OPEN ACCESS

Saudi Journal of Humanities and Social Sciences
Abbreviated Key Title: Saudi J Humanities Soc Sci
ISSN 2415-6256 (Print) | ISSN 2415-6248 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Blue Resources Under-Exploitation and Development Impediment along Atlantic Coastline: Example from Akwa Ibom State, Nigeria

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DOI: https://doi.org/10.36348/sjhss.2025.v10i04.002 | **Received:** 26.02.2025 | **Accepted:** 04.04.2025 | **Published:** 07.04.2025

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Abstract

The study painstakingly assessed "Blue Resources under-exploitation and Development Impediment along Atlantic Coastline: Example from Akwa Ibom State, Nigeria''. Reconnaissance survey was done prior to field work between September 2024 to February 2025. The study employed descriptive method of data analysis alongside in-depth interview using community leaders, Women Association and Youth Forum and other concerned social groups. Focus Group Discussion was further employed using 15 males and 15 females with participants ranging from 28 years and above. Forty (40) structured questionnaires were distributed to heads of household in ten (10) selected communities making a total of 400 questionnaires. Findings revealed that there are numerous blue resources potentials in Akwa Ibom State including blue food, blue tourism resources, blue mineral, blue energy, blue-green resources and blue transport. The study revealed that in order of resource utilization, blue minerals and blue tourism take the leads, while investment in blue energy, maritime services, wetlands farming and aquaculture was under-utilised. Linking this finding with the level of economic development of the region, blue resource under-utilisation contributed significantly to the declining economic situation. It was further realized that household economic status was relatively low in comparison to the huge natural resources availability. The study however, recommended that more efforts should be re-directed towards multi-sectoral and holistic resource management that could ensure that all dimensions of blue resources in the region are incorporated into the economic sector for development. Hence, an organized, participatory and multi-lateral investment, laced with modern skills on environmentally friendly resource exploitation, resource marketing and resource value-chain optimization are suggested.

Keyword: Blue Resources Under-exploitation, Development Impediment, Atlantic Coastline.

INTRODUCTION

Discourse on natural resource under-exploitation or used interchangeably as resource under-utilisation has taken a central position in contemporary social science research. Meanwhile some decades ago, studies by Ostrom (1977), Agrawal, (1994) and other colleagues revolutionized natural resource utilization particularly over-exploitation of common resources. Reckless resource consumption nearly depleted global fisheries, forestry, water and pastures until institutional arrangement for resolving common problems came into being (Ostrom, 1987). The complexities and perplexities in natural resource management in developing economies is driven by the forces of over-exploitation on one end and under-utilisation on the other end. Resource under-utilisation begets economic stagnation and over-exploitation leads to ecological degradation. Recently, interest in blue resource exploitation has increased across nations of the world, yet regions around the South Atlantic Shoreline continually lags behind in ‘’Blue Wealth Creation’’ (Jimmy & Osogi, 2024).

Blue Resource management involves the strategic management of resources from the coast with a particular focus on how this management affects the quality of life for both present and future generation. It deals with managing the way in which people demand for blue-related resources (Adeoba & Tracy, 2024).

At global setting, the United Nations Sustainable Development Goals (SDGs) recognizes natural resources management as one of the key solutions for addressing global socio-economic and developmental barriers including poverty, food insecurity, water related issues, climate change among others. **F**ollowing the expiration of the implementation timeline of the Millennium Development Goals (MDGs), which came to an end in 2015, the international community through the United Nations in collaboration with the Heads of States and Governments of the 193 Member Nations, launched the Sustainable Development Goals (SDGs) as a new developmental agenda.

This new agenda, also known as Agenda 2030, is framed into 17 Goals, 169 Targets and 230 Indicators. Nigeria, being one of the countries that ratified and adopted the Agenda for implementation in September 2015, proceeded immediately to domesticate it, and then began with the data mapping of the SDGs with a view to identifying which agencies of government and other stakeholders could fast track the attainment of these laudable goals. Blue economy concept came up to consolidate the attainment of SDGs from ocean-based dimension otherwise called ‘’blue-resource’’ (Jimmy & Osogi, 2024).

Effective blue resources investment is intricately linked with the attainment of goal 1, 2 and 3 (poverty, hunger and sustainable agriculture respectively) among others. Blue-related resources management plays a significant role in the alleviation of poverty and the achievement of food security in many part of the world. Management of these resources can trigger rural development by providing enabling environment for the growth of small and medium scale enterprises, raw materials for industries, household income, revenue generation to the community and the government, job opportunities and food security among others (Claes, *et al*., 2022).

On a specific note, translation of blue resources exploitation for community development is the main strength of contemporary resource management. Many organizations and economies have currently incorporated blue resources exploitation for transformational development lately (Jimmy & Osogi, 2024). To begin with, it is one thing to be endowed with natural resource but on the other hand, a different issue entirely for such assets to leave behind developmental imprint. Nigeria as a country is not left out in this dilemma of blue resources abundant with no outstanding development in resource-endowed communities. As one of the objectives of this work, the causes the level of community development from resource exploitation was evaluated.

