

# Unsustainable monitoring of environmental pollutants, post UNEP report: The effects of leachates on Niger Delta Eco-zones, Nigeria

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**Abstract.** This expository study revealed the continuum impact of unsustainable monitoring of environmental pollutants (oil-spills and leachates) nearly a decade after UNEP impact assessment report on Ogoniland and Niger Delta eco-zones. The background is focused on pollutants that have continued threats to the environment and ecologically sensitive areas in the region. It infers the dimensions and dynamics of management failures and poor attitude towards environmental policy implementations. A structured questionnaire was adopted using an online survey approach. The target audience includes academicians, undergraduates, and postgraduates. The majority are from Niger Delta, the region where this research was carried out. An online questionnaire was sent across to 30 respondents through e-mail and others, due to Covid-19 restrictions. Their feedback was processed, analysed, and presented in graphics. We found pollution contributions to the mangrove forest to be 47%, oil exploration 77%. The effects were more on soil, water, and air quality. The water bodies are constantly losing the variety of its resources caused by the release of untreated leachates, industrial waste, and petrochemicals. A rather deteriorating fate lies ahead of the people as population increases, and environmental policies and monitoring seem ineffective. The study will be beneficial to the government, policymakers, waste agencies, researchers, etc.

## 1 Introduction

Sustainable environmental monitoring entails detecting ecological degradation, understanding its causes, effects, and future consequences, and finding ways to effectively deal with the problems associated with the modern environmental mishaps. It focuses on the provision of information about changes to the structure and function of ecosystems. They were used in impact assessment, educational purposes, environmental protection, or

management. The monitoring involves repeated measurements of inorganic, organic, ecological, social, or economic variables in ecosystems that predict future abnormalities or contributes to climate change, a threat to human, flora, and fauna Okpara et al. [1]. It also seeks to determine the best means of prevention or mitigation, especially now that coronavirus sources are linked to animals within the environment.

However, our discussion is centered on the Niger Delta region. According to Best et al. [2] Niger Delta region is a dense cultural area covering about 70,000 square kilometres in the southern part of Nigeria and has been estimated to be occupied by over 25 million inhabitants who formed the indigenous people from over 40 ethnic groups. Due to environmental pollution, an independent study by the United Nations Environmental Program (UNEP) was conducted in Ogoniland between 2009 and 2011. Their findings revealed that more than 1 million residents were exposed to daily pollution of hydrocarbons and air pollutions. An update on this report showed that 2014 to 2015 recorded more cases of oil spills, amounting to 1879, according to the Nigerian National oil spill detection and response agency (NOSDRA) [3]. Only 64 cases were cleaned, as reported by Kalejaye [4]. Presently about 5000 sites are massively polluted across the region, according to Nsima Ekere, the managing director Niger Delta development commission with 25% in Ogoniland alone, Chukwu [5].

However, as there are only preparatory actions to facilitate the remedial program in the region after almost a decade of report submission, people's hope on the commitment of the project by stakeholders is in doubt. Niger Delta (ND) and indeed Ogoni people have continued to blame the government for playing an image laundering tool over the report and its implementation Chukwu [6]. The UNEP report of 4th August 2011 affirmed that it could take up to 30 years to clean up oil pollution and environmental restoration of Nigeria's Nine (9) oil-producing states. The clean-up exercise cost for contaminated drinking water, land creeks, and other eco-system was estimated with an initial investment of \$1 billion (UN news center [7] for only five years. The report further showed that the region could experience a loss of 40% of its inhabitable terrain in the next thirty years because of extensive dam construction and the oil industry's carelessness, which has precipitated this situation. Other cited reports include (NNPC, 1983 as cited in Business Ethics, 2015). More so, the Niger Delta Development Commission (NDDC) and the Nigerian government is not doing enough to handle old, current and future (wastes) management from oil exploration, exploitation and municipal waste materials. Throughout the world, the words "clean and green, environmentally friendly" have been catch cries in response to climate change. Nigerian people expect their government and elected legislators to act on this basis.

