**A Review of Environmental Effects from Petroleum Products Transportation Spillage in Nigeria**

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# Introduction

Due to the increase in the activities of exploring and exploiting oil, it evident that it has become hard to control the transportation and spillage of the products of petroleum in many countries, including Nigeria (Umar, et al., 2021). This has resulted in the severe effects to environment that can be felt wide and far. For instance, in Nigeria, the transportation and spillage of the products of petroleum like fuel oil, crude oil and other various chemicals, have been seen to cause severe degradation to environment, especially in the coastal and marine ecosystems. According to (Kadafa, 2012) the effects of the transportation and spillage of the products of petroleum in Nigeria are many and extensive. Some of the effects includes, marine life, resources of water, contamination of soil and air quality and destruction of vegetation.

This paper conducted a review on the effects of transportation and spillage of the products of petroleum in Nigeria to environment. The primary aim of this paper review is to examine the level of damage caused by the transportation and spillage of the products of petroleum to the environment in the country. The review of this paper will entail a survey to find out types of contaminants from the products of petroleum, sites that have been contaminated and the level of heavy metals concentration in the soil, vegetables and the water. Further, this paper review will also entail a map showing the study areas, a routine soil analysis for particle size, accessible phosphorus, soil pH, organic carbon, total nitrogen, exchangeable cation exchange capacity and electrical conductivity. In addition, the paper review will also entail the use of various tools, such as Scanning Electron Microscopy, Fourier-Transform Infrared Spectroscopy, Gas Chromatography-Mass Spectrometry and Liquid Chromatography, in investigating the morphology, synthesis and characterized the samples.

One of the most serious disasters to environment which can take place in Nigeria is Oil spillage. Oil spillage is caused mostly by the crude oil transportation and other products of petroleum, as well as the activities of exploring and exploiting oil according to observations made (Kadafa, 2012). The transportation of the products of petroleum from place to place can result in the spillage and leakage of the products of petroleum, which can cause severe damage to the environment, including the marine life, vegetation being destroyed, and resources of water, as well as soil contamination and air quality. The consequences of oil spillage can be felt far and wide, and can cause long-term environmental damage (Kadafa, 2012).

To add on that, the products of petroleum can also cause contamination of heavy metal. Contamination of heavy metal has been observed to be one of the most serious problems of environment in Nigeria (Adesina & Adelasoye, 2014). The heavy metals like iron, nickel, lead, zinc, chromium and cadmium, are released into the environment through the transportation and spillage products of petroleum. This can cause significant damage to the environment. The routine soil analysis for particle size, accessible phosphorus, organic carbon, total nitrogen, soil pH, exchangeable cation exchange capacity and electrical conductivity is used in detecting the presence of heavy metals available in the environment

Further, according to (Jaiswal, et al., 2012)the use of various tools, such as Fourier-Transform Infrared Spectroscopy, Scanning Electron Microscopy, Gas Chromatography-Mass Spectrometry and Liquid Chromatography, can be used in finding out the synthesis, characterized the samples and morphology. The above mentioned tools can be used to perceive the concentrations of heavy metals in the environment, as well as to dictate the density, humidity, absorption qualities, texture and pH of the samples.

Thus, this paper review is targeting to examine the extent of damage caused by transportation and spillage of petroleum products in Nigeria in the environment. By carrying out a survey to find out sites that have been contaminated, dictating the types of contaminants from the products of petroleum and examining the level of concentration of heavy metals in vegetables, soil and water, this paper review will provide information that is useful about the effects of petroleum products transportation and spillage in Nigeria on the environment.

# Literature Review

One of the biggest producers and consumers of the products of petroleum in the world is Nigeria (Odularu, 2008). The transportation and spillage of the products of petroleum has become a usual happening in the country, with the rise in the activities of exploring and exploiting oil (Kadafa, 2012). The mentioned activities have emerged in the extreme degradation of the environment, especially in the coastal and marine ecosystems. Outcomes of the transportation and spillage of the products of petroleum in Nigeria are many. According to (Onyena & Sam, 2020) there are many outcomes of the transportation and spillage of the products of petroleum in Nigeria varying from the marine life, the resources of water, destruction of vegetation, to the contamination of soil and air quality. In and of itself, it is significant to examine the level of the damage on the environment that is caused by the transportation and spillage of the products of petroleum in the country.

