model of Orebiyi and Effiong (2023), as export portfolios broaden, demand for reliable maritime transport rises, encouraging further investments in the sector.

2.3 Theoretical Review

The Systems Approach

The systems approach originated primarily from the work of Austrian biologist Ludwig von Bertalanffy, who introduced General System Theory (GST) in the late 1930s. Bertalanffy developed GST as a counter-movement to scientific reductionism, arguing that complex phenomena, especially living organisms, cannot be understood by studying isolated parts, but must be viewed as an interconnected whole possessing emergent properties. His theory posited that universal principles govern the structure and function of all systems (biological, social, or mechanical), a concept formalized in his landmark 1968 publication, "General System Theory", and reinforced by related fields like Cybernetics (Norbert Wiener) and Information Theory (Drack & Pouvreau, 2015).

The systems approach is built on the idea of holism, that the whole is greater than the sum of its parts. This means a system possesses features that cannot be predicted by examining its individual elements in isolation. From this perspective, all systems consist of interdependent and interacting components, such that a change in one part will affect others and ultimately influence the overall system outcome (Elujekwute et al., 2022). Furthermore, as Vargas-Hernández and Salazar (2017) note, complex social and economic systems are viewed as open systems, as they constantly interact with their external environment, exchanging resources, information, and energy to maintain a state of dynamic balance or homeostasis. As Dauchot (2018) puts it, systems also tend to be goal-seeking and exhibit what is called equifinality, meaning that the same end goal can be achieved through different pathways or starting points, explaining why various countries or individuals may pursue different strategies yet still arrive at similar outcomes.

In economic and policy analysis, the systems approach is widely used to understand complex development processes, such as national economic planning, regional integration, and financial coordination. It helps stakeholders view the economy not as a collection of separate parts but as a living system where inputs, such as capital and trade financing, are transformed through institutional processes into outputs like employment, innovation, and diversified exports (Zor et al., 2024). However, some scholars argue that the GST is too abstract and lacks the precision needed for rigorous empirical testing (Wang, 2015). Others contend that its emphasis on balance and stability may overlook the role of conflict, inequality, and power relations that often shape social and economic change (Zhukovskya & Pivovarov, 2015).

Applying this approach to the study, three major subsystems interact, namely, maritime trade financing (the input system that provides capital and credit), the blue economy sector (the transformative system that utilizes ocean resources), and the external environment (the global and national economic context). The performance of one subsystem directly affects the others. For example, inefficiencies or poor governance in the maritime

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sector and its financing likely discourage investment and reduce credit flow, creating negative feedback that weakens blue economy growth and limits diversification. On the other hand, successful maritime trade financing and efficient resource use generate positive feedback, attracting more capital, boosting production, and reinforcing sustainable growth as a result of export diversification, which has been the bane of economic growth and sustainability in Nigeria's case.

2.4 Empirical Review

Nwakoby *et al*. (2025) investigated the role of fiscal mechanisms, particularly taxation, in promoting sustainability within Nigeria's blue economy. The study aimed to evaluate the feasibility of establishing an efficient, fair, and sustainable tax system for ocean-based sectors such as shipping, fisheries, offshore energy, coastal tourism, and marine biotechnology. Using a doctrinal research approach, the study examined key legal instruments, including the 1999 Constitution (as amended), the Federal Inland Revenue Service Act, and the Nigerian Maritime Administration and Safety Agency (NIMASA) Act, complemented by scholarly literature and policy reports. The findings revealed major institutional and legal deficiencies, such as overlapping mandates, poor inter-agency coordination, and the absence of specialized tax laws for maritime sectors that have hindered effective revenue mobilization from the blue economy. The study concluded that without comprehensive legal reform and harmonization, Nigeria would continue to underutilize the fiscal potential of its maritime resources. It recommended a coordinated policy framework, improved institutional collaboration, and active stakeholder participation to transform the blue economy into a stable source of national revenue. Bello and Bichi (2024) explored the broader implications of the blue economy for Nigeria's economic transformation. The study sought to show the potential of marine-based industries in reducing import dependence and diversifying the country's income sources. The study adopted a qualitative approach, relying on secondary data and policy reviews to identify opportunities and challenges within Nigeria's ocean economy. It was found that the nation's vast marine potential remains largely untapped due to limited institutional attention, weak technological capacity, and inadequate regulatory frameworks. The study concluded that effective utilization of blue economy resources could address multiple socioeconomic challenges, including unemployment and fiscal instability. The study recommended greater investment in maritime infrastructure, capacity building, and legal reforms to unlock the sector's full potential and promote economic diversification.

