

ASSESSING THE DUAL THREATS OF OIL SPILLS AND CLIMATE CHANGE ON SUSTAINABLE DEVELOPMENT IN OGBIA, BAYELSA STATE NIGERIA

¹Amos, K.G. and ²Okoro, E.O.

¹Department of Political Science, Isaac Jasper Boro College of Education, Sagbama

²Environmental Management and Toxicology Department Federal University Otuoke

Corresponding Email: okoroe@fuotuo.ke.edu.ng, orcid.org/0000-00020474-3093
 +2348063583693

Received: 18-12-2024

Accepted: 07-02-2025

<https://dx.doi.org/10.4314/sa.v24i1.12>

This is an Open Access article distributed under the terms of the Creative Commons Licenses [CC BY-NC-ND 4.0]

<http://creativecommons.org/licenses/by-nc-nd/4.0>.

Journal Homepage: <http://www.scientia-african.uniportjournal.info>

Publisher: *Faculty of Science, University of Port Harcourt.*

ABSTRACT

This study investigates the observed climate patterns and their potential impacts on livelihood in Ogbia Local Government Area, Bayelsa State, Nigeria. The study analyzes temperature and rainfall trends over the past three decades and their correlation with agricultural productivity (farming and fishing). The results reveal that oil spills are a prevalent concern, with 53% of respondents reporting regular occurrences, while only 5% indicated they have never experienced spills. Additionally, the findings highlight a significant rise in average temperature at a rate of 0.024°C per year, peaking at 32.74°C in 2023. Rainfall variability was also evident, with an average annual rainfall of 246.86 mm, and significant fluctuations between 2020 (187.74 mm) and 2021 (388.16 mm), while the rate of rainfall increases (1.32 mm/year) was weak, pointing to growing variability in precipitation patterns. The study's major findings show that rising temperatures and erratic rainfall negatively impact agriculture, especially temperature-sensitive crops like cassava, yam, and plantain. These climate changes lead to heat stress, reduced crop yields, and water scarcity, which threaten food security in the region. Similarly, fish stocks are affected by rising water temperatures, which reduce oxygen levels in aquatic environments and disrupt breeding patterns. The study recommends adopting climate-resilient agricultural practices, improving flood management systems, and enhancing fishery management to mitigate these impacts. Additionally, the need for community awareness and education on climate adaptation strategies is emphasized to ensure sustainable livelihoods in the face of climate change.

Keywords: livelihood, climate, sustainability, oil spill, farmers

INTRODUCTION

The Niger Delta region of Nigeria, which is rich in natural resources including oil, has faced extensive environmental degradation due to oil spills and the increasing impacts of climate change. This has led to significant disruptions in the livelihoods of local communities that depend on agriculture,

fishing, and other natural-resource-based activities. Oil exploration and extraction in this region have resulted in frequent oil spills, contamination of water sources, and loss of biodiversity (Nriagu *et al.*, 2016). In addition to pollution from oil spills, the region is vulnerable to climate change, which results in unpredictable weather patterns, rising sea levels, and frequent flooding. These combined

threats exacerbate the environmental challenges faced by local populations, thereby creating a vicious cycle of degradation (Benson, 2020). Although the individual impacts of oil spills and climate change on the Niger Delta have been well documented, there is limited research focusing on their combined effects on ecosystems and livelihoods. Oil spills degrade soil quality, poison freshwater ecosystems, and reduce agricultural productivity, whereas climate change intensifies these impacts by contributing to more extreme weather events, coastal erosion, and saltwater intrusion (Sharma *et al.*, 2024). Together, these phenomena undermine food security and economic stability, creating a complex web of vulnerabilities in the local communities (Nef *et al.*, 2022). The Ogbia Local Government Area (LGA), located in Bayelsa State, provides a valuable case study for understanding how these dual threats affect local communities. Ogbia, like many parts of the Niger Delta, heavily relies on natural resource-based livelihoods. The area has experienced numerous oil spills over the years, severely affecting soil and water quality. Moreover, climate-induced flooding has exacerbated these challenges by destroying infrastructure and displacing families (Odele *et al.*, 2020). In this context, it is crucial to assess the socioeconomic impact of oil spills and climate change on local livelihoods, identify coping strategies, and offer recommendations for sustainable development. This study aimed to evaluate the effects of oil spills and climate change on local livelihoods in Ogbia LGA, Bayelsa State, by assessing their impact on agriculture and fishing, examining the role of climate change in exacerbating environmental challenges, exploring adaptation strategies, and offering policy recommendations to address these combined environmental threats. This study draws on the sustainable livelihood framework (SLF) to understand how the different assets (natural, social, human, physical, and financial) of local communities in Ogbia LGA are impacted by oil spills and climate change. The framework helps to examine how these

communities respond to shocks and stresses, and how they can enhance resilience through better resource management (Chang *et al.*, 2014, David *et al.*, 2021). Furthermore, the study incorporates elements of the environmental justice theory to ensure that interventions are equitable and hold responsible parties, such as oil companies, accountable for the environmental damage they have caused (Ozundu, and Egbunike, 2023). The case study of Ogbia LGA provides a deeper understanding of the compounded environmental and socioeconomic challenges faced by the Niger Delta. The findings of this study will contribute to the development of more effective strategies to manage the risks posed by oil spills and climate change, enhance the resilience of local communities, and promote sustainable livelihoods in the region.

