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Advancing Development: The Impact of Geoscience Education in Nigeria's Rural Coastal Areas of the Niger Delta Region

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***Abstract* - The Niger Delta region of Nigeria is a significant ecological and environmental zone that is classified as a rural coastal area. The development of this region is critical to Nigeria's socio-economic growth. One of the key factors that have been identified to have a significant impact on the development of this region is geosciences education. Geoscience education helps to develop a better understanding of the natural environment, including the processes that have shaped it and the various resources available to it. This abstract presents an analysis of the impact of geoscience education in the rural coastal areas of the Niger Delta region of Nigeria. A review of existing literature on geosciences education and its impact on the development of rural coastal areas was conducted. The results show that geoscience education has significant potential in the development of the Niger Delta region of Nigeria. The research also indicates that geoscience education enhances awareness of the environmental challenges facing the region, engenders better adaptation to climate change, and underscores the importance of natural resources. Furthermore, geoscience education improves the competitiveness of the rural coastal area residents in the area of agriculture, fisheries, mining, and tourism. Therefore, it is recommended that geoscience education should be included in the curriculum of primary and secondary schools in the rural coastal areas of the Niger Delta region of Nigeria. As well as providing more opportunities for tertiary education and training in relevant geoscience subjects. Furthermore, the importance of these subjects should be widely publicized among community leaders, stakeholders, and residents to ensure they understand the positive impact on education and their development.**
Keywords: **Geoscience Education, Coastal Areas, Environmental Zone, Fisheries, Mining, Tourism**

I. INTRODUCTION

Geo-science education involves the study of geological and related natural phenomena, including the earth's structure, minerals, rocks, soils, water, and environment. In Nigeria's rural coastal areas, geoscience education is crucial, particularly in the Niger Delta region, which accounts for a significant proportion of the country's oil production [7]. Geoscience education provides individuals with the knowledge and skills necessary to work in the oil industry, which is a significant contributor to the region's economy.

In addition to supporting the oil industry, geoscience education is important for the management and conservation of natural resources, including coastal areas, water resources, and soil. The Niger Delta region, in particular, faces numerous environmental challenges, including deforestation, soil erosion, and pollution. Geoscience education can help individuals understand these issues and work to develop sustainable solutions [5].

Moreover, geoscience education can improve the livelihoods of rural communities in the Niger Delta region. The knowledge acquired through this education can be applied to developing and implementing strategies for sustainable agriculture, water management and preservation, and other sustainable natural resource use. By promoting rural development, geoscience education can contribute to economic growth, reduce poverty, and alleviate social inequality.

In summary, geoscience education is essential to the rural coastal areas of Niger Delta as it supports the oil industry, contributes to the management and conservation of natural resources, and enhances rural development and economic growth in the region.

A. Accessibility and Location of the Studied Area

The coastal Niger Delta is located in southern Nigeria along the coast of the Gulf of Guinea. It encompasses a region covering parts of Rivers, Bayelsa, Akwa Ibom, Delta, and Ondo states. The Niger Delta region is accessible through various means of transportation such as air, land, and water.

By air, the major airports in the region are the Port Harcourt International Airport in Rivers State, the Asaba International Airport in Delta State, and the Akwa Ibom International Airport in Akwa Ibom State.

By land, the region can be accessed through various highways such as the East-West Road, which runs from Warri in Delta State to Oron in Akwa Ibom State.

By water, the region is accessible through the numerous rivers and waterways that crisscross the area. There are several ports in the region, including the Onne Port in Rivers State and the Warri Port in Delta State, which are used for shipping of goods and commodities.

The location coordinates of some major cities in the coastal Niger Delta region are:
- Port Harcourt, Rivers State: 4.8156° N, 7.0498° E
- Yenagoa, Bayelsa State: 4.9247° N, 6.2659° E
- Uyo, Akwa Ibom State: 5.0280° N, 7.9277° E
- Warri, Delta State: 5.5167° N, 5.7500° E