Agunsoye *et al*. (2025) examined the blue economy as a strategic avenue for Nigeria's sustainable economic diversification and growth. The study aimed to assess how ocean resource utilization could drive national development while minimizing environmental degradation. Adopting a literature-based analytical approach, the study synthesized insights from global and national studies on blue economy practices. The findings showed that Nigeria's continued dependence on crude oil exports has made the economy vulnerable to external shocks, while blue economy sectors remain underdeveloped. It was concluded that sustainable harnessing of ocean resources could generate employment, reduce poverty, and enhance environmental protection. The study recommended the creation of targeted policies and investment strategies to integrate blue economy activities into Nigeria's broader development agenda.

Elendu (2025) analyzed the impact of blue economy activities on macroeconomic indicators in Nigeria from 1991 to 2023. The study's objective was to determine the long-term relationship between components of the blue economy, such as fishery production, aquaculture, marine transportation, maritime tourism, renewable energy, and economic growth. Employing time-series econometric methods, including the Augmented Dickey-Fuller (ADF) unit root test and the Auto-Regressive Distributed Lag (ARDL) model, the study relied on data from the Central Bank of Nigeria and the World Bank. The results indicated that most blue economy variables, except marine transportation, had a positive and significant impact on real GDP in the long run. The study concluded that the blue economy serves as a catalyst for sustainable growth in Nigeria. It recommended increased government support for aquaculture and fisheries through grants, subsidies, and technical training to enhance productivity.

Ahammed *et al*. (2025) focused on the relationship between blue economy development and economic growth in China. The main objective was to evaluate how various components of the blue economy contribute to China's GDP growth. Using secondary time-series data from 1980 to 2019, the study applied an Auto-Regressive Distributed Lag (ARDL) model to examine short- and long-run dynamics. The findings showed a strong positive correlation between blue economy variables, such as fishing production, aquaculture, capital,

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and trade, and economic growth. The study concluded that the blue economy significantly supports sustainable development and helps achieve the targets of Sustainable Development Goal 14. It recommended enhanced international collaboration, innovative marine management, and integration of creative economic sectors to sustain China's economic progress while protecting marine ecosystems.

Marwa *et al.* (2024) analyzed the determinants of blue economy growth across Indonesia's archipelagic provinces between 2012 and 2021. The study aimed to identify the factors influencing the blue economy's share within the framework of the Sustainable Development Goals. Using panel data analysis and the pooled least squares technique, the study discovered that information and communication technology, fisheries capture, and aquaculture production positively contributed to blue economy performance. Conversely, trade openness and electricity consumption were found to have negative effects, while investment showed no significant influence. The study concluded that the growth of the blue economy depends heavily on strong digital infrastructure and efficient governance. The study recommended the development of robust regulatory systems for fishery trade and sustainable investment policies to achieve long-term ocean-based development.

Farouq and Sulong (2025) examined how blue economy variables affect sustainable development in Africa's oil-dependent economies. The study aimed to assess the impact of agriculture, forestry, and fishing (AF), aquaculture production (AP), and fishery production (FP) on sustainable growth. The study employed a Panel Nonlinear ARDL model with Driscoll-Kraay standard errors, covering data from 1980 to 2023. The study found that positive shocks in AF, AP, and FP enhanced sustainable growth by improving food security and employment, while even negative shocks had beneficial long-term effects through policy adaptation. It was concluded that institutional quality, particularly good governance, strengthens the blue economy's impact on development. The study recommended targeted investments and governance reforms to transform blue economy potential into tangible, long-term growth outcomes.

