

Evaluating The Impact Of Climate Change On The Blue Economy's Potential For Poverty Reduction In Lokoja, Nigeria: Research And Policy Implications

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Abstract

This study evaluates the impact of climate change on the blue economy's potential for poverty reduction among riparian communities at the confluence of Rivers Niger and Benue in Lokoja, Nigeria. Using a quantitative cross-sectional research design, primary data were collected through structured questionnaires administered to fishermen and boat/ferry operators. The research is limited by unknown population size due to unregistered blue economy operators in the study area. Non-response bias is handled through repeated questionnaire administration in the study area to ensure significant coverage of respondents. Descriptive statistics and the Ordinary Least Square (OLS) regression were employed to analyze the data for this study. Findings revealed that fishing is more affected by climate change than water transportation. However, the impact of climate change on blue economy output and poverty reduction is not significant ($p = 0.682$ and $p = 0.720$ respectively). Furthermore, blue economy activities is revealed to have maintained stability in terms output and income and contributes to reduction of poverty in the study area. The adaptation strategies commonly adopted by operators included changing fishing times and locations, adherence to weather forecasts, and livelihood diversification. The study recommended the organization of cooperatives by operators to improve access to loans, insurance services and government intervention. The National Inland Waterways Authority (NIWA) Lokoja should facilitate the provision of timely weather information (weather forecasts, flood alerts, and river levels) to operators of the blue economy; rehabilitate jetties and fish landing sites; and provide fishing gear, safer boats, and life jackets at affordable prices to operators.

Keywords: Blue economy, Climate change, Nigeria, and Poverty.

JEL Classification: Q01, Q54, O55, I32.

1. INTRODUCTION

Nnam and Inyang (2022) assert that poverty has been a major challenge to the attainment of economic development across the globe. Goal one of the sustainable development goals (SDGs) - No poverty, is the United Nations response to eradicating poverty in all its ramifications and everywhere across the globe by the year 2030. Globally, more than 736 million people live in abject poverty (Nnam & Inyang, 2022). It is also suggested that 70 percent of the poorest people in the world live in Africa, and reside mostly in rural areas where basic infrastructures are lacking (World Bank, 2018). Furthermore, approximately 490 million people in 2021 survived on less than one dollar per day in Africa (UNCTAD, 2021). In 2011, Nigeria was ranked 159th position out of 165th extremely poor nations of the world. This trend continued in 2018 with Nigeria ranked 125th out of 137 poorest nations in the world (World Economic Forum, 2018).

According to the Nigeria Bureau of Statistics (NBS, 2022), 63 percent of the Nigerian population are multi-dimensionally poor. This percentage represents one hundred and thirty-three million Nigerians out of a total population of two hundred and thirteen million people. Kogi state despite having the confluence of rivers Niger and Benue in Lokoja with numerous blue economy opportunities, has remained a poor state in the North where the poorest states in Nigeria are located (NBS, 2022). The geographical location of the state shapes its biodiversity, agricultural systems, and vulnerability to climate impacts (Uzomba, Udi & Abbah, 2025). In recent decades, the Kogi state has faced a rising frequency and intensity of climate-related hazards, including floods especially that of the 2012 and 2022; prolonged heat waves, drought and land degradation. Riparian communities along the confluence have been particularly affected, with recurring disasters leading to mass displacement and widespread food system disruptions (Abbah, Udeh, Mancha & Musa, 2023).

The blue economy as advocated by the United Nations through the Sustainable Development Goals (SDGs) - goal 14, has the potential to grow the African continent into becoming one of the most developed regions of the world. Globally, it is estimated that approximately over 3 billion persons rely on blue economy resources for their livelihood (WB, 2017 & UNECA, 2017). Despite Nigeria's abundant human and natural resources across each

state of the federation, and the two major rivers, Niger and Benue flowing through the country from the north to the south with its confluence at Lokoja, Kogi State; economic growth in Nigeria seems not to transmit positively in reducing poverty over the years. Poor economic policies and the over reliance on the extractive mineral sector, to the neglect of other vital sectors (like the blue economy) have been identified as the likely reasons why economic growth has not been effective in curtailing the rising level of poverty in the country (NBS, 2022). It is further revealed that climate change is a major challenge to harnessing the benefits of the blue economy in the country. The country continues to experience heavy flooding and drought from time to time, thus making blue economy opportunities unreliable.

The increasing impact of climate change made visible by frequent flooding and drought which distort the livelihoods of riparian communities in Nigeria, and further plunges them into poverty is a key motivation of this research. Furthermore, despite the blue economy's potential to alleviate poverty, there is a significant gap in understanding how climate change affects both the economic opportunities and socio-economic conditions of riparian communities in Nigeria and especially of those living at the banks of the confluence of rivers Niger and Benue at Lokoja. This research aims to investigate this critical knowledge gap by exploring the complex relationships between climate change, the blue economy, and poverty reduction in Nigeria.

Flowing from the exposition therefore, this research broadly seeks to investigate the effect of climate change on the blue economy's potential in reducing poverty in Nigeria. Specifically, this study is posed to: identify the blue economy activities carried out by riparian communities at the confluence of rivers Niger and Benue; assess the impact of climate change on the output of economic activities within the blue economy at the confluence of rivers Niger and Benue by riparian communities; investigate the adaptive strategies being implemented by the riparian communities at the confluence of rivers Niger and Benue to reduce the impacts of climate change; determine the extent to which the blue economy contributes to poverty reduction of riparian communities at the confluence of rivers Niger and Benue; and identify the challenges facing the blue economy at the confluence. Despite the recognized blue-economy potential of the Niger–Benue confluence, there is limited empirical evidence on how climate change is affecting blue-economy activities and the capacity of these activities to reduce poverty and enhance food security among riparian communities in Lokoja. This lack of evidence constrains targeted policy interventions.

This research is organized as follows: introduction; literature review; methodology and data; data presentation and result analysis; discussion of findings; conclusion and recommendations; conflict of interest; statement of ethical approval; and references.

2. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Climate Change

Climate change is opined to be significant and measurable changes in weather conditions of a place usually over decades (IPCC, 2014). Climate change is seen as changes in nature that result in irregular rainfall patterns, fluctuation in temperature, relative humidity, and other elements of weather (Todaro and Smith, 2015). Furthermore, Ojuederie and Ogunsola (2017) see climate change as the alteration of weather conditions over a long period resulting in changes in the pattern of rainfall, temperature, flooding, desertification, land degradation, and erosion. Abbah, Doki and Andohol (2025) defined climate change as the combination of carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) released into the atmosphere during the process of food production and from other sources. These gases are responsible for global warming and the primary elements of climate change in the forms of drought, floods, and high temperatures. Climate change in this study refers the measurable, significant and physical changes in the primary elements of weather: flood, drought and temperature. These variables shall be measured by their frequency of occurrence and severity.

