Central Asian Journal of Environmental Science and Technology Innovation **1**(1): 30-42 (2020)

RESEARCH PAPER

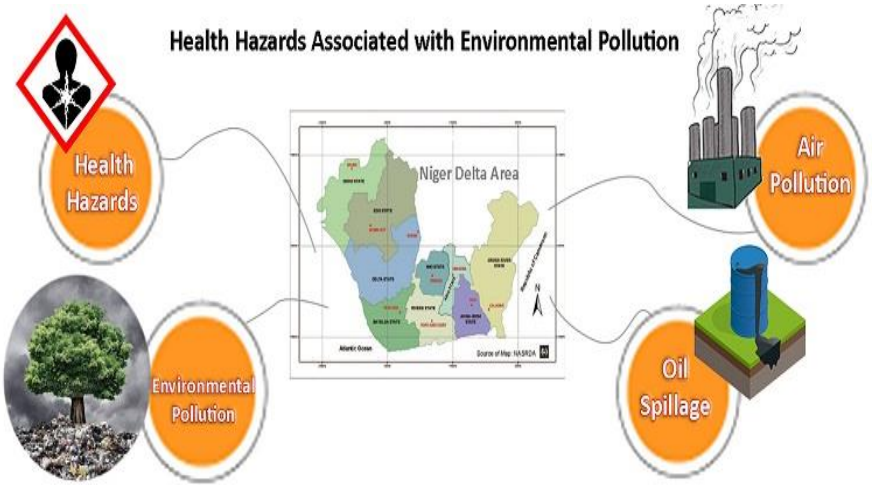
Environmental pollution and associated health hazards to host communities (Case study: Niger delta region of Nigeria)

Abonyi Nichodemus Nnaemeka *
Department of Political Science, University of Maiduguri, PMB 1069, Maiduguri, Nigeria

Highlights

- Upward review of financial allocation to states of the region through the Ministry of Niger Delta affairs.
- Equitable sharing of the harvest from the region.
- Financial confederalism as the formula for managing all mineral deposits in the nation.
- A review of the activities of the Niger Delta Development Commission (NDDC) with a view to comprehensively addressing maladministration in the commission.
- Material relief and immediate and long-term medical care are also recommended, irrespective of the cause of the spill, to ensure that the potential health effects of the exposures to the spills are properly addressed.

Graphical Abstract



Article Info

Receive Date: 14 September 2019
Revise Date: 05 October 2019
Accept Date: 15 October
Available online: 10 January 2020

Keywords:
Environmental pollution
Health effects
Niger Delta
Nigeria
Oil spill

Abstract

Niger River Delta located in Nigeria supplies the economic necessities which situates it firmly in the Comity of Nations and sustains its enviable position in the world map as Africa's largest economy and the most endowed country of the world. Over the years, this natural endowment which expectedly should have enhanced the regional peoples' welfare (not neglecting other regions though) has unfortunately become a trouble. To say that the Niger Delta is suffering would be such a mild interpretation to the gross disaster which has been plaguing not just its human population but other inhabitants (all living creatures) of all other habitats. This investigation focuses on the health hazards associated with environmental pollution in the region. It concludes that these hazards can be contained through a series of recommendations which include financial confederalism and upward review of revenue allocation to the region.

10.22034/CAJESTI.2020.01.04

E-ISSN: 2717-0519
P-ISSN: 2717-4034

* Corresponding author: gentle.twister@yahoo.com (A.N. Nnaemeka)

1. Introduction

The significant bulk of Nigeria's economic harvest comes from its Niger River delta region, no doubt. The core of the crop according to widespread belief is its vital oil. The principal criteria are not in numerical quantification of the nation's mineral resources and their locations across the land, but the economic value of each resource when measured against others. Nigeria's Niger Delta region, which is undoubtedly maximally endowed with the world's most sought-after natural resource, has, over time, become the scene of crisis, wars, tears, sorrows, and a theatre of blood. Health hazards (which are covert and slow in manifestation) from environmental pollution due to oil exploration, drilling, and associated production activities have cut many short lives and often thrown the nation into the darkest sides of global news. This present study is interested in discussing the challenges of environmental pollution, associated health hazards, and their consequences on the Niger Delta people, to proffer practical solutions (not punitive measures) to saving people life (Ordinioha and Brisibe, 2013; Osuji and Achugasim, 2010; Uzoekwe et al., 2011).