MATERIALS AND METHOD

Study Area

Ogbia Local Government Area (LGA) is located in the northeastern part of Bayelsa State, Nigeria, between latitudes 4°39' N and 5°02' N, and longitudes 6°16' E and 6°35' E. It shares borders with other LGAs within Bayelsa State, including Nembe to the southeast and Yenagoa to the west. Ogbia is part of the Niger Delta region, characterized by low-lying, swampy terrain and a network of rivers and creeks. The LGA covers an area of approximately 695 square kilometers. According to the 2006 Nigerian census (NPC, 2006), Ogbia had a population of about 179,926 people, resulting in a population density of roughly 259 people per square kilometer. The region experiences high annual rainfall, reflecting its tropical climate, with some areas receiving up to 97.3 mm of rain. Maximum temperatures typically range between 30°C and 41°C. The principal occupations in Ogbia are predominantly agriculture, fishing, and oil-related activities. Agriculture, especially the cultivation of crops such as cassava, yam, and plantain, plays a key role in the local economy. Fishing, both for subsistence and commercial purposes, is also

significant, given the region's proximity to riverine and coastal areas. Additionally, oil exploration and associated industries have become increasingly important, as Bayelsa

State is one of Nigeria's primary oil-producing regions. Together, these sectors form the backbone of Ogbia's economy, supporting both rural and urban populations.

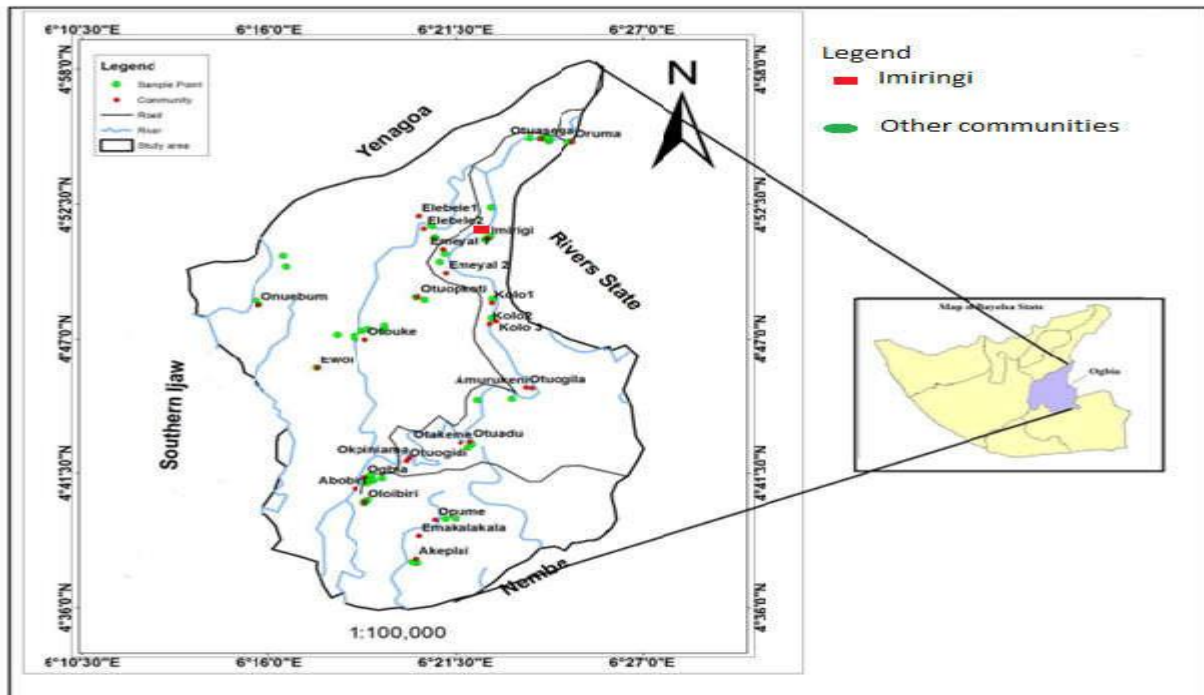


Figure 1: Map of Bayelsa Showing Ogbia, LGA

Source: Anekwe, and Onoja (2020).

MATERIALS AND METHODS

A mixed-method approach was employed, combining quantitative data from surveys with meteorological data from the Nigerian Meteorological Agency (NiMet) to provide a comprehensive assessment of the impacts of oil spills and climate change on sustainable livelihoods in Ogbia LGA. A structured questionnaire was administered to 400 respondents, including farmers, fishermen, and other community members whose livelihoods depend on natural resources. The questionnaire was designed to gather information on the frequency of oil spills, location, and perceived impacts on agricultural productivity and fish stocks. Changes in weather patterns, such as temperature and rainfall, and their effects on local farming and fishing activities. Adopted local response to environmental changes, and perceptions of

livelihood sustainability in the face of environmental degradation. Stratified random sampling was employed to ensure representation across different communities in Ogbia. Historical climate data (1993–2023) was obtained from NiMet's station in Abuja, including information on temperature, rainfall patterns, and other relevant climate variables. The dataset was used to analyze climate trends and patterns over the last three decades. The survey responses were analyzed using descriptive statistics to summarize the key findings related to the impacts of oil spills and climate change on livelihoods. The meteorological data was correlated with the survey findings to establish any relationships between observed climate patterns (e.g., changes in rainfall and temperature) and reported changes in agricultural productivity and fish stocks.