2.1.2 Blue Economy

Dike (2024) defined blue economy as a strategy towards supporting economic growth that is sustainable through oceans-related sectors and activities, while improving human well-being and social equity and preserving the environment. Smith-Godfrey (2016) opined that the blue economy refers to a holistic approach to the sustainable development of the ocean economy which includes sectors such as shipping, fisheries, aquaculture, tourism, marine minerals, maritime transport and many others. Nigerian Blue Economy encompasses all economic activities connected to seas, coasts and oceans such as fisheries, shipping, oil and gas exploration, renewable energy, waste management, maritime transport, and tourism (Ekemeabasi, 2020).

Blue economy for this research is defined as the economic activities (fishing and boat/ferry transportation) that are carried out by fishermen and boat/ferry operators within the riparian communities (Kpata market area and Ganaja village) in Lokoja. These are the dominant

blue economy activities in the study area and are believed to create jobs for individuals, generate income, ensure food security, reduce poverty, serve as cheap means of transportation and help diversify the economy. Other blue economy activities like marine biotechnology, renewable energy, shipping, oil and gas exploration, and the likes are non-existent at the confluence.

2.1.3 Poverty

The World Bank (2000) and Addae-Korankye (2014) define poverty as pronounced deprivation in well-being, such that an individual does not have access to basic resources required for him or her, and it consists of several dimensions, including low income and the inability to possess basic goods and services required for survival with self-esteem. In 2015, the United Nations Statistical Division (UNSD) opined that poverty is the inability to obtain adequate food and other basic necessities, the contemporary focus continues to be on material deprivations, i.e., the failure to command private resources. Aigbokhan (2010) defined poverty simply as the inability to achieve a certain minimal standard of living. But standard of living in itself is determined by several factors of which income is chief. This presupposes that defining poverty in terms of standard of living is invariably defining it in terms of income.

Poverty in this research is measured by the level of income gotten from blue economy activities (fishing and boat/ferry transportation) by fishermen and boat/ferry operators within the riparian communities in Lokoja.

2.2 THEORETICAL REVIEW

2.2.1 The Lewis theory of Economic Development

The Lewis theory of economic development was propounded by Arthur Lewis in 1954. The theory was later extended and formalized by Fei and Ranis to become the general theory of development process in surplus-labour developing nations. This theory explains the transition of an economy from the traditional, labour-surplus agricultural sector to a modern industrial sector. This structural change has the potentials of reducing poverty while ensuring sustainable development. The diversification of the economy by the movement of surplus labour at riparian communities into productive blue sectors like tourism, aquaculture, marine biotechnology, and water transportation drives economic growth and development, and ensure sustainability especially when innovative strategies and modern technologies are applied to this expansion of the economy.

2.2.2 The Solow-Swan Neoclassical Growth Theory

The Solow-Swan Neoclassical Growth Theory was developed by Solow and Swan in 1957. The theory asserts that technological progress, capital accumulation, and productivity of labour are major determinants of long term economic growth and development. Investment in human capital, marine infrastructure, and sustainable technologies can enhance productivity and resilience to the negative consequences of climate change. The sustainable growth of the blue economy has the potential of sustaining riparian livelihoods without depriving future generations blue economy benefits. The Solow-Swan production function is mathematically represented as $Y = K^\alpha (AL)^{1-\alpha}$ where Y is gross domestic product, K is the stock of capital, L is labour, and A represents technology, which grows at an exogenous rate.

The three theories reviewed provide a strong conceptual foundation for understanding the relationship between climate change, the blue economy, and poverty reduction in the study area. The Lewis theory of economic development explains how the transition of labour from traditional subsistence activities into more productive blue economy sectors such as fishing and water transportation can enhance income generation and reduce poverty among riparian communities. Similarly, the Solow-Swan neoclassical growth theory emphasizes the role of capital accumulation, labour productivity, and technological advancement in driving sustainable economic growth. In relation to this study, investments in infrastructure, skills, and climate-resilient technologies within the blue economy can enhance productivity while mitigating the adverse effects of climate change. Together, these theories collectively explain how economic transformation, environmental sustainability, and technological progress interact to influence poverty reduction outcomes.

2.3 EMPIRICAL REVIEW

Scholars through painstaking arrays of research have opined that climate change affects water bodies leading to alterations of the marine ecosystems with the attendant consequences of pollution and the degradation of the water habitat. Riparian communities that depend on the water bodies for their livelihoods are also affected by the effects of climate change. Climate change tends to have a greater impact on riparian communities of developing countries mostly because of poverty. These communities do not have the wherewithal to curb the negative effects of climate change and thus, continue to suffer endlessly even with the rising rate of climate

change. Previous studies in this area of research are x-rayed for a better understanding of the nexus between climate change and the blue economy in Nigeria.

Aladejana, Onyejiuwa, Oluwalana, and Alabi (2025) examined the blue economy and sustainable development in Nigeria using time series data from 1990 to 2021. The study employed the ordinary least square (OLS) methodology and found that the blue economy activities contributes positively and significantly improves sustainable development index, thereby reducing the level of poverty among the people. Furthermore, findings revealed that climate change in the form of carbon dioxide emissions negatively impacted the blue economy's potentials of reducing poverty and improving the living standard of the people, especially of those involved in economic activities of the blue economy. The study advocated for a comprehensive blue economy policy that will balance growth with sustainability of the sector.

Employing the Dynamic Ordinary Least Square (DOLS) and the Johansen Cointegrating regression (JCR), Enueshike and Anyanwu (2025) investigated the potentials of the blue economy in employment generation, improvement in trade and national development in Nigeria. The study used time series data covering 1986 to 2022, and opined that the blue economy has great potentials in the area of diversification of the economy, job creation, and improvement of livelihoods of those connected to the blue economy. Results from the findings revealed that fish production is positively related to gross domestic product, while maritime transportation shows a negative and insignificant relationship with gross domestic product. This result implies that while fish production does lead to employment generation, the contribution of maritime transportation is minimal. The study recommended increased funding of the maritime sector to boost its productivity in Nigeria.

Esin, Ndekhedehe, and Esin (2025) examined the role of the blue economy in alleviating poverty in Nigeria. This research relied on the review of empirical literature to obtain in-depth understanding on how the blue economy can alleviate poverty in Nigeria. Findings from the result of the study revealed that fishery, tourism, shipping and logistics, and marine biotechnology provide employment outlets for millions of Nigerians, especially improving the livelihoods of those living in riparian communities where poverty is severe. This research advocates a robust blue economy policy that is backed up by the political will to genuinely develop the sector.

