IKR Publishers

IKR Journal of Arts, Humanities and Social Sciences (IKRJAHSS)
Journal homepage: https://ikrpublishers.com/ikrjahss/
Volume-1, Issue-5 (November-December) 2025
OPEN ACCESS
ISSN: 3107-4014 (Online)

Influence of Drill Cuttings Management on Morbidity in Rivers State

Moro, O.[1*], Omojola, A. S.[2] & Fasona, M. J.[3]

[1]Department of Environmental Management, Faculty of Environmental Science, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State

[2]Department of Geography, Faculty of Social Sciences, University of Lagos, Akoka, Yaba, Lagos State

[3]Department of Geography, Faculty of Social Sciences, University of Lagos, Akoka, Yaba, Lagos State

DOI:*10.5281/zenodo.17508296*

ARTICLE INFO

Article history:
Received : 16-10-2025
Accepted : 25-10-2025
Available online : 02-11-2025

Citation: Moro, O., Omojola, A. S., & Fasona, M. J. (2025). Influence of Drill Cuttings Management on Morbidity in Rivers State. *IKR Journal of Arts, Humanities and Social Sciences (IKRJAHSS)*, 1(5), 320-325.

ABSTRACT **Original research paper**

Drill cuttings management in this study comprises transportation of drill cuttings from the rig (onshore or offshore) to the treatment facility, for further recovery and possible disposal. This study evaluates the influence of drill cuttings management on morbidity in Rivers State. The study adopts a mixed-methods approach, combining a qualitative approach using reports and policy documents from the internet with a quantitative approach using research questionnaires to survey the Ikwerre, Eleme, Obio-Akpor, and Port Harcourt Local Government Areas (LGAs) in Rivers State with a significant history of drilling activities. A multistage sampling technique was adopted to select a sample of 400 respondents from locations where drilling management activities were conducted. The data were analysed using one-way analysis of variance (ANOVA). Findings revealed statistically significant differences in the group means for health ($p = 0.02$) and waste management activities within the communities, both below the critical value of 0.05. This implied that drilling management activities had significantly impacted the health of the dwellers in the investigated communities. The study concludes that drill cuttings management has a significant effect on health and that there is a causal link between disposal practices in Rivers State and health outcomes in communities, requiring immediate policy intervention, compliance tracking, and community engagement. The study recommends a value-driven, reward-based system to engage third-party contractors to foster green production of construction materials, while diverting drill cuttings from disposal sites. This will enable the Nigerian oil and gas industries to meet the United Nations Sustainable Development Goal Targets 3.9, 6.3, 12.4, and 12.6, which aim to reduce illnesses from hazardous waste components; improve the quality of waste treatment; manage hazardous waste; and promote corporate sustainability reporting, respectively. Thus, being accountable for ensuring that drill cuttings waste is converted into valuable materials for beneficial reuse in each region.

Keywords: Corporate sustainability, Drilling wastes, Green construction, Hazardous waste, Health.

**Corresponding author: Moro, O.*
Department of Environmental Management, Faculty of Environmental Science, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State

Introduction

Exploration and production can generate large volumes of drill cuttings, which pose health risks (Xu et al., 2018). The toxicity of drill cuttings depends on the type of drilling fluid used during drilling operations. Drilling fluids can be classified into oil-based, synthetic-based, or water-based fluids; likewise, the generated cuttings (Ayati et al., 2016). Over the years, resource-efficient solutions have been developed to convert drill cuttings waste into a valuable resource, enabling waste cuttings to be included in the supply chain for construction materials (Kurdve et al., 2015). Hydrocarbon extraction in Nigeria spans 323 developed

fields, both offshore and onshore. Some of these fields are linked to production process stations after which the stabilised oil is exported via designated terminals (NUPRC, 2025). The oil and gas industry has, however, experienced peculiar challenges with illegal refineries, oil theft, and pipeline vandalism, which were uncovered during the clampdown on the illicit bunkering by locals in different local government areas, especially Ikwerre, where about 184 illegal refineries were sealed off during the past political administration in 2022 (Adiel, 2022). Considering that Nigeria targets a 2 million barrels per day increase in oil production by 2026, more drill cuttings waste will be generated requiring strict monitoring of the entire waste management process from cradle to grave, and enhance regulatory reforms throughout the exploration and production process to ensure energy targets, increased acquisitions and production initiatives are properly coordinated safely, not jeopadising human health and minimised risk to the environment throughout all the critical field development plan locations (Energy Capital & Power, 2025).