RESULTS AND DISCUSSION

Table 1: Social economic status of the respondents

	Frequency	Percentage (%)
No of questionnaire distributed	400	100
No of questionnaire returned	396	99
No of questionnaire not returned	4	1
Sex		
Male	247	62.37
Female	149	27.63
Age		
20 - 30	28	7.07
31 – 40	133	33.59
41 – 50	102	25.76
51 – 60	73	18.43
61 and above	60	15.15
Educational Qualification		
FSLC/ Non-Formal Education	52	13.13
SSCE	71	17.93
OND/NCE/HND	82	20.71
B.Sc	86	21.72
M.Sc & Ph.D	105	26.51
Occupation		
Farming	115	29.04
Fishing	102	25.76
Trader	33	8.33
Civil servant/Oil and gas	50	12.63
Community leaders/stakeholders	96	24.24

The survey result in Table 1 shows that the majority of respondents were male, with females participating at a significantly lower rate. Most respondents were aged between 31 and 40 years, followed by those in the 41-50 age group, with a notable representation of older individuals as well. Educational attainment was relatively high, with a large proportion holding advanced degrees (M.Sc or Ph.D.), and a smaller group having only basic education or none. The dominant occupations were farming and fishing, reflecting a largely rural or agricultural community, while community leaders were also well represented, and smaller numbers worked in civil service,

oil and, gas, or trading. The survey results reflect demographic trends similar to studies in South-South and Southeast Nigeria. The predominance of males and high educational attainment, particularly with advanced degrees, suggest better understanding and engagement in local issues. The large representation of farmers and fishermen mirrors the region's economic reliance on agriculture and fishing (Onwuebele, 2015). Involvement of community leaders supports findings that highlight their key role in local development and policy implementation (Ajala and Adebajo 2019).

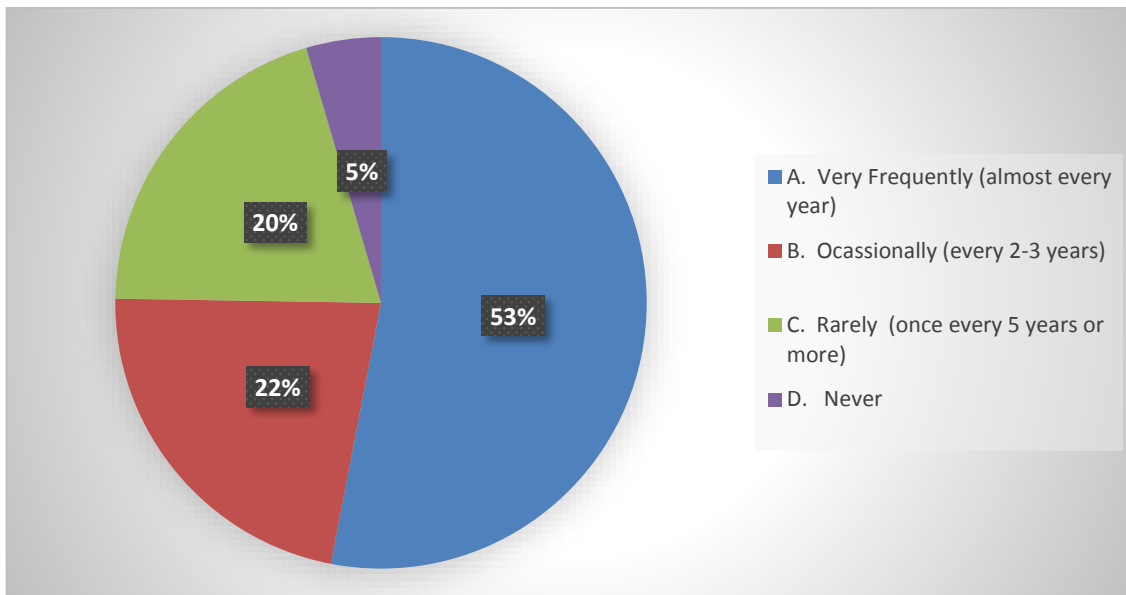


Figure 2: The frequency of oil spill in the community

The data clearly shows that oil spills are a common occurrence in the communities, with the majority of respondents (210 out of 396, or 53%) experiencing spills frequently. Additionally, 88 respondents (22%) reported that spills occur occasionally, every 2-3 years. A further 80 respondents (20%) indicated that spills happen rarely, about once every 5 years, while 18 respondents (5%) stated that spills have never occurred in Ogbia LGA. The data reveals that oil spills are frequent in Ogbia LGA, with 53% of respondents reporting regular occurrences. This mirrors the situation in the broader Niger Delta, where oil spills

from exploration activities cause widespread environmental damage, contaminating land, water, and affecting livelihoods (UNEP, 2011). Occasional and rare spills (22% and 20%, respectively) align with findings from Nriagu *et al.* (2016), where spills are less frequent but still impactful in health risks and economic losses from pollution are significant, particularly in agriculture and fisheries. The findings underscore the need for stronger environmental regulations and spill response mechanisms to mitigate the effects of oil spills in these regions.

