EFFECT OF DEEP BLUE PRACTICES ON THE GROWTH OF SELECTED MARITIME COMPANIES IN SOUTH-SOUTH NIGERIA

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Abstract
This study examined the effect of deep blue practices on the growth of selected maritime companies in south-south Nigeria. The study used the survey research design; the target population of this study was 384 senior and mid-level employees from eight (8) selected private maritime firms and expert offices actively operating within the Niger Delta region. This research study utilized a census sampling method to gather data from the entire population while Purposive sampling technique was adopted to select the respondents. The data for this study were collected with the aid of a well-structured 5-point Likert scale questionnaire and the reliability of this instrument was tested using Cronbach Alpha. Partial Least Square Structural Equation Modelling (PLS-SEM) was employed to test the hypotheses formulated of which the study found that renewable energy has a positive significant effect on the growth of the selected maritime companies in south-south Nigeria. Sustainable fisheries exert a negative insignificant effect on the growth of selected maritime companies in south-south Nigeria, while aquaculture has a positive significant effect on the growth of maritime industry in Nigeria. The study recommends that Maritime companies in South-South Nigeria should allocate more resources towards expanding their renewable energy infrastructure. This includes investing in solar, and tidal energy projects to power their operations. Maritime companies should adopt more stringent regulations to prevent overfishing, improve fish stock assessments, and enforce sustainable catch limits. Collaborating with local communities, scientists, and policymakers to develop and implement more effective and sustainable fisheries management plans can help mitigate the negative impact on growth and ensure long-term viability of fish stocks. Maritime companies should focus on enhancing and scaling their aquaculture operations. This includes investing in advanced aquaculture technologies, improving the efficiency of breeding and feeding practices, and ensuring high standards of water quality management.
Keywords: *Renewable Energy, Sustainable Fisheries, Aquaculture, Maritime Companies*

INTRODUCTION

The concept of deep blue practices has gained global recognition as a strategy for fostering social, economic, and environmental progress of firms by responsibly utilizing oceans and inland water resources. Oceans, seas, and coastal regions make up a substantial portion of the Earth's surface. Consequently, the ocean represents the planet's largest ecosystem and contributes significantly to growth by creating sustainable livelihoods. Additionally, the ocean plays a crucial role in job creation, global well-being, and enhancing resilience to environmental disruptions.

As highlighted by Adetona (2020), over three billion people rely on marine resources for their livelihoods and food security. The practice of utilizing the sea and its assets to drive economic growth is known as the blue economy. The underlying principle of the blue economy is to substantially reduce environmental risks and ecological scarcities while simultaneously enhancing the quality of life. A multitude of ocean species serve as sources for medicines.

The deep blue practices also known as blue economy introduces a fresh and innovative approach to harnessing the economic potential of oceans, lakes, rivers, and various aquatic environments. Its primary aim is to promote economic expansion, social inclusivity, and the preservation or enhancement of people's well-being, all while ensuring the sustainability of the environment. At its core, it involves disentangling socioeconomic progress derived from ocean-related sectors and activities from the degradation of the environment and ecosystems.

To realize a blue economy in Nigeria and leverage maritime resources, the health of the ocean and the sustenance of the ecosystem are pivotal. This necessitates safeguarding the environment from detrimental elements and factors. The protection of the environment can be achieved through the development and

enforcement of protective legislation designed to shield marine resources from pollution, unsustainable resource extraction, the impacts of climate change, and the destruction of marine habitats, as noted by Sule (2021).

According to Hammed (2018), dimensions of blue economy include but not limited to renewable energy, sustainable fisheries, and aquaculture.

According to Jia et al. (2023), renewable energy refers to energy sources that are naturally replenished and can be used indefinitely, or at least over long periods of time, without depleting their resources. These energy sources are derived from natural processes and are considered environmentally friendly because they produce minimal or no harmful emissions that contribute to air pollution or climate change. Renewable energy has the potential to revolutionize the maritime industry by reducing its environmental impact, improving energy efficiency, and creating new economic opportunities. The integration of renewable energy sources and technologies in maritime operations aligns with the global shift toward sustainability and cleaner energy solutions in various industries, including the maritime sector.

Sustainable fisheries refer to the management and harvesting of fish from oceans, rivers, lakes, and other bodies of water in a manner that ensures the long-term health and productivity of aquatic ecosystems while also meeting the economic and social needs of human populations. Sustainable fisheries are guided by principles and practices aimed at maintaining the balance between fishing activities and the natural capacity of aquatic ecosystems to regenerate and support aquatic life (Luo & Chi 2023). Sustainable fisheries are an essential component of the maritime industry's growth. Their responsible and eco-friendly practices contribute to economic development, job creation, and technological advancements while ensuring the long-term sustainability of marine resources. The two sectors are interlinked, and the growth of one often depends on the sustainability and responsible management of the other.

Aquaculture is defined is the practice of cultivating, breeding, and harvesting aquatic organisms, including fish, shellfish, plants, and algae, in controlled environments such as ponds, tanks, or enclosures in oceans, rivers, or other bodies of water (Adewumi, 2015). Also known as "aquafarming", aquaculture involves the controlled management of aquatic species to meet human demands for seafood/plants and other aquatic products. Aquaculture is an integral part of the maritime industry's growth. Its contribution extends beyond seafood production, impacting job creation, technology, and infrastructure development, and supporting sustainable practices. The two sectors are interconnected, and the growth of aquaculture often complements and enhances the overall growth of the maritime industry.

The increase in capability and productivity of any country when measured in money terms is referred to as growth. Growth has been defined as an increased production of economic goods and services from one period to another (Chappelow, 2019). The maritime industry is intertwined with growth by virtue of its role in global trade facilitation, job creation, infrastructure development, energy and resource transport, and tourism. As economies expand, the maritime sector typically experiences growth in demand for its services, contributing to overall economic development in both maritime and landlocked regions.