1.1. Conceptual clarifications the Niger river delta

Once known as the Oil Rivers, Nigeria's Niger Delta region is a very densely populated region, a major palm oil producer. After its expansion, it became the Niger Coast Protectorate. Stretching directly on the Gulf of Guinea on the Atlantic Ocean in Nigeria, the Niger Delta used to be historically made up of present-day Bayelsa, Rivers, and Delta states are today, made up of nine coastal states. The federal government of Nigeria's current definition states that the delta extends over about seventy thousand km² and makes up almost 7 percent of its landmass. According to a Catholic Relief Services (CRS) Report for Congress, Nigeria's finding has about 31 million human inhabitants spread across more than forty ethnic groups. Major ethnic groups of the region include the Ogoni, Bini, Efik, Ibibio, Igbo, Anang, Kalabari, Ijaw, Ikwere Yoruba, Isoko, Itsekiri, Ukwuani, Okrika and Oron all speaking about 250 different dialects (Ordinioha and Brisibe, 2013).

The Niger Delta comprises of level low lying muggy landscape that is befuddled by wandering and anastomosing streams, waterways and brooks. It is the biggest wetland in Africa and the third biggest on the planet. Its central storm atmosphere is affected by the south west monsoonal winds sea tropical (MT) air mass originating from the South Atlantic Ocean. The area has a super-blessed biological system containing four environmental zones: seaside hindrance islands, mangrove swamp backwoods, freshwater bogs, and marsh rainforests. These have probably the most elevated convergence of biodiversity on the planet, notwithstanding supporting inexhaustible greenery, arable landscape that can continue a wide scope of horticultural items, and trees, timber just as various types of freshwater angles contrasted with different biological systems in considered locale. Two types of forest swamps dominate the vegetation of the region: A belt of saline/salty Mangrove swamp isolated from the ocean by sand sea shore edges (this is closest to the ocean), and Fresh water swamps. The last step by step override the mangrove on the landward side. Either oil related ventures or non-oil related businesses in Upstream and Downstream discharge huge amounts of contaminations into the environments. In the territory are discovered various sandy islands with new water vegetation. Inferable from its moist, semi-hot central atmosphere temperature ranges are little and consistent consistently.

It is noteworthy that the Niger Delta and the South-south geopolitical zone are two different entities (The South-south geopolitical zone only has six states of the Niger Delta region). Major cities of the area are Port Harcourt (capital of Rivers state), Benin City (capital of Edo state), Warri (Delta state), Sapele (Delta state), Eket (Akwa Ibom state), and Calaba (Cross River state).

This is clearly from the Niger Delta. Because of the discovery of oil in one other research (present-day Bayelsa state) after half a century of exploration, Nigeria joined the team of the world's major oil producers in 1958 when its first oil stream of 5,100 bpd was produced. Thus, in 1971, the nation joined the Organization of Petroleum Exporting Countries (OPEC). With its wealthy and unquantifiable endowments, the Niger Delta has, over the years, become the subject of both domestic and international discourse owing to the monumental decay and indescribable suffering of its people (Dennis and Romanus, 2018). This is large because of natural

contamination, which could be viewed as one of the most noticeably awful examinations with comparable delta zones all around (Fig. 1).

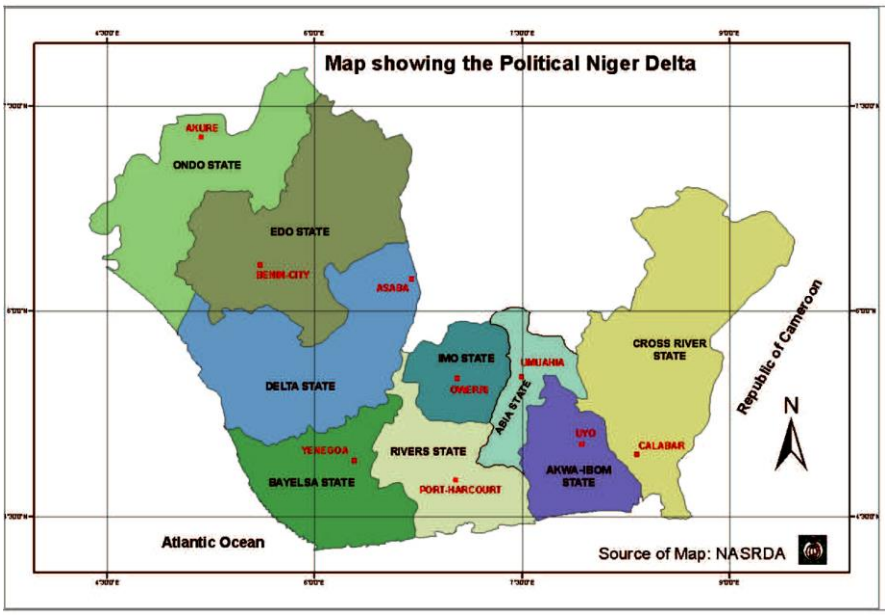


Fig. 1. Political Map of the Niger Delta Area.