NDDC in this June 2020, displayed a high level of gross mismanagement of the commission's resources meant to develop the region (Arise news and channel TV station, 14<sup>th</sup> June 2020). Therefore, our primary purpose is focused on how monitoring is being neglected and the impacts, as pollutants continued to cause a potential threat to both the environment and ecologically sensitive areas in the region. The state of environmental monitoring in the Niger delta is appalling. It would significantly affect livelihood, flora, and fauna if no proactive actions or paradigm shift towards implementing proper policies, conserving and promoting future sustainability of the environment, and the region's stakeholder's management are not changed.

## **2 Method**

## 2.1 Qualitative Questionnaire Method Based (QQMB)

In this study, the questionnaire method was adopted. The questionnaire can be classified as both quantitative and qualitative, but it depends on the nature of the question. We tailored our questions to obtain answers based on open-ended questionnaires to analyse results using qualitative methods. This involves discussions and critical analyses without using numbers and calculations, unlike quantitative closed-ended questions with multiple choice answer options. The advantages of choosing qualitative in this study are to avoid ambiguity and present a logical and straightforward orderliness that critically evaluates the situation. It also includes increased data collection speed, low or zero cost requirements, and a higher level of objectivity than many alternative methods of primary data collection. In all, the author administered 30 questionnaires having ten questions to different respondents via online base due to covid19 distancing and isolation rule. Table 1 shows the questions presented to the respondents.

Table 1. Question of study

S/N	Questions
Q1	The mangrove forest is the most economically prosperous (huge mineral reserves) of the four zones in Niger Delta?
Q2	Pollution in the Niger Delta may directly impact soil, water, and air affecting the communities?
Q3	Water resources in the Niger Delta do not currently sustain a rich variety of marine life?
Q4	There is an adequate policy in Nigeria to manage pollution impact on environmental problems?
Q5	Oil Exploration is the only source of pollution endangering the natural ecosystem in Niger delta?
Q6	Is policy implementation the actual problem in Niger Delta biodiversity and eco-zones?
Q7	Evaluation and lack of frequent monitoring and reporting situation for quality environmental assessment are caused by what in Niger Delta?
Q8	The most anthropogenic activities affecting Niger Delta people could be deforestation, fishing, oil exploitation, and waste dumping? Indicate others, if any?
Q9	There are no degradation or environmental problems in Niger delta soil, water, and air, reducing delta eco-zones?
Q10	The prominent future solution for pollution control in Niger Delta would be monitoring pollutants and policy implementation?

The question's answer sections were formulated for easy understanding such as – SA= strongly Agree, A= agree, SD= strongly disagree, D= disagree and NS= not sure, and answers were obtained immediately and recorded as shown in table 1.

## 2.2 Major stakeholders for environmental promotion in Nigeria

**i) National environmental standard and regulation enforcement agency (NESREA)**  
 Established through an act by the National assemble in 2007. This agency is responsible for enforcing environmental standards, regulations, rules, laws, policies, and guidelines. They are responsible for protecting and developing Nigeria's natural resources in general and environmental technology, including coordination and liaison with relevant stakeholders within and outside Nigeria on matters relating to environmental issues nesrea.gov.ng [8]. Adegoroye [9] also cited some legal instruments such as criminal codes embedded in their roles.

**ii) Federal environmental protection agency (FEPA)** Created in 1988, and is charged with the overall responsibility of protecting and developing Nigerian environment. As part of their duty, they drafted National Policy on the environment as a working document to preserve and protect the Nigerian environment Nerry and Akpoforu [10]. They also encouraged states and local government's councils to establish their environmental policies as it fits their particular terrain for the excellent purpose of sustaining and maintaining environmental quality and life.

**iii) National oil spill detection and resource agency (NOSDRA).** Nigeria is a signatory with the international convention on oil pollution preparedness, response and co-operation (OPRC) of 1990, [environment.gov.ng/agencies/parastatals/nosdra](http://environment.gov.ng/agencies/parastatals/nosdra) [11]. This agency was established in 2006 by Nigerian government and under its position, is responsible for co-ordinating the implementation of the National oil spill contingency plan (NOSCP) for Nigeria. Thereby should be playing stakeholders leading roles of ensuring timely effective and appropriate response to oil spills, leachates contamination, recovery, clean up and remediation actions.