The Niger Delta region is at the forefront of deep blue economy development, recognizing the pivotal role oceans will play in humanity's future. The deep blue economy concept offers a framework for achieving sustainable development that is better tailored to the unique circumstances, constraints, and challenges faced by regions like the Niger Delta.

The rationale behind this study stems from the numerous challenges and issues confronting Nigeria's maritime sector leading to delays and reduced competitiveness in the industry. It is within this context that this study investigates the effect of the deep blue practices on the growth of selected maritime companies in south-south Nigeria. The study seeks to introduce the notion of the blue economy and explore how countries, including Nigeria, can leverage it to their advantage.

Statement of the Problem

The global recognition of deep blue economy activities underscores their pivotal role in mitigating extreme poverty and hunger by creating employment and diverse economic opportunities. These activities encompass seagoing personnel supply, ship recycling, ship ownership and operation, shipbuilding, repair, and port services, among others. Nigeria boasts approximately 870 kilometers of coastline and an extensive network of inland waterways spanning about 3,000 kilometers, rich in diverse natural resources such as petroleum, natural gas, tin, columbite, iron ore, coal, zinc, limestone, lead, and other minerals. The unforeseeable and adverse consequences of heavy reliance on oil have accentuated the imperative to diversify Nigeria's economy from oil toward the realms of the blue economy. Advocates for increased agricultural outputs believe that the blue economy's potential holds the capacity to invigorate the maritime industry within the Nigerian economy, fostering desired growth and development. The blue economy is not only vital for a wide array of biodiversity and ecosystems but also for food chains, livelihoods, and climate regulation, especially in the context of a global population approaching nine billion individuals (Abdullahel, 2017).

Despite the government's endeavors to boost the blue economy in Nigeria, challenges persist, exerting considerable strain on coastal and marine resources. Local issues, including piracy, armed robbery, oil spills, illicit fishing methods, inadequate waste management, limited dredging, and inefficient cargo handling practices, remain prevalent. Additionally, there is a shortage of research addressing the influence of the blue economy on the maritime industry's growth in Nigeria. This research gap underscores the need for the formulation of comprehensive policies and strategies aimed at fostering sustainability and inclusivity within Nigeria's blue economy.

As far as the author of this study is aware, there has been limited research conducted on this topic within the Nigerian context. Additionally, the existing research that examines the effect of the blue economy on maritime industry growth primarily centers on developed nations, using renewable energy and Aquaculture giving relatively little consideration to developing countries like Nigeria. Likewise, most of the studies that have explored the influence of the deep blue economy on maritime industry growth have been limited in their scope and reach (Wenhai, et al. 2019; Martínez-Vázquez, et al. 2021; Md. Nazrul, 2022; Okemwa, 2019; Vázquez et al. 2021) were conducted in developed nations and various emerging economies.

Objectives of the Study

The main objective of the study is to examine the effect of deep blue practices on the growth of selected maritime companies in south-south Nigeria. The specific objectives are to:

i. investigate the effect of renewable energy on the growth of selected maritime companies in south-south Nigeria;
ii. determine the effect of sustainable fisheries the growth of selected maritime companies in south-south Nigeria;
iii. assess the effect of aquaculture on the growth of selected maritime companies in south-south Nigeria.

LITERATURE REVIEW

According to the World Bank (2016), the deep blue practices also known as blue economy is defined as the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs whereas protecting the health of ocean scheme. European Commission defined the deep blue economy as all economic activities associated with oceans, seas, and coasts. It covers a large vary of interlinked established and rising sectors. The concept Blue Economy as an economic philosophy was first introduced by Professor Gunter Pauli in 1994 when asked by the United Nations to reflect on the business models of the future in preparation for COP3 in Japan where the Kyoto Protocol was decided (Pauli, 2010). The idea 'blue economy' was propounded within the urban center Summit of 2012 that is additionally acquainted as 'Rio+20', by the world organization setting Program. Practically, the planned idea is an application of each 'green economy' in cycle with inexperienced growth and ideas to the ocean realm, up human eudemonia, and social equity in parallel with less environmental hurt and economical resource utilization were the very important causes behind underpinning the blue economy idea within the Rio+20 summit (UNEP, 2013).

The concept of a Blue Economy focuses on fostering the growth of a "Green Economy", an economy that seeks to reduce the environmental risks and ecological rarities that will assure an improvement in human well-being and social equity. (Voyer et al. 2017).

According to the U.S. Department of Energy Renewable energy is energy from sources that are naturally replenishing and virtually inexhaustible, such as sunlight, wind, and geothermal heat (Rafindadi &Ozturk, 2017). The International Energy Agency (IEA) defined renewable energy as energy that is derived from natural processes that are replenished constantly. This includes sunlight, geothermal heat, wind, tides, water, and various forms of biomass (Berto, et al. 2020). The World Wildlife Fund (WWF) (2015) described renewable energy as energy that is collected from resources that are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. The United Nations Framework Convention on Climate Change (UNFCCC) defined renewable energy as "energy derived from natural processes that are replenished at a rate that is equal to or greater than the rate at which they are consumed (Rafindadi &Ozturk, 2017). The European Commission defined renewable energy as energy from sources that are naturally replenished, including sunlight, wind, and water (Berto, et al. 2020).

To Rahman and Velayudhan (2020), Renewable energy is defined as natural energy sources that can be used without harming future generations' ability to meet their own energy needs. The concept is also defined as an environmentally friendly power generation methods that do not rely on fossil fuels.

There is no internationally agreed definition of 'sustainable fisheries. One common understanding of this term refers to fishing activities that can be continued on a sustained or indefinite basis (UNTAD, 2014). A more methodological approach refers to the application of the maximum sustainable yield (MSY), in some cases updated by economic and social considerations. The methodology requires, and is based on, science-based fish stocks management. Nonetheless, it can ignore, depending on how such methodologies are designed, the fact that fishing practices may negatively affect the balance of ecosystems and other species (if not well regulated and monitored), and that ecosystems affected by pollution and other external factors may hinder the reproduction and recovery capacity of fish and other marine stocks. This has led to the incorporation – not only in the case of oceans, but also in relation to biodiversity conservation – of a more holistic approach to the conservation, resilience and sustainability of ecosystems and the services they produce, as witnessed in the recently adopted SDGs.