2. Materials and Methods

2.1. Environmental pollution

Pollutants constitute significant threats to both plant and animal life. In man's living space, health and wellness are often determined by the environment's safety, often affected by their activities. Environmental pollution simply implies issues with pollutants that alter the natural course (and adversely affect) the ground. Decay occurs in various ways, which include but are not limited to air, water, land, and noise pollution, etc. In Nigeria's Niger River Delta region, lives have been endangered and lost in unquantifiable numbers due to health hazards emanating from environmental pollution. The activities (production and otherwise) in the oil sector, which is the region's predominant economic activity daily, produce tons of ecological nuisance. And poor management of these wastes coupled with neglect for the sanctity of human life and other regrettable factors have seen the region clamoring for survival in more ways than one. These have become a grave threat to the area. The major persistent environmental pollution problems bedeviling the Niger Delta come from two sources (Oil spillage and air pollution via gas flaring).

2.1.1. Oil spillage

Out of an all-out 2.4 million barrels, an expected 1.89 million barrels of oil were spilled into the Niger Delta somewhere in the range of 1976 and 1996 out of 4,835 episodes. 69% of these spills happened seaward, a quarter in the bogs, and 6% ashore. In other reports, a normal of 240,000 barrels of unrefined petroleum are spilled in the Niger Delta consistently, mostly because of unknown causes (31.85%), outsider movement (20.74%), and mechanical disappointment (17.04%) (Ordinioha and Brisibe, 2013).

The spills sullied the surface water, groundwater, encompassing air, and yields with hydrocarbons, with realized cancer-causing agents like sweet-smelling polycyclic hydrocarbons and Benzo [a] pyrene, normally happening harmful constituents, and follow metals that were extra bio-collected in some nourishment crops. The oil slicks could prompt a 60% decrease in family nourishment safety and were equipped for diminishing the ascorbic corrosive substance of vegetables by as much as 36% and the rough protein substance of cassava by 40%. These could bring about a 24% expansion in the pervasiveness of youth Unhealthiness. Creature contemplates showing that connection with Nigerian unrefined petroleum could be hemotoxic and hepatotoxic,

and could cause barrenness and malignant growth. As indicated by another report, the oil slicks influenced, in any event, 1500 networks in the eight raw petroleum delivering states in Nigeria and were, for the most part from the 5284 oil wells that were penetrated (as of 2006) and the 7000 km of unrefined petroleum pipeline that confuses the Niger delta locale. Table 1 shows the reasons for the unrefined petroleum spill (Idowu and Lambo, 2018).

Over 30% of the spills were unknown causes, while 20.74% were ascribed to outsider movement (Obaseki, 2019). The oil slicks frequently brought about surface water defilement with hydrocarbons and followed metals, as estimated utilizing nuclear spectrometry. An investigation recorded convergences of benzo (a) pyrene that went from 0 to 2.32 ug/l. (Anyakora et al., 2004). As indicated by Table 2, the following metal defilement was recorded in an investigation completed in the Ughoton stream of Edo State (Uzoekwe et al., 2011).

Table 1. The reasons for oil pipeline disappointments somewhere in the range of 1999 and 2005(Obaseki, 2019).

Cause	Number (N=135)	Percentage %
Mechanical failure	23	17.04
Corrosion	21	15.56
Operational error	17	12.59
Third-party activity	28	20.74
Natural hazard	3	2.22
Unknown	43	31.85

Table 2. The concentrations of trace metals in the Ughoton stream during an oil spill (Uzoekwe et al., 2011).