Regionally, the Niger Delta is blessed with abundant blue food including marine shell and non-shell fish, contributing significantly to the informal sector (oyster harvesting, periwinkle harvesting, cray fish harvesting, crab harvesting, prawn harvesting, harvesting of sea urchin, turtle, shrimps) tortoise hunting, snails hunting/farming; blue-related agriculture like aquaculture, shell fish farming; blue-green resources like aquatic lifeforms, blue-related minerals; blue tourism resources and other blue-related occupations such as palm wine tapping, alcohol and methane production, bio-fuel investment, traditional medicine practice and lumbering. These resources also include virgin islands, estuaries, nature park, coastal beaches, historical monument (Mary Sclessor’s house, and amalgamation house) and others too numerous to mention.

Blue resources in Akwa Ibom State and Nigeria by extension have not been fully developed partly as a result of low prioritization and investment as well as shortage in modern-day blue strategic development approach.

In a different light, Abraham *et al*., (2024) added that the vast water bodies in Akwa Ibom State with over one hundred (100) fishing settlements should have cater for the protein needs of the state, however, there are numerous barriers related to fishing technology and miniaturized number of investors in aquaculture and mariculture.

A study by Jimmy (2016) has outlined management constraint associated with blue minerals in Akwa Ibom State, reiterating that about three hundred and sixty nine (369) solid mineral extraction sites producing various forms of sand aggregates and after few years of exploitation, an extensive part of the state has been wounded with ecological scars, particularly borrow pit and abandoned mines.

Blue-related minerals such as clay, sharp sand, gravel plastering sand, laterite are resources that could easily improve living condition in the informal sector. These resources are either abandoned, mis-managed or abruptly under-utilised (Abraham, Essien and Marcus, 2017).

Beside solid minerals, there is a vast expanse of fertile blue-green resources specifically wetlands in Akwa Ibom State. A total of about 30% of the entire soils in Akwa Ibom State generally is wet. A study by Umoh (2013) noted that wetland soils in Akwa Ibom State has the potential to curb food insecurity and encourage wealth creation. Among the many barriers to wetland utilization is funds, know-how and communal restiveness. According to Udo (2001), communal restiveness has been recorded as the primary reason for

the collapse of wetlands agro-ecological zone in Itu LGA, particularly Ikot Offiong-Oku Iboku axis.

Reports on Communal clashes in Mbo, Esit Eket, Ibeno, Oron, Ikot Abasi, Eket and Eastern Obolo chiefly from total disregard over the welfare of host communities, infrastructural decay and ecological degradation are available (Abraham *et al*., 2022; Jimmy & Osogi, 2024). For over three (3) decades, community clash had led to resettlement, disruption of farming and food insecurity. Community clashes also emanates from land tussle, boundary issue and struggle over territorial control. In addition, piracy along major water ways to a greater extent affects management of blue resources resulting to uncertainties and fear on the mind of investors to penetrate those regions for business (Jimmy & Osogi, 2024).

Another classical example is the case of Ibeno and Eastern Obolo LGAs, and being the largest fishing settlement, oil and gas, likewise potential maritime hub, struggles with development over the years. According to Enemugwem (2009) oil was discovered in Eastern Obolo in 1957 by the Shell D' Archy Petroleum Development Company, though commercial production began in 1976, after many years of exploitation, there is no safe water to drink, neither a better health facility, school, market, road, police station, magistrate court and real estate.

Fifty years of oil multinational presence has not correspondingly reflected in social and economic fabrics. The situation of Ibeno and Eastern Obolo is never an outcome of resource under-utilisation, rather a product of skewed resource management with no regard for indigenous people and their rights.

In another case, resource under-utilisation for instance, clay and kaolin in Ntak Inyang, Ikot Ebom Itam, Ikot Ekwere Itam, Odiok Afaha Itam and Ekim Itam communities, likewise Ibaka bay for sea port development and renewable energy technology are cases of significant concern. It is on this justification, this study seeks to explore blue resources under-exploitation and development impediment along Atlantic Coastline. Example from Akwa Ibom State, Nigeria.

LITERATURE REVIEW

(i) Blue-Green Resources

Blue-green resources involve various forms of riparian vegetation, swamp soil, marshes and many others. Blue-green resources are classified into shallow water life forms and sea bed life forms. Blue-green resources is segmented into shallow water bio-resources and deep sea bed bio-resources (Jimmy & Osogi, 2024). The shallow water ecosystem supports the cultivation of crops like rice, yam, cassava, cocoyam, maize, okro, water leaf, fluted pumpkin as well as economic trees (see feature 1& 2).