On an institutional basis, 'sustainable fisheries' can be perceived to be fishing practices and actions that follow, and effectively apply, relevant international agreements, guidelines and best practices agreed under the United Nations Convention on the Law of the Seas (UNCLOS), the FAO and the International Maritime Organization (IMO), or under binding trade agreements, such as those negotiated through the World Trade Organization (WTO), in relation to market entry (tariffs) and market access (sanitary and phytosanitary measures), (UNTAD 2015; FAO 2014) technical regulations (e.g. harvesting and packing regulations), unfair practices (e.g. subsidies), and private standards and labelling (fishing practices).

Aquaculture is the management of aquatic organism in a controlled environment for the economic and social benefits. As a form of farming system, aquaculture managed both fish and non-fish aquatic animals in an artificial environment. The subset of aquaculture that focuses mainly on management of fish alone under controlled or semi-control conditions for the benefit of making profit is called fish farming (pisciculture) (Baruwa & Omodara 2019). Aquaculture means the natural or controlled cultivation of both aquatic animals and plants such as shellfish, fish and seaweed, in freshwater or marine environment. It can also be regarded as fish farming (Udemezue & Oseghue 2018).

Aquaculture, to which fish farming is categorized is the commercial rearing of aquatic plants and fish in settings where the basic means of production can be managed within their respective limits and where producers strive for optimal economic results (Tunde et al., 2015). It is the cultivation of aquatic resources (freshwater and saltwater populations); aquatic organisms that could be reared include fish, insects, bivalves and pearls, mollusks, crustaceans, and aquatic plants, while the controlled environments include ponds, cages, pens, and raceways (Tunde et al., 2015). Most of these aquatic organisms are consumed by man to

meet their demand for high quality animal protein. However, at present, species such as tilapia, carp, mudfish, and catfish are the only cultured fishery operation in Nigeria.

Economic growth refers to a positive increase in the aggregate level of output within a given time period in a country while economic development is seen as sustainable increase in the aggregate level of output and incomes, with due consideration given to the quality of life which hopefully takes account of such issues as equal distribution of income, healthcare, education, environmental degradation, reduction in global pollution, freedom, and justice, etc.(Elisha, 2019).

Empirical Review

George et al. (2023) investigated the impact of renewable energy on growth in Nigeria. The paper used secondary data from the World Bank data bank from 1990 to 2020 for its analysis. It used Toda-Yamamoto augmented granger causality test to test for the nature of the relationship between the two variables and Auto Regressive Distributed Lag (ARDL) bounds test to examine the impact of renewable energy on growth. The study found a bi-directional relationship between the variables. The regression results also showed a significant positive impact of renewable energy on growth. It therefore recommends that the government should encourage investments in the renewable energy sector by providing a conducive business environment and create awareness on the importance of the use of renewable energy in the country. While the study is thorough, it relied on secondary data, whereas the present research utilizes primary data. Primary data collection allows for the gathering of fresh, specific, and directly relevant information tailored to the research objectives. Additionally, primary data ensures greater control over data quality and relevance, reducing the risk of biases and inaccuracies that can sometimes accompany secondary data.

Dollah, et al. (2022) investigated the effect of sustainable fisheries on growth in Rivers State, Nigeria. The cross-sectional research design which endeavors to collect information from respondents across the population at a specific time in the study area was employed for this study. The target populations were fishermen/women in coastal communities in different LGAs in Rivers State. Multistage sampling method was employed, whereby 5 communities were selected from 5 randomly selected LGAs. Thereafter, convenient sampling was used to select 100 fishermen/women whereby 20 each were randomly selected from each LGA. Both primary and secondary data sources were utilized for the study. The primary data was acquired from the field surveys which involved the administration of questionnaires to the target population. Questionnaire samples returned were coded, recorded in excel worksheet 2010 and imported into the Statistical Package for Social Scientist (SPSS) 24.0 version for data analysis. Findings revealed that sustainable fisheries had an insignificant positive effect on growth in Rivers State. The study was confined to Rivers state, whereas the current study encompasses a wider geographical scope, examining the entire Niger Delta region.

Shahin and Alam (2023) explored the effect of aquaculture on growth in Bangladesh using Panel data analysis. The study used a population of all 64 districts in Bangladesh over the period 2002-2020. The sample size is 1,152 observations. They collected data from a variety of sources, including the Bangladesh Bureau of Statistics, the Bangladesh Fisheries Research Institute, and the World Bank. Panel data regression model was used to analyze the data. The model includes the following variables: Aquaculture production value (BDT million), GDP growth rate (%), Population growth rate (%), Inflation rate (%), Trade openness (%), Infrastructure investment (BDT million) and Education expenditure (BDT million). Findings revealed that aquaculture has a positive and significant effect on growth in Bangladesh. The study also found that the effect of aquaculture is stronger in districts with higher levels of trade openness, infrastructure investment, and education expenditure. A criticism of this study centers on the variance in geographical scope and research methodology, as the current study is primarily dedicated to Nigeria and employs survey research.