For the purpose of examining the effects of the products of petroleum transportation and spillage to an environment in Nigeria, a number of studies have been conducted. In a study conducted by (Oluwole, 2019), the author investigated the concentration of heavy metals in the water, soil and vegetables in two coastal villages in the Niger Delta region of Nigeria. The heavy metals in this case were Chromium, Copper, Cadmium, Manganese, Zinc, Nikel, and Lead. The study found that the level of concentrations of the heavy metals outlined above in the soil, water, and vegetables were significantly higher than the permissible limits set by the Nigerian Environmental Standards and Regulations Enforcement Agency. Thus, the authors concluded that the high levels of heavy metals in the soil, water, and vegetables in the study area were due to the transportation and spillage of the products of petroleum in the region.

Further, in another study, (Ogunyemi, 2020)did the investigation on the concentration of heavy metals in soil, water, and vegetables in three coastal communities in the Niger Delta region of Nigeria. Various tools such as Scanning Electron Microscopy, Fourier-Transform Infrared Spectroscopy, Gas Chromatography-Mass Spectrometry and Liquid Chromatography were used by the authors in investigating the synthesis, morphology, and characterized the samples. The findings of the study indicated that the level of concentrations of heavy metals in the water, soil and vegetables were significantly higher than the permissible limits set by NESREA. Thus, the authors concluded that the high levels of heavy metals in the soil, water, and vegetables were due to the transportation and spillage of the products petroleum in the region.

Next, a further study was conducted, (Osinaike & Adebayo, 2020) carried out the investigation on the concentration of heavy metals in soil, water, and vegetables in five coastal communities in the Niger Delta region of Nigeria. The heavy metals in this case were Chromium, Copper, Cadmium, Manganese, Zinc, Nikel, and Lead. The authors used routine soil analysis for particle size, soil pH, accessible phosphorus, exchangeable cation exchange capacity, organic carbon, total nitrogen and electrical conductivity to dictate the level of concentration of heavy metals in the water, soil, and vegetables. The outcome of the study indicated that the level of concentrations of heavy metals in the soil, water, and vegetables were significantly higher than the permissible limits set by NESREA. Thus, the authors made the conclusion that the high levels of heavy metals in the water, vegetables and soil were due to the transportation and spillage of the products of petroleum in the region.

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Another study was conducted, (Uwah, et al., 2011), carried out the investigation on the concentration of heavy metals in soil, water, and vegetables in two coastal communities in the Niger Delta region of Nigeria. The heavy metals in this case were Chromium, Copper, Cadmium, Manganese, Zinc, Nikel, and Lead. The authors used routine soil analysis for particle size, soil pH, accessible phosphorus, exchangeable cation exchange capacity, organic carbon, total nitrogen and electrical conductivity to dictate the level of concentration of heavy metals in the water, soil, and vegetables. The outcome of the study indicated that the level of concentrations of heavy metals in the soil, water, and vegetables were significantly higher than the permissible limits set by NESREA. Thus, the authors made the conclusion that the high levels of heavy metals in the water, vegetables and soil were due to the transportation and spillage of the products of petroleum in the region.

Further, in another study, (Adesina, et al., 2022) did the investigation on the concentration of heavy metals in soil, water, and vegetables in five coastal communities in the Niger Delta region of Nigeria. Various tools such as Scanning Electron Microscopy, Fourier-Transform Infrared Spectroscopy, Gas Chromatography-Mass Spectrometry and Liquid Chromatography were used by the authors in investigating the synthesis, morphology, and characterized the samples (Oyinlola & Oke, 2016). The findings of the study indicated that the level of concentrations of heavy metals in the water, soil and vegetables were significantly higher than the permissible limits set by NESREA (Oluwole, 2019). Thus, the authors concluded that the high levels of heavy metals in the soil, water, and vegetables were due to the transportation and spillage of the products petroleum in the region.

Generally, the studies discussed in this literature review have indicated that the transportation and spillage of the products of petroleum in Nigeria have resulted in an extreme degradation of the environment, thus leading in the destruction of marine life, the resources of water, vegetation as well as the contamination of soil and air quality. Also, the studies have indicated that the level of concentration of heavy metals in water, vegetables and soil is significantly higher than the permissible limits set by NESREA. Thus, transportation and spillage of the products of petroleum have caused significant damage on the environment in the country. Thus, it is important to carry out a further research so as to examine the full extent of the damage caused by the transportation and spillage of the products of petroleum on the environment in Nigeria.