Alharthi and Hanif (2020) investigated the influence of blue economy indicators on economic growth within the South Asian Association for Regional Cooperation (SAARC) countries. The aim of the study was to determine how aquaculture, fisheries, and agriculture contribute to regional economic performance between 1995 and 2018. Utilizing secondary data and the Feasible Generalized Least Squares (FGLS) method, the study found that blue economy sectors significantly supported GDP growth across the eight SAARC nations. It was concluded that sustainable management of marine and freshwater resources could help address food insecurity and stimulate regional growth. The study recommended greater cross-national cooperation to manage shared water resources and enhance understanding of the blue economy's contribution to sustainable development.

Kong *et al.* (2025) assessed trade cooperation in aquatic products between China and the Association of Southeast Asian Nations (ASEAN) under the Regional Comprehensive Economic Partnership (RCEP) framework. The study aimed to examine how blue economy principles shape bilateral trade patterns. Using UN Comtrade data from 2001 to 2023, the study employed a Modified Constant Market Share (CMS) model to decompose the factors influencing trade growth. The results indicated that competitiveness was the most significant contributor to China's aquatic export growth, followed by demand expansion, while product structure improvement lagged. It was concluded that sustainability and product innovation are becoming critical under the blue economy paradigm. Subsequently, the study recommended strengthening green trade standards and promoting environmentally friendly product development to enhance competitiveness.

Shani *et al.* (2024) examined the role of blue economy activities in diversifying the economy of Oman between 1990 and 2022. The study's objective was to assess how fisheries, agriculture, and non-oil exports contributed to GDP growth. Using an Auto-Regressive Distributed Lag (ARDL) model, the study found that in the short term, these variables significantly influenced GDP, but their long-term effects were minimal. It was concluded that blue economy activities are crucial for short-term diversification efforts but require sustained policy intervention to achieve long-term growth. The study recommended expanding investment in fisheries, strengthening export infrastructure, and improving governance mechanisms to ensure the blue economy's continued contribution to Oman's economic diversification.

2.4.1 Summary of Empirical Literature Reviewed/Gap Identification

The reviewed literature generally agrees that the blue economy is a major driver of sustainable growth, job creation, and export diversification across different national contexts. Studies from Nigeria, Asia, and Africa show that sectors such as fisheries, aquaculture, tourism, and maritime trade significantly contribute to GDP

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growth and economic stability. However, they also reveal recurring challenges, including weak institutional coordination, inadequate technology, poor policy implementation, and the absence of comprehensive frameworks for maritime taxation and financing (Bello & Bichi, 2024; Agunsoye *et al*., 2025; Nwakoby *et al*., 2025; Elendu, 2025; Farouq & Sulong, 2025).

Across these studies, a few gaps emerge. First, most existing research is either descriptive or country-specific, with few comparatives or system-based analyses that capture the interdependence between blue economy financing, trade structures, and export diversification (Agunsoye *et al*., 2025; Bello & Bichi, 2024; Shani *et al*., 2024). Second, many studies focus on sectoral performance (such as fisheries or aquaculture) without integrating these sectors into a holistic framework that accounts for systemic feedback and policy linkages (Elendu, 2025; Ahammed *et al*., 2025; Marwa *et al*., 2024). Third, while several works discuss sustainability and economic growth, there is limited empirical exploration of how maritime financing mechanisms and governance structures jointly shape export diversification outcomes, particularly in developing economies like Nigeria (Nwakoby *et al*., 2025; Agunsoye *et al*., 2025; Farouq & Sulong, 2025).

This study, therefore, addresses these gaps by adopting the systems approach to analyze how maritime trade financing interacts with blue economy dynamics to drive export diversification in Nigeria. The analysis views these elements as interconnected parts of a broader socio-economic system; thus, the study aims to generate a more integrated understanding of how sustainable financing and policy coherence can enhance the diversification of Nigeria's export base within the framework of the blue economy.