Theoretical Framework

This study adopts the Blue Economy Theory as it encompasses all economic activities related to the ocean, including fishing, aquaculture, shipping, tourism, and renewable energy. It also emphasizes the importance of sustainable growth and development and environmental protection. The Blue Economy Theory was first proposed in 2014 by the World Bank in its report The Blue Economy: An Overview of the Opportunities

and Challenges (World Bank, 2014). The Blue Economy Theory is a broad concept that encompasses all economic activities related to the ocean, including fishing, aquaculture, shipping, tourism, and renewable energy. It argues that the ocean has the potential to provide sustainable economic opportunities for billions of people around the world. The Blue Economy Theory is based on the following assumptions: The ocean is a vast and largely untapped resource with the potential to provide sustainable economic opportunities for billions of people. Sustainable economic development in the ocean is essential to protect the marine environment and ensure the long-term viability of the ocean economy. Innovation and technological development are key to unlocking the full potential of the ocean economy. Public-private partnerships are essential to achieve sustainable blue growth. Some critics argue that the Blue Economy Theory is too optimistic and that it does not adequately account for the challenges of sustainable ocean development. Others argue that the theory is too focused on economic growth and that it does not give enough attention to the social and environmental dimensions of sustainable development.

The Blue Economy Theory stands for a sustainable and inclusive approach to the development of the ocean economy. It aims to promote economic growth and job creation, while also protecting the marine environment and ensuring the long-term viability of the ocean economy. Examples of the Blue Economy in action are Sustainable fishing practices, offshore renewable energy development, Marine biotechnology, blue carbon sequestration and Marine tourism. Benefits of the Blue Economy are but not limited to Economic growth and job creation, Protection of the marine environment, Long-term viability of the ocean economy, Improved food security, Increased energy security and Enhanced coastal resilience. The Blue Economy Theory, focusing on sustainable and inclusive utilization of ocean resources, aligns with the principles of the deep blue economy, and together they can drive the growth of Nigeria's maritime industry by promoting responsible and value-added practices in the marine sector.

METHODOLOGY

The survey research design is used for this study. A survey research design is a research method that involves collecting data from a sample of people using a questionnaire or interview. Survey research is a quantitative research method, which means that it produces quantitative data that can be analyzed using statistical methods.

The study's population will comprise 384 senior and mid-level employees from eight (8) selected private maritime firms and expert offices actively operating within the Niger Delta region, chosen due to the region's substantial oil and gas reserves, the firms' well-established nature, their accessibility to publicly available data, which supports more robust research, and their valid registration and licensing by the Nigerian Maritime Administration and Safety Agency (NIMASA), responsible for regulating and overseeing various aspects of Nigeria's maritime sector, as indicated in Table 3.1 based on data obtained from a pilot study conducted with these entities.

Table 3.1 Number of Private Maritime Firms and Employees

S/N	**Name of private maritime firms and Employees**	**Number of Employees**
1	Nigerian Maritime Services (NMS)	56
2	Egina Offshore Field Operators	59
3	Aquatrans Nigeria Limited	47
4	Marine Platforms Limited	38
5	Ocean Marine Solutions	43
6	Nigerian Trawler Owners Association	57
7	Blue Sea Energy Limited	43
8	Cruise and Maritime Services	41
	Total	**384**

Source: Field Survey, 2023

Due to the limited size of the population under investigation, it is both feasible and practical to gather data from every individual within it, and thus, this study will employ a census sampling approach to collect data

from the entire population, comprising 384 senior and mid-level employees from eight selected private maritime firms, accomplished by distributing a questionnaire to all population members. Purposive sampling was used to select the respondents.

The study primarily relied on collecting fresh, specific, and directly relevant information tailored to the research objectives from primary sources, obtained by surveying participants through a closed-ended questionnaire. This questionnaire is structured using a 5-point Likert scale, ranging from "strongly agree" to "strongly disagree," to ensure clarity and reduce the likelihood of ambiguity, confusion, or misinterpretation of the questions.

Construct Reliability

To effectively demonstrate the reliability of the notion, it is commonly acknowledged that both Cronbach's alpha and composite reliability (CR) should ideally surpass the threshold of 0.7, as this value is widely recognized as the rule of thumb for ensuring a high level of internal consistency. The results of the Cronbach's Alpha, rho_A, composite reliability and average variance extracted are presented in Table 3.2

Table 3.2: Construct Reliability and Validity of the Indicators

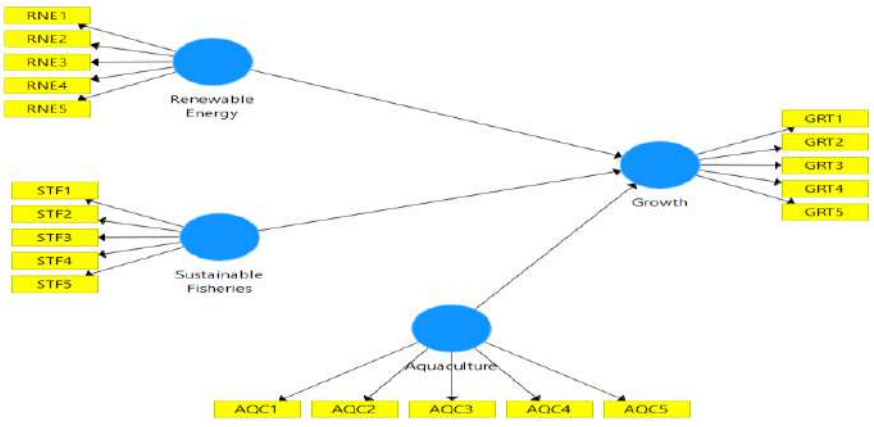
Variables	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Renewable Energy	0.854	0.765	0.867	0.612
Sustainable Fisheries	0.868	0.812	0.878	0.632
Aquaculture	0.876	0.704	0.789	0.646
Growth	0.901	0.762	0.899	0.676

Source: Researcher's Compilation using SMART PLS.