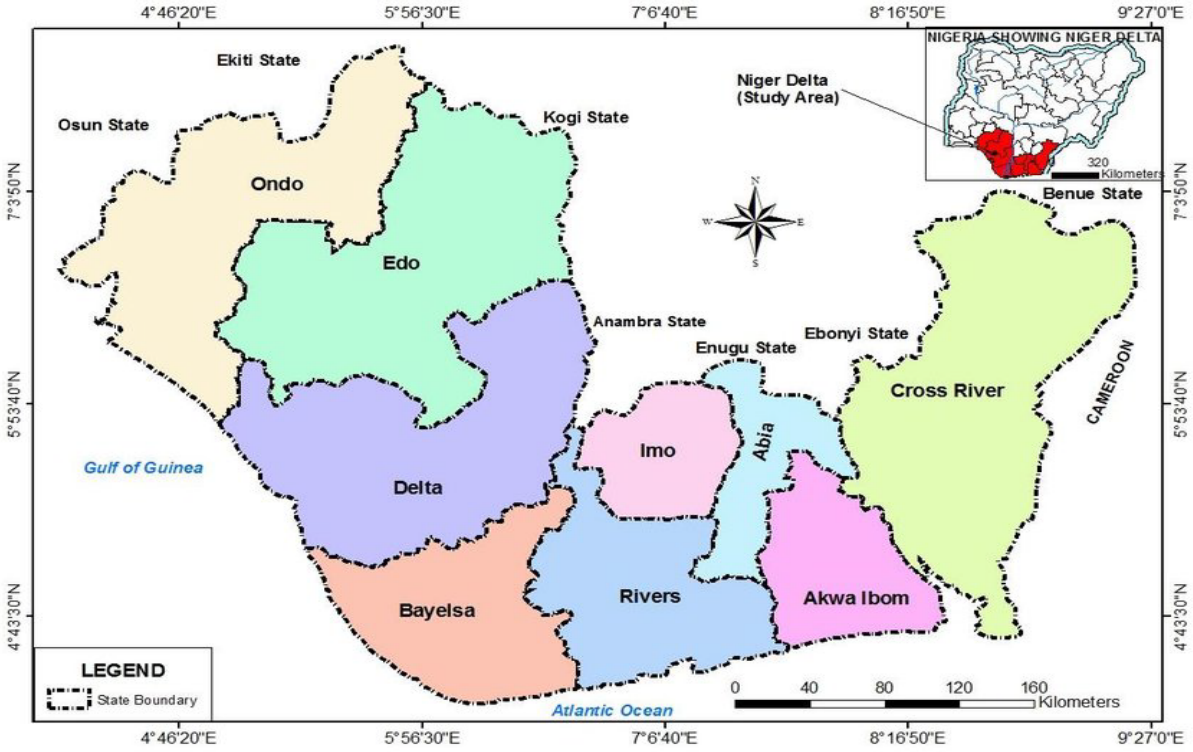


Fig. 1 Location Map of the Studied Area

It is important to note that the accessibility of some areas in the Niger Delta region may be affected by the poor state of infrastructure, especially the roads.

B. History of Geo-science Education

The history of geo-science education can be traced back to the nineteenth century when major advancements in the study of geology, geography, and earth science were made by notable scientists such as Charles Lyell, William Smith, and James Hutton. As a result, geological surveying of different parts of the world was carried out to better understand the topography, soil composition, and mineral resources of these areas [6].

Geoscience education gained momentum in the mid-twentieth century as a result of the oil boom in Nigeria. The Nigerian government established a number of public universities and schools of geoscience, such as the University of Ibadan, University of Nigeria, and the Nigerian Institute of Mining and Geosciences, to train geoscientists, geologists, geophysicists, and other professionals in related fields [8]. These institutions helped to provide a solid foundation for geoscience education in Nigeria, particularly in the Niger Delta region which is known for its oil and gas reserves.

Towards the end of the twentieth century, the importance of geoscience in rural coastal areas of the Niger Delta region of Nigeria became apparent. Geoscience education was needed to address issues related to environmental degradation, pollution, and loss of biodiversity due to oil exploration and exploitation activities in the region. Additionally, geoscience education was necessary to improve the living conditions and livelihoods of the rural communities in the region by providing sustainable solutions to environmental issues [10].

Along with traditional methods of geoscience education, innovative approaches such as community-based research and experiential learning have been adopted to provide geoscience education in the rural coastal areas of the Niger Delta. This has helped to increase the involvement of local communities in the process of environmental recovery and management, as well as the development of sustainable oil and gas exploitation practices.