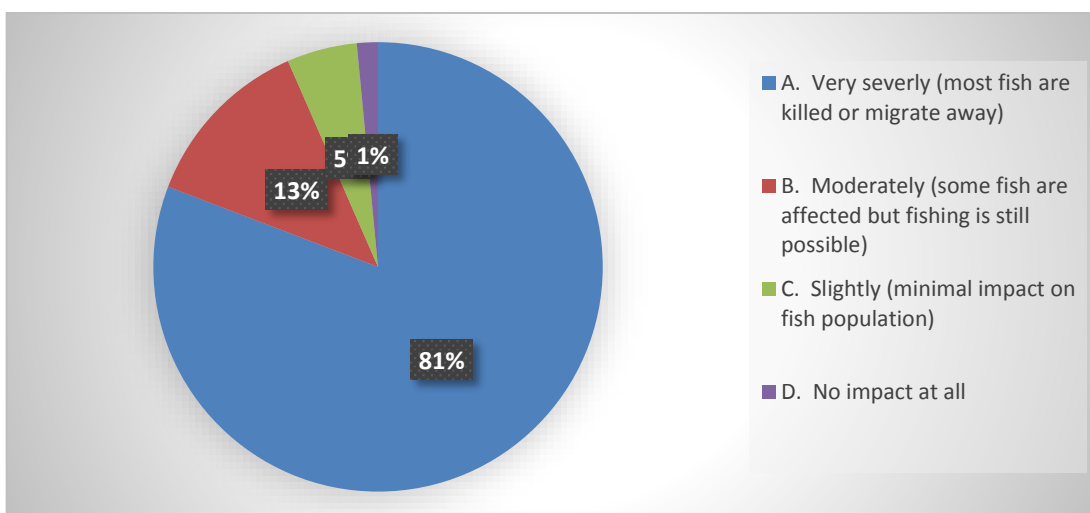


Figure 3: The extent oil spills have affected the fishing activities in your community

The data reveals that oil spills significantly affect fishing activities in the communities. Majority of the respondents (320) reported that spills have a very severe impact, with most fish either dying or migrating away. Another 50 respondents indicated a moderate effect, where some fish are affected but fishing remains possible. A smaller group of 20 noted only a slight impact on fish populations, while 6 respondents stated that oil spills have no impact on fishing activities. Overall, the results highlight the detrimental impact of oil spills on the community's fishing industry, with severe consequences for local livelihoods. The data shows that oil spills

significantly impact fishing activities in Ogbia LGA, with 81% of respondents reporting severe effects, including fish deaths or migration. This aligns with studies from the Niger Delta, where oil pollution devastates aquatic ecosystems, reducing fish populations and harming livelihoods. Studies by Ushie *et al.* (2020) and Alvernia *et al.* (2021) confirmed the decline in fish catches in oil-polluted waters, leading to economic hardship for local communities. Although a few respondents noted moderate or slight impacts, the overall findings highlight the critical threat oil spills pose to fishing and food security in South-South and southeastern Nigeria.

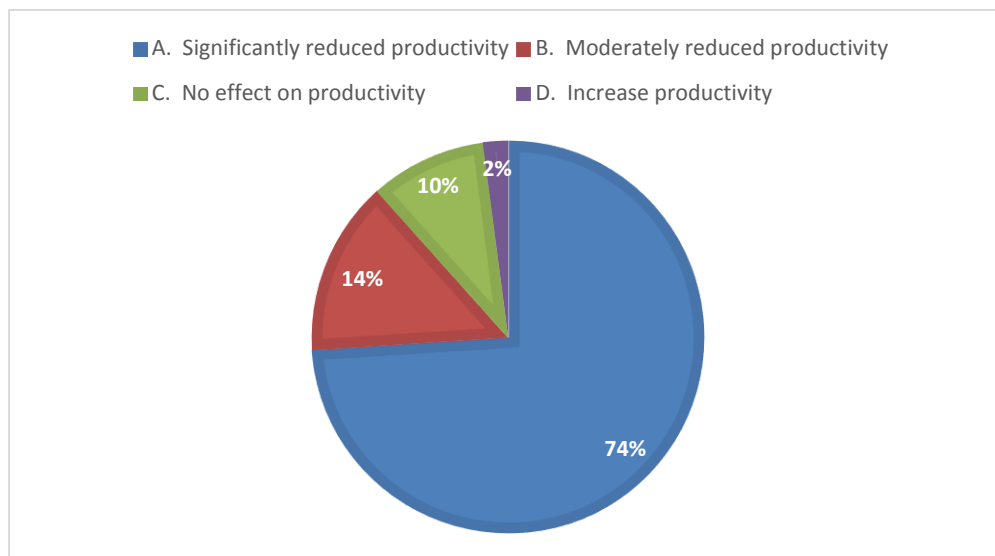


Figure 4: The impact of climate change on Agricultural productivity

The data indicates that climate change has had a substantial impact on agricultural productivity in the area. A majority of respondents (293) reported that rising temperatures and altered rainfall patterns have significantly reduced productivity. Another 57 respondents noted a moderate reduction in productivity. Meanwhile, 38 respondents stated that climate change has had no effect on their agricultural output, and only 8 respondents reported an increase in productivity. Overall, the findings suggest that climate change is primarily having a negative effect on agriculture in the region. The data reveals that climate change negatively impacts agricultural productivity in the region, with