Trace mineral	Range (mg/l)	Averege conc (mg/l)	Who desirable limit (mg/l)
Iron	0.25-0.36	0.31	0.3 *
Zinc	0.02-0.04	0.03	3 *
Copper	0.04-0.05	0.14	2
Chromium	ND-0.08	0.053	0.05
Manganese	0.12-0.17	0.14	0.4 *
Nickel	ND-0.08	0.023	0.07
Lead	ND-0.01	0.005	0.01
Cadmium	ND-0.08	0.023	0.003
THC	3.40-6.20	4.93	-

* Levels likely to give rise to consumer complaint; ND - Not detectable; THC - Total Hydrocarbon content

No investigation was found broadcasting in real-time nature of the slick oil locales. Yet, the centralizations of the unstable segments of the unrefined petroleum are regularly too high, as appeared by the qualities recorded 2 months after the spill was halted (Table 3).

The unrefined petroleum of the locale contains some usually happening radioactive materials (NORM); the rot arrangement of naturally occurring radionuclides headed by Uranium-238 (238U) and Thorium-232 have mean movement centralizations of 0.80 ± 0.37 Bq/kg and 0.17 ± 0.09 Bq/kg, separately, in the raw petroleum mixes, while the mean convergence of the non-rot arrangement radionuclide, Potassium-40 (40K) is 10.52 ± 0.03 Bq/kg (Ajayi et al., 2009). Unrefined petroleum spills decreased soil ripeness (Osuji and Achugasim, 2010). They additionally covered monetary trees and nourishment crops, totally executing them or reducing their yield, causing a sixty percent decrease in family unit nourishment safety as evaluated utilizing the Cornell-Radimer scale as appeared in Tables 4 & 5 (Ordinioha and Sawyer, 2008). The nourishment weakness and weakening of the staple nourishment's nature prompted a 24% expansion in the pervasiveness of youth lack of healthy sustenance in the influenced networks (Table 6).

Table 3. The fragrant groupings in a slick oil site, two months after the spillage (Osuji and Achugasim, 2010).

Aromatic compounds	Average concentration (mg/kg)
Benzene	73.21
Chlorobenzene	9.79
1,2-Dichlorobenzene	20.50
1,3-Dichlorobenzene	37.73
1,4-Dichlorobenzene	4.86
Ethylbenzene	7.04
Toluene	19.20
m/p-Xylene	19.69
o-Xylene	2.04

The raw petroleum spills additionally came about in the bio-aggregation of overwhelming metals in the enduring nourishment crops like cassava and pumpkin (Table 7). The convergence of lead and cadmium expanded in pumpkin leaves by 90 and 94.29%, separately (Table 8).

Table 4. The predominance of family nourishment insecurity (Ordinioha and Sawyer, 2008).

Food security status	Oil spill community (%) (N=301)	Reference community (%) (N=291)
Food secure	9 (2.99)	194 (66.67)
Food uncertainty	22 (7.31)	67 (23.02)
Food insecurity without hunger	76 (25.25)	23 (7.90)
Food insecurity with moderate hunger	105 (34.88)	7 (2.41)
Food insecurity with severe hunger	89 (29.57)	0 (0.00)

Tables 9 & 10 demonstrate that exposures to spilled unrefined petroleum were related with huge increments in the period commonness for loose bowels, sore eyes, bothersome skin, word related wounds, Shock, intense renal disappointment, and broad epidermolysis, conjunctivitis, mucositis, esophagitis. Compound pneumonitis was accounted for in a 2-year-old treated for febrile spasm with Nigerian raw petroleum. Creature considers, led by taking care of rodents and other test creatures with nourishments polluted with unrefined petroleum, show that exposures to Nigerian raw petroleum could bring about barrenness, hemotoxicity, hepatotoxicity, and carcinogenesis (through its consequences for chromatin DNA) (Ordinioha and Sawyer, 2009).

Table 5. The ascorbic corrosive substance in some basic vegetables developed in unrefined petroleum-contaminated soil, while the rough protein substance of cassava was diminished by 40%.

Vegetable	Unpolluted soil (mg/100 g)	Polluted soil (mg/100 g)
Spinach oleraceae (spinach)	1057	635
Solanum melongena (garden egg)	880	712
Talinum triangulare (waterleaf)	550	352

Past investigations demonstrated constituents of unrefined petroleum generally appropriated in the bio-physical condition of the affected districts. The nearness and amount of these constituents are known to be equipped to apply some intense and long-haul unfriendly wellbeing impacts.