From Table 3.2, all the composite reliability indicators, without exception, exceeded the threshold of 0.7, which is an acceptable level of reliability. Furthermore, the assessment of internal consistency was conducted utilizing Cronbach's Alpha, and the results all show that the values surpassed the benchmark of 0.8. This signifies that there is a high level of confidence in the reliability of all the constructs under investigation. Dijkstra and Henseler (2015) introduced Rho_A as a metric for construct reliability to offer an alternative viewpoint, which lies between Cronbach's alpha and composite reliability. Furthermore, an assessment was conducted on the average extracted variance (AVE) of each construct, revealing values well above the recommended threshold of 0.5 proposed by Chin (1988). Hence, it can be inferred that the constructs being analyzed exhibit a significant amount of extracted variance.

Techniques for Data Analysis and Model Specification

The study employed partial least square – structural equation modeling (PLS-SEM) to examine the effect of each independent variable on the dependent variable. Smart PLS was used to code and analyze the data for this study to achieve all the set objectives.



RESULT AND DISCUSSION

Table 4.1: Distribution and Retrieval of Questionnaire

S/No.	Name of Airline	Number Distributed	Number Retrieved	Number not Retrieved
1.	Nigerian Maritime Services (NMS)	56	53	3
2.	Egina Offshore Field Operators	59	57	2
3.	Aquatrans Nigeria Limited	47	47	0
4.	Marine Platforms Limited	38	36	2
5.	Ocean Marine Solutions	43	40	3
6.	Nigerian Trawler Owners Association	57	55	2
7.	Blue Sea Energy Limited	43	43	0
8.	Cruise and Maritime Services	41	40	1
	Total	**384(100%)**	**371(96.61%)**	**13(3.39%)**

Source: Field Survey, 2024.

Table 4.1 presents the data concerning the distribution and retrieval of copies of the questionnaire to private maritime companies in the South-South region of Nigeria. The tabulated information delineates the specific distribution of questionnaires to each company, including Nigerian Maritime Services (NMS); Egina Offshore Field Operators; Aquatrans Nigeria Limited; Marine Platforms Limited; Ocean Marine Solutions; Nigerian Trawler Owners Association; Blue Sea Energy Limited; and Cruise and Maritime Services. It is noteworthy to highlight that a total of 384 copies of the questionnaire were distributed to these firms. Nevertheless, 371 copies were collected from them, with distinct tallies per company standing at 53, 57, 47, 36, 40, 55, 43, and 40 for Nigerian Maritime Services (NMS); Egina Offshore Field Operators; Aquatrans Nigeria Limited; Marine Platforms Limited; Ocean Marine Solutions; Nigerian Trawler Owners Association; Blue Sea Energy Limited; and Cruise and Maritime Services, respectively. Notably, these recovered questionnaires represent 96.61% of the overall distributed copies, thus constituting the foundation for the data analysis of this study. This response rate meets satisfies the threshold in research as stated by Fincham (2008), that a response rate of at least 50% is generally considered acceptable in many social science studies. Higher response rates, such as 60-70%, are preferable as they can increase the reliability and validity of the findings.

Descriptive Statistics

Table 4.2: Descriptive Statistics

Statistic	GRT	RNE	STF	AQC
Mean	3.348	3.464	3.787	3.464
Median	4.104	4.211	4.324	4.431
Maximum	5.000	5.000	5.000	5.000
Minimum	1.000	1.000	1.000	1.000
Std. Dev.	1.642	1.626	1.006	1.626
Skewness	-1.483	-1.356	0.396	-1.356
Excess Kurtosis	2.120	4.011	3.016	4.4512

Source: Researcher's Compilation from Smart PLS

Table 4.2 presents the descriptive statistics – mean, median, maximum, minimum, standard deviation, skewness and excess kurtosis of the variables used in this study. The median values for the variables – growth (GRT), renewal energy (RNE), sustainable fisheries (STF), and aquaculture (AQC), are recorded as 4.104; 4.211; 4.324; and 4.431, respectively. The median values suggest generally positive responses towards growth, renewable energy, sustainable fisheries, and aquaculture. It is worthy to note that the standard deviation values being smaller than two suggest that the datasets remain in close alignment with the expected values. When data is distributed normally, aligning with its mean, the skewness typically amounts to zero. In this case, the skewness values for majority of the variables appear to be negatively skewed, except STF which is quite like that of a normal distribution as the skewness is approximately zero. As for the kurtosis statistic of a normal distribution, it is typically valued at 3. This statistical measure is employed to gauge the degree of peakedness and flatness of a normal curve. To put it simply, the kurtosis offers insights into the

extent to which a distribution is peaked, with a value around 3 indicating a distribution that is commonly regarded as normal. In contrast, the variables RNE, STF and AQC tend to display leptokurtic distributions (where k > 3), characterized by a high peak and "fat tails". On the other hand, the variables GRT exhibit platykurtic distributions (where k < 3), which are characterized by thinner tails and curves that are somewhat flat-topped. It is important to note that these series do not display any significant bias, despite their kurtosis values.