## 2.3 Sources of pollutants in eco-zones of Niger Delta

### 2.3.1 Oil spill and pollution in the soil eco-zones

The resultant effects of hydrocarbon leakage from the pipes and other means are known as oil spillage. Nigeria has low maintenance culture and this equally affects oil pipelines and monitoring of pressure regimes of the fluids. A substantial amount of wastewater is usually accompanied by large discharge in the form of brines; Marcus and Ekpete [12] study results showed an appreciable concentration of chemical contaminants, wastewater discharged from a refinery in Port Harcourt. Based on the report of Galadima et al, [13] constituents are sodium, calcium, ammonia, boron, trace metals plus high total dissolved solids (TDS). Local dwellers in the oil-rich Niger Delta of Nigeria are mostly victims of oil spills and other environmental hazards associated with oil companies.

### 2.3.2 Dumpsites and leachates pollution

None existence of sanitary landfills in Niger Delta encourages an out-dated disposal method that is environmentally unsound and socially unacceptable Okpara et al [1]. Open dumps do not only pollute the soil but are found to be perceptibly located in areas that are hydrogeological inclined which are sensitive to the protection of the environment including groundwater and surface waters. Operational and low management strategies have positioned poor communities to bear the waste burden when their reserved farmlands have been selected and converted into a dumpsites operation. Due to the uncontrolled system of dumping, this primitive landfilling practice increases the risk of leachates percolation. The poor farmers who do not only sacrificed their lands, stands to lose quality underground water supply, insect and rodent bites as vectors (agents) of food poison, noise pollution and adverse effects on their health, ecosystem as well as the agricultural produce which they rely on Okpara and Kharlamova [14].

Highly toxic chemicals leach into the ground from landfills when rain falls on the refuse. Some organic and inorganic components (mostly metals) can dissolve, leach into the ground and reach the water table thus contaminating the groundwater. Nagarajan et al, [15] and Okpara et al [1] studied the effects of leachate percolation on groundwater quality and their

impacts respectively. The measurement of the concentration of various leachate and groundwater samples collected showed physicochemical properties and some heavy metals such as zinc, copper, iron, lead, and chromium. Their results show multiple levels of  $\text{NO}_3^-$ ,  $\text{NH}_4^+$ ,  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$  in groundwater samples taken near the landfill site. This percolation of leachate into the ground has a significant impact on water quality and thus renders it unsafe for domestic use. Underflows leachate to land resources through infiltration from the precipitation processes without baseline cover/protection are unsatisfactory, thereby subjecting environmental and public health to possible risks [16, 17]. The risk exposure can be very dangerous or hazardous as toxic heavy metals keep releasing contaminants to the soil [18], produce greenhouse gas [19, 20] pollute water bodies [21] and volatile organic compounds [22]. Unprotected dumpsites leachate contamination gives rise to significant health and safety concerns while the land sites where they are dumped are most often prone to terrible degradation.

### *2.3.3 Gas flaring pollution in Niger Delta region*

Gases connected to oil production have been flared. About 99% of the gas produced in Nigeria since 1970 was flared. Though in 1997, it was estimated to have reduced to 72%, but the volume steadily increased between 1970 and 1996 [23]. More efforts by the Nigerian government to develop liquefied natural gas (LNG) in the bonny plant for industries and electricity generation brought down flared gas to approximately 23.0 million cubic meters (812.24 billion cubic feet), accounting to 39% of total gas produced between 2004/2005 [24]. An estimation made in 2004 showed gas flaring contributed 12.7 million metric tonnes of carbon in Nigeria through  $\text{CO}_2$  emissions, which was 41% of total  $\text{CO}_2$  [25] out of a total of 21.49Tg/yr.  $\text{CO}$  in Nigeria. Flared gas has represented 12%.

### *2.3.4 Groundwater safety in Niger Delta*

Water is a rich natural resource with enormous effects on human survival. It is used in almost every aspect of life and so, it is a fundamental human need. Unfortunately, water bodies in Nigeria continue to witness unabated defacing of industrial oil spillage, gas flaring, leachate percolation from dumpsites, sediment flow, and other cultural activities all emanating from human activities Okpara and Effiong [26]. This is a common practice, especially in the oil-rich Niger Delta region. A recent study in the region by Ordinioha [27] showed that (37.9 %) of the most common sources of drinking water was from surface water, (61.2%) from drawers. There was an average of 17 communities in Niger Delta with water supply facilities, but only (23.8%) of the facilities were functional and the community members mostly managed them. More than two-third (67.9%) tested samples were found to contain significant numbers of *Escherichia coli*.