Igejongbo, Amadu, and Agbebi (2025) investigated the impact of climate change on the blue economy in Nigeria, an assessment of vulnerability and resilience. Findings from the study revealed that the blue economy contributes to food security of the nation, and the livelihoods of riparian communities. Climate change is found to negatively and significantly impact the resources of the blue economy and thus, hampers its potentials as a vibrant sector for the diversification of the Nigerian economy, and poverty reduction strategy. The study therefore opined that appropriate steps in terms of effective policy frameworks should be taken to reduce greenhouse gas emissions in the country. Sustainable resource management, and determined government interventions in the area of provision of adequate funding to agencies and ministries in the sector for environmental protection are also advocated.

Employing systematic literature review in assessing the potentials, challenges, and policy frameworks for the sustainable development of the blue economy in Nigeria, Nweke and Dhakir (2025) advocated for the formulation of a comprehensive and actionable blue economy policy. Findings from the result of the research revealed that the blue economy provide employment opportunities, renewable energy potential, and enhance trade and economic diversification. The negative effects of climate change, inadequate infrastructure, illegal maritime activities, limited investment in the sector, inadequate skilled workforce, and lack of policy and regulatory framework for the sector were identified as the major hindrances to the optimal use of resources from the sector.

Rotimi, Chinedu, and Zanak (2025) examined the nexus between blue economy, sustainable development and economic growth in Nigeria. This study relied on typical literature review backed cases of the blue economy facilitating sustainable development and economic growth. Findings revealed that the blue economy is a sector with great potentials for economic growth and development in Nigeria, however, the potentials of the blue economy is under serious threat due to the negative effects of climate change. Furthermore, results from the study revealed that the blue economy creates employment opportunities, and increases the living standard of economic agents along riparian communities in Nigeria, thereby alleviating poverty. The study recommended that the national policy on marine and blue economy should be further accompanied by a draft blue economy bill which will guarantee the Nigeria maximizes the potentials of the blue economy in terms of fishery, tourism, transportation, mining, and blue energy.

Dike (2024) investigated the economic and environmental sustainability of the blue economy in Nigeria. Result from the findings revealed that the blue economy in Nigeria has the potential of reducing poverty, and ensuring sustainable development. Other potentials of the blue economy include: job creation, improvement in the standard of living of riparian communities, stimulation of economic growth and national development. Environmental pollution, limited funding, lack of a working blue economy policy, and urbanization were identified as some of the challenges hindering the maximization of the blue economy potentials in Nigeria. The study advocated for the creation and implementation of blue economy policy, and the reduction of marine pollution and unsustainable maritime practices in Nigeria.

Employing secondary data obtained from systematic literature review and related agencies of government in the blue economy sector, Osuji and Agbakwuru (2024) used descriptive methodology to investigate ocean and coastal resource components and their contributions to sustainable development in Nigeria. The findings of their study revealed that out of the ten blue economic activities investigated: oil and gas exploration, fishing, maritime transport, and shipping dominated blue economic contributions; with oil and gas exploration contributing 90 percent of the blue economic value in Nigeria. Furthermore, these activities associated with the blue economy were found to create employment and reduce poverty. Therefore, the study recommended that the government and the private sector should pursue the opportunities that abound in the other subsectors of the blue economy to ensure the provision of employment opportunities and income for the teeming unemployed population of the country.

Yusuff and Ibidapo-Obe (2024) investigated the potentials and challenges of the blue economy in Nigeria using systematic literature review technique. Findings from the study revealed that fisheries, tourism, maritime transportation, and renewable energy transmit positively in creating jobs, improving food security, and ensuring economic growth. Climate change, overfishing, environmental degradation, and poor regulation of the blue economy sector were found to be the challenges hindering the optimal productivity of the sector. The study further recommended a comprehensive policy that will promote inclusive economic growth and sustainable use of the blue economy.

Examining the opportunities and difficulties of the blue economy in driving Nigeria's economic development, Odey (2023) found that the blue economy transmits positively to job creation and poverty reduction in Nigeria. Furthermore, findings from the study revealed that

climate change, terrorism, sea piracy, and the destruction of maritime ecosystems are the challenges limiting the optimal benefits of the blue economy in Nigeria. The study advocated for maritime education and skill training schools to enhance the preservation and sustainable use of the blue economy in Nigeria.

Zakayo and Mbilinyi (2023) assessed the potentials of the blue economy resources for poverty reduction in Tanzania. The data collected mostly through documentary review revealed that the major blue economy sectors: fisheries, coastal tourism and transportation have contributed to economic growth and development of the country through employment creation, food security, and happiness which transmits positively to poverty reduction. Furthermore, it is revealed that national income generated from these blue economy sectors are channeled to other important sectors like education, health, and economic infrastructures which further reduces poverty among the people. The study recommended the sensitization of citizens especially those living along the banks of water bodies on the need for conservation and sustainable use of the blue economy.

Abiodun (2021) examined the importance of the effective management of the Nigerian blue economy. Using descriptive analysis of the data gathered through the use of questionnaires on 110 participants, the findings of the study revealed that Nigeria has great blue economy potential to ensure its rapid economic development. However, climate change, piracy, and armed robbery, pollution, and illegal, unreported, and unregulated fishing were identified as major challenges to the effective use of the blue economy in Nigeria. The study advocated for effective maritime security, ecological integrity, and partnerships among stakeholders to galvanize the blue economy resources in Nigeria.

Employing the fully modified ordinary least squares (FMOLS), and vector error correction model (VECM) methodologies; Badircea, Manta, Florea, Puiu, Manta, and Doran (2021) investigated the causality nexus between the blue economy, economic growth and climate change in 28 European Union (EU) countries from 2009 to 2018. Results from the findings revealed that activities from the blue economy negatively and significantly contributed to greenhouse gas emissions in the long-run. Furthermore, economic growth causes greenhouse gas emissions, while in turn, greenhouse gas emissions influences economic growth in the short-run. This implies that, climate change in the short-run influences the potentials of the blue economy in improving the livelihoods of economic agents in riparian communities, and by extension,

reducing poverty and ensuring economic growth and development. The research advocated the conservation of water bodies through the implementation of the marine strategy framework directive (MSFD), and the use of effective measures to mitigate the negative effects of climate change.

Otekenari (2019) examined the prospects for economic growth, and the challenges of the blue economy in the Niger Delta region of Nigeria. Job creation, food security, and poverty eradication were found to be the benefits of the blue economy in the region. Piracy, terrorism, the destruction of maritime ecosystems, and climate change are revealed to be the challenges been faced by the blue economy sector. The study therefore recommended the recruitment of special armed forces to protect waterways in the region, and the sensitization of citizens living along the banks of water bodies on the need for preservation and sustainable use of the blue economy.