Sustainable Transition of Waste to Resources

The cradle-to-grave concept promotes the sustainable transition of waste materials by modifying management processes (Baas & Hjelm, 2015) to enable socio-technical innovations that influence resource recovery options (Fallde& Eklund, 2015). The continuous disposal of drill cuttings during offshore drilling results in the discharge of pollutants into the environment (Bakke et al., 2013). Some innovative approaches to utilise drill cuttings as a resource in cement preparation have been developed, which are expected to reduce dependence on natural resources for cement production, thereby fostering sustainable practices such as resource conservation and environmental protection, which are a gateway to economic growth and development (Wang et al., 2024). Eco-friendly concrete-based materials are in high demand as the need for cement and concrete increases. It can be observed that incorporating high volumes of waste materials can serve as substitutes for natural materials to produce lightweight aggregate concrete (Aslam et al., 2016). Drill cuttings have been considered suitable as a mineral powder in asphalt concrete mixtures for road construction (Vaisman et al., 2020) and as a partial replacement for cement (Mostavi et al., 2015). The stabilisation and solidification of drill cuttings eliminate the need to dispose of residual cuttings (Kogbara et al., 2017).

Hazardous Wastes in Africa

In Africa, hazardous waste is considered a high-potential material for recycling and as a substitute for marketable products (Akpan &Olukanni, 2020). In the past, there have been cases of unethical practices in which some African countries in debt accepted toxic waste to gain access to aid from developed countries (Kelbessa, 2023). The right to a clean and healthy environment is threatened by the illicit movement of hazardous waste across borders and within states, driven by poor shipment tracking (Waswa, 2024). Regulations on the transportation of drill cuttings vary locally and internationally, depending on country-specific environmental compliance requirements (Moro, 2023).

The health implications of treated drilling waste can be harmful to ecosystems and humans, especially in areas with high drilling activity, such as Ogoni land in Rivers State (Antia et al., 2022). The increase in drilling operations and associated environmental impacts (Moro, 2025) requires continual monitoring, as they can pose a serious health hazard (Adewole et al., 2010). Further, occupational exposure cannot be ruled out when considering the health implications of drill cuttings management, including vapour (Daae et al., 2019). Common health effects include skin irritation and inhalation of vapour; severity depends on the length of exposure and the effectiveness of personal protective equipment in controlling exposure (Ismail et al., 2017). Skin and eye irritation, headaches, cough, inhalation of aerosols, and nausea are the most prevalent health-related effects of drilling fluid, which also depends on the type of drilling fluid (Egypt Oil & Gas, 2019). The petroleum industry maintains strict health and safety protocols during each stage of the drilling waste management process to minimise environmental impact and prevent accidents (Dubi Nigeria Limited, 2025).

The Nigerian government is actively advancing regulatory reforms to protect the environment, improve healthcare, and foster wealth creation by expanding exploration, especially in mineral-rich regions, to attract investors, enhance infrastructure development, and encourage community involvement to boost local content development while exploring renewable energy options (International Trade Administration, 2025). However, perceptions of host communities regarding the government's petroleum development policies indicate that they continue to experience adverse effects on their health, natural environment, and socioeconomic activities, thereby reducing their quality of life (Ite et al., 2024). The mitigation of adverse effects, such as illnesses and other health hazards, has been associated with the externalities of oil drilling activities in the Niger Delta to some extent (Obuah & Keke, 2022). Currently (2025), the Nigerian Upstream Petroleum Regulatory Commission is not relenting in ensuring that host communities are not left underdeveloped and vulnerable; hence, the remarkable decision to embark on multiple projects to be executed simultaneously. The projects include the remodelling of cottage hospitals, in compliance with Section 235 of the Petroleum Industry Act of 2021, which envisions oil companies executing Host Community Development Trusts for the benefit of locals. Already, oil companies like Total Energies have flagged off notable projects in the Obagi oil-producing community in Rivers State (Channels Television, 2025).