## **3 Results and discussion**

The Mangrove reserve is the most economically prosperous area in the Niger Delta region. Pollution in the region affects the lives of the people through realizable effects in the current state of the soil, water and air quality. The study found that policies in place were inadequate and not known by the inhabitants of the region who are willing to be custodians of these policies to safeguard their environment. Problems such as deforestation, overfishing, and illicit dumping of waste have gotten out of hand. One of the significant findings seems to be

the problem associated with policy implementation regarding environmental issues relating to large corporation's industrial activities. A strong regulation that gives authority to some autonomous government agencies as suggested by Olowoporoku et al [28] is vital to remedy the situation and ensure sustainable growth. The following were responses collected from data.

**Responses from processed data:**

**Q1 The mangrove forest is the most economically prosperous (huge mineral reserves) of the four zones in Niger Delta?** 47% of the respondents strongly agreed that mangrove forest is the economically rich zones, which shows that the zone deserved to be protected.

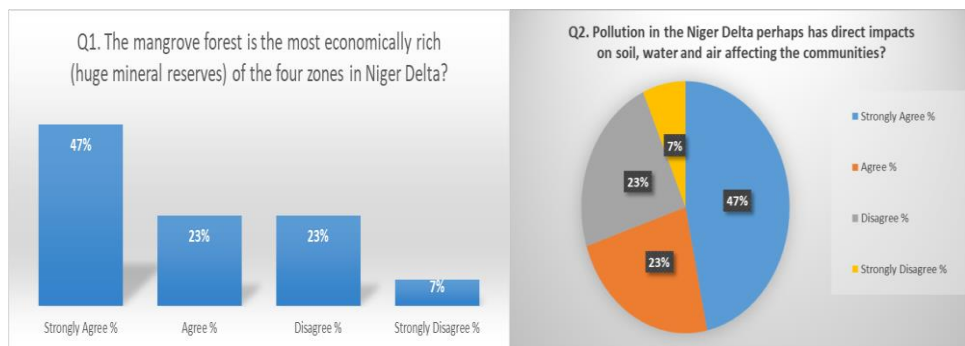
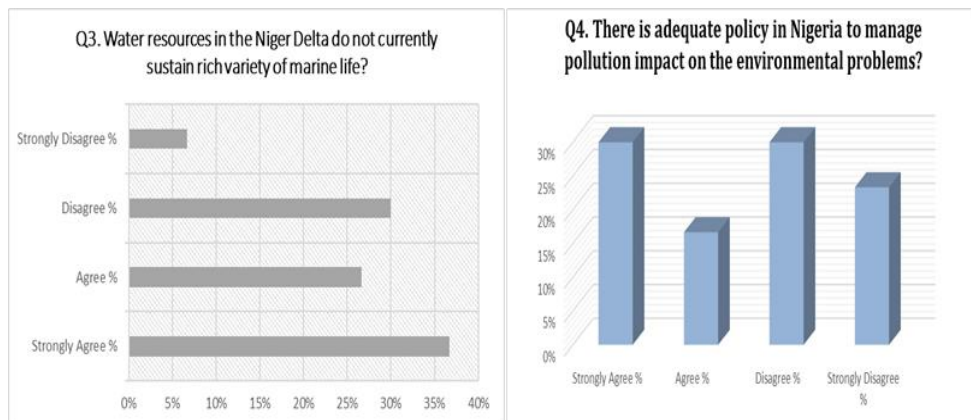


Fig. 1. shows the response for mangrove forest and the direct impacts pollution on soils.

**Q2 Pollution in the Niger Delta may directly impact soil, water and air affecting the communities?** In this question, 47% of respondents strongly agreed that pollution in Niger Delta might directly impact soil, water, and air. 23% agreed. The majority formed the opinion to support regular complaints from the communities in the zones that pollutions become higher daily.