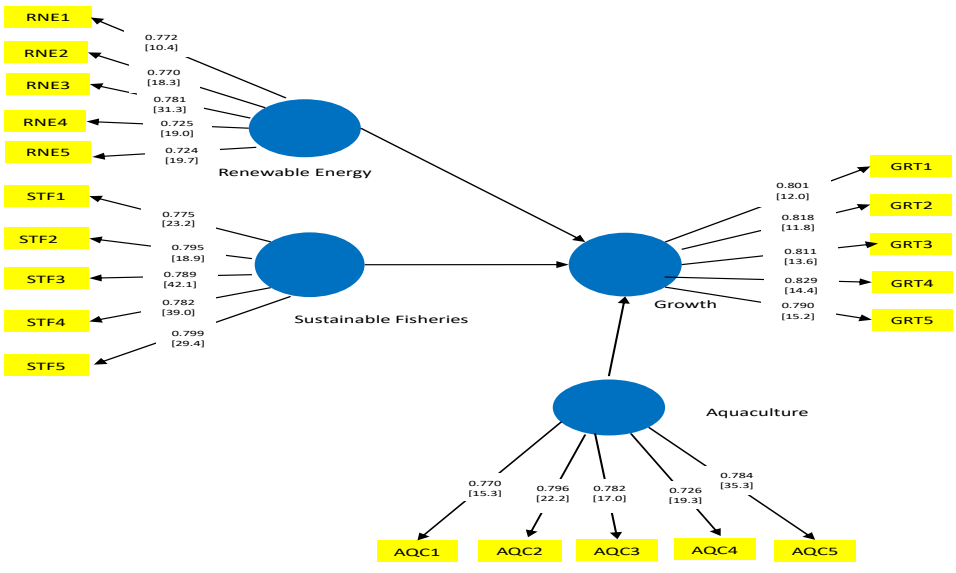
Table 4.3: Factor Loading

Latent Variable	Manifest Variable	Loading	t-statistic
Renewal Energy (RNE)	RNE1	0.772	10.361
	RNE2	0.770	18.321
	RNE3	0.781	31.312
	RNE4	0.725	18.963
	RNE5	0.724	19.732
Sustainable Fisheries (STF)	STF1	0.775	23.187
	STF2	0.795	18.937
	STF3	0.789	42.122
	STF4	0.782	38.992
	STF5	0.799	29.410
Aquaculture (AQC)	AQC1	0.770	15.287
	AQC2	0.796	22.197
	AQC3	0.782	16.927
	AQC4	0.726	19.329
	AQC5	0.784	35.312
Growth (GRT)	GRT1	0.801	11.988
	GRT2	0.818	11.799
	GRT3	0.811	13.610
	GRT4	0.829	14.421
	GRT5	0.790	15.232

Source: Researcher's Compilation from Smart PLS

Table 4.3 shows that each of the deep blue practice's measures, such as renewable energy, sustainable fisheries, and aquaculture, along with growth indices, exhibit loading factors exceeding the threshold of 0.7 as stated by Hair and Sarstedt, (2019). This unequivocally indicates the high reliability of all the variables under consideration. The presentation of these item loadings can be observed in Figure 4.1, which visually represents the relationships between the independent and dependent variables in a clear and concise manner.

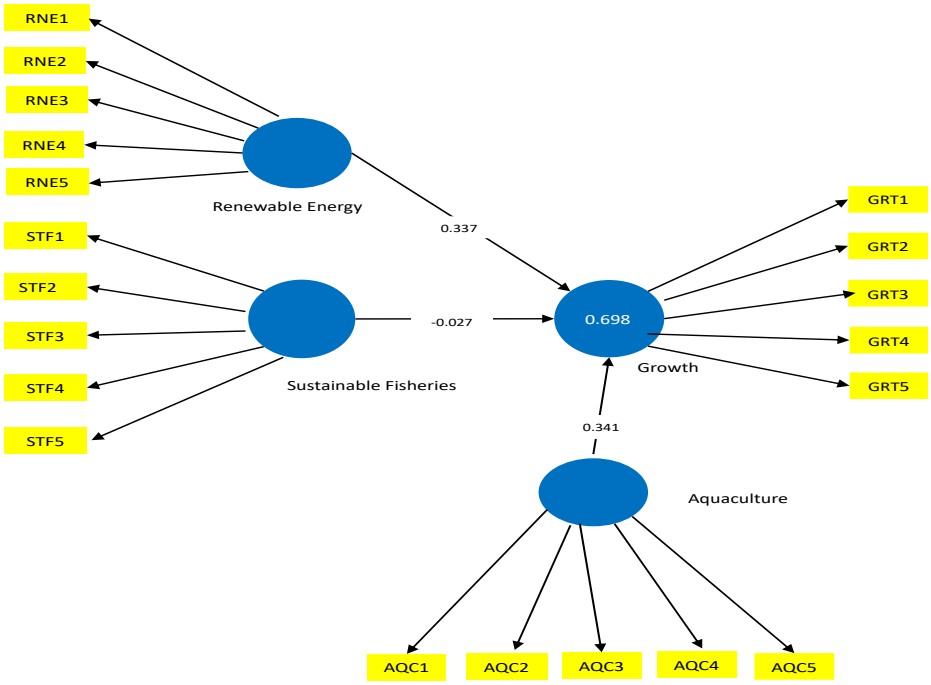
Figure 4.1: PLS Algorithm (Item Loadings and t-statistics)



Note: t-statistics are in square brackets, [].

Source: Researcher's Construction from Smart PLS, 2024.

Figure 4.2: Structural Model (Path Coefficients and R^2)



Figures 4.1.& 4.2 shows that the independent variables – renewable energy, sustainable fisheries, and aquaculture, play a significant role in predicting the growth of the selected maritime companies in south-south Nigeria. It is noteworthy to emphasize that each of these variables exhibits statistical importance, which is supported by the t-values and probability values derived from the analysis. Furthermore, a critical examination of these latent variables necessitates the use of component scores corresponding to each variable on the scales. To strengthen the groundwork for hypothesis testing, it is essential to establish linkages between the latent variables under consideration, specifically focusing on the expected influences of the three distinct factors on the dependent variable. By delving into the intricacies of these relationships, researchers can gain a deeper understanding of how the identified independent variables collectively impact the growth of the selected maritime companies in south-south Nigeria.