Realized cancer-causing agents like benzo (a) pyrene and sweet-smelling polycyclic hydrocarbon (PAH) were individual, found in the surface water and soil of the affected networks. Like other known cancer-causing agents, they don't have any sheltered levels, as even a couple of atoms of these can be genotoxic (El-Masri et al., 2002). These realized cancer-causing agents' movement likely clarifies the cancer-causing nature announced in the creature study (Brambilla et al., 2012). The distinction in the grouping of PAH in the encompassing air was

likewise given as a purpose behind the greater pervasiveness of specific sorts of diseases found in Port Harcourt contrasted and Ibadan (Ana et al., 2009). Additionally, it was likewise shown that raw petroleum spill raises 45% expansion in radiation level, a cancer-causing risk that could build pervasiveness of specific malignant growths after the oil slick. The radiation tainting brought about by raw petroleum spill in the Niger Delta locale is frequently so across the board that the surface water (Obida et al., 2018) and crops developed in the affected condition (Sam et al., 2017)are likewise defiled past the most extreme passable cutoff.

Table 6. Rate proximate organization and calorific estimation of cassava tuber collected from oil slick and non-oil ruin soils.

Constituents	Tuber from unpolluted soil (%)	Tuber from polluted soil (%)
Moisture	60.81	63.95
Ash	0.50	0.58
Crude protein	0.74	0.44
Crude lipid	0.31	1.20
Crude fiber	1.41	1.56
Total carbohydrate	36.23	32.27
Calorific value (Kcal/100 g)	150.67	141.64

Table 7. Prevalence of childhood malnutrition (Ordinioha and Sawyer, 2008).

Characteristics	Oil spill community (N=521) (%)	Reference community (N=435) (%)
Prevalence of underweight	246 (47.22)	101 (23.22)
Prevalence of stunting	149 (28.6)	113 (25.98)
Prevalence of wasting	109 (20.92)	58 (13.33)

Table 8. The normal convergences of substantial metals (mg/kg) in the leaves of nourishment crops.

Trace mineral	Unpolluted site (cassava)	Polluted site (cassava)	Unpolluted site (pumpkin)	Polluted site (pumpkin)
Chromium	0.25	0.48	0.00	0.87
Nickel	0.025	0.035	0.025	0.04
Lead	0.08	0.14	0.11	0.21
Cadmium	0.08	0.16	0.035	0.068

As appeared in Table 9, while the intense side effects were frequently gentle and transient, cut off could prompt intense renal disappointment exposures as revealed in the 2-year-old kid (Njoroge et al., 2015) or even hepatotoxicity (Orisakwe et al., 2005) and hemotoxicity, (Ordinioha and Brisibe, 2013) as detailed in the creature examines. The period pervasiveness of the side effects announced in the Niger Delta locale was distinguished to be greater than the commonness detailed in the grounded oil giant haulers (Campbell et al., 1993; Lyons et al., 1999), showing more noteworthy degrees of presentation in the Niger Delta district. For example, the pervasiveness of sore eyes is considered zone was diminished from 32.86 to 28% during the establishing of the big hauler braer in Shetland, Scotland (Campbell et al., 1993) and 19.7% recorded during the Sea Empress oil slick in south west Wales (Lyons et al., 1999). This distinction was credited to the way that individuals from the affected networks in the Niger Delta district, being food ranchers and fisher-people, kept on carrying out their specialty in the contaminated condition, with no defensive devices (Suárez et al., 2005). The pervasiveness of the bowels' looseness was likewise noted to be altogether more significant in the Niger Delta research because the fish and creatures murdered by the spill were consumed. No predictable information on the amount of raw petroleum spilled in the Niger Delta is not open. Yet, roughly 13 million barrels of unrefined petroleum is assessed to have been spilled since 1958 from more than 7000 oil slick occurrences, 240,000 barrels every year

(Murphy et al., 2016). Incompatibility of crude oil spilled was due to the difficult accessibility of some spill sites limited access; safety issues. Another reason noted that 1) some spills have indeed occurred far from community locations, 2) a long interval between the spill occurrence and its detection; 3) the high unpredictability of unrefined petroleum, 4) causing an expected half to vanish inside 24-48 h; 5) deliberate organization and government under-detailing; and 6) deficient government oversight (Leschine, 2002).

Table 9. Side effects are announced by respondents by presentation classes and affiliations (Ordinioha and Sawyer, 2009).