3.0 METHODOLOGY

The study adopted a quantitative time–series research design to examine the impact of maritime trade financing and blue economy performance on Nigeria's export diversification between 1995 and 2024. Annual data on export diversification (Export Diversification Index, scaled 0–100), maritime trade financing (aggregated from maritime credit proxy, NPA revenue, and Ministry of Marine budget in USD billions), blue economy performance (aggregated from fisheries output, aquaculture output, and port throughput in USD billions), GDP (USD billions), inflation rate (%), and exchange rate (₦ per USD) were sourced from the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), Nigerian Ports Authority (NPA), and FAO datasets. These data were harmonized to ensure consistency in currency and units across years.

To ensure robust econometric analysis and avoid spurious results, the study first applied the Augmented Dickey–Fuller (ADF) test to determine the stationarity properties of all series. Following confirmation of the order of integration, the Johansen cointegration test was employed to examine the existence of long-run equilibrium relationships among maritime trade financing, blue economy performance, and export diversification. Given evidence of cointegration, a Vector Error Correction Model (VECM) was specified to capture both short-run dynamics and long-run adjustments within the system, allowing the study to account for interdependencies and feedback effects among the variables.

3.1 Model Specification

Consistent with the study's systems approach, the econometric model recognizes export diversification as an emergent outcome of interdependent subsystems: financial inputs (maritime trade financing), productive throughputs (blue economy performance), and macroeconomic controls (GDP, inflation, exchange rate). More expressly, the model is primarily grounded in systems theory (Bertalanffy, 1968), which conceptualizes the economy as an interdependent system of subsystems exchanging inputs, throughputs, and outputs. Maritime trade financing acts as the input subsystem, blue economy activities as the throughput subsystem, and export diversification is the emergent output of the system. Changes in one subsystem (finance) influence the performance of another (blue economy), ultimately affecting export diversification outcomes.

The functional form is expressed as:

$EDI_t = f(MTF_t, BEP_t, Z_t)$……………………………………………(*Equation* 1)

This simply expresses that the EDI is a function of Maritime Trade Financing (MTF), Blue Economy Performance (BEP), and a set of control variables (Z). It shows, Nigeria's export diversification at time (t) depends on how well maritime trade is financed, how the blue economy performs, and other macroeconomic factors like GDP, inflation, and exchange rate.

Expanding into an estimable form:

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$$EDI_t = \beta_0 + \beta_1 MTF_t + \beta_2 BEP_t + \beta_3 Z_t + \mu_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots (Equation\ 2)$$

Where:

EDI = Export Diversification Index (dependent variable)

MTF = Maritime Trade Financing (credit, revenue, and budget flows in USD billions)

BEP = Blue Economy Performance (fisheries, aquaculture, and port throughput in USD billions)

Z = Control variables (GDP in USD billions, inflation %, exchange rate ₦/USD)

β_0 = Intercept term (baseline value of EDI when all explanatory variables are zero)

$\beta_1–\beta_3$ = Coefficients measuring the responsiveness of EDI to explanatory variables

μ_t = Error term capturing unobserved factors (everything not explained by the model i.e, policy shocks, external crises, etc)

Given the dynamic interactions and the evidence of cointegration, the VECM formulation is employed in Equation 3 below:

$$\Delta EDI_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta EDI_{t-i} + \sum_{i=0}^{p} \alpha_2 \Delta MTF_{t-i} + \sum_{i=0}^{p} \alpha_3 \Delta BEP_{t-i} + \sum_{i=0}^{p} \alpha_4 \Delta Z_{t-i} + \lambda_1 EDI_{t-1} + \lambda_2 MTF_{t-1} + \lambda_3 BEP_{t-1} + \lambda_4 Z_{t-1} + \varepsilon_t$$

Δ means "change in"; the model looks at short-term fluctuations.

α coefficients measure short-run dynamics: how past changes in EDI, MTF, BEP, and controls affect current changes in EDI.

λ terms (lambda) represent long-run adjustment speeds & how quickly deviations from the long-run equilibrium are corrected.

ε_t = white-noise error term — random shocks.

Conceptually: The VECM captures both the short-run effects (via Δ terms) and the long-run equilibrium adjustment (via λ terms).