Feature 1: Wetland farming

Wetland farming supports the production of honey, shell fishes, non-shell fishes and frog. Frog farming in recent times open a new source of protein to household who are unable to afford the cost of pork meat and cow meat. Studies have indicated the economic opportunities related to frog farming across Asia, Nigeria and Europe (Talukdar & Sengupta, 2020; Talukdar *et al*., 2020). *A cross sectional view of frog farming in Niger Delta is shown in figure 2.*

Figure 2: Frog farming

Apart from the recreational benefit derived from blue-green environment, shallow water ecosystems are food basket that feed world population. Blue-green resources are multifaceted encompassing all forms of flora and fauna found in marine environment (Doreen *et al*., 2024; Sudhakar *et al*., 2018). Numerous studies on the socio-economic potential of wetlands has been reviewed (Friess *et al*., 2020; Pittman *et al*., 2019; Umoh, 2000a; Umoh, 2015, 2016).

Besides, studies on deep water bio-resources is inadequate in Africa. Marine ecosystem is one of the earth's most valuable assets. The economic potentials of phytoplankton, coral, sea algae, sea weed, marine mammals have been reported (Rimmer *et al*., 2021; Rees, 2019; Rajauria & Yuan, 2021; Silva *et al*., 2020; Mu *et al*., 2019).

The deep sea bed is also a vast reservoir of biological resources that could have profound implications for medicine, biotechnology, and agriculture. Organisms in the deep sea have evolved to survive under extreme pressure, cold, and darkness, resulting in unique biochemical processes and compounds with potential applications in industrial processes, environmental remediation and drug discovery. For instance, deep-sea bacteria and fungi have yielded compounds with antimicrobial, anti-inflammatory, and anticancer properties (Newman & Cragg, 2016). The exploration of the deep sea for novel medicinal compounds has led to the discovery of new drugs, such as the anticancer agent Halaven, derived from a marine sponge (Blunt *et al*., 2018). The vast biodiversity of the deep ocean represents an untapped potential for future biomedical discoveries in Nigeria and Africa.

Enzymes from deep-sea organisms, such as thermophilic bacteria, are highly sought after for industrial applications. These enzymes are stable at extreme temperatures and pressures, making them ideal candidates for processes in harsh environments, such as waste management, biofuel production, and food processing. The ability to harness these enzymes could revolutionize various industries, providing more sustainable and efficient solutions.

Currently, many industries including food, pharmaceutical, bio-technology, construction as well as many other industries depend on blue-green biodiversity for their operations and production (Sesan *et al*., 2024; Bhatia & Chugh, 2015; Chakraborty, 2023; Chowdhury *et al*., 2021). Along the coast of Akwa Ibom State and the entire Niger Delta, the shallow waters and deep sea bed bio-resources are generally under-utilized.

(ii) Blue-Related Minerals

Within the coastal plains and deep sea bed, lies a huge mass of rocks, pellets, oil and gas, gold, diamond, sand aggregates, lithium and many other liquid and solid minerals.

Due to fluvial processes particularly fluvial transport and deposition, wide variety of minerals are overlaid over a long stretch of sea shore and coastal plains (see feature 3)

Feature 3: Granite and Hard core and Clay Mining around coastal plain

The deep sea bed is enriched with polymetallic nodules, polymetallic sulfides, and cobalt-rich ferromanganese crusts. These resources are rich in metals such as nickel, copper, cobalt, and rare earth elements (REEs), which are essential for manufacturing a wide range of electronic devices, electric vehicles, batteries, renewable energy storage, and even military equipment (Hein *et al*., 2013). The growing demand for these materials, especially in the context of the global transition to green technologies, has sparked interest in deep-sea mining as a viable solution. A study by Kato *et al*., (2019) noted that regions within the sea floor, particularly in the Clarion-Clipperton Zone (CCZ) in the Pacific Ocean holds over 200 billion tons of polymetallic nodules, with a value potentially exceeding trillions of dollars (Miller *et al*., 2021).

Polymetallic sulfide deposits are typically found around hydrothermal vent systems, where superheated water rich in minerals emerges from the Earth's crust. These deposits contain significant quantities of gold, silver, copper, zinc, and lead. Hydrothermal vent ecosystems, while fragile and poorly understood, represent an area of intense scientific interest and commercial potential (Jenkins *et al*., 2018). Notably, these areas also offer potential for biotechnological applications, as the extreme conditions foster the development of unique organisms whose enzymes could be used in industrial processes. The Niger Delta region of Nigeria has never harnessed the immense materials deposit in the deep sea bed due to knowledge gap and financial investment.

Another study by Reynolds *et al*., (2019) has identified Cobalt-rich ferromanganese crusts found on the slopes of underwater mountains and seamounts as a potential economic booster. These crusts contain high concentrations of cobalt, nickel, and rare earth elements, all of which are critical to the production of renewable energy technologies such as wind turbines and electric vehicle batteries. With the global push for decarbonization, the importance of these resources cannot be overstated.