In conclusion, geoscience education has played a critical role in the development and management of Nigeria's natural resources, particularly its oil and gas reserves. It has also helped to address environmental issues prevalent in the rural coastal areas of the Niger Delta. The continued promotion and development of geoscience education in

Nigeria, specifically in the Niger Delta region is crucial to ensure the sustainable development of the country's natural resources.

C. Geology and Topography of the Studied Area

The Niger Delta region of Nigeria is a low-lying floodplain with the topography dominated by vast swamps, lagoons, and creeks, all interconnecting to form the Niger Delta region. The region covers an area of approximately 75,000 km² and is located at the southern end of Nigeria, where the Niger River discharges into the Atlantic Ocean [4].

The geology of the Niger Delta is characterized by layers of sedimentary rocks consisting of sand, clay, silt, and gravel deposited by the Niger River over millions of years. These sediments were deposited on a shallow marine shelf, and the subsequent subsidence of the region created the present-day topography of the Niger Delta [1].

The sedimentary rocks of the Niger Delta are extensive and form a thick sequence of alternating sandstones, shales, and claystones, with some contributions from coal and limestone. These rocks are of Cretaceous age and were formed during the Campanian and Maastrichtian stages, about 70-98 million years ago [11].

The Niger Delta is one of the world's largest deltas, with its intricate network of rivers, creeks, and canals spanning over 70,000 km² of swamp and overlying deposits. The topography and geology of the region are significant because of the large deposits of oil and natural gas that are found in the sedimentary rocks.

The geology and topography of the Niger Delta make it prone to environmental degradation, such as soil erosion, loss of biodiversity, water pollution, and deforestation. This has led to various measures being put in place to mitigate the negative impacts of exploration and production activities in the region [4 and 6].

D. Research Questions for the Impact of Geo-science Education to the Rural Coastal Areas of Niger Delta of Nigeria

Research questions for the impact of geoscience education to the rural coastal areas of Niger Delta of Nigeria could include:

1. How does geoscience education contribute to the understanding and management of the natural resources in the rural coastal areas of Niger Delta of Nigeria?
2. What are the attitudes and perceptions of students towards geoscience education in rural coastal areas of Niger Delta of Nigeria?
3. What are the challenges facing the implementation of geoscience education in the rural coastal areas of Niger Delta of Nigeria?
4. How effective are current geoscience education programs in addressing the needs and priorities of the rural coastal communities in Niger Delta of Nigeria?
5. How can geoscience education be improved to better serve the needs of the rural coastal areas of Niger Delta of Nigeria?
6. What are the potential economic benefits of geoscience education to the rural coastal communities in Niger Delta of Nigeria?
7. Are there environmental impacts of geoscience education on the rural coastal areas of Niger Delta of Nigeria?
8. Can geoscience education be integrated with other forms of education to provide a more comprehensive understanding of the rural coastal areas of Niger Delta of Nigeria?

II. LITERATURE REVIEW

The Niger Delta of Nigeria is a region with a high concentration of rural coastal communities that depend heavily on the environment for their livelihood. Geoscience education has the potential to enhance the understanding of the natural resources and hazards in the region, as well as promote sustainable development and conservation practices. This literature review explores the impact of geoscience education on the rural coastal areas of Niger Delta of Nigeria. Several studies have highlighted the importance of geoscience education in promoting sustainable development in coastal communities. For instance, [9] noted that geoscience education can enhance the capacity of coastal communities to manage natural resources, mitigate environmental hazards, and promote sustainable livelihoods. The authors further emphasized the need for geoscience education to be integrated into the formal and informal education systems in the Niger Delta.

Similarly, a study by [12] assessed the impact of geoscience education on the environmental knowledge and attitudes of coastal communities in the Niger Delta. The study found that geoscience education improved the environmental knowledge and conservation practices of the participants. The authors recommended the inclusion of geoscience education in the curricula of primary and secondary schools in the region.

Furthermore, [2] conducted a study on the impact of geoscience education on the perception of environmental hazards among rural coastal communities in the Niger Delta. The study found that geoscience education enhanced the understanding of environmental hazards and improved the preparedness of the communities to respond to disasters. The authors recommended the integration of geoscience education into disaster risk reduction programs in the region.

In conclusion, the literature review shows that geoscience education has a significant impact on the rural coastal areas of Niger Delta of Nigeria. It enhances the environmental

knowledge, conservation practices, and disaster preparedness of the communities. Therefore, there is a need for the integration of geoscience education into the formal and informal education systems in the region to promote sustainable development and conservation practices.