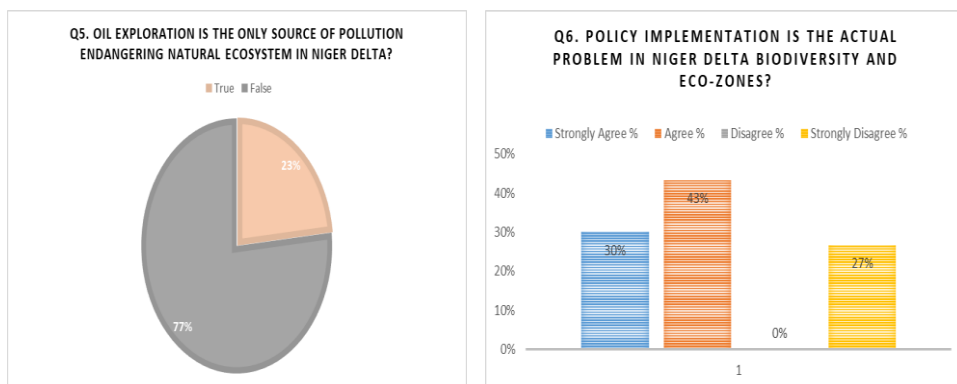
**Q3 Water resources in the Niger Delta do not currently sustain rich variety of marine life?** About 37% of respondents strongly agreed to this fact. However, it buttressed the point that water resources in Niger delta are polluted and cannot sustainably sustain marine life.



**Fig. 2.** Response on water resources and policy adequacy.

**Q4 There is adequate policy in Nigeria to manage pollution impact on the environmental problems?** Policy is another important issue and 30% of the respondents as shown above strongly agreed to the question raised and 30% disagreed with this notion. 25% strongly disagreed and 15% agreed. Policy is an essential factor and should be adequately looked into.

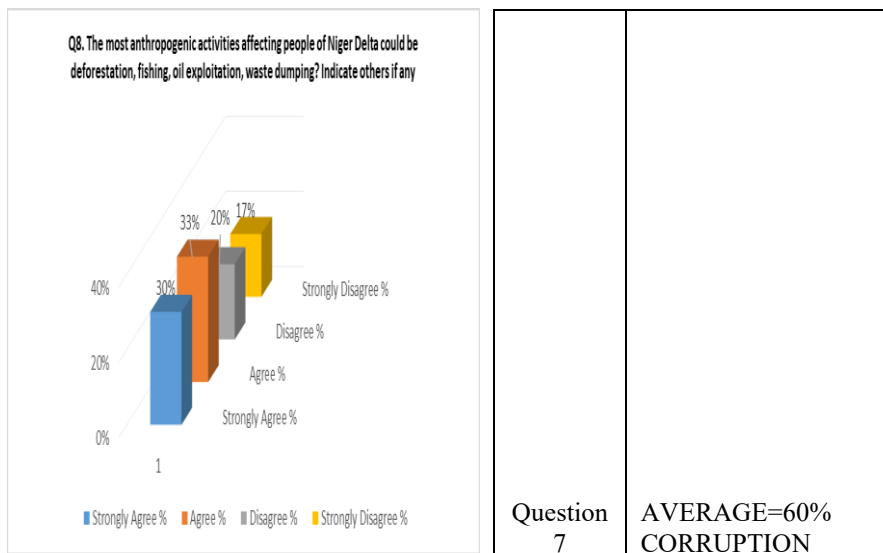
**Q5 Oil Exploration is the only source of pollution endangering the natural ecosystem in Niger delta?** About 58 years of oil exploration could be reasons while 77% of respondents strongly agreed that oil is the only source of pollution in Niger Delta. 23% however believed that other sources of pollution exist.



**Fig. 3.** Response on oil exploration pollution and biodiversity in eco-zones.

**Q6 Policy implementation is the actual problem in Niger Delta biodiversity and eco-zones?** One fact is to have a policy on the ground; another is to implement such policies. Nigeria does not lack policy but implementing them remains the biggest challenge. 43% of the respondents strongly agreed, 30% agreed.