Another intriguing energy resources found beneath the ocean floor is methane hydrates, also known as "fire ice." These crystalline compounds consist of methane gas trapped within ice molecules and are found in sedimentary deposits in the deep ocean. Methane hydrates are thought to contain vast amounts of natural gas, potentially surpassing the global reserves of conventional natural gas (Kvenvolden, 2001). However, the technical challenges and environmental risks associated with extracting methane from these deposits are significant. If these challenges can be overcome, methane hydrates could play a critical role in meeting future global energy demands.

Accessing the resources of the deep sea bed requires advanced technologies that can withstand the extreme pressures, low temperatures, and high salinity of the deep ocean. Over the past few decades, technological advancements in robotics, submersibles, and remotely operated vehicles (ROVs) have made deep-sea exploration more feasible. For instance, the use of autonomous underwater vehicles (AUVs) equipped with sophisticated sensors has enabled the mapping of the deep sea bed and the identification of mineral deposits (Sharma *et al*., 2022).

In addition to minerals, the deep sea bed is a potential source of significant energy resources, particularly oil and gas. While much of the oil and gas extraction has been focused on continental shelves and offshore platforms, advances in deepwater drilling technologies are opening up new frontiers for energy exploration in deeper and unexplored maritime-bound areas.

In the study area, out of the 31 local government areas of Akwa Ibom State, oil and gas deposit is confirmed in more half of the entire LGAs including Nsit Atai, Nsit Ibom, Nsit Ubium, Ibesikpo Asutan, Uruan, Itu, Okobo, Ikot Abasi, Eastern Obolo, Eket, Esit Eket, Oron, Udung Uko, Urue Offong Oruko, Ibeno, Mbo, Onna, Etinan. Out of the identified places, active exploitation of oil and gas is primarily carried out in Eastern Obolo, Ibeno, Ikot Abasi, Mbo, Eket and Esit Eket, while the remaining places have been corked for future consumption.

In addition, the discovery of abundant Aluminium ore in the coastal fringes of Akwa Ibom State led to the establishment of ALSCON to kickstart industrial development in the Niger Delta and Nigeria by extension. Unfortunately, issues of poor management led to the total shut down after few years of operation.

(iii) Blue Tourism

Coastal tourism often called blue tourism is intricately linked with socio-economic development. Blue tourism, or ocean-based tourism, is the fastest-growing sectors in global travel. It encompasses a wide variety of activities, including cruising, water sports, ocean expedition (e.g The Titanic wreck exploration) and marine exploration like scuba diving and whale watching (Jimmy & Osogi, 2024). Blue tourism in modern time encapsulates under-water infrastructural development like stadium, hotels, scientific platforms and many others.

Feature 4: Inter-State water transport route

Blue tourism may present another vista for fun seekers to enjoy the majesty of nature-based attractions.

The Maldives, an island nation in the Indian Ocean, is a prime example of how blue tourism can generate substantial economic benefits. Tourism is the Maldives' largest industry, contributing around 28% of its GDP (World Bank, 2021). The country's coral reefs, crystal-clear waters, and biodiversity attract millions of tourists annually. Blue tourism can be further categorized into:

- **Coastal and Beach Tourism:** Beaches and coastal destinations, with their natural beauty, are among the most popular tourist spots globally. Activities include swimming, surfing, sunbathing, and ecotourism tours to explore the marine environment.
- **Cruise Tourism:** The cruise industry represents a significant portion of blue tourism, offering travelers the opportunity to visit multiple coastal regions in a single trip. However, the environmental impact of cruise ships—such as

pollution and fuel consumption—has raised concerns about its sustainability.

- **Marine Wildlife Tourism:** Activities such as whale watching, diving, and snorkelling provide tourists with opportunities to interact with marine life. Destinations like the Great Barrier Reef and the Galápagos Islands attract millions of visitors every year for these experiences.
- **Eco-Tourism and Conservation-Based Travel:** This form of tourism focuses on visiting marine protected areas (MPAs) and participating in conservation efforts. Such travel aims to promote sustainability and environmental awareness while ensuring that marine ecosystems are protected.

(iv) Blue- Agriculture

Blue agriculture, often referred to as "sustainable aquaculture" or "blue food systems," focuses on the utilization of aquatic resources to provide food, livelihoods, and ecosystem services in a sustainable manner. Blue agriculture encompasses a variety of practices that involve the cultivation, harvest, and processing of aquatic organisms both natural and in a control environment (Gopalakrishnan *et al*., 2023; Mojjada *et al*., 2021). These practices can be broadly categorized into aquaculture and wild-capture fisheries, which both contribute to the production of aquatic-based food products. While aquaculture involves the farming of aquatic organisms in controlled environments, such as fish farms, shellfish beds, and seaweed cultivation systems, on the other hand, the Wild-Capture Fisheries involves the harvesting of wild fish and other aquatic species from natural water bodies like oceans, rivers, and lakes (Salim & Anuja, 2022). As the demand for seafood grows with the global population, blue agriculture has become essential to meet dietary needs while ensuring the health of the oceans. Blue agriculture is seen as a potential solution to overfishing and depletion of wild fish stocks, but its expansion must be carefully managed to avoid detrimental environmental impacts. It is a growing sector that emphasizes the importance of both marine and freshwater ecosystems in addressing global food security, nutrition, and environmental concerns.