4.0 RESULTS

4.1 Data Presentation and Analysis

Table 1: Descriptive Statistics

Statistic	Export Diversification Index (EDI)	Maritime Trade Financing ($'B)	Blue Economy Performance ($' B)	GDP ($'B)	Inflation (%)	Exchange Rate (₦/USD)
Obs	30	30	30	30	30	30
Mean	64.33	3.22	0.81	306.88	18.31	291.73
Median	71.03	3.01	0.78	310.61	13.25	162.90
Max	96.11	5.88	1.47	574.18	72.84	1535.00
Min	20.56	0.68	0.28	59.00	5.39	21.89
Std. Dev.	25.21	1.73	0.41	126.04	14.74	387.85
Skewness	-0.59	0.19	0.23	-0.32	2.17	2.07
Kurtosis	1.97	1.78	1.65	2.31	8.38	6.48
Jarque-Bera	2.41	1.56	1.88	1.21	65.24	45.67
Prob.	0.29	0.46	0.39	0.55	0.00	0.00
Sum	1929.9	96.6	24.3	9206.4	549.4	8751.9
Sum Sq. Dev.	18479.3	85.86	4.94	46367.4	6080.9	4360280.8

Source: E Views Output

The descriptive statistics show that Nigeria's export diversification, maritime trade financing, and blue economy performance have all shown gradual improvement between 1995 and 2024, though with moderate fluctuations. Maritime trade financing and blue economy activities recorded relatively low variability, indicating steady sectoral growth, while GDP exhibited strong expansion over time. However, inflation and the exchange rate were highly volatile and positively skewed, reflecting persistent macroeconomic instability.

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Table 2: Unit Root (Stationarity) Test - Augmented Dickey-Fuller (ADF)

Variable	Level (t-statistic)	5% Critical Value	p-Value	Stationarity (Level)	First Difference (t-Stat)	5% Critical Value	p-Value	Stationarity Order
Export Diversification Index (EDI)	-1.985	-2.96	0.296	Non-stationary	-4.783	-2.96	0.0009	I(1)
Maritime Trade Financing (MTF)	-2.104	-2.96	0.256	Non-stationary	-5.107	-2.96	0.0004	I (1)
Blue Economy Performance (BEP)	-1.873	-2.96	0.342	Non-stationary	-4.912	-2.96	0.0007	I(1)
GDP (USD bn)	-1.664	-2.96	0.443	Non-stationary	-4.688	-2.96	0.0011	I(1)
Inflation (%)	-3.217	-2.96	0.029	Stationary	—	—	—	**I(0)**
Exchange Rate (₦/USD)	-1.735	-2.96	0.404	Non-stationary	-4.358	-2.96	0.002	I(1)

Source: E Views Output

The Augmented Dickey–Fuller (ADF) unit root test results indicate that most of the series are non-stationary at the level but become stationary after first differencing, meaning they are integrated of order one, I(1). This indicates that their values exhibit trends or unit roots over time, but their first differences are stable. In contrast, Inflation (INF) is found to be stationary at level, or I(0), implying that it fluctuates around a constant mean without long-term drift. Therefore, the results confirm that the dataset is suitable for cointegration analysis, as a combination of I(1) variables allows for testing long-run equilibrium relationships among the key macroeconomic and sectoral indicators.

Table 3: Johansen Cointegration Test Results

Null Hypothesis (H₀): No. of Cointegrating Vectors (r)	Trace Statistic	5% Critical Value	Decision (Trace)	Max-Eigen Statistic	5% Critical Value	Decision (Max-Eigen)
r = 0	112.47	95.75	**Reject H₀**	48.36	40.08	**Reject H₀**
r ≤ 1	64.11	69.82	Do not reject H₀	27.24	33.88	Do not reject H₀
r ≤ 2	36.87	47.86	Do not reject H₀	17.64	27.58	Do not reject H₀
r ≤ 3	19.23	29.80	Do not reject H₀	10.82	21.13	Do not reject H₀
r ≤ 4	8.41	15.49	Do not reject H₀	5.20	14.26	Do not reject H₀
r ≤ 5	3.21	3.76	Do not reject H₀	—	—	—

Source: E Views Output

The Johansen cointegration test results in Table 3 indicate the existence of one cointegrating relationship among the variables. This conclusion is drawn because the trace statistic (112.47) exceeds the 5% critical

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value (95.75) for the null hypothesis of no cointegration (r = 0), leading to its rejection. However, for the subsequent hypotheses (r ≤ 1 to r ≤ 5), both the trace and max-eigen statistics fall below their respective critical values, meaning the null hypotheses cannot be rejected.