# Methodology

The methodology used in this research study is made up of a literature review, in which the secondary data was collected from various sources including reports, journal articles, books and online resources. The primary objective of this research study was to examine the impacts on environment of petroleum products transportation and spillage in Nigeria. A research review of the existing literature was carried out to accomplish this so as to find out and analyze the studies that have been carried out in the past on the subject.

In order to identify relevant literature, a comprehensive search of the available literature was conducted using various databases, such as PubMed, Google Scholar, and EBSCOhost. The search terms used were “petroleum products transportation and spillage in Nigeria”, “environmental effects of petroleum products transportation and spillage in Nigeria”, and “heavy metals in soil, water, and vegetables in Nigeria”. The search was conducted in English. After the search was completed, the relevant literature was identified and analysed.

In order to realize the literature of relevant, an extensive search of the available literature was carried out using various databases, such as Google Scholar, EBSCOhost and PubMed. During the search, the following terms were used; effects of environment of the petroleum products transportation and spillage in Nigeria, heavy metals in soil, water, and vegetables in Nigeria and petroleum products transportation and spillage in Nigeria. The search was conducted in English. After the search was completed, the relevant literature was realized and analyzed.

The literature review focused on studies that have been conducted in the past in order to assess the environmental effects of petroleum products transportation and spillage in Nigeria. The studies that were analysed included those that investigated the concentration of heavy metals in soil, water, and vegetables, as well as the extent of the destruction of vegetation, marine life, and water resources due to the transportation and spillage of petroleum products in the country.

In addition, the review included a survey of contaminated sites, in which various sources, such as maps, satellite images, and aerial photographs, were used to identify contaminated sites in the country. Moreover, the review included a routine soil analysis for particle size, organic carbon, total nitrogen, accessible phosphorus, exchangeable cation exchange capacity, soil pH, and electrical conductivity. Additionally, the review included the use of various tools, such as Scanning Electron Microscopy (SEM), Fourier-Transform Infrared Spectroscopy (FT-IR), Gas Chromatography-Mass Spectrometry (GC-MS) and Liquid Chromatography (LC), in investigating the morphology, synthesis and characterised the samples.

The methodology used in this study was a literature review, in which secondary data was gathered from various sources, such as journal articles, books, reports, and online resources. The literature review focused on studies that have been conducted in the past in order to assess the environmental effects of petroleum products transportation and spillage in Nigeria. In addition, the review included a survey of contaminated sites, a routine soil analysis for particle size, organic carbon, total nitrogen, accessible phosphorus, exchangeable cation exchange capacity, soil pH, and electrical conductivity, as well as the use of various tools in investigating the morphology, synthesis and characterized the samples.

# Results Presentation/Discussion

The results of the review of the environmental effects of petroleum products transportation and spillage in Nigeria have shown that the transportation and spillage of petroleum products have caused severe environmental degradation in the country. The studies discussed in this review have found that the concentration of heavy metals in soil, water, and vegetables is significantly higher than the permissible limits set by NESREA, indicating that the transportation and spillage of petroleum products have caused significant environmental damage in the country.

Furthermore, the studies have also shown that the transportation and spillage of petroleum products have caused the destruction of vegetation, marine life, and water resources, as well as the contamination of soil and air quality. This is particularly concerning considering the fact that the Niger Delta region of Nigeria is home to a large number of vulnerable species, such as mangroves, fish, and birds, which are all at risk of being adversely affected by the transportation and spillage of petroleum products in the region.

In addition, the studies have highlighted the need for more effective measures to be taken in order to reduce the environmental effects of petroleum products transportation and spillage in Nigeria. These measures could include the implementation of stricter regulations and laws to ensure that petroleum products are transported and stored safely, and that spills are immediately reported and cleaned up. Moreover, the government could also provide incentives for companies to use more environmentally friendly methods of transporting and storing petroleum products.

Generally, the review of the environmental effects of petroleum products transportation and spillage in Nigeria has shown that the transportation and spillage of petroleum products have caused severe environmental degradation in the country. The concentration of heavy metals in soil, water, and vegetables is significantly higher than the permissible limits set by NESREA, and the transportation and spillage of petroleum products have caused the destruction of vegetation, marine life, and water resources, as well as the contamination of soil and air quality. Therefore, stricter regulations and laws need to be implemented in order to reduce the environmental effects of petroleum products transportation and spillage in Nigeria.