Blue agriculture also accommodates farming of other life forms like aquatic grasses, flowers, herbs, ferns, wildlife, birds, aquatic reptiles including snakes, earthworm, tortoise, snails, shell fishes and non-shell fishes. The various forms of blue-agriculture are:

- **Marine Fish Farming:** This involves the cultivation of fish species such as salmon, tuna, and sea bass in controlled marine environments. It helps meet the global demand for seafood without depleting wild fish stocks. However, fish farming can lead to issues like disease transmission, pollution from fish waste, and the spread of invasive species.
- **Shellfish Farming:** Shellfish such as oysters, mussels, and clams are increasingly farmed in coastal waters. These species are filter feeders, helping to improve water quality by removing excess nutrients and pollutants from the water.
- **Seaweed Farming:** Seaweed has gained popularity as a sustainable crop in blue agriculture. It is used in food, biofuels, cosmetics, and pharmaceuticals. Seaweed farming requires minimal resources and has a low environmental footprint compared to land-based crops.
- **Integrated Multi-Trophic Aquaculture (IMTA):** This method combines the farming of multiple species at different trophic levels, such as fish, shellfish, and seaweed, to create more sustainable and balanced ecosystems within aquaculture.

Blue agriculture plays a significant role in the fight against global food security and malnutrition. According to the Food and Agriculture Organization (FAO), fish and seafood contribute to around 17% of the global animal protein consumption, providing essential nutrients, including omega-3 fatty acids, vitamins, and minerals (FAO, 2020; UNWTO, 2020). Additionally, aquaculture production has grown significantly, accounting for 46% of the world's seafood supply in 2018, a figure that is expected to continue rising. A report by FAO (2020) estimated that about 60 million people are directly employed in fisheries and aquaculture worldwide (FAO, 2020). Norway is one of the world's largest producers of farmed salmon, a key player in the global blue agriculture market. With over 1.3 million tons of salmon produced annually, Norwegian aquaculture provides jobs for thousands of people and contributes significantly to the country's economy (Norwegian Seafood Council, 2020; Asche *et al*., 2019).

Another classical example of successful blue-agriculture is the seaweed farming in Indonesia. Seaweed farming has become a significant part of Indonesia's blue agriculture sector (Pereira, *et al*., 2020). Seaweed farming is environmentally friendly, requiring no additional inputs such as fertilizers or pesticides. Moreover, seaweed has a wide range of uses, including in food products, cosmetics, and biofuels. Indonesia's seaweed farming sector has grown rapidly, supported by both local and international demand (Aslan *et al*., 2020; Newman & Cragg, 2016).

In the U.S., recirculating aquaculture systems (RAS) have been developed as a more sustainable alternative to traditional aquaculture methods. These systems are increasingly being used to farm species like tilapia, shrimp, and salmon. One notable example is the Ocean Breeze Seafood farm in Florida, which uses RAS to grow fish in an energy-efficient manner while reducing environmental impact (Luo *et al*., 2019).

In Canada, Integrated Multi-Trophic Aquaculture (IMTA) that involves farming multiple species at different trophic levels. In Canada, IMTA systems have been successfully implemented in coastal aquaculture, where fish such as salmon are farmed alongside shellfish and seaweed. The integration of different species improves the sustainability of aquaculture by promoting nutrient recycling and reducing the reliance on external inputs (Chopin *et al*., 2008; Van Dover, 2014).

The future of blue agriculture lies in enhancing sustainability through innovation and better management practices. Case studies from around the world demonstrate that with careful management and technological advancements, blue agriculture can be both a sustainable and economically viable food source for the future. By continuing to support sustainable practices and fostering innovation, blue agriculture can contribute significantly to a more secure and resilient global food system.

Blue Transport

Transport system within the framework of blue economy cut across ocean based transport and maritime services across the globe. It is the largest economic sector in modern society since bulky goods and services are easily convey through this medium. The growth of sea ports around nations of the world and globalization has redefined the transport sector significantly. Container shipping facilitate international trade in a fast, flexible, safe and economical dimension (Alyami, 2019).

Blue- Energy

Offshore renewable energy, including wind and solar, is another promising aspect of the blue economy. According to Jimmy & Osogi (2024), Africa has vast untapped potential for offshore wind farms, particularly along the coasts of South Africa, Morocco, Egypt and Nigeria. Such investment could create new job opportunities, technological innovation, and climate mitigation. The World Bank estimates that the offshore wind potential in Africa alone could generate more than 70,000 174 MW of electricity (World Bank, 2019). This sector offers a significant opportunity for green energy investments, which could help the continent diversify its energy mix and achieve sustainable development. The forces of tide, wave and wind along the shore of Atlantic ocean in Akwa Ibom State could generate substantial energy for the entire coastal region (Jimmy & Osogi, 2024). Ibaka Bay has a yearly average tidal range at the offshore boundary of about 1.7 meters, water level of five meters (5 m) above mean lowest low water datum (MLLW) in the region and a non-dredged draft of 13.5 meters in most part of the Bay (Ephraim *et al*., 2015).