74% of respondents reporting significant reductions due to rising temperatures and altered rainfall patterns. This aligns with findings from studies in the Niger Delta, where increased temperatures and erratic rainfall have disrupted planting and harvest cycles, leading to lower yields. According to Adamaagashi *et al.* (2023), climate change in Nigeria has exacerbated agricultural challenges, affecting crop growth and food security. Similarly, Grigorieva *et al.* (2023) highlight how changing weather patterns have negatively affected farming communities in Nigeria, emphasizing the urgent need for adaptive agricultural practices.

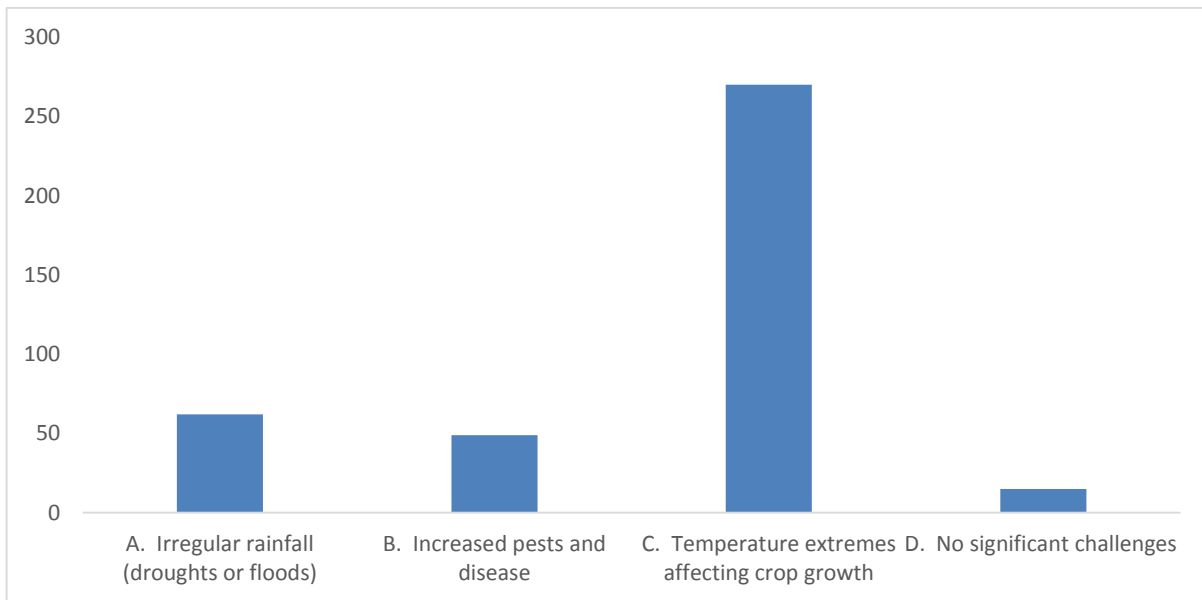


Figure 5: Climate-related challenges noticed in agricultural activities

The data shows that climate-related challenges are significantly impacting agricultural activities in the area. The most commonly reported issue is temperature extremes affecting crop growth, with 270 respondents highlighting this as a major challenge. Irregular rainfall, such as droughts or floods, was identified by 62 respondents, while 49 noted an increase in pests and diseases due to changing climate conditions. Only 15 respondents indicated that they have not faced any significant climate-related challenges. Overall, temperature extremes appear to be the most critical issue, followed by irregular rainfall and increased pests and diseases. The data shows that climate-related challenges, particularly temperature extremes, irregular rainfall, and flooding, are significantly impacting agriculture in the area. The majority

of respondents (270) reported temperature extremes as a major issue affecting crop growth. Okon *et al.* (2021) emphasized that irregular rainfall and increased pests and diseases were also common concerns, reflecting broader trends in Nigeria. Additionally, frequent flooding, reported by the respondents, highlights the serious risks posed by rising sea levels and erratic rainfall patterns in the region (Nwanosike *et al.*, 2021). There are limited adaptation strategies to oil spills and climate change, with most respondents lacking specific measures. Some have diversified activities or relocated. This reflects regional challenges, as many in the Niger Delta struggle with inadequate resources and knowledge to adopt effective adaptation strategies (Sam *et al.*, 2024).