III. METHODOLOGY

We developed a questionnaire or survey instrument to collect data from residents of the rural coastal area. It Include questions to assess the current level of knowledge on geosciences concepts, the perception of the impact of geoscience education, the need for geoscience education in local schools, and the potential benefits of improved geoscience education in the region. The Administration of the survey to the selected participants is through face-to-face interviews or online surveys, depending on the accessibility and preferences of the participants.

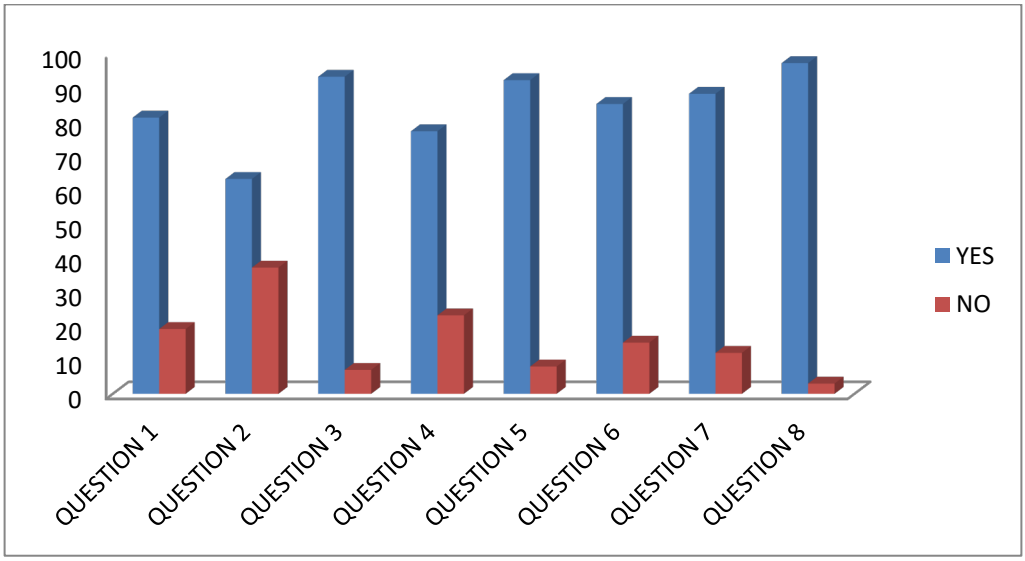
We collected additional qualitative data through focus group discussions or individual interviews to gain more in-depth insights into specific issues or challenges related to geosciences education. Finally, online secondary materials such as past journals and related textbooks were not left out.

IV. RESULTS OF THE STUDY

TABLE I SUMMARIZED RESULT

Sl. No.	Items	Yes (%)	No (%)
1	Contribution to management of the studied area	81	19
2	The attitudes and perceptions of students towards geoscience education in rural coastal areas of Niger Delta of Nigeria is positive	63	37
3	We have challenges facing the implementation of geoscience education in the rural coastal areas of Niger Delta of Nigeria.	93	07
4	Current geoscience education programs are effective in addressing the needs and priorities of the rural coastal communities in Niger Delta of Nigeria	77	23
5	Geoscience education can be improved to better serve the needs of the rural coastal areas of Niger Delta of Nigeria	92	08
6	There are potential economic benefits of geoscience education to the rural coastal communities in Niger Delta of Nigeria	85	15
7	There are environmental impacts of geoscience education on the rural coastal areas of Niger Delta of Nigeria	88	12
8	Can geoscience education be integrated with other forms of education to provide a more comprehensive understanding of the rural coastal areas of Niger Delta of Nigeria	97	03

Source: Field report (2023)



Source: Field Report 2023

Fig. 2 Research Analysis

A. Recent Geo-science Education Activities in the Studied Zone

Geo-science education has become increasingly important for the development of the rural coastal areas in Niger Delta, Nigeria. Recent achievements indicate that efforts have been made to bring geoscience education to these regions. One notable achievement is the establishment of the Department of Geology at the Niger Delta University in Amassoma, Bayelsa State. This has enabled the training of geoscientists in the region, who can then work in various industries that require geological expertise.

In addition, the Nigerian Association of Petroleum Explorationists (NAPE) has organized conferences and training programs in geoscience for students in the Niger Delta region. The programs involve lectures, field trips, and practical sessions, providing an opportunity for the students to learn about the geology of their region and to network with professionals in the field.