Hypotheses Testing

Table 4.4: Path Coefficient of the Model for Hypotheses Testing

Hypothesis	Beta	t-value	p-value	Decision	f^2
H_{o1}: Renewal Energy → Growth	0.337*	6.731	0.000	Rejected Ho	0.422
H_{o2}: Sustainable Fisheries → Growth	-0.027	-1.751	0.115	Accepted Ho	0.012
H_{o3}: Aquaculture → Growth	0.341*	6.726	0.000	Rejected Ho	0.451

*Notes: *indicates significance at 5% significance level.*
Source: Smart-PLS Results

Hypothesis One

H_{01}: Renewable energy has no significant effect on the growth of selected maritime companies in south-south Nigeria**.**

The results of the path coefficient analysis conducted on the model presented in Table 4.4 show that renewable energy has a positive effect on the growth of the selected maritime companies in south-south Nigeria. This positive effect is revealed by the coefficient value of 0.337, which implies that a one percent increase in renewable energy within the study area will lead to a 33.7 percent increase in the growth of maritime companies, and vice versa. Furthermore, since the probability value of 0.000 associated with this coefficient is less than 0.05 (5%) level of significance, the effect of renewable energy on growth of maritime

companies is statistically significance at 5% level of significance. The f-squared (f^2) statistic evaluates the power of the independent variable in explaining the dependent variable. According to Cohen's (1988) classification, f^2 values of 0.02, 0.15, and 0.35 correspond to weak, moderate, and strong (large) effects of important independent variables, respectively. In this case, the calculated f^2 value for this variable (renewable energy) is 0.422, indicating a strong (large) effect size.

The result of the t-statistic and the probability value give substantiating evidence to conclude that the first null hypothesis, which posits renewable energy has no significant effect on the growth of selected maritime companies in south-south Nigeria, is rejected and its alternative accepted. Thus, it can be stated that renewable energy has significant effect on the growth of selected maritime companies in south-south Nigeria.

Hypothesis Two

H_{02}: Sustainable fisheries have no significant effect on the growth of selected maritime companies in south-south Nigeria.

The results presented in Table 4.4 revealed that sustainable fisheries exert a negative effect on the growth of selected maritime companies in south-south Nigeria, as reported by its coefficient of -0.027. This implies that a one percent increase in sustainable fisheries would correspondingly lead to a 2.7% percent decrease in the growth of maritime companies in south-south Nigeria, and vice versa. This finding is contrary to expectations and might be since sustainable fisheries in south-south Nigeria limit the overexploitation of marine resources, which restricts the short-term profits of certain maritime companies that rely on high-volume fishing practices. Furthermore, the probability value of 0.115, along with its associated t-statistic of -1.751, shows that the effect of sustainable fisheries on the growth of maritime companies in south-south Nigeria is statistically insignificant at the 5% level of significance. This is because, the probability value of 0.115 is greater than the 5% (0.05) level of significance. On the effect size pertaining to this path coefficient (the coefficient linking sustainable fisheries and growth), the f^2 value of 0.002, shows that the effect size is small.

As a result of the insignificant effect that sustainable fisheries have on the growth of the maritime companies in the study area, the second null hypothesis, is accepted, and its alternative is rejected. Thus, it suffices to say that sustainable fisheries have no significant effect on the growth of selected maritime companies in south-south Nigeria.

Hypothesis Three

H_{03}: Aquaculture has no significant effect on the growth of selected maritime companies in south-south Nigeria.

The results of the path coefficients presented in Table 4.4 show that, in line with expectations, aquaculture has positive coefficient of 0.341. This implies that aquaculture has a positive effect on the growth of maritime industry in Nigeria. To elaborate further, a one percent increase in aquaculture results in a 34.1% decrease in the growth of maritime industry, and vice versa. The magnitude of this effect is further emphasized by the f^2 statistic value of 0.451, which signifies a large effect.

The reported t-statistic of 6.726 and the associated probability value of 0.000 which is less than 0.05 (5%) level of significance shows that the effect of aquaculture on the growth of the maritime companies in the study area is statistically significant at 5% level of significance. Therefore, we reject null hypothesis three, which states that aquaculture has no significant effect on the growth of selected maritime companies in south-south Nigeria; and accept its alternative hypothesis. This implies that aquaculture has significant effect on the growth of selected maritime companies in south-south Nigeria.

Table 4.5: R^2 of the Model

Dependent Variable	R^2
Growth	0.698

Source: Researcher's Computation from Smart-PLS.

The result presented in Table 4.5 shows the R^2 value 0.698. This denotes that, changes in measures of deep blue economy – renewable energy, sustainable fisheries, and aquaculture– account for 69.8 percent of the changes observed in the growth of maritime industry in Nigeria. The remaining 30.2% of changes in the growth of the maritime industry in the study area are attributed to other factors which accounts for factors affecting the growth of the maritime industry in Nigeria not included in the model of the study and the errors of measurement.

Discussion of Findings

Renewable energy and the growth of selected maritime companies in south-south Nigeria.

The first objective of this study was to investigate the effect of renewable energy on the growth of selected maritime companies in south-south Nigeria. The results obtained show that renewable energy has a positive and significant effect on the growth of selected maritime companies in south-south Nigeria. The finding that renewable energy has a positive and significant effect on the growth of selected maritime companies in South-South Nigeria underscores the transformative potential of sustainable energy practices in enhancing industrial performance. This region, rich in marine resources, benefits substantially from renewable energy adoption, which reduces operational costs and dependency on erratic fossil fuels, thus improving efficiency and profitability. Moreover, the integration of renewable energy aligns with global environmental standards, fostering corporate social responsibility and enhancing the market competitiveness of these companies. This growth trajectory not only strengthens the maritime sector but also stimulates broader economic development and sustainable practices within the region. The finding of this study aligns with that of George et al. (2023) who investigated the impact of renewable energy on growth in Nigeria and found that a significant positive impact of renewable energy on growth.

Sustainable fisheries and the growth of selected maritime companies in south-south Nigeria.

Secondly, this study sought to determine the effect of sustainable fisheries the growth of selected maritime companies in south-south Nigeria. The results of the SEM-PLS path coefficients show that sustainable fisheries have a negative and insignificant effect on the growth of selected maritime companies in south-south Nigeria. This finding suggests that the adoption of sustainable fishery practices has not yet translated into measurable economic benefits for the maritime industry in Nigeria. This finding is contrary to expectations and might be due to the restrictive nature of sustainable practices on high-volume fishing. Sustainable fisheries aim to prevent overexploitation of marine resources, ensuring long-term ecological balance and resource availability. However, these practices can limit the immediate catch volumes for maritime companies that depend on high yields for their profitability. Consequently, these restrictions might reduce short-term revenues, making the impact of sustainable fisheries appear negative and insignificant in the short run. This highlights the tension between long-term environmental sustainability and immediate economic gains, suggesting a need for these companies to adapt their business models towards more sustainable and diversified practices to align long-term growth with ecological preservation.