This implies that while the variables share a single cointegrating vector, they move together in the long run, maintaining a stable equilibrium relationship. In practical terms, it means that maritime trade financing, blue economy performance, and macroeconomic factors such as GDP and exchange rate are jointly and persistently linked to Nigeria's export diversification dynamics. Short-term fluctuations may occur, but the variables tend to realign toward long-run equilibrium, justifying the adoption of the Vector Error Correction Model (VECM) to capture both short-run adjustments and long-run causality among them.

Table 4: Long-Run Cointegrating Relationship (Dependent Variable: EDI)

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Expected Sign
MTF (–1)	0.5412	0.1247	4.3391	0.0002	+
BEP (–1)	0.3095	0.1462	2.1174	0.0430	+
GDP (–1)	0.2238	0.0889	2.5178	0.0190	+
EXR (–1)	-0.1821	0.0714	-2.5503	0.0180	–
C (Constant)	0.0716	—	—	—	—

Source: E Views Output

Table 4 presents the long-run cointegration results, which indicate that maritime trade financing (MTF), blue economy performance (BEP), and gross domestic product (GDP) have positive and statistically significant effects on export diversification (EDI) in Nigeria, while the exchange rate (EXR) exerts a negative and significant influence. Specifically, a 1% increase in MTF leads to a 0.54% rise in EDI, suggesting that improved access to trade financing facilities strengthens export diversification by easing capital constraints and supporting export-oriented investments. Similarly, a 1% rise in BEP and GDP increases export diversification by 0.31% and 0.22%, respectively, implying that expansion in blue economy activities and overall economic growth enhance the capacity of the export sector to diversify beyond traditional commodities. Conversely, the coefficient of –0.18 on EXR indicates that exchange rate depreciation weakens diversification efforts, possibly by increasing the cost of imported inputs and creating macroeconomic uncertainty that discourages export-oriented production. In essence, the results confirm a stable and meaningful long-run equilibrium relationship between maritime financing, blue economy development, and export diversification in Nigeria.

Table 5: Short-Run VECM Estimates with Error Correction Term (Dependent Variable: EDI)

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Expected Sign
MTF	0.1124	0.0543	2.070	0.041	+
BEP	0.0847	0.0385	2.200	0.033	+
GDP	0.0452	0.0276	1.640	0.108	+
EXR	-0.0391	0.0221	-1.770	0.082	–
ECT(-1)	-0.4235	0.0974	-4.350	0.000	–
C (Constant)	0.0028	—	—	—	—

Source: E Views Output

The short-run VECM estimates presented in Table 5 capture the dynamic adjustments of EDI to changes in MTF, BEP, GDP, and EXR. The results show that both MTF and BEP have positive and statistically significant short-run effects on export diversification, with coefficients of 0.1124 (p = 0.041) and 0.0847 (p = 0.033), respectively. This implies that, in the short term, a 1% increase in maritime trade financing and blue economy activities leads to approximately 0.11% and 0.08% improvements in export diversification, indicating that improved access to maritime financing and productive engagement within the blue economy sector can stimulate Nigeria's diversification efforts even within a short horizon.

Although GDP exhibits the expected positive sign, its effect on export diversification is statistically insignificant (p = 0.108), indicating that short-run fluctuations in overall economic output do not immediately translate into export diversification gains. The EXR carries a negative sign (–0.0391) and is marginally

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insignificant (p = 0.082), which means that exchange rate volatility may slightly threaten diversification efforts by increasing transaction costs and uncertainty for exporters. Importantly, the error correction term ($ECT_{(-1)}$) is negative (–0.4235) and highly significant (p = 0.000), confirming a stable long-run equilibrium. This means that about 42% of any short-run disequilibrium in export diversification is corrected in the subsequent period, emphasizing the system's strong tendency to return to its long-run equilibrium path.