Materials and Methods

The study comprises 4 local government areas (LGAs): Obio-Akpor, Eleme, Port Harcourt and Ikwerre (Figure 1). Obio-Akpor LGA is situated within a latitude of 4.938920N to 4.772673N and a longitude of 6.880542E to 7.42855E, with an annual temperature of 25 - 28°C and precipitation of 2000-2500mm from the period of April to October (Richard &Agnide, 2020). Eleme LGA is situated between longitudes 7° and 7°15'E and latitudes 4°60' and 4°35'N. Port Harcourt lies at longitude 7°0'0" E and latitude 4°46'30" N (Wizor& Obafemi, 2019), with a mean annual temperature of 30°C and a yearly rainfall of 2000mm (NIMET, 2018). Also,Ikwerre LGA is situated between 4°55' and 5°15' and between longitudes 6°40' and 6°55' E (Ukpere et al., 2021), with a mean daily temperature of 30°C (Wali et al., 2021) and adequate rainfall, which has decreased from 4700mm to 1700mm (Weli & Bajie, 2017). The map showing the average temperature of the study locations is represented in Figure 2.The multistage sampling technique was adopted for this study, comprising 400 respondents from communities with a long history of drilling operations and drilling waste management facilities in Ikwerre, Port Harcourt, Obio-Akpor and Eleme LGAs. The primary data were obtained using research questionnaires, which were statistically analysed using the one-way analysis of variance (ANOVA). The research hypothesis was formulated and tested as follows:

H_{01}: There is no significant relationship between drill cuttings management and health in the selected LGAs in Rivers State.

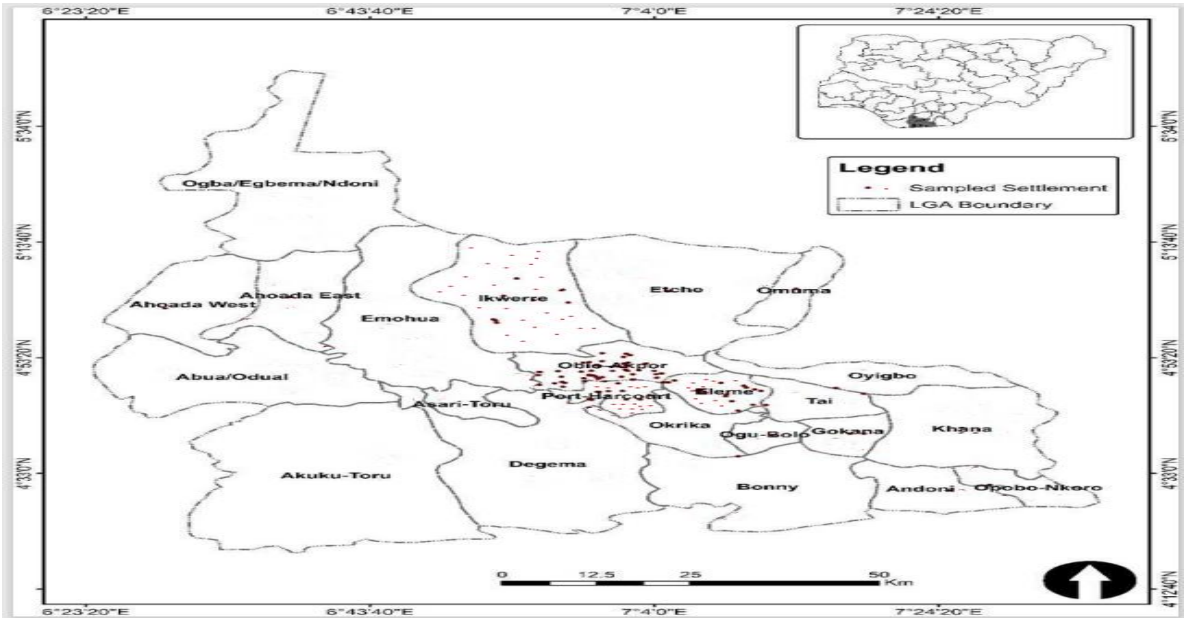

Figure 1: Map of Rivers State Showing the Study Area.