Furthermore, Amarh (2017) investigated the role of the blue economy in national development in Ghana and found that the blue economy contributes positively to national development through job creation, facilitation of trade and commerce, enhance food security, source of tourism and energy; and mining. Climate change, over-exploitation of the sector, and government's neglect of the sector have been identified as the challenges facing the optimal performance of the blue economy in Ghana. The study advocated the education of all economic agents connected with the use of the blue economy on the need for the sustainable use of the blue resources. The study further recommended the reformation of blue economy policy to include appropriate sanctions against the inappropriate usage of the blue economy.

2.3.1 Gap in Literature

The work of Zakayo and Mbilinyi (2023) is based in Tanzania, while the work of Amarh (2017) used Ghana as a case study; and the work of Badircea, Manta, Florea, Puiu, Manta, and Doran (2021) considered 28 European Union (EU) countries. These studies neglected Nigeria that has two major rivers, Niger and Benue; and with many tributaries where blue economy potentials abound. Furthermore, the work of Otekenari (2019) although carried out in Nigeria, used the Niger Delta region of the country as the case study. While, the works of Aladejana, Onyejiuwa, Oluwalana, and Alabi (2025), Enueshike and Anyanwu (2025), Esin, Ndekhehede, and Esin (2025), Nweke and Dhakir (2025), Rotimi, Chinedu, and Zanak (2025), Yusuff and

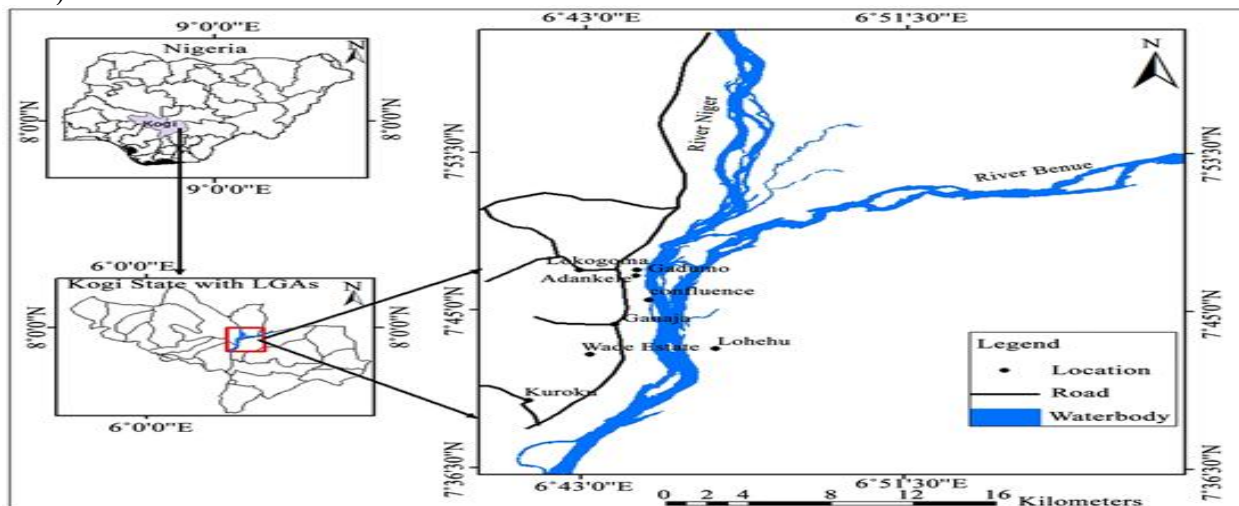
Ibidapo-Obe (2024); and Odey (2023) were all done using the entire country, Nigeria as a case study. These studies neglected location specific and in-depth study of riparian communities of Ilokoja, the confluence of rivers Niger and Benue where blue economy opportunities abound, but poverty persist.

3. METHODOLOGY AND DATA

This research employed the quantitative cross-sectional research design. The data for this study were obtained through the use of structured questionnaires administered through purposive sampling to respondents who are involved in blue economic activities in Kpata market area and Ganaja village riparian communities in Ilokoja due to their strategic importance as hubs of blue economic activities. The absence of sampling frame arising from the prevalence of unregistered operators, and non-existent official records from the National Inland Waterways Authority (NIWA) Ilokoja and operators unions is a limitation of this research. However, non-response bias is handled through repeated questionnaire administration in the study area which ensured significant coverage of respondents given the size of the area of study. Given the relatively small and accessible population of the riparian communities and blue economy operators within the study area through field investigation, the study adopted a census sampling approach, whereby all available and willing respondents were included in the survey. The adoption of a census approach eliminates sampling error and enhances the internal validity of the study by ensuring that all relevant actors within the defined study scope are represented. Field enumeration identified a total of 47 active respondents, comprising twenty-two (22) fishermen and twenty-five (25) boat/ferry operators. Although preliminary investigation from the National Inland Waterways Authority (NIWA) in Ilokoja suggested a smaller population, field verification revealed unregistered participants who were actively engaged in blue economy activities but deliberately excluded themselves from official registration to avoid regulatory oversight. The Statistical Package for Social Sciences (SPSS) was used to analyze the data collected from the questionnaires administered. Descriptive statistics such as percentages and tables were further employed to thematically analyze the research objectives. The Cronbach's Alpha coefficient of 0.84 indicates good reliability of the internal consistency of the instrument used for this study. Content validity was ensured through expert review by specialists (Professors of geography and development economics).

3.1 Study Area: The study was conducted in Lokoja, the capital of Kogi State, Nigeria, located at the confluence of Rivers Niger and Benue. The area is characterized by extensive inland water resources that support a range of blue economy activities such as fishing, ferry transportation, and shoreline trading. There are two riparian communities at the confluence in Lokoja: Kpata market area and Ganaja village. These two riparian communities, Kpata market area and Ganaja village were purposively selected due to their high concentration of water-dependent economic activities and vulnerability to climate-related hazards such as flooding and fluctuating water levels. The geographical location of Lokoja shapes its biodiversity, agricultural systems, and vulnerability to climate impacts (Abbah, Udeh, Mancha, & Musa; 2023).

Fig 1: The map of Nigeria showing the confluence of rivers Niger and Benue at Lokoja (study area).



Source: Adopted by the authors from Buba, Obaguo, Ogah, and Ajayi (2021).



Source: Field survey, 2026.