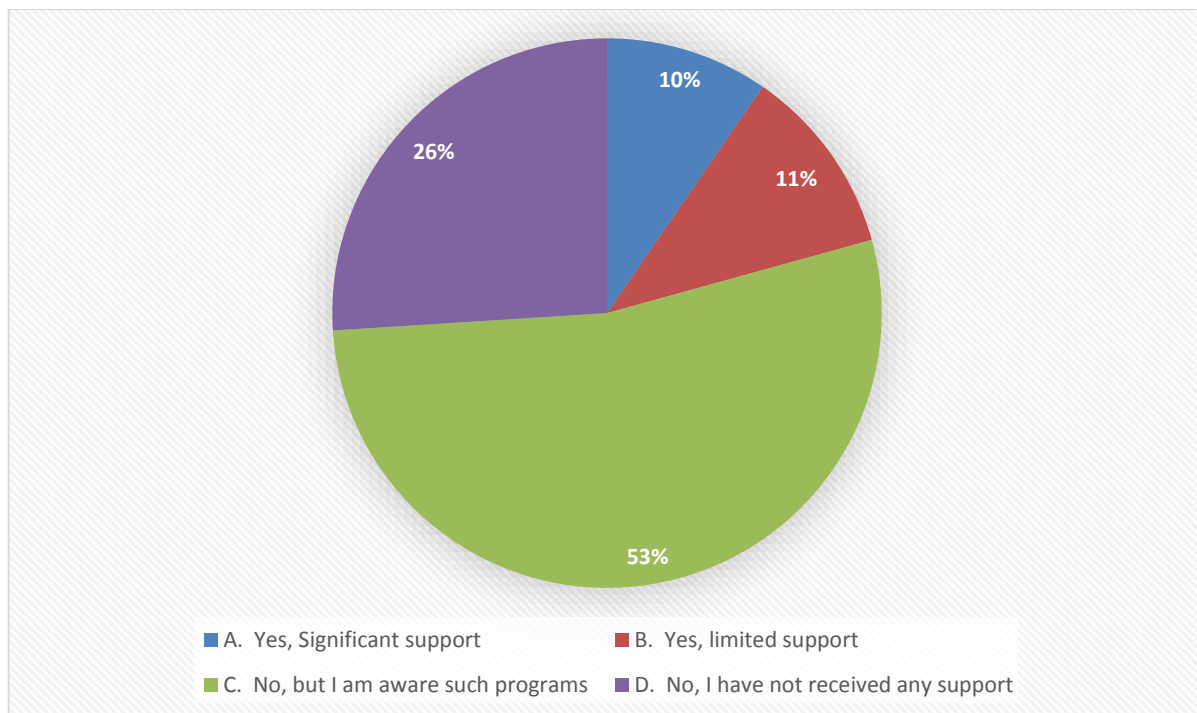


Figure 6: Do you receive any support from government or NGOs to mitigate the effects of oil spills and climate change on your livelihoods

The data shows that most respondents have not received support to mitigate the effects of oil spills and climate change on their livelihoods. A large group (211) reported being aware of such programs but have not received any assistance, while 103 respondents said they had not received any support at all. Only 44 respondents indicated they have received limited support, and 38 reported receiving significant assistance. Overall, the findings suggest a gap in the reach or effectiveness of support programs, leaving many in the community without adequate help to address these challenges. The data highlights a significant gap in support for communities facing the combined challenges of oil spills and climate change, with most respondents (211) aware of mitigation programs but not receiving assistance. This is consistent with regional studies, such as Nriagu *et al.* (2016),

which found that government support for Niger Delta communities is often insufficient or poorly targeted, leaving many vulnerable to the environmental impacts of oil spills and climate change. Furthermore, dissatisfaction with government policies is widespread, with 301 respondents rating them as ineffective. The lack of awareness among 54 respondents also points to the failure of policy communication, further exacerbating the challenges faced by local communities. There is a strong community support for comprehensive policy changes to address oil spills and climate change, respondents advocating for stricter oil company regulations, climate-resilient agriculture, and flood management. This reflects a desire for a multi-faceted approach to mitigate environmental challenges and protect livelihoods (Anser *et al.*, 2023)