MATERIAL AND METHODS

Study Area

The study was conducted in Akwa Ibom State, one of the maritime regions in Nigeria. The region stretch along the South Atlantic Ocean. It is rich in mineral resources, oil and gas, timber and non-timber, swamp, marsh, and fisheries. The coastal area is interconnected by estuaries, creek, islands, beach, rivers and sea shore which have eco-tourism potential. Different species of fishes and non-fishes are abundantly found (Uwem *et al*., 2010).

The riparian vegetation comprises aquatic herbaceous and a graminaceous layer mostly on seasonal flooded soils which favour the cultivation of rice and cocoyam. Elaeis guinensis, rhizophora racemosa, rhizophora mangle, rhizophora harrisonii, nypa fruticans, laguncularia racemose, pandanus candelabrum, raphia and phoenix reclinata (Ukpong, 2000, 2015; Udofia *et al*., 2011).

Methods

The study centres on coastal areas of Akwa Ibom State which has a massive landmass. Eight LGAs were randomly selected. In each Local government, five (5) riverine communities were sampled making a total of 40 communities. Reconnaissance survey was done prior to field work between June 2024 and February 2025. The study employed both descriptive and quantitative methods. In-depth interview was equally employed taking cognizance of community age grades: community leaders, women association and youth. Focus Group Discussions at four (4) community civic centres were held. Ten (10) structured questionnaires were distributed to heads of household in forty (40) communities selected communities making a total of 400 questionnaires. A survey of natural resources in the study area was taken from interview, field observation and questionnaire guide. Occupation and income of inhabitants were captured in interview and questionnaire checklist in a bid to understand how blue resources in their domain had impacted on their livelihoods.

RESULTS AND DISCUSSIONS

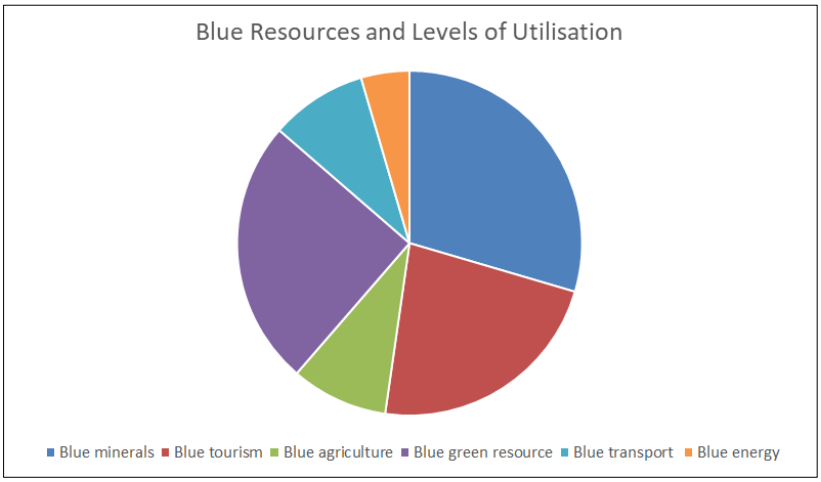

Figure 1: Blue Resources and Levels of Utilisation
Source: Fieldwork, 2025

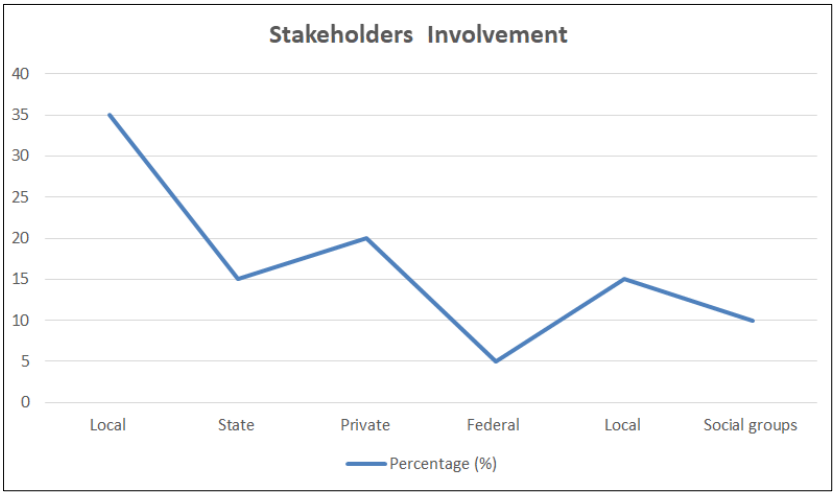

Figure 2: Stakeholders involvement in blue resources management
Source: Fieldwork, 2025