4. DATA PRESENTATION AND RESULT ANALYSIS

4.1 Table 1: Socio-economic Characteristics of Respondents

Variables	Frequencies	Percentages
Age		
18-25	7	14.9
26-35	12	25.5
36-45	15	31.9
46-55	11	23.4
56 and above	2	4.3
Gender		
Male	47	100
Female	0	0
Marital Status		
Single	14	29.8
Married	28	59.6
Divorced	2	4.3
Separated	3	6.4
Education		
No formal schooling	13	27.7
Primary	10	21.3
Junior secondary	9	19.1
Senior secondary	14	29.8
Tertiary	1	2.1
Number of years lived in the community		
Less than 5 years	1	2.1
5-9 years	3	6.4
10-19 years	13	27.7
20 years and above	30	63.8
Income from blue economic activities		
26-50%	1	2.1
51-75%	27	57.4
Above 75%	19	40.4
Total	47	100

Source: Field survey, 2026.

Table 1 present the socio-economic characteristics of the respondents for this study. Nineteen (19) respondents representing 40.4 percent are between the age 18-35, twenty-six (26) respondents representing 55.3 percent are between the age 36-55; while two (2) respondents representing 4.3 percent are between the age 56 and above. This result implies that majority of the participants in the blue economy activities are young people. Forty-seven respondents representing 100 percent are male. This is an indication that the blue economy activities considered for this study are male dominated. Fourteen (14) respondents representing 29.8 percent are single, twenty-eight (28) respondents representing 59.6 percent are married, two (2)

respondents representing 4.3 percent are divorced, and three (3) respondents representing 6.4 percent are separated.

Forty-seven (47) respondents representing 100 percent of the respondents are male. This implies that the major blue economy activities in the study area, fishing and boat/ferry transportation are carried out by only male. This result is not intriguing considering the exclusion of females from such occupations due to religion and cultural practices in the study area.

Furthermore, thirteen (13) respondents representing 27.7 percent have no formal schooling, ten (10) respondents representing 21.3 percent attended primary school, nine (9) respondents representing 19.1 percent acquired junior secondary education, fourteen (14) respondents representing 29.8 percent attended senior secondary school, while one (1) respondent acquired tertiary education. Thirty (30) respondents representing 63.8 percent have lived in lokoja for 20 years and above. Thirteen (13) respondents representing 27.7 percent have lived 10-19 years in the community. While, three (3) respondents and one (1) respondent representing 6.4 percent and 2.1 percent respectively have lived in the community for 5-9 years and less than 5 years correspondingly. The implication of this result is that a significant number of the respondents have lived above 10 years in the area of the study which is a prerequisite for accurate knowledge about the impact of climate change in the community.

Finally, nineteen (19) respondents representing 40.4 percent earn above 75 percent of their income from participating in blue economic activities. Twenty-seven (27) respondents representing 57.4 percent earn 51-75 percent of their income from engaging in blue economy activities, while; one (1) respondent representing 2.1 percent earn 26-50 percent of his income from participating in blue economy activities. This result suggests that a significant number (46 respondents) earn more than half of their income from partaking in blue economy activities. This is an indication that the blue economy if properly harnessed will generate sustainable income and secure the livelihoods of families of riparian communities especially in Lokoja.

4.2 Research Question One: What are the major blue economy activities undertaken by riparian communities in Lokoja?

Table 2: Major blue economy activities identified at the confluence in Lokoja.

Economic activities	Frequencies	Percentages
Fishing	22	46.81
Ferry/boat transportation	25	53.19
Total	47	100

Source: Field survey, 2026.

Table 2 revealed the major blue economy activities carried out at the confluence in Lokoja to include: fishing and ferry or boat transportation. This finding is an indication that the blue economy at the confluence in Lokoja is not well developed or properly harnessed for maximization of its benefits.

4.3 Research Question Two: How do flood, drought, erosion, rainfall, wind and temperature variations affect the output of blue economy activities in Lokoja riparian communities?

Table 3: The perception of climate change on blue economy output

Economic activities	Response scale	Frequencies	Percentages
Fishing	Disagree	2	9.1
	Agree	19	86.4
	Strongly agree	1	4.5
Total		22	100
Ferry/boat transportation	Strongly disagree	3	12
	Disagree	20	80
	Agree	2	8
Total		25	100

Source: Field survey, 2026.

The impact of climate change on blue economy output of economic agents in the riparian communities of Lokoja is revealed in Table 3. Twenty (20) respondents representing 90.9 percent of the responses agreed that climate change over the last ten years affected fishing output. While, two (2) respondents representing 9.1 percent of the responses disagree and opined that climate change has not affected their fishing output. On the other hand, twenty-three (23) respondents representing 92 percent of the response disagrees that climate change affect water transportation, while two (2) respondents representing 8 percent agree that climate change affect water transportation. The implication of this result is that the impact of climate change is felt differently by the economic agents who engage in blue economy activities at the confluence in Lokoja. While raising temperature, flood and drought largely affected fishing output, these elements of climate change slightly influenced water transportation. The dynamic nature of climate change on blue economy output as revealed by this result is in agreement with the *a priori* expectation and the work of Igejongbo, Amadu, and Agbebi (2025).

The significance level of the impact of climate change on combined blue economy output in the riparian communities is further tested using the Ordinary Least Square regression analysis as presented in Table 4.

Table 4: Estimating the impact of climate change on blue economy output using regression analysis.

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	2.175	1.252		1.737	.089
ccp	.127	.308	.061	.412	.682
education	-.111	.077	-.215	-1.444	.156

a. Dependent Variable: ccbeo

Table 4 presents the significance level of the impact of climate change (ccp) on blue economy output (ccbeo) in the riparian communities under investigation. The result revealed that an improvement in climate change management by one unit will increase blue economy output/income by approximately 13 percent. However, the impact of climate change on the combined output of fishing and water transportation in the study area is not significant (0.682).

4.4 Research Question Three: What adaptation strategies are used by blue economy agents in riparian communities in Lokoja riparian communities?

Table 5: Strategies employed by blue economy agents to overcome climate change impacts

Economic activities	Item	Response scale	Frequencies	Percentages
Fishing	Changing time/season/location of fishing	Very often	22	100
	Multiple sources of income	Very often	15	68.2
	Adhering to weather forecasts	Often	22	100
Total			22	100
Ferry/boat transportation	Multiple sources of income	Very often	23	92
	Adhering to weather forecasts	Very often	21	84
	Using improved equipment	Very often	17	68
Total			25	100

Source: Field survey, 2026.

The strategies adapted by blue economy agents to overcome the negative consequences of climate change are presented in Table 5. Fishermen adapted three strategies namely: changing time or season or the location of fishing activities, engaging in multiple sources of income, and adhering to weather forecast. Furthermore, ferry and boat transporters engage in multiple sources of income, adhered to weather forecast, and used improved equipment in seasons of bad weather.