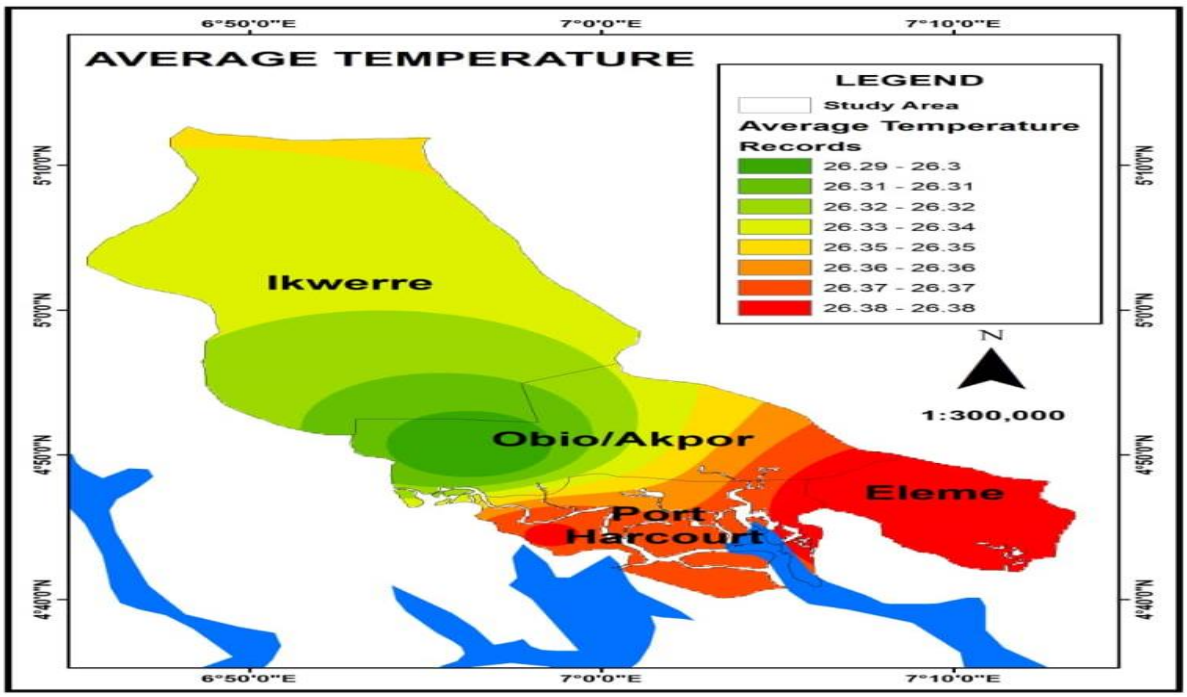

Figure 2: Map of the Study Area Showing the Average Temperature.

Result

In **Table 1,** the probability value was 0.020 (i.e., $p = 0.02$), which was below the critical value of 0.05. Thus, there was a statistically significant difference in the mean of the health (sicknesses that occurred within the last six months) and the waste management activities carried out within the community. Hence, the null hypothesis was rejected. This implies that the drill cuttings management activities had a significant negative effect on the health of the people.

Table 1: Results of the Effect of Drill Cuttings Management on Health

Health (Sickness in the last six months)	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	193.511	10	19.351	2.153	0.020
Within Groups	3496.129	389	8.987		
Total	**3689.640**	**399**			

Discussion

The findings from the study suggest that there may be health risks associated with the type of drill cuttings management practice. The contractor's drill cuttings management approach can influence community morbidity by increasing disease incidence. Further, improper disposal of drill cuttings can introduce a primary source of hydrocarbon and other contaminants into the local environment, affecting the quality of water, air, and food sources. Thus, regulatory bodies and oil companies are challenged to improve the management of drill cuttings to mitigate potential adverse health outcomes.