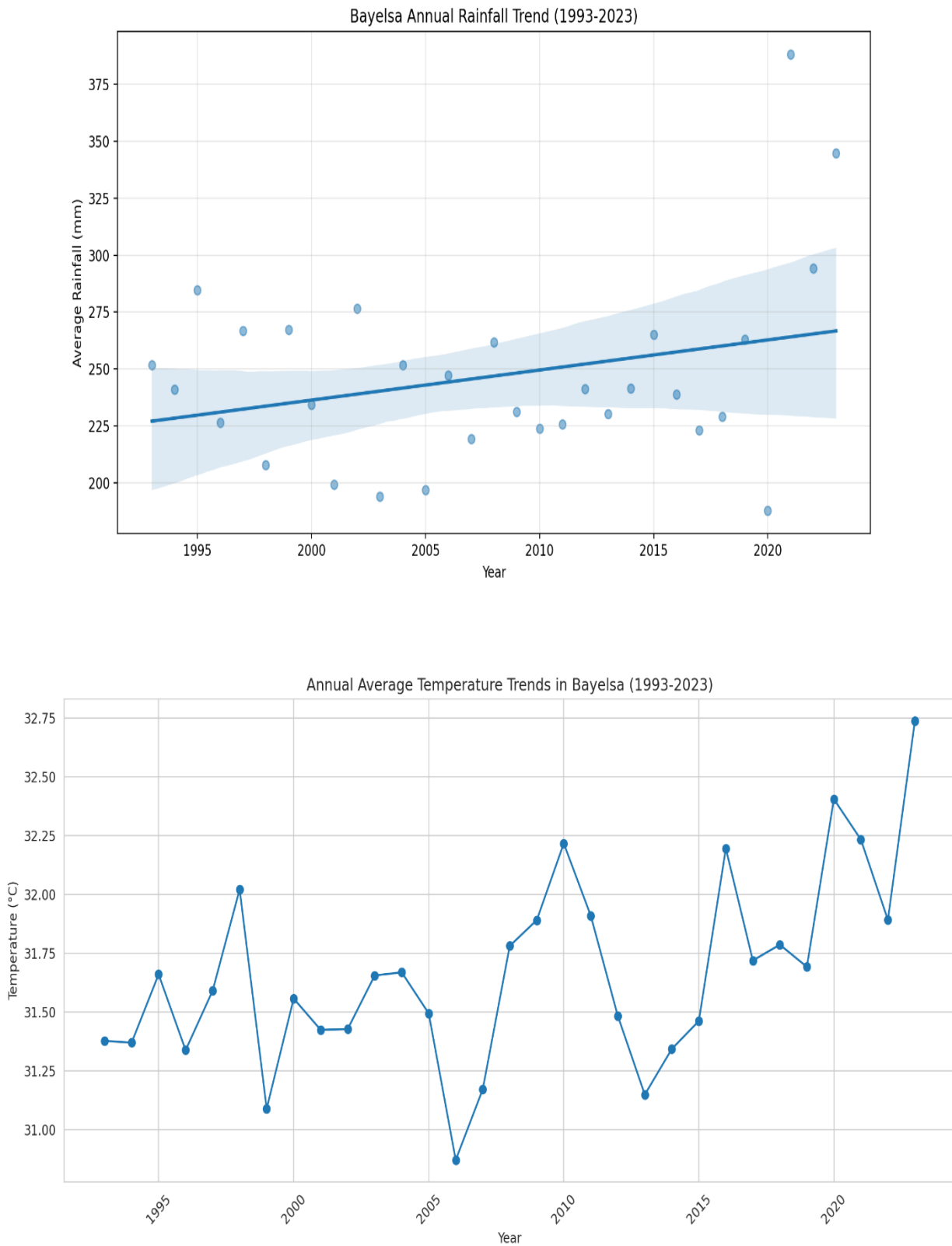


Figure 7: Annual Rainfall and Temperature trend in Ogbia LGA from 1993 to 2023

Over the past three decades, the average temperature in Ogbia LGA, Bayelsa State, has been 31.66°C, with a steady increase of 0.024°C per year. The highest annual average temperature was recorded in 2023 at 32.74°C, and February is the warmest month, reaching 34.40°C. In contrast, August is the coolest month at 28.95°C. Rainfall has varied significantly, with an average of 246.86 mm annually. The highest rainfall was in 2021 at 388.16 mm, while the lowest occurred in 2020 at 187.74 mm. Although rainfall is increasing at a rate of 1.32 mm per year, the trend is weak, with 0.05 significance. The study establishes a relationship between observed climate patterns (temperature and rainfall trends) and changes in agricultural productivity (farming and fishing) in Ogbia LGA, Bayelsa State, and revealed that increasing temperature and rainfall variability correlate with agricultural and aquatic ecosystem changes, referencing known climate impacts on these sectors. The key potential impacts of climate change on both farming and fishing are: rising temperatures, especially during the hottest months, can cause heat stress on temperature-sensitive crops like cassava, yam, and plantain, essential staples in the region. This, combined with increased evapotranspiration, heightens water stress during low rainfall periods. Furthermore, rainfall variability—such as the extreme rainfall in 2021 and droughts in 2020—disrupts planting and harvesting, leading to crop losses. Excessive rainfall exacerbates flooding, which is common in Bayelsa, causing soil erosion, nutrient depletion, and farmland destruction. The rising water temperatures negatively affect aquatic ecosystems by reducing oxygen levels, potentially stressing fish populations and leading to fish kills. Temperature fluctuations also disrupt fish breeding and migration, reducing overall fish productivity. Additionally, increased rainfall and flooding can destroy fish habitats in rivers and wetlands. Heavy rainfall causes sedimentation and nutrient runoff, degrading water quality, which affects fish health and growth.

CONCLUSION

This study identified key climate trends in Ogbia LGA, Bayelsa State, highlighting the increasing temperature and rainfall variability that significantly impact agriculture and fishing. The findings revealed that rising temperatures and extreme rainfall events adversely affected crop yields and fish stocks, threatening local livelihoods. This study provides valuable climate data and insight into how these changes disrupt traditional agricultural practices and aquatic ecosystems. Several recommendations have been proposed based on these findings. The first is the implementation of climate-resilient agricultural practices, including drought-resistant crops and improved irrigation systems, to mitigate the effects of temperature extremes and water scarcity. Second, flood management strategies, such as better drainage systems and flood forecasting, should be established to reduce the impact of flooding. Third, fishery management can be enhanced by protecting habitats and improving water quality through better sediment and nutrient runoff control. Finally, raising awareness and educating the community on adaptive strategies and climate-change mitigation efforts are crucial to building resilience. These measures will help to reduce the negative impacts of climate change on local communities and ensure sustainable agricultural and fishing practices in the region.