The intriguing discovery about their adaptation strategy is that both blue economy agents are involved in multiple sources of income mostly farming to compliment the income from their main occupation. Some of the fishermen are ferry or boat transporters, and some of the ferry or boat transporters are fishermen.

4.5 Research Question Four: To what extent does participation in blue economy activities reduce poverty in Lokoja riparian communities?

Table 6: The perception of blue economy activities and poverty reduction in Lokoja

The blue economy and poverty reduction in riparian communities		
Part A		
Response scale	Frequencies	Percentages
Agree	8	17
Strongly agree	39	83
Total	47	100
Part B		
Income variations despite changes in weather on blue economy activities in riparian communities		
Response scale	Frequencies	Percentages
Much higher	5	10.6
Slightly higher	38	80.9
About the same	3	6.4
Slightly lower	1	2.1
Total	47	100

Source: Field survey, 2026.

Part A of Table 6 presents the perception of blue economy activities on poverty reduction in Lokoja riparian communities. Forty-seven (47) respondents representing 100 percent of the respondents opined that participation in blue economy activities over the years have improved the living condition of blue economy operators in their communities. This result is an indication that the blue economy at the confluence has the potentials in employing a large number of people if this economic sector is adequately invested in by government and key stakeholders. This result is in agreement with the a priori expectation and the works of Aladejana, Onyejiuwa, Oluwalana, and Alabi (2025) and Dike (2024).

Part B of Table 6 presents income variations despite changes in weather conditions on blue economy activities in riparian communities. Thirty-eight (38) respondents representing 80.9 percent opined that despite the variations in climate change, their income were slightly higher. Five (5) respondents representing 10.6 percent suggest that their incomes were much higher, while three (3) respondents representing 6.4 percent opined that their incomes were about the same level, and one (1) respondent representing 2.1 percent suggest that his income was slightly lower than before. Despite the effects of climate change on blue economy output, incomes from

these activities have remained relatively stable. This result is buttressed by the findings on Table 7 which revealed that the impact of climate change on poverty proxied by income is not significant.

The significance level of the impact of climate change on poverty reduction in the riparian communities is tested using the Ordinary Least Square regression analysis and the result is presented in Table 7.

Table 7: Estimating the impact of climate change on poverty reduction using regression analysis.

Coefficients^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	4.411	.684		6.452	.000
ccp	-.061	.168	-.050	-.361	.720
education	-.134	.042	-.440	-3.193	.003

a. Dependent Variable: ccpov

Table 7 presents the significance level of the impact of climate change (ccp) on poverty reduction (ccpov) in the riparian communities under investigation. Findings revealed that a unit change in climate change causes a reduction in poverty by 6 percent. Furthermore, it is revealed that this improvement in the living standard of the respondents is not significant (0.720).

4.6 Research Question Five: What are the challenges facing the blue economy in Lokoja riparian communities?

Table 8: The challenges experienced by operators of the blue economy

Economic activities	Item	Response scale	Frequencies	Percentages
Fishing	Climate change	Very serious challenge	22	100
	Poor infrastructure	Serious challenge	20	90.9
	Inadequate government support	Very serious challenge	19	86.4
	Shallowness/low water level	Very serious challenge	19	86.4
Total			22	100
Ferry/boat transportation	Inadequate government support	Very serious challenge	24	96
	High cost of inputs	Very serious challenge	23	92
	Poor infrastructure	Very serious challenge	22	88
	Inadequate access to credit/loans	Very serious challenge	22	88
Total			25	100

Source: Field survey, 2026.

Table 8 presents the challenges experienced by economic agents involved in the use of the blue economy in Lokoja riparian communities. Climate change, inadequate government support, river depth, and poor infrastructure are identified as serious challenges affecting the use of the blue economy by fishermen. Furthermore, inadequate government support, poor infrastructure, high cost of inputs, and inadequate access to credit or loans are the serious challenges influencing the use of the blue economy for ferry or boat transportation in the study area. The implication of this result is that climate change affects blue economic activities differently. While its impact on fishing is significant, it has not influenced ferry or boat transportation significantly. Inadequate government support and poor infrastructure is a common denominator of the challenges faced by both fishermen and ferry or both transporters. The challenges identified by this research are corroborated by the works of Yusuf and Ibidapo-Obe (2024), and Nweke and Dhakir (2025).

5. DISCUSSION OF FINDINGS

Research question one examined the major blue economy activities undertaken by riparian communities in Lokoja. Findings revealed that fishing and ferry/boat transportation constitute the dominant blue economy activities in the study area. This supports the findings of Osuji and Agbakwuru (2024), which identified fisheries and water transportation as significant contributors to livelihoods within Nigeria's blue economy. The finding also aligns with the Lewis Theory of Economic Development, which emphasizes the movement of labour into productive sectors capable of generating income and reducing poverty.

Research question two assessed the impact of climate change on blue economy output. Results showed that climate change majorly affected fishing activities through flooding, drought, and rising temperatures, while water transportation was only slightly affected. Although regression results indicated that the overall impact on combined blue economy output was statistically insignificant, the finding corroborates the studies of Igejongbo et al. (2025) and Aladejana et al. (2025), which found that climate change adversely affects blue economy resources and productivity. The finding further supports the Solow-Swan Growth Theory, which emphasizes the importance of technological adaptation and capital investment in mitigating productivity losses arising from environmental shocks.

Research question three investigated the adaptation strategies adopted by blue economy operators. Findings revealed that respondents adjusted fishing locations and seasons, diversified

income sources, adhered to weather forecasts, and adopted improved equipment. These findings are consistent with the resilience and adaptation perspectives highlighted by Igejongbo et al. (2025), which advocate adaptive responses to climate-related risks. The adaptation measures demonstrate efforts by operators to sustain productivity despite environmental uncertainties.

Research question four examined the extent to which participation in blue economy activities reduces poverty. Findings revealed that all respondents agreed that blue economy activities contributed to poverty reduction through income generation and livelihood support. This finding agrees with Dike (2024), Nantayi Faridah et al.(2022), Esin et al. (2025), and Zakayo and Mbilinyi (2023), who reported that blue economy activities, create employment opportunities and improve living standards. The result equally validates the Lewis and Solow-Swan theories, which associate productive employment, capital accumulation, and economic diversification with poverty reduction.

Finally, research question five identified the challenges confronting blue economy operators. Climate change, inadequate government support, poor infrastructure, limited access to credit, and high operational costs emerged as major constraints. These findings support Nweke and Dhakir (2025) and Yusuf and Ibidapo-Obe (2024), who identified similar institutional and infrastructural barriers limiting the full realization of blue economy potentials.