Globally, there is an integration of policies comprising state and national regulations, international conventions, as well as a range of management strategies to minimise harmful effects on the environment (Giorgos et al., 2021), enforce strict monitoring of the haulage of drill cuttings, disposal sites and treatment facilities to ensure consistent compliance, especially at the peak of drilling activities onshore and offshore. When there is an effective mitigation strategy that is value-driven and reward-based, the third party contractors who are responsible for the conversion of the drilling waste materials to construction materials for reuse as paving stones, fill materials and blocks will be more committed to recycling drill cuttings as they will be driven by profit which will enhance green production of construction materials and divert residual drill cuttings from lined disposal sites, improper disposal and indiscriminate dumping during peak periods of drilling operations (Wang et al., 2018).

Conclusion

The study recommends a value-driven, reward-based system to engage third-party contractors to foster green production of construction materials, while diverting drill cuttings from disposal sites. This will enable the Nigerian oil and gas industries to meet the United Nations Sustainable Development Goal Targets 3.9, 6.3, 12.4, and 12.6, which aim to reduce illnesses from hazardous waste components; improve the quality of waste treatment; manage hazardous waste; and promote corporate sustainability reporting, respectively. Thus, being accountable for ensuring that drill cuttings waste is converted into valuable materials for beneficial reuse in each region.

Recommendation

The study recommends periodic reporting on the conversion rate of drill cuttings to reusable materials, transparency in the multiple community projects designed to revamp healthcare facilities, and access to funds to source manpower from locals in building cottage infrastructure.

References

1. Adiela, U.P. (2022). Oil exploration and production in Nigeria: From bottom to top and beyond. An Inaugural Lecture held on Wednesday, December 14 2022, Series No. 83, pp. 56. Available online: https://www.rsu.edu.ng/wp-content/uploads/2023/04/OIL-EXPLORATION-AND-PRODUCTION-IN-NIGERIA-1.pdf(Accessed October 14, 2025)
2. Adewole, G.M., Adewale, T.M., & Ufuoma, E. (2010). Environmental aspect of oil and water-based drilling muds and cuttings from Dibi and Ewan off-shore wells in the Niger Delta, Nigeria, *African Journal of Environmental Science and Technology*, *4*(5), 284-292. DOI: 10.5897/AJEST09.243
3. Akpan, V. E., & Olukanni, D. O. (2020). Hazardous Waste Management: An African Overview. *Recycling***,** *5*(3),15.https://doi.org/10.3390/recycling5030015
4. Antia, M., Ezejiofor, N., Obasi, C.N., Orisakwe, O.E. (2022). Environmental and public health effects of spent drilling fluid: An updated systematic review. *Journal of Hazardous Materials Advances*, *7*(5), 1-10. DOI:10.1016/j.hazadv.2022.100120
5. Aslam, M., Shafigh, P., Zamin, M., Mohame, J. L. (2016). Benefits of using blended waste coarse lightweight aggregates in structural lightweight aggregate concrete, *Journal of Cleaner Production*, *119*, 108-117, DOI:10.1016/j.jclepro.2016.01.071.
6. Ayati, B., Molineux, C., Newport, D., & Cheeseman, C. (2019). Manufacture and performance of lightweight aggregate from waste drill cuttings, *Journal of Cleaner Production*, 208, 252-260, DOI:10.1016/j.jclepro.2018.10.134.
7. Baas, L. & Hjelm, O. (2015). Support your future today: enhancing sustainable transitions by experimenting at academic conferences, *Journal of Cleaner Production*, *98*, 1-7, DOI:10.1016/j.jclepro.2015.02.059.