Furthermore, the Nigerian National Petroleum Corporation (NNPC) has established a research center in the region to promote research in geology and other related fields. The center also provides training for students and professionals in the region. These recent achievements demonstrate the commitment of various stakeholders to bring geoscience education to the rural coastal areas of Niger Delta, Nigeria. This would facilitate the sustainable development of the region, as geoscience plays a critical role in areas such as oil and gas exploration, mining, and agriculture.

B. Hindrance to Geo-science Education Activities in the Studied Area

1. *Limited Access to Education Resources:* One of the major hindrances to geoscience education activities in rural coastal areas of Niger Delta is the limited access to education resources. Most of the schools in rural areas lack basic educational resources like textbooks, laboratory equipment, and internet facilities required for effective geoscience education.

2. *Poor Infrastructure:* Poor infrastructure such as bad roads, inadequate transportation facilities, and lack of electricity supply makes it difficult for geoscience educators to reach out to rural communities. This also affects the ability of students to attend school regularly.

3. *Insufficient Funding:* Insufficient funding is another hindrance to geoscience education activities in rural coastal areas of Niger Delta. Schools in these areas often receive little or no funding from the government, making it difficult for them to provide quality education to their students.

4. *Lack of Qualified Teachers:* Lack of qualified and experienced geoscience teachers is a major challenge in rural coastal areas of Niger Delta. Most of the teachers in these areas are either untrained or underqualified, which limits their ability to provide quality education to their students.

5. *Cultural Barriers:* Cultural barriers such as traditional beliefs and practices can also hinder geoscience education activities in rural coastal areas of Niger Delta. Some communities may not value education and may prioritize other activities over schooling [3].

6. *Insecurity:* Insecurity is another major hindrance to geoscience education activities in rural coastal areas of Niger Delta. The region is prone to various forms of violence, including cultism, kidnapping, and militancy, which can affect the safety of teachers and students and disrupt educational activities.

V. RECOMMENDATION FOR GEOSCIENCE EDUCATION IN THE STUDIED AREA

Geo-science education is an important area of study that focuses on the understanding of the Earth's structure, composition, and dynamics [4]. It plays a fundamental role in the development of rural coastal areas like the Niger Delta of Nigeria, where natural resources such as oil and gas are of major economic importance.

Recommendations for geo-science education in the Niger Delta region include,

1. Providing access to educational materials and resources related to geoscience.
2. Establishing links with universities and other research institutions to provide support and knowledge exchange for students.
3. Developing specialized programs and courses to help people in the area gain a better understanding of the Earth's processes and their impact on the environment.
4. Supporting and encouraging students in the region to pursue higher studies in geoscience.
5. Enhancing collaboration between government, industry, and academia to develop policies and regulations that promote sustainability in local aspects and economies.
6. Promoting research and development activities in the region to ensure its long-term economic growth and environmental protection.
7. Collaboration between government, industry and academia to develop educational programs tailored to the local context.
8. Encouraging local teachers and mentors to use digital media platforms to facilitate remote learning.
9. Working with community leaders to identify and address local perceived needs for greater understanding of the environmental impacts of geoscience in the region.
10. Promoting the use of technology such as Geographic Information Systems (GIS) to support education, planning and decisions related to geoscience.
11. Strengthening initiatives that promote public awareness and understanding of geoscience activities in the region.

VI. CONCLUSION

The Niger Delta is a unique region in Nigeria, being the major oil and gas production area of the country. Unfortunately, rural coastal areas of the Niger Delta face numerous challenges, ranging from environmental degradation to security and infrastructure concerns. As a result, access to education - especially in the field of geoscience is severely limited [9]. Despite these challenges, there are ways in which geoscience education can be

provided to the rural coastal areas of Niger Delta. One approach could be through interactive online courses and resources, making it easier for people in the region to access quality education. Additionally, investment in local infrastructure, such as classrooms, labs, and computers, would also help to facilitate geoscience education in the region [5]. Moreover, connecting with experts and organizations from around the world would help to offer valuable mentorship to students, while providing adequate funding for research in the region. In conclusion, though there are many challenges in getting quality geoscience education to rural coastal areas of the Niger Delta, there are opportunities for progress if proper investment is made.

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