Variable	Exposed (N=210) (%)	Unexposed (N=210) (%)	O/R	p-value
Malaise	49 (23.33)	33 (15.77)	1.63	< 0.05
Headache	76 (36.19)	27 (12.86)	3.84	< 0.001
Nausea	48 (22.86)	11 (5.24)	5.36	< 0.001
Diarrhoea	87 (41.43)	28 (13.33)	4.60	< 0.001
Sore eyes	69 (32.86)	9 (4.29)	10.93	< 0.001
Sore throat	63 (30)	13 (6.19)	6.49	< 0.001
Cough	56 (26.67)	17 (8.1)	4.13	< 0.001
Itchy skin	103 (49.05)	14 (6.67)	13.48	< 0.001
Rashes	90 (42.86)	13 (6.19)	11.37	< 0.001
Occupational injuries	51 (24.29)	12 (5.71)	5.29	< 0.001

Table 10. Semen parameters of study animals (Ngokere et al., 2014).

Parameter	Rats exposed to crude oil (n=7)	Unexposed rats (n=8)
Relative weight testis (g/100 g bwt)	0.20 ± 0.03	0.28 ± 0.04
Sperm density (epididymal sperm reserves) (×106/ml)	20.0 ± 1.30	14.5 ± 2.70
Sperm motility (%)	70 ± 8.20	40 ± 6.60

2.1.2. Air pollution

2.1.2.1. Industrial emissions

These originate from both the oil and non-oil related enterprises which overwhelm modern exercises in the Niger Delta. Such ventures as a treatment facility, petrochemical, Liquefied Natural Gas (LNG), concrete, paper, concoction compost, an aluminum smelter, battery, flour, wood, and material enterprises, and so forth., discharge different sorts of air poisons which add to the weight of vaporous and particulate toxins noticeable all around. The Niger Delta region is arguably the most industrialized area of the country, and it plays host to many of these industries. Other research showed that there were three points in each of the industrial locations (the Port Harcourt Refinery Company -PHRC, Nigeria's largest oil refinery and Engro Polymer and Chemicals Ltd -EPCL, Chlor-Vinyl chemical Products company, and the nation's major petrochemical complex, that assessed the quality of air from both production facilities based on key priority pollutants (Ana et al., 2009). At The refinery, the highest concentration of Pb and Ni levels, was recorded 0.20 and 0.86 mg/m^{3,} respectively, at the PHRC. The highest Pb and Ni levels were recorded 0.16 and 0.05 mg/m^3, respectively, at EPCL.

2.1.2.2. Pipeline explosion

Militancy in the Niger Delta has contributed majorly to pipeline explosions in the region. Apart from these efforts at sabotage, the pipeline explosion can also be accidental. The outcome is consistently fire flare-up, which sees the consuming fire and smoke from the oil pipelines discharging enormous groupings of vaporous

ingredients and particulate issues. Furthermore, many occurrences incorporate carbon dark, carbon dioxide, ash, nitrogen oxide, and substantial metal deposits.

2.1.2.3. Gas flaring

Petroleum gas was removed in oil wells in the Niger Delta, and quite a bit of it is promptly flared into the earth at a surmised pace of 70 million/m3 for every day compared to 40% of African gaseous petrol utilization. This sum establishes the soley most significant wellspring of ozone-depleting substance outflows on the planet (Borck, 2016). As per other work, Nigeria holds the most elevated record (19.79%) of flammable gas flaring worldwide and is answerable for around 46% of Africa's all-out gas extended per ton of oil created (Perner and Seeliger, 2004). Other work found that there are at the very least 123 flaring destinations in the area until the present, making Nigeria one of the most elevated producers of ozone-depleting substances in Africa (Giwa et al., 2014). So also, the Central Bank of Nigeria (CBN), in its 2004 explanatory appraisal of the measurable notice of the locale, indicated that the average pace of gas flaring in Nigeria during 1970-1979, 1980-1989, and 1990-1999 was at 97, 97, and 95%, separately. Between 2000 and 2004, 51% was flared.

Similarly, during 1970 - 2004, 76% of the total gas production was reported in Nigeria. After an examination of convergences of surrounding air poisons in the district and Lagos State, (Olajire et al., 2011) infers that contamination focuses are most elevated in the Niger Delta and contends that specific ozone harming substances (counting methane and carbon dioxide) discharged at flare locales add to a worldwide temperature alteration. Of incredible extent of these flare destinations are accounted for to be in the Niger Delta.

2.1.2.4. Biomass combustion

Significant cooking fuel sources in the Niger Delta include biomass such as firewood (the most frequently used), coal, bamboo trunks, and dead leaves. These are immediately available in the neighborhoods – bushes and forests – and when burned, release gaseous pollutants and particulate matter.