8. Bakke, T., Klungsøyr, J., & Sanni, S. (2013). Environmental impacts of produced water and drilling waste discharges from the Norwegian offshore petroleum industry, *Marine Environmental Research, 92*, 154-169, DOI:10.1016/j.marenvres.2013.09.012.
9. Channels Television (October 14, 2025). Niger Delta: FG Embarks on 536 Projects, Host Community Fund Hits ₦373b — NUPRC • Channels Television. Available online: https://www.channelstv.com/2025/10/14/niger-delta-fg-embarks-on-536-projects-host-community-fund-hits-%E2%82%A6373b-nuprc/ (Accessed October 14, 2025)
10. Daae, H.L., Heldal, K.K., Madsen, A.M., Olsen, R., Skaugset, N.P., Graff, P. (2019).Occupational exposure during treatment of offshore drilling waste and characterisation of microbiological diversity, *Science of The Total Environment, 681*, 533-540, DOI:10.1016/j.scitotenv.2019.05.131
11. Dubi Nigeria Limited. (2025). Safety Protocols in Drilling Waste Management. Available online:https://dubinigeria.com/safety-protocols-in-drilling-waste-management/ (Accessed October 13, 2025)
12. Egypt Oil & Gas (2019). Drilling Waste Management: An Indicator for Advanced HSE Standards. Available online:https://egyptoil-gas.com/features/drilling-waste-management-an-indicator-for-advanced-hse-standards/ (Accessed October 15, 2025)
13. Energy Capital & Power (2025). Major developments in Nigeria's oil and gas sector. Available online: https://www.rsu.edu.ng/wp-content/uploads/2023/04/OIL-EXPLORATION-AND-PRODUCTION-IN-NIGERIA-1.pdf (Accessed October 14, 2025)
14. Fallde, M. & Eklund, M. (2015). Towards a sustainable socio-technical system of biogas for transport: The case of the city of Linköping in Sweden, *Journal of Cleaner Production, 98*, 17-28, DOI:10.1016/j.jclepro.2014.05.089.
15. Giorgos, K. & Zorpas, A. (2021). Drill cuttings waste management from oil & gas exploitation industries through end-of-waste criteria in the framework of circular economy strategy. *Journal of Cleaner Production. 322*. 129098. 10.1016/j.jclepro.2021.129098.
16. International Trade Administration US Department of Commerce (2025). Nigeria CountryCommercial Guide. Available online: https://www.trade.gov/country-commercial-guides/nigeria-oil-gas-and-mining-sectors (Accessed October 14, 2025).
17. Ismail, A.R., Aliasc, A.H., Sulaimana, W.R.W., Jaafara, M.Z., & Ismail, I. (2017). *Drilling Fluid Waste Management in Drilling for Oil and Gas Wells.* Editors: Klemeš, J.J., Liew, P.Y., Ho, W.S., & Lim, J.S. AIDIC, The Italian Association of Chemical Engineering, Chemical Engineering Transactions, 56, DOI: 10.3303/CET1756226
18. Ite, A.E., Ite, I.A., Edem, E.D., & Okon, J.E. (2024). Nigeria's oil and gas exploration and production: Socioeconomic implications, environmental impacts, and mitigation strategies. *Socio Economy and Policy Studies 4*(2), 100-114. DOI:10.26480/seps.02.2024.100.114
19. Kelbessa, W. (2023). *Environmental injustice and disposal of hazardous waste in Africa*. In: Brinkmann, R. (eds) The Palgrave Handbook of Global Sustainability. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-01949-4_122
20. Kurdve, M., Shahbazi, S., Wendin, M., Bengtsson, C., & Wiktorsson, M. (2015). Waste flow mapping to improve sustainability of waste management: a case study approach, *Journal of Cleaner Production, 98*, 304-315, DOI:10.1016/j.jclepro.2014.06.076.
21. Kogbara, R.B., Dumkhana, B.B., Ayotamuno, J.M., & Okparanma, R.N. (2017). Recycling stabilised/solidified drill cuttings for forage production in acidic soils, *Chemosphere*, 184, 652-663, DOI:10.1016/j.chemosphere.2017.06.042.
22. Moro, O. (2025). Novel Assessment of Drill Cuttings in Ionic Liquid. *Journal of Built Environment and Geological Research, 7*(4), 43-49 https://doi.org/10.70382/ajbegr.v7i4.006
23. Moro, O. (2023). A Review of Optimisation of Transportation of Drill Cuttings Waste. *J. Appl. Sci. Environ. Manage., 27*(2), 585-592
24. Mostavi, E., Asadi, S. & Ugochukwu, E. (2015). Feasibility Study of the Potential Use of Drill Cuttings in Concrete. International Conference on Sustainable Design, Engineering and Construction. *Procedia Engineering 118*, 1015–1023. DOI:10.1016/j.proeng.2015.08.543
25. Nigerian Upstream Petroleum Regulatory Commission (NUPRC) (2025). Oil production StatusReport: National liquid hydrocarbon Report. Available online: https://www.nuprc.gov.ng/oil-production-status-report/ (Accessed October 14, 2025)
26. NIMET (2018): Seasonal Rainfall Predictions over Port Harcourt. Nigeria Meteorological Agency Annual Bulletin, 2018
27. Obuah, E.E. and Keke, R.C. (2022). Mitigating the Negative Externalities of Oil Drilling Activities in the Niger Delta, Nigeria. *Open Access Library Journal, 9*, 1-21. doi: 10.4236/oalib.1108629
28. Obenade M., Ugochi, E.E., Okeke, H.U., & Francis, O.I (2020). An Assessment of theEnvironmental Impacts of Land Use Dynamics in Eleme, Rivers State, Nigeria. IOSR *Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT), 14*(10), 41-55.
29. Richard, J. U., & Agnide, E. L. (2020). Application of remote sensing and geographic information system (GIS) to analyse the impact of landuse on the wetlands in Port-Harcourt, and ObioAkpor L.G.A, Rivers State,