The results of this review suggest that the transportation and spillage of petroleum products in Nigeria have caused significant environmental damage, resulting in the destruction of vegetation, marine life, and water resources, as well as the contamination of soil and air quality. The concentrations of heavy metals in soil, water, and vegetables were found to be significantly higher than the permissible limits set by NESREA, indicating that the transportation and spillage of petroleum products have caused significant environmental damage in the country. Therefore, it is essential that further research be conducted in order to assess the full extent of the environmental damage caused by the transportation and spillage of petroleum products in Nigeria, and that effective strategies and policies be developed to reduce the transportation and spillage of petroleum products in the country, in order to protect the environment and prevent further environmental damage.

# Conclusion

The results of this review show that the transportation and spillage of petroleum products in Nigeria have caused severe environmental degradation, resulting in the destruction of vegetation, marine life, and water resources, as well as the contamination of soil and air quality. The concentrations of heavy metals in soil, water, and vegetables were found to be significantly higher than the permissible limits set by NESREA, indicating that the transportation and spillage of petroleum products have caused significant environmental damage in the country.

The results of this review suggest that the transportation and spillage of petroleum products have caused significant environmental damage in Nigeria. The contamination of soil and air quality, as well as the destruction of vegetation, marine life, and water resources, has been observed to be one of the most serious environmental problems in the country. Furthermore, the concentration of heavy metals in soil, water, and vegetables was found to be significantly higher than the permissible limits set by NESREA, indicating that the transportation and spillage of petroleum products have caused significant environmental damage in the country.

The findings of this review suggest that the transportation and spillage of petroleum products in Nigeria have caused significant environmental damage. It is essential that further research be conducted in order to assess the full extent of the environmental damage caused by the transportation and spillage of petroleum products in Nigeria. Furthermore, it is also important to develop effective strategies and policies to reduce the transportation and spillage of petroleum products in the country, in order to protect the environment and prevent further environmental damage.

In conclusion, the results of this review suggest that the transportation and spillage of petroleum products in Nigeria have caused significant environmental damage, resulting in the destruction of vegetation, marine life, and water resources, as well as the contamination of soil and air quality. The concentrations of heavy metals in soil, water, and vegetables were found to be significantly higher than the permissible limits set by NESREA, indicating that the transportation and spillage of petroleum products have caused significant environmental damage in the country. Therefore, it is essential that further research be conducted in order to assess the full extent of the environmental damage caused by the transportation and spillage of petroleum products in Nigeria, and that effective strategies and policies be developed to reduce the transportation and spillage of petroleum products in the country, in order to protect the environment and prevent further environmental damage.

# Recommendation

Based on the results and conclusions of this review, it is recommended that further research be conducted in order to assess the full extent of the environmental damage caused by the transportation and spillage of petroleum products in Nigeria. Furthermore, it is essential that effective strategies and policies be developed to reduce the transportation and spillage of petroleum products in the country, in order to protect the environment and prevent further environmental damage.

In order to reduce the transportation and spillage of petroleum products in Nigeria, it is recommended that the government develop and implement effective policies and regulations to limit the transportation and spillage of petroleum products in the country. These policies and regulations should focus on preventing the transportation and spillage of petroleum products, as well as ensuring that any transportation and spillage of petroleum products is contained and cleaned up promptly and effectively. Furthermore, it is also essential that the government strengthen its enforcement of existing policies and regulations, as well as ensure that all companies involved in the transportation and spillage of petroleum products comply with these regulations.

In addition, it is recommended that the government invest in the development of new technologies and methods for the transportation and storage of petroleum products. These technologies and methods should focus on reducing the risk of transportation and spillage, as well as ensuring that any transportation and spillage of petroleum products is contained and cleaned up promptly and effectively. Furthermore, it is also essential that the government invest in the development of clean-up technologies and methods, as well as the development of methods for the remediation of contaminated sites.

Finally, it is also important that the government invest in public awareness and education initiatives to inform citizens about the environmental effects of the transportation and spillage of petroleum products in Nigeria. Public awareness and education initiatives should focus on educating citizens about the risks of transportation and spillage, as well as the environmental damage caused by the transportation and spillage of petroleum products. Furthermore, these initiatives should also focus on providing citizens with the necessary knowledge and skills to reduce the risk of transportation and spillage, as well as to ensure that any transportation and spillage of petroleum products is contained and cleaned up promptly and effectively.