2.1.2.5. Refuse burning

In the Niger Delta, the residue is generated daily in large tonnage from domestic, agricultural, and industrial sources. However, the main challenge facing its people daily (especially in its urban centers) is handling and disposal processes, which has become a major environmental problem. A common refuse disposal practice in the region is open-air Burning anywhere but notably within residential areas. This very unhealthy practice generates varieties of toxins and hazardous pollutants. Frequently, hydrocarbons, CO2, SO2, and VOCs are emitted into the air. And all determine the air quality around the area.

2.1.2.6. Bush burning

Due to its farming and land cultivation practices, which form a significant part of the Niger Delta people's occupation, bush burning is common in most communities. This procedure produces different sorts of vaporous poisons and particulate issues. Contingent upon the fire's fuel organization and power, the gas stream is regularly stacked with unstable organics and oxides of CO2, SO2, and NO2. The burning procedure additionally regularly delivers particulate issues ordinarily inside the 10μm size range.

2.1.2.7. Traffic emissions

As per a few reports, contamination because of traffic comprises more than ninety percent of the surrounding carbon monoxide (CO) levels, 80–90% of nitrogen dioxide (NO2), hydrocarbon, and particulate issue on the planet, representing a genuine danger to human wellbeing (Moore et al., 2003). Reports show that more than 600 million individuals all-inclusive are presented to the dangerous degree of traffic – created toxins. In a worldwide view, it presumes that transportation is the significant guilty party of air contamination representing over 80% of complete air toxins. In Nigeria, general industrial pollution and oil industries

pollution are of high and particular attention, while mobile transportation pollution received the less concentration. Unarguably, people are exposed to the risk of contracting severe health problems due to these pollutants, especially in urban areas where pollution levels increase after a comparative study of the emission levels from automobiles in Lagos, the Niger Delta (Rosenlieb et al., 2018).

The TSP focuses were likewise high for the two areas compared to standard (Balmes, 2019). Accessible information shows an expansion from 38,000 to 1.6 million during 1950 - 1992 for the complete number of vehicles enrolled in Nigeria (Okafor et al., 2014). Somewhere in the range of 1999 and 2004, around 6,000,000 cars (70% of the enlisted vehicles were vehicles and 30% transports and trucks) were enrolled in Nigeria as indicated by information from Nigeria's Federal Road Safety Commission. Lagos State recorded the enlistment of around 223,764 vehicles in 2008, contrasted with 160,134 vehicles enrolled in 2007. The end along these lines is that the standard discharge focus from engine vehicles and cruisers in the nation keeps on rising (Ihueze and Onwurah, 2018).

3. Results and Discussion

3.1. Health hazards

All environmental pollution activities in the Niger Delta present severe health hazards to its people as below.

3.1.1. Visibility impairment

Oxides of nitrogen and lower hydrocarbons are released from most combustion processes in the region. In the presence of ultra-violet (UV) radiation, this could result in smog, which could, in turn result in a decrease in visibility.

3.1. 2. Acid rain

Clearly, a few fermented downpour instances happen in the locale because of the arrival of the huge centralization of oxides of nitrogen and sulfur in nature. One investigation announced low pH esteems from water acquired from shallow hand-delved wells in Ughelli, Warri, and Okurekpo, all in Delta State (Bini and Bresolin, 1998). As per another work, raised degrees of lead (0.56 mg/l) and low pH esteems running from 5.10 – 6.35 in downpour water gathered in Warri and environs have been recorded (Imiete and Viacheslovovna Alekseeva, 2018). This antagonistically influences the erosion pace of material sheets, landmarks, and other financial structures in the zone, which have been seen to break down at rather alarming rates.

3.1. 3. Air quality impairment

In an air quality appraisal of the Niger Delta, Ayanlade and Howard demonstrated that the degrees of unstable carbon oxide, nitrogen and sulfur, and all-out particulates surpass existing Federal Environmental Protection Agency's gauges (Ayanlade and Howard, 2019). Other work demonstrated the raised degrees of lead at convergences of 0.56 mg/l in the air ((Anifowose et al., 2016).

3.1. 4. Impacts on vegetation and animal life

It is a well-known fact that heat production destroys vegetation around its production area. This results in the retardation of blossoming plants' development, general reduction in farming life, and wildlife biodiversity. After investigating this factor in the Niger Delta zone, Ayanlade and Howard indicated that flares affect vegetation development, creature life, and natural harmony (Ayanlade and Howard, 2017).