**Q7 Evaluation and lack of frequent monitoring and reporting situations for quality environmental assessment are caused by Niger Delta and briefly explain your opinion in a percentage score.** An average calculation from the respondents shows that stakeholder's corruption practices is the most identified as the major problem hindering smooth flow of the reporting pollution offenders. 60% of the respondents strongly agreed. It was observed that political leaders and some local community elders often compromised and accepts white envelopes to keep the status quo. This is a very unhealthy practice that cannot solve the problem but attitudinal change will better the future. In order to get reasonable result, corruption must be done away with to allow sustainable monitoring to succeed.

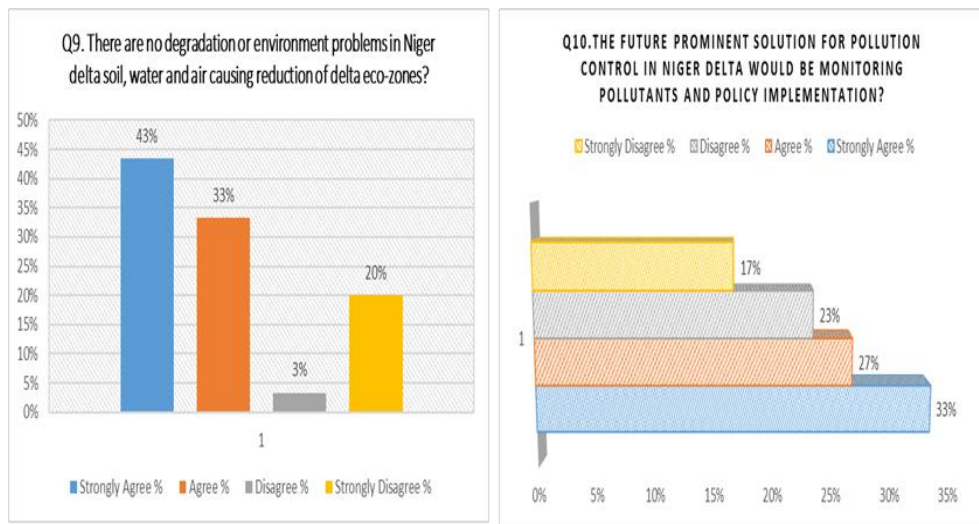


**Fig. 4.** Response to corruption and anthropogenic activities.

**Q8. The most anthropogenic activities affecting Niger Delta people could be deforestation, fishing, oil exploitation, and waste dumping?** Many activities by the locals and multinational companies operating in the Niger delta have contributed significantly to the eco-zones' pollution. 30% strongly agreed that 33% agreed, 20% disagreed while 17% strongly disagreed.

**Q9. There are no degradation or environmental problems in Niger delta soil, water, and air, reducing delta eco-zones?** The answer supplied by the respondents to this question showed that 43% of them strongly agreed, 33% agreed, 3% disagree while 20% strongly disagreed. Though, evidence of pollution and in Niger delta shows that environmental degradation is on-going. This also showed that awareness is still very vital.





**Fig. 5.** shows factors causing environmental degradation and solutions for pollution.

**Q10. The prominent future solution for pollution control in Niger Delta would be monitoring pollutants and policy implementation?** The respondents' attempt to answer this question suggests that 33% of them strongly agreed, 27% agreed. With the highest number strongly agreed, the opinion pool maintained that monitoring pollutants and policy implementation is the way forward.

## 4 Conclusions

The study sought to understand the current state of the environmental problems and its monitoring in Nigeria's Niger Delta region. The findings suggest that environmental conditions have not improved over the years compared with other researchers' previous work. Dumpsites in Niger delta as an alternative use for sanitary landfilling is a cheap method for waste disposal. As no treatment goes on there, leachate percolation continues to endanger natural habitats. It has numerous problems and significant disadvantages resulting from organic, inorganic and microbial pollutant contamination from leachate production. A rather deteriorating fate lies ahead of the people as population increases and implementation of environmental policies and their monitoring seem ineffective. The research ascertained that the ecosystem is the primary means of sustaining the life of the people. The people's health and life expectancy will likely deteriorate with time if measures are not put in place to remedy the situation. However, we propose that a quantitative study linking the life expectancy to other environmental factors and monitoring activities should be conducted to state a case to the government through environmental activism firmly.

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