Nigeria. *International Journal of Research,8*(05), 355 - 364

30. Ukpere, D.R.T., Wali, I., & Clifford, B.A. (2021). Land use and land cover change in IkwerreLocal Government Area of Rivers State, Nigeria (1987-2020). *International Journal of Geography and Regional Planning Research, 6*(1), 43-61.
31. Vaisman, Y.I., Pugin, K.G., & Vlasov, A.S. (2020). Using the Resource Potential of Drill Cuttings in Road Construction, *International Science and Technology Conference "Earth Science"*, IOP Conf. Series: *Earth and Environmental Science, 459*,1-6. DOI:10.1088/1755-1315/459/2/022078 1
32. Wali, E., Phil-Eze, P. O., Wizor, C. H., Abdullahi, M., Afolabi, O. O., Eze, I.C., & Bosco-Abiahu. L.C. (2021). "Flood Vulnerability Assessment on Selected Communities in Ikwerre Local Government Area of Rivers State, Nigeria, Using Remote Sensing and GIS Techniques". *Journal of Geography, Environment and Earth Science International 25,* (9), 46–57. https://doi.org/10.9734/jgeesi/2021/v25i930308.
33. Wang, W., Ding, Y., Ren, Y., Zhou, Y. & Shi, Y. (2024). Comparison of Phosphogypsum-Steel Slag-Based cement and Portland cement for stabilisation of heavy metals in oil-based drillings cuttings, *Science of The Total Environment,946*, DOI:10.1016/j.scitotenv.2024.174082.
34. Wang, L., Chen, L., Tsang, D., Li, J., Baek, K., Hou, D., Ding, S., Poon, C.S. (2018). Recycling dredged sediment into fill materials, partition blocks, and paving blocks: Technical and economic assessment. *Journal of Cleaner Production. 199*. DOI:10.1016/j.jclepro.2018.07.165.
35. Waswa, S. (2024). 'Hazardous waste and the right to a healthy environment: reflections on the LIDHO decision of the African Court on Human and Peoples' Rights.' 8 *African Human Rights Yearbook* 554-579. DOI:10.29053/2523-1367/2024/v8a22
36. Weli, V. & Bajie, S. (2017). Adaptation of Root Crop Farming System to Climate Change in Ikwerre Local Government Area of Rivers State, Nigeria. *American Journal of Climate Change*, **6**, 40-51. DOI:10.4236/ajcc.2017.61003.
37. Wizor, C.H., & Obafemi, A.A. (2019). Effects of Urbanisation on Housing for the Urban Poor in Port Harcourt City, Nigeria. *IIARD International Journal of Geography and Environmental Management, 5*(2), 46–58.
38. Xu, T., Wang, L., Wang, X., Li, T., & Zhan, X. (2018). Heavy metal pollution of oil-based drill cuttings at a shale gas drilling field in Chongqing, China: A human health risk assessment for the workers, *Ecotoxicology and Environmental Safety, 165*, 160-163, DOI:10.1016/j.ecoenv.2018.08.104.