6. CONCLUSION AND RECOMMENDATIONS

This research concludes that the blue economy plays a major role in reducing poverty among riparian communities at the confluence of rivers Niger and Benue in Lokoja. Fishing and ferry/boat transportation provided stable outputs and incomes despite the influence of climate change. Climate change affected fishing more than water transportation, however, the impact on their outputs or incomes; and on their ability in reducing poverty is insignificant. Changing fishing times and locations, adherence to weather forecasts, and livelihood diversification were identified as major adaptive strategies used by the blue economy operators in the study area.

This study recommends the establishment of dedicated blue economy cooperative societies or credit schemes by fishermen and boat/ferry operators to facilitate collective access to low interest loans or grants since majority of the respondents derive more than half of their income from blue economy activities. The National Inland Waterways Authority (NIWA) Lokoja area office which is a regulatory body of the blue economy should facilitate the provision

of timely weather information (weather forecasts, flood alerts, and river levels) to operators of the blue economy, given that majority of fishermen reported that fishing output were majorly affected by climate change. Finally, the government should invest in blue economy support facilities and diversify the economy by rehabilitating neglected jetties and fish landing sites in Lokoja; encourage investors to invest in the non-existent or poorly operated subsectors of the blue economy in Lokoja; and provide fishing gear, safer boats, and life jackets at affordable prices to blue economy operators.

7. CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

8. STATEMENT OF ETHICAL APPROVAL

This study received ethical approval from the research ethics committee of Federal University Lokoja. Participation in the study is entirely voluntary, and informed consent was obtained from all respondents before data collection. Participants' identities and responses are kept strictly confidential and used solely for academic research purposes.

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APPENDIX I
RESEARCH QUESTIONNAIRE

Federal University Lokoja,
Department of Economics
5th February, 2026.

Dear Respondent,

LETTER OF INTRODUCTION

I am a researcher from Federal University Lokoja conducting a study titled “Evaluating the Impact of Climate Change on the Blue Economy’s Potential for Poverty Reduction in Nigeria: Research and Policy Implications,” with a focus on riparian communities at the confluence of Rivers Niger and Benue, Lokoja.

You have been selected to participate in this study because your experiences and knowledge are valuable to understanding how climate change affects river-based livelihoods and the blue economy in your community. The information you provide will contribute significantly to academic research and may help inform policies and interventions aimed at improving the welfare of communities that depend on river resources.

I, kindly request that you answer all questions honestly and to the best of your knowledge. There is no right or wrong answers; what matters most is your sincere opinion and experience. Please be assured that all information provided will be treated with the strictest confidentiality. Your responses will be used solely for research purposes and will not be disclosed to any unauthorized person. Participation is voluntary, and you may decline to answer any question if you so wish.

Thank you for your time, cooperation, and valuable contribution to this study.

Yours faithfully,

Emmanuel Umale Abbah, PhD.

Research Questionnaire

Study Title:

Evaluating the impact of climate change on the blue economy's potential for poverty reduction in Nigeria: Research and policy implications

(Focus: Riparian communities at the confluence of Rivers Niger and Benue, Lokoja)

SECTION A: SOCIO-DEMOGRAPHIC AND HOUSEHOLD CHARACTERISTICS

Please tick (✓) or fill in as appropriate.

A1. Community/Settlement: _____

A2. Local Government Area (LGA):

☐ Lokoja ☐ Kogi (Koton-Karfe) ☐ Others (specify) _____

A3. Sex:

☐ Male ☐ Female

A4. Age (in completed years):

☐ 18–25 ☐ 26–35 ☐ 36–45 ☐ 46–55 ☐ 56 and above

A5. Marital Status:

☐ Single ☐ Married ☐ Divorced ☐ Separated ☐ Widowed

A6. Highest Educational Level Completed:

☐ No formal schooling
☐ Primary
☐ Junior secondary
☐ Senior secondary
☐ Tertiary (NCE/ND/HND/BSc and above)

A7. Household size (number of people who eat from the same pot): _____

A8. Number of children under 18 in the household: _____

A9. How long have you lived in this community?

☐ Less than 5 years ☐ 5–9 years ☐ 10–19 years ☐ 20 years and above

A10. What is your **main occupation**?

☐ Fishing
☐ Water transportation (boat/canoe operator, ferry, etc.)
☐ Sand/mineral extraction
☐ Trading/marketing
☐ Civil servant
☐ Artisan (mason, carpenter, mechanic, etc.)
☐ Others (specify) _____

A11. Do you currently engage in any **blue-economy activity** related to the rivers (Niger or Benue)?

☐ Yes ☐ No

If **No**, go to **SECTION F**.

If **Yes**, continue.

A12. Which blue-economy activity is your **main river-based livelihood**? (Tick one)

- ☐ Fishing
☐ Water transportation
☐ Tourism/recreation (boat cruise, guiding, hospitality)
☐ Sand/mineral extraction
☐ Fish processing/marketing
☐ Shoreline trading (goods/services along the riverside)
☐ Boat building/repair
☐ Others (specify) _____

A13. Do you have any **secondary source(s) of income** apart from the main blue-economy activity?

☐ Yes ☐ No

If yes, specify: _____

A14. Approximate share of blue-economy income in your total household income:

☐ 0–25% ☐ 26–50% ☐ 51–75% ☐ Above 75%

SECTION B: PARTICIPATION IN BLUE ECONOMY ACTIVITIES

B1. For each activity below, indicate whether you are involved and your role.

Activity	Involved? (Yes/No)	Main or Secondary Activity?	Your Role (owner, worker, helper, etc.)
Fishing			
Water transportation			
Tourism/recreation			
Sand/mineral (e.g. sand dredging)			
Fish processing and/or marketing			
Shoreline trading (food/other goods)			
Boat building/repair			
Other (specify) _____			

B2. For your **main blue-economy activity**, please provide rough estimates:

- Average number of days per week you work in this activity: _____ days
- Average monthly income from this activity (₦):
☐ Below 30,000 ☐ 30,000–59,999 ☐ 60,000–89,999
☐ 90,000–119,999 ☐ 120,000 and above

B3. Compared with **10 years ago**, your output/income from the main blue-economy activity is:

☐ Much higher ☐ Slightly higher ☐ About the same
☐ Slightly lower ☐ Much lower

SECTION C: PERCEPTIONS OF CLIMATE CHANGE AND HAZARDS

Instruction: Using your experience over the last 10 years, kindly indicate your level of agreement with the following statements.