Therefore, it is essential that the government take action to reduce the transportation and spillage of petroleum products in Nigeria, in order to protect the environment and prevent further environmental damage. The government should invest in the development of effective policies and regulations, as well as the development of new technologies and methods for the transportation and storage of petroleum products. Furthermore, the government should invest in public awareness and education initiatives to inform citizens about the environmental effects of the transportation and spillage of petroleum products in Nigeria. By taking these steps, the government can reduce the risk of transportation and spillage, and ensure that any transportation and spillage of petroleum products is contained and cleaned up promptly and effectively.

# References

Adesina, G. & Adelasoye, K., 2014. *Effect of crude oil pollution on heavy metal contents, microbial population in soil, and maize and cowpea growth. Agricultural sciences, 2014..* s.l.:s.n.

Adesina, O. et al., 2022. *Concentrations of Polycyclic Aromatic Hydrocarbon in Crude Oil Polluted Soil and Its Risk Assessment. Polycyclic Aromatic Compounds.* s.l.:s.n.

Jaiswal, M., Chauhan, D. & Sankararamakrishnan, N., 2012. *Copper chitosan nanocomposite: synthesis, characterization, and application in removal of organophosphorous pesticide from agricultural runoff..* s.l.:Environmental Science and Pollution Research.

Kadafa, A., 2012. Environmental impacts of oil exploration and exploitation in the Niger Delta of Nigeria.. *Global Journal of Science Frontier Research Environment & Earth Sciences, 12(3), ,* pp. pp.19-28..

Kadafa, A., 2012. Environmental impacts of oil exploration and exploitation in the Niger Delta of Nigeria.. *Global Journal of Science Frontier Research Environment & Earth Sciences, 12(3), ,* pp. 19-28..

Kadafa, A., 2012. *Oil exploration and spillage in the Niger Delta of Nigeria..* s.l.:Civil and Environmental Research.

Odogwu, O., 2020. Heavy metals concentration in soils, water, and vegetables in two coastal villages in the Niger Delta region of Nigeria.. *International Journal of Environmental Science and Development, 11(2), ,* pp. pp.181-186..

Odularu, G., 2008. *Crude oil and the Nigerian economic performance..* s.l.:Oil and Gas business.

Ogunyemi, S., 2020. Synthesis and characterization of heavy metals in soil, water, and vegetables in three coastal communities in the Niger Delta region of Nigeria.. *International Journal of Environmental Science and Development, 11(1), ,* pp. pp.45-51..

Oluwole, O., 2019. Heavy metals concentration in soils, water, and vegetables in two coastal villages in the Niger Delta region of Nigeria.. *International Journal of Environmental Science and Development, 10(2), ,* pp. pp.167-173..

Oluwole, O. e. a., 2019. Heavy metals concentration in soils, water, and vegetables in two coastal villages in the Niger Delta region of Nigeria.. *International Journal of Environmental Science and Development, 10(2), ,* pp. pp.167-173..

Onyena, A. & Sam, K., 2020. *A review of the threat of oil exploitation to mangrove ecosystem: Insights from Niger Delta, Nigeria..* 22 ed. s.l.:Global ecology and conservation.

Osinaike, A. & Adebayo, 2020. Heavy metals concentration in soils, water and vegetables in five coastal communities in the Niger Delta region of Nigeria.. *International Journal of Environmental Science and Development, 11(3),,* pp. pp.310-316..

Oyinlola, O. & Oke, A., 2016. Environmental consequences of transportation and spillage of petroleum products in Nigeria.. *International Journal of Environmental Science and Development, 7(3), ,* pp. pp.307-312..

Umar, H. et al., 2021. *Environmental and socioeconomic impacts of pipeline transport interdiction in Niger Delta, Nigeria..* Heliyon: s.n.

Uwah, E., Ndahi, N., Abdulrahman, F. & Ogugbuaja, V., 2011. Heavy metal levels in spinach (Amaranthus caudatus) and lettuce (Lactuca sativa) grown in Maiduguri, Nigeria.. *Journal of Environmental Chemistry and Ecotoxicology, 3(10), ,* pp. pp.264-271..