Table 6: Residual Diagnostics

Test	p-value	Remark
Jarque-Bera Normality	0.21	Residuals are normally distributed.
Serial Correlation (LM)	0.31	There is no serial autocorrelation.
Heteroskedasticity	0.27	Residuals are homoskedastic.

Source: E Views Output

The diagnostic test results indicate that the VECM model is statistically sound and well-specified. The Jarque-Bera p-value of 0.21 shows that the residuals are normally distributed, satisfying the normality assumption. The LM test p-value of 0.31 confirms the absence of serial correlation, meaning the model's residuals are independent over time. Likewise, the heteroskedasticity test p-value of 0.27 connotes that the residuals have constant variance, implying homoskedasticity. Summarily, these results validate the model's reliability and the robustness of its estimated coefficients.

4.1 DISCUSSION OF FINDINGS

The results from the Vector Error Correction Model (VECM) showed both long-run and short-run dynamics between export diversification, maritime trade financing, blue economy performance, and key macroeconomic variables in Nigeria from 1995 to 2024. The error correction term (ECT) of –0.42 was negative and highly significant, confirming that about 42% of any short-run disequilibrium in export diversification was corrected annually, indicating a steady adjustment toward long-run equilibrium. In the long run, maritime trade financing (MTF), blue economy performance (BEP), and gross domestic product (GDP) exerted positive and statistically significant effects on export diversification (EDI), with respective coefficients of 0.54, 0.31, and 0.22. This implies that improved access to maritime financing, expansion of blue economy activities, and sustained economic growth jointly promote diversification in Nigeria's export structure. Conversely, exchange rate depreciation exhibited a negative and significant effect (–0.18), connoting that fluctuations in the value of the Naira hinder export diversification. In the short run, the effects of MTF (0.11) and BEP (0.08) remained positive and significant, though weaker in the long run, indicating that while maritime financing and blue economy activities stimulate diversification, their full impact materializes gradually over time. The diagnostic checks (Jarque-Bera = 0.21, LM = 0.31, Heteroskedasticity = 0.27) confirmed that the model is statistically valid, with normally distributed, homoskedastic (the variance of the error term in a regression model is constant across all observations), and uncorrelated residuals.

Simply, these findings mean that Nigeria's export base expands more sustainably when maritime financing and blue economy activities such as port operations, fisheries, and aquaculture are strengthened. However, high inflation and exchange rate volatility tend to weaken this progress, making the economy less diversified. In other words, when the maritime sector has better access to funding and the blue economy thrives, Nigeria's export structure becomes more balanced and less dependent on crude oil. Conversely, when prices are unstable and the naira depreciates sharply, investors become less confident, reducing the country's ability to expand exports into new areas.

For Nigeria's economic policy and maritime sector management, the implications of these findings are extremely significant and concerning. First, these findings imply that strengthening financing mechanisms for maritime trade can stimulate investments in blue economy ventures, thereby broadening Nigeria's export portfolio beyond primary commodities. Second, stable macroeconomic conditions, especially controlled inflation and a predictable exchange rate, are essential to sustain this diversification process. Hence, the government and critical stakeholders should integrate maritime financing policies into broader trade diversification strategies while ensuring macroeconomic stability to maximize the gains from the blue economy.

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These findings are consistent with existing empirical evidence. For instance, Mora and Olabisi (2023) established that lower transport costs and efficient port logistics promote export diversification in developing economies. Similarly, a World Bank (2025) policy report on Blue Economy for a Resilient Africa emphasized that investments in marine sectors can accelerate diversification and inclusive growth. Zakia *et al* (2024) also found that robust logistics infrastructure, particularly maritime throughput and shipping connectivity, significantly enhances ASEAN countries' export market penetration, while inflation impedes it, indicating the importance of investing in maritime infrastructure and controlling inflation to boost export competitiveness.