The finding of this study regarding the effect of sustainable fisheries and the growth of the maritime industry in Nigeria, in one way aligns with those of Dollah, et al. (2022) who investigated the effect of sustainable fisheries on growth in Rivers State, Nigeria and reported that sustainable fisheries had an insignificant effect on growth in Rivers State. On the nature of the effect, the finding of this current study contradicts with that of Dollah, et al. (2022) who found that sustainable fisheries have positive effect on growth in Rivers State of Nigeria. The possible reasons for the differences could be attributed to the scope and methodology of the present study as it covers the entire south-south region and used PLS-SEM in the analysis.

Aquaculture and the growth of selected maritime companies in south-south Nigeria.

In the third place, this study assessed the effect of aquaculture on the growth of selected maritime companies in south-south Nigeria. Findings revealed that aquaculture has significant positive effect on the growth of selected maritime companies in south-south Nigeria. This underscores the transformative potential of sustainable aquatic farming in regional economic development. By integrating aquaculture practices into their operations, maritime companies not only diversify their revenue streams but also leverage local resources to bolster food security and employment opportunities. This synergy enhances the resilience of coastal economies, fostering innovation and collaboration within the maritime sector while simultaneously

addressing pressing social and environmental challenges. As aquaculture continues to flourish, its ripple effects lead to growth of maritime industry in Nigeria.

The results obtained from this research concerning the beneficial and noteworthy impact of aquaculture on the development of maritime enterprises in the south-south region of Nigeria aligns with the findings of Shahin and Alam (2023) who delved into the influence of aquaculture on growth in Bangladesh through the utilization of Panel data analysis. They concluded that aquaculture indeed exerts a positive and substantial influence on growth within the Bangladeshi context.

CONCLUSION AND RECOMMENDATIONS

The study employed structural equation modeling with partial least squares (PLS-SEM) to examine the impact of various components of the deep blue economy on selected maritime companies in South-South Nigeria reveals several critical insights. Firstly, renewable energy significantly enhances the growth of these companies, thus we can conclude that renewable energy has the potential to drive industrial performance and subsequently economic development of the region. Secondly, sustainable fisheries do not show a benefit (growth) for the maritime industry, indicating a gap between the adoption of sustainable practices and their financial outcomes. We can also conclude that since aquaculture emerges as a positive influence on company growth, it demonstrates the viability of aquaculture as a growth driver within the maritime sector. Based on the findings of this study, the following recommendations are proffered:

i. Maritime companies in South-South Nigeria should allocate more resources towards expanding their renewable energy infrastructure. This includes investing in solar, and tidal energy projects to power their operations. By doing so, companies can reduce operational costs, improve sustainability, and potentially benefit from government incentives for renewable energy adoption. Additionally, this can enhance their corporate social responsibility profile and appeal to environmentally conscious customers and investors.
ii. Given that sustainable fisheries currently have a negative impact on growth, it is crucial to reassess and improve fisheries management practices. Maritime authorities should adopt more stringent regulations to prevent overfishing, improve fish stock assessments, and enforce sustainable catch limits. Collaborating with local communities, scientists, and policymakers to develop and implement more effective and sustainable fisheries management plans can help mitigate the negative impact on growth and ensure long-term viability of fish stocks.
iii. To capitalize on the positive effects of aquaculture, maritime companies should focus on enhancing and scaling their aquaculture operations. This includes investing in advanced aquaculture technologies, improving the efficiency of breeding and feeding practices, and ensuring high standards of water quality management. Additionally, maritime companies should explore opportunities for diversification within aquaculture to include a variety of species, which can reduce risks associated with market fluctuations and environmental factors. Training and supporting local aquaculture farmers can also drive sector growth and sustainability.

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Appendix

Research Questionnaire

S/N	Renewable energy (RNE)	SA	A	N	D	SD
RNE1	Renewable energy plays a role in promoting the sustainable growth of the maritime industry in Nigeria					
RNE2	I am satisfied with the Nigerian government's efforts to promote the use of renewable energy in the maritime industry					
RNE3	My organisation pays a 5% premium for maritime services that use renewable energy					
RNE4	My organisation is concerned about the environmental impact of the maritime industry					
RNE5	I strongly feel the maritime industry would transition to 100% renewable energy by 2050					
	Sustainable Fisheries (STF)					
STF1	The Nigerian government is doing enough to promote sustainable fisheries					
STF2	My organisation provides seafood that is certified sustainable					
STF3	My organisation is concerned about the sustainability of the world's fisheries					
STF4	I am willing to take action to support sustainable fisheries in Nigeria					
STF5	The growth of the deep blue economy will have a positive impact on sustainable fisheries in Nigeria					
	Aquaculture (AQC)					
AQC1	Aquaculture is a sustainable way to produce seafood					
AQC2	Aquaculture plays a role in reducing overfishing of wild fish populations					
AQC3	My organisation provides seafood from aquaculture farms					
AQC4	The Nigerian government is doing enough to support sustainable aquaculture practices					
AQC5	My organisation provides seafood from aquaculture farms that are certified sustainable					
	Growth (GRT)					
GRT1	The maritime industry through my organisation contributes significantly to Nigeria's GDP					
GRT2	The maritime industry through my organisation creates jobs and supports livelihoods in Nigeria					
GRT3	The maritime industry through my organisation is a key driver of economic growth in Nigeria's coastal communities					
GRT4	The Nigerian government is doing enough to support the economic growth of the maritime industry					
GRT5	I am optimistic about the future economic growth of the maritime industry in Nigeria					