REFERENCES

- Adamaagashi, I. P., Adedeji, O. B., and Omotoso, J. A. (2023). Investigating the Adaptive Practices Implemented by Rural Communities in Nigeria to Alleviate the Impacts of Climate Change on Agricultural Sectors. *International Journal of Agriculture and Earth Science*, 9(4), 28-46.
- Ajala, A. T. and Adebajo, R.O. (2019). The Role of Community Leaders in Actualisation of Community Road Development Project. *African Scholar Journal of African Sustainable Development*, 15(2), 237-247.

- Anekwe, U. L., and Onoja, R.A. (2020). Assessment of Environmental Radioactivity Level and its Health Implication in Imiringi Community Bayelsa State, Nigeria. *J. Appl. Sci. Environ. Management*, 24(6), 1045-1050.
- Alvernina, P., Utomo, S., Soesilo, T. E. B., and Herdiansyah, H. (2021). Studies of fishermen's economic loss due to oil spills. *IOP Conference Series: Earth and Environmental Science*, 802(1), 012002. <https://doi.org/10.1088/1755-1315/802/1/012002>
- Anser, M. K., Yousaf, S. U., Usman, B., Azam, K., Bandar, F. A. N., Jambari, H., Sriyanto, S., and Zaman, K. (2023). Beyond climate change: Examining the role of environmental justice, agricultural mechanization, and social expenditures in alleviating rural poverty. *Sustainable Futures*, 6, 100130. doi.org/10.1016/j.sftr.2023.100130.
- Benson, A. (2020). Social and Environmental Drivers of Climate Change Vulnerability in the Niger Delta region, Nigeria. *European Journal of Environment and Earth Sciences*, 1(5), 1-10. <https://doi.org/10.24018/ejgeo.2020.1.5.69>
- Chang, S. E., Stone, J., Demes, K., and Piscitelli, M. (2014). Consequences of oil spills: a review and framework for informing planning. *Ecology and Society*, 19(2), 26. doi.org/10.5751/ES-06406-190226.
- David, I. L., Stephen, R. J., and Sheppard, D. H. (2021). A perspective on oil spills: What we should have learned about global warming. *Ocean & Coastal Management*, 202, 105509. doi.org/10.1016/j.ocecoaman.2020.105509.
- Grigorieva, E., Livenets, A., and Stelmakh, E. (2023). Adaptation of Agriculture to Climate Change: A Scoping Review. *Climate*, 11(10), 202. doi.org/10.3390/cli11100202.
- Nef, D. P., Kotra, K. K., Stauffacher, M., Six, J., and Kruetli, P. (2022). Vulnerability to Food Insecurity in a Telecoupled World: Insights from Vanuatu. *Frontier Sustainability Food System*, 6:818586. [doi: 10.3389/fsufs.2022.818586](https://doi.org/10.3389/fsufs.2022.818586) (Adedeji et al., 2022).
- Nriagu, J., Udofia, E. A., Ekong, I., and Ebuk, G. (2016). Health Risks Associated with Oil Pollution in the Niger Delta, Nigeria. *Int J Environ Res Public Health*, 13(3):346. [doi: 10.3390/ijerph13030346](https://doi.org/10.3390/ijerph13030346). PMID: 27007391; PMCID: PMC4809009.
- Nwanosike, S. O., Mmom, P. C., and Weli, V. E. (2021). Impacts of Flooding on Residents of the Niger Delta Region of Nigeria: Deleterious and Beneficial Dimensions. *Journal of Research in Humanities and Social Science*, 9(11), 58-68.
- Odele, M., Idris, N. M., Babalola, A., and Modibbo, M. (2022). Climate Change Impact and Adaptation Strategies of Farmers and Fishermen in Bayelsa State, Nigeria. *ATBU Journal of Environmental Technology*, 15(2), 19-38.
- Onwuemele, A. (2015). Livelihood Responses to Climate Change in the Niger-Delta: Implications for food security in Nigeria. *International Journal of Development and Management Review*, 10; 125-135.
- Ozundu, E. M., and Egbunike, P. A. (2023). Oil Spillage and Environmental Degradation in Niger Delta: Effects. *Journal of Global Accounting*, 9(3), 1-17.
- Sam, K., Zabbey, N., Vincent-Akpu, I. F., Komi, G., Onyagbodor, P. O., and Babatunde, B. B. (2024). Socio-economic baseline for oil-impacted communities in Ogoniland: towards a restoration framework in Niger Delta, Nigeria. *Environ. Sci. Pollut. Res. Int.*, 17, 25671-25687. [doi: 10.1007/s11356-024-32805-0](https://doi.org/10.1007/s11356-024-32805-0).
- Sharma, K., Shah, G., Singhal, K., and Soni, V. (2024). Comprehensive insights into the impact of oil pollution on the environment. *Regional Studies in Marine Science*, 74, 103516. doi.org/10.1016/j.rsma.2024.103516.

UNEP. (2011). Environmental Assessment of Ogoniland. *United Nations Environment Program*.

Ushie, L., Chukwu-Okeah, G. O., and Imiete, G. (2020). Oil Pollution, Water Quality

and Livelihood Sources in the Kolo Creek Area, Bayelsa State Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 38(9), 38-47. doi.org/10.9734/ajaees/2020