Response scale:

4 = Strongly Agree (SA); 3 = Agree (A); 2 = Disagree (D); 1 = Strongly Disagree (SD)

S/N	Statement	SA (4)	A (3)	D (2)	SD (1)
C1	Flooding events along the river have become more frequent in the last 10 years.				
C2	Flooding along the river is now more severe (deeper water, larger area covered) than before.				
C3	Periods of little or no rainfall (drought/low river levels) are now more common.				
C4	Very high temperatures and heat waves have become more frequent.				
C5	The start of the rainy season is now more unpredictable than it used to be.				
C6	The end of the rainy season is now more unpredictable than it used to be.				
C7	Strong winds/storms over the river have increased in frequency or intensity.				
C8	In general, changes in climate and weather patterns have affected everyday life in this community.				

SECTION D: IMPACT OF CLIMATE CHANGE ON BLUE-ECONOMY OUTPUT

Instruction: Answer for your main blue-economy activity (e.g. fishing, transportation, sand mining).
How much do these climate-related events affect your **output or income**?

Response scale:

4 = Extremely affected; 3 = Moderately affected; 2 = Slightly affected; 1 = Not affected

S/N	Climate-related factor (for your main activity)	4	3	2	1
D1	Flood affects my output/income from this activity.				
D2	Drought/low river water level affects my output/income from this activity.				
D3	High temperature/heat waves affect my output/income from this activity.				
D4	Early onset of the rainy season affects my output/income from this activity.				
D5	Late onset or early cessation of the rainy season affects my output/income from this activity.				
D6	Strong winds/storms (on the river) affect my output/income from this activity.				
D7	Riverbank erosion and changes in the river channel affect my output/income.				

(Optional sub-section if you do more than one activity: repeat for a second activity if required.)

SECTION E: ADAPTATION STRATEGIES TO CLIMATE CHANGE

Instruction: Indicate how often you use each strategy in response to the effects of climate change on your river-based livelihood.

Response scale:

4 = Very often; 3 = Often; 2 = Rarely; 1 = Never

S/N	Adaptation Strategy	4	3	2	1
E1	Having multiple sources of livelihood (diversifying income).				
E2	Changing the time of day/season when I work on the river (e.g. early morning, dry/wet season).				
E3	Changing the location or route used for fishing/transport/mining during bad weather.				
E4	Using improved equipment (boats, engines, nets, safety gear) to cope with climate impacts.				
E5	Adhering to weather and flood forecasts from radio/TV/phone or government agencies.				
E6	Joining/cooperating with associations or cooperatives for support in bad years.				
E7	Using savings/loans to recover after floods or droughts.				
E8	Temporarily relocating to other areas during severe climate events.				
E9	Permanently leaving this activity because of climate impacts.				
E10	Receiving support from government/NGOs (cash, materials, training) to cope with climate impacts.				

E11. In your own words, which **adaptation strategies** have worked best for you?

.....

SECTION F: POVERTY AND LIVELIHOOD OUTCOMES

F1. Approximate **total monthly household income** from all sources:

- ☐ Below 30,000 ☐ 30,000–59,999 ☐ 60,000–89,999
☐ 90,000–119,999 ☐ 120,000–149,999 ☐ 150,000 and above

F2. Compared with 10 years ago, my household's **overall living standard** is:

- ☐ Much better ☐ Slightly better ☐ About the same
☐ Slightly worse ☐ Much worse

Instruction: Using the scale below, indicate the extent to which blue-economy activities have contributed to **reducing poverty** in your household.

Scale: 4 = Strongly Agree; 3 = Agree; 2 = Disagree; 1 = Strongly Disagree

S/N	Statement	4	3	2	1
F3	My blue-economy activities have created job opportunities for myself/other household members.				
F4	Income from river-based activities is a major source of livelihood for my household.				
F5	Blue-economy activities have helped me to send my children/wards to school.				
F6	Blue-economy income has helped me improve my housing conditions.				
F7	Blue-economy income has enabled me to access health care when needed.				
F8	Because of blue-economy activities, my household experiences less poverty than before.				
F9	Without blue-economy activities, my household would be much poorer than it is now.				

SECTION G: FOOD SECURITY

G1. Does your household obtain food directly from river-based activities (e.g. fish, other aquatic products)?

- ☐ Yes ☐ No

If **Yes**, what percentage of your household's food comes from these activities?

- ☐ Less than 25% ☐ 25–49% ☐ 50–74% ☐ 75% or more

Instruction: In the **last 30 days**, how often did the following situations occur in your household **because of lack of money or other resources**?

Response scale:

4 = Often; 3 = Sometimes; 2 = Rarely; 1 = Never

S/N	Situation in the last 30 days	4	3	2	1
G2	You worried that your household would not have enough food.				
G3	Someone in your household had to eat less than they felt they should.				
G4	A member of your household skipped a meal because there was not enough food.				
G5	Any adult in your household went a whole day without eating.				

Contribution of blue-economy activities to food security

Scale: 4 = Strongly Agree; 3 = Agree; 2 = Disagree; 1 = Strongly Disagree

S/N	Statement	4	3	2	1
G6	Blue-economy activities ensure a steady supply of food (especially fish) for my household.				
G7	River-based activities make it easier to transport food to and from this community.				
G8	Income from blue-economy activities improves my household's ability to purchase enough food.				
G9	Blue-economy activities have increased the overall availability of food in this community.				

SECTION H: CONSTRAINTS AND CHALLENGES FACING THE BLUE ECONOMY

Instruction: How serious are the following challenges for your main blue-economy activity?

Response scale:

4 = Very serious; 3 = Serious; 2 = Minor; 1 = Not a challenge

S/N	Challenge	4	3	2	1
H1	Inadequate government support (policies, programmes, subsidies).				
H2	Climate change (flood, drought, extreme temperatures).				
H3	Shallowness/low water level at the confluence.				
H4	Over-exploitation of fish and other resources.				
H5	Inadequate access to credit/loans for improving boats, nets or other equipment.				
H6	Poor infrastructure (jetties, landing sites, storage/cold rooms, roads).				
H7	Pollution of the river (waste, oil, chemicals, etc.).				
H8	Insecurity/robbery/piracy or conflicts on the river.				
H9	High cost of inputs (fuel, nets, gear, spare parts).				
H10	Lack of training/technical knowledge on safe and sustainable river-based practices.				

H11. In your opinion, what **three major problems** are most seriously affecting blue-economy activities in this community?

1.
2.
3.

SECTION I: OPEN-ENDED VIEWS AND POLICY SUGGESTIONS

I1. In your own words, what are the most important **changes you have noticed in the rivers and your livelihood** over the past 10 years?

.....
.....

I2. What **support or policies** from government, NGOs or other organisations would most help you sustain or improve your river-based livelihood?

.....
.....

I3. Any other comments or suggestions about climate change, the blue economy, poverty or food in your community:

.....
.....