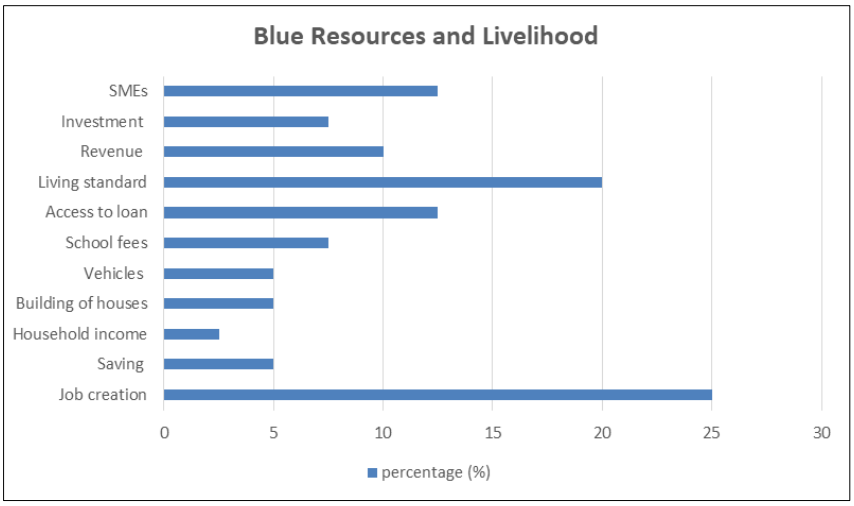

Figure 3: Impact of Blue Resources on Livelihood
Source, Fieldwork, 2025

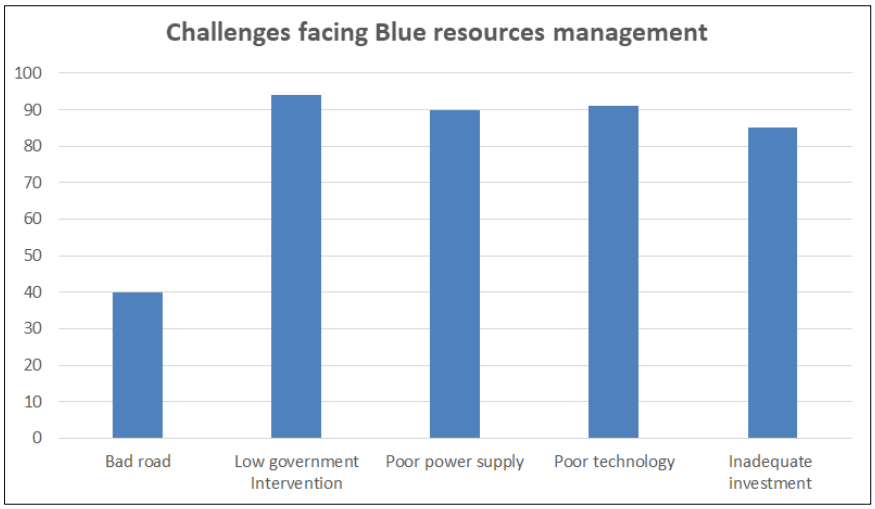

Figure 4: Challenges facing Blue resources management

Table 4: Blue Resources potential and Level of Coastal Community's Development

Villages	Local Government Area	Category of blue resources	Rating on the Level of Coastal Community's Development
Etebi Idung Asan	Esit Eket	Oil and gas	Low
Akwata Etebi	Esit Eket	Oil and gas/ wetlands	Low
Edor	Esit Eket	Oil and gas/ wetlands	Low
Uquo	Esit Eket	Oil and gas/ wetlands	Low
Ekpene Obo	Esit Eket	Oil and gas/ wetlands	Low
Efiat	Mbo	Oil and gas/ wetlands	Low
Unyenge	Mbo	Oil and gas/ wetlands	Moderate
Ibaka	Mbo	Sea port/hydropower	Moderate
Udesi	Mbo	Wetlands/fishing	Low
Ebughu	Mbo	Wetlands/fishing	Low
Isuo Oro Island	Oron	Fishing port	Low
Esin Uffot	Oron	Fishing port	Low
Idua Assang	Oron	Fishing port	Low
Esuk Oron	Oron	Fishing port	Moderate
Parrot Island	Oron	Fishing port	Low
Ifiayong	Uruan	Nwaniba Beach	Moderate
Idu Uruan	Uruan	Le meridian/ golf resort	Moderate
Ishiet	Uruan	Fish market	Moderate
Iboku Uruan	Uruan	Cultural festival	Low
Mbiaya Uruan	Uruan	Rolling Hills	Low
Okopedi	Itu	Coastal island/beach	Low
Oku Iboku	Itu	British Colonial House	Low
Ntak Inyang	Itu	Forest reserve	Low
Ikot Akpan Uso	Itu	Monkey forest reserve- sclater's guenon habitat	Low
Ayadehe	Itu	Wetlands	Low
Ikot Akpan Udo	Ikot Abasi	Wetlands	Low
Ikot Ada Udo	Ikot Abasi	Oil and gas	Low
Edemeya	Ikot Abasi	Wetlands	Low
Urua Essien Etok	Ikot Abasi	Creek	Low
Uta Ewa	Ikot Abasi	Estuary	Low
Odorokuku	Ibeno	Wetlands	Low
Iko	Eastern Obolo	Estuary	Moderate
Edonwik/Agassa	Eastern Obolo	Island	Low
Emeroke 1& 11	Eastern Obolo	oil and gas	low
Isi-otoyo	Eastern Obolo	Island	Low