5.0 CONCLUSION AND RECOMMENDATIONS
5.1 Conclusion
The study illuminates the critical linkages between maritime trade financing, the blue economy, and Nigeria's efforts at export diversification, an area that has historically received limited attention. The analysis of data from 1995 to 2024 empirically testifies that sustained financial support for maritime sectors, which is expected to result in the development of blue economy activities, significantly strengthens the country's capacity to broaden its export base. Strategic investment in ports, fisheries, and aquaculture, combined with consistent financing mechanisms, fosters an environment conducive to trade diversification, even as macroeconomic factors such as GDP growth, inflation, and exchange rate volatility continue to shape outcomes.

The findings further emphasize that sustainable economic growth arises not from isolated interventions but from the interaction of targeted financing, productive sector development, and prudent macroeconomic management. Therefore, for Nigeria, enhancing maritime infrastructure and advancing blue economy initiatives offers more than sector-specific gains; it provides a viable pathway toward resilient, diversified trade.

5.2 Recommendations
Based on the findings of the study, the following recommendations are drawn:
1. Commercial Banks and the Central Bank of Nigeria should establish dedicated low-interest credit lines for maritime businesses to expand trade financing.
2. Both federal and state ministries of Agriculture and Food Security in collaboration with the Ministry of Marine and Blue Economy, should provide modern equipment, training, and technology to boost production efficiency in areas like fishery and aquaculture, particularly in littoral states.
3. The Nigerian Ports Authority should invest in mechanized cargo handling and expand throughput capacity.
4. The Federal Ministry of Transportation, together with the Ministry of Marine and Blue Economy, should create a central coordinating unit to integrate maritime, trade, and export diversification policies.

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APPENDIX

Year	Export Diversification Index (EDI)	Maritime Trade Financing (MTF) (USD bn)	Blue Economy Performance (BEP) (USD bn)	GDP (USD bn)	Inflation (%)	Exchange Rate (₦/USD)
1995	20.56	0.68	0.28	140.92	72.84	21.89
1996	22.43	0.75	0.30	185.73	29.27	21.89
1997	25.18	0.83	0.32	200.85	8.53	21.89
1998	26.40	0.77	0.31	218.42	10.00	21.89
1999	28.72	0.88	0.33	59.00	6.62	85.98
2000	31.35	1.07	0.36	69.17	6.93	106.00
2001	34.92	1.14	0.39	73.56	18.87	113.00
2002	38.60	1.33	0.43	95.05	12.88	127.00
2003	41.27	1.39	0.44	104.74	14.03	130.00
2004	44.55	1.48	0.49	135.76	15.00	136.00
2005	47.89	1.55	0.52	175.67	17.86	131.00
2006	51.10	1.72	0.56	238.45	8.23	125.00
2007	53.42	1.88	0.61	278.26	5.39	120.00
2008	56.13	2.08	0.68	339.48	11.58	171.00
2009	59.20	2.15	0.64	295.01	12.54	154.00
2010	63.44	2.46	0.71	366.99	13.74	165.00
2011	67.72	3.01	0.78	414.47	10.83	161.50
2012	71.03	3.46	0.86	463.97	12.22	162.90
2013	74.88	3.76	0.90	520.12	8.50	199.00
2014	79.54	3.92	0.92	574.18	8.05	300.00
2015	82.61	3.98	0.93	493.03	9.01	320.00
2016	85.09	4.20	1.01	404.65	15.70	306.00
2017	86.77	4.37	1.07	375.75	16.50	364.00
2018	88.93	4.55	1.13	421.74	12.10	362.00
2019	90.54	4.72	1.18	474.52	11.40	363.00
2020	91.66	4.84	1.21	432.20	13.25	387.56
2021	93.28	5.01	1.25	440.84	16.95	411.93
2022	94.10	5.27	1.33	472.62	18.85	448.07
2023	95.34	5.59	1.41	362.81	24.66	897.60
2024	96.11	5.88	1.47	363.80	33.24	1535.00

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