Elek Okpoon blue beach	Eastern Obolo	A long stretch of Beach	Low
Ibeno	Ibeno	Beach/fishing port	Moderate
Mkpanak	Ibeno	Oil and gas	Moderate
Upenekang	Ibeno	Oil and gas	Moderate
Inua Eyet Ikot	Ibeno	Fishing port/Oil and gas	Low
Odorokuku	Ibeno	Island/wetlands	Low

Source: Field survey, 2025

DISCUSSION OF FINDINGS

The study analyzed the various resources including blue mineral, blue agricultural resources, blue green resources, blue tourism and many others. Attempt was made to explore the levels of utilization for the different categories of blue resources. Findings shown that Blue minerals particularly oil and gas, sand aggregates were the major resources exploited, followed by blue tourism, blue green resources, blue transport, blue agriculture and lastly blue energy. The most under-utilised resource was navigable water for maritime transport and shipping, renewable energy from the coastline (tidal, wind and hydro-power), wetlands farming, aquaculture and marine tourism. From the interview carried out, the region has the deepest navigable water for maritime shipping but yet untapped. Further investigation on the significance of resources on community development, the study indicated that blue resources have a significant contribution in rural development in such a manner that the rural people mostly depend on them for their livelihood. Dependence and effective utilization of these resources, opens more opportunities for multiple livelihood options including savings/investment, steady flow of household income, job creation and development of small and medium scale enterprises. From the result of the study, it was revealed that blue resources contributed to multiple socio-economic dimensions including job creation, saving of money in bank, steady flow in household income, building of houses, purchase of vehicles, payment of children school fees, access to loan and grant, improved household income, revenue generation, improved household investment and opening of new business outlets.

A respondent through interview added:

> *''I am much aware of the numerous deep sea bio-resources and minerals in our waters, we are only constraint by the know-how to extract these resources to better our lives''. Oyibo meaning a White man from oversea has all the skills needed to harness resources in the deep sea, until when they arrive our communities, we shall all enjoy the wealth of nature.*

The indigenous riverine communities believe that their inadequacy in deep sea technology is a significant barrier to their financial freedom and community development. The abundance of resources in their domain could not offer them the much needed economic freedom, because they are not equipped with the modern-day knowledge on blue-resources extraction.

The study equally assessed the level of impact blue resources exploitation has contributed to coastal communities. From findings, it was revealed that due to low priority on blue resources investment, the inhabitants could not harness optimally the potential of resources in their domain. Overcoming barriers of blue resources management therefore becomes the key concern of this investigation.

In the course of the study, other challenges facing blue resource management were identified particularly poor road network, inadequate institutional intervention, low power supply and crude technology. These challenges make it more difficult for sustainable development and economic freedom to be attainable for communities lying along the Atlantic coastline.

CONCLUSION AND RECOMMENDATIONS

Blue resources management is a very critical element in contemporary development discourse, especially when considering indigenous coastal communities and their livelihood struggles. Effectiveness of blue resource management could promote equitable distribution of resource proceed, reduce wastage and conflict, ensure food security and industrial development.

In spite of all the relevance of blue resources, several barriers hinders the full utilization of blue resources in Akwa Ibom State and Niger Delta generally and these ranges from inadequate investment, unsustainable fishing, miniaturized capacity on blue resources planning, fluctuating prices of blue-related resources, inadequate innovative technological know-how. Given the above challenges and problems in blue resources management and development of riverine communities, there is need for holistic approach towards resource extraction, processing, marketing and human capacity building. Based on the finding of the study, the work recommends the following;

- Database on blue resources along the Atlantic coastline should be created for policy implementation and development
- There is need to establish Blue Resources Development Commission in Akwa Ibom

State, in collaboration with related research and development Institutes

- Government should provide sufficient funding for coastal infrastructural investment, mainly roads, health care, cold room, renewable energy systems, blue resource processing and packaging centres.
- There should be adequate training and re-training of stakeholders in blue resource industry. Capacity building through periodic monitoring, training and empowerment can turn around the economic conditions of a great number of hopeless individuals.
- Blue-resource investment requires huge capital and determination, hence, Akwa Ibom State should partner with relevant stakeholders across national and international boundaries for regional economic development.
- Communities should initiate Inter-sectoral and Inter-agency Blue resources Development Bureau to identify the problems of the region, tackle the problem mutually, provide advisory input for development and provide feedback mechanism to the State government.

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