3.1. 5.Thermal conditions of the region

From flare locales in Isoko, Delta State temperature about 400 °C at a standard separation of 43.8 meters have been recorded. Diemuodeke and Briggs inform that temperatures delivered at burst destinations could be

almost 1,600 °C (Diemuodeke and Briggs, 2018). Additionally, as per Babatunde and associates, some 45.8 billion kilowatts of warmth is released into the climate of the Niger Delta from 1.8 billion cubic feet of gas each day (Babatunde et al., 2019).

3.1.6. Coastal erosion and flooding

The anticipated effects of ocean level ascent (SLR) on the Nigerian coastal zone and assets include massive scope immersion, expanded waterfront disintegration, saltwater interruption into beachfront springs, natural surroundings adjustment with direct impacts on untamed life conveyance, expanded recurrence of high power precipitation occasions and related expanded runoff, raised disintegration rates, streak floods and developed repeat of sea storm floods (Nicholls and Klein, 2005). In sum, these issues daily manifest in the adverse effects on, especially the rural peoples' major occupations–fishing and farming– with the destruction of farmlands and rivers on the rise. Also, there is lack/low development of sanitary systems, schools, unemployment, flooding, oil spillage destruction, low road networks, and pathetic condition of creek dwellers, high-risk transport systems, mainly by seas and rivers, and neglect of the region/underdevelopment by oil drilling and affiliate production companies.

3.2. Health effects on the people

Severe health challenges are faced by residents and the workforce of Niger Delta communities. After a survey on the health conditions of these people, Ana, and the group, announced fundamental medical issues in the general Population. There is an outline of the pervasive air contamination related morbidities, for example, Breathing Difficulties, Bronchitis, Aggravation of Asthma, Cardio-respiratory scatters, Pulmonary edema, Eye issue, and Skin issue (Ana et al., 2009). One investigation indicated the common medical problems in the modern network. Out of 384 plant laborers met in a synthetic compost industry at Onne in the Niger Delta, 70.5% go through 8 hours out of each day at work. 66.1% complicated respiratory issue, 24.4% announced skin issue, and 22.6% revealed eye issue. There were solid affiliations ($p< 0.05$) among eye and respiratory problems and the laborers' mechanical exercises. Another review did in among processing plant (PHRC) and petrochemicals (EPCL) plant laborers detailed that 70.8% of laborers at PHRC when contrasted with 67.2% at EPCL revealed different medical issues identified with poor air quality conditions. In the two cases, the significant reason was credited to gas flaring—side effects related to presentation to vapor and splashes. There were reports of respiratory indications related to the residue and smoke presentation, prompting disturbance among 65.7% PHRC and 57.1% EPCL laborers. Both the eyes and the skin were among different body pieces, likewise influenced by the aggravations (Ana et al., 2009). Further factual investigation showed that the length of remain of PHRC laborers in their private networks was altogether connected with respiratory medical issues ($p= 0.000$), with malignant growths ($p= 0.000$). At EPCL, the length of living arrangement in the network was fundamentally connected with premature deliveries ($p= 0.000$), with twisted kids ($p= 0.000$), and with side effects identified with wellbeing impacts from air contaminants ($p= 0.000$).

There are likewise signs of developing medical issues in the locale. Studies by Dendup and associates uncovered that of the two malignancy reference focuses: Ibadan in the South-west and Port Harcourt in the Niger Delta, the proportion of revealing was 1:4 for University of Port Harcourt Teaching Hospital (UPTH) (904) and University school Hospital (UCH) (3521) individually (Dendup et al., 2018). The outcomes demonstrate a steady perception with the specialists' previous investigations, which showed expanded malignant lung growths in the Port Harcourt condition due to presentation to air affronts. Likewise, the higher level of skin malignant growth in Port Harcourt over documented in Ibadan could be clarified with some level of vulnerability by the expanded ecological hazard aspects in the more developed Port Harcourt territory (Ana et al., 2009). Malignant growth pervasiveness is accepted to be on the expansion. Official records in Nigeria have so far not tended to these wellbeing impacts adequately. However, their situation as potential significant supporters of the ailment trouble in oil-bearing networks isn't in question.

4. Conclusions

After a thorough review of these studies, the conclusion from there shows that general environmental pollution and associated health hazards in the Niger Delta have intense and long haul impacts on both human wellbeing and its whole environment. However, the paper concludes that these hazards can be contained through the series of recommendations above.

Reference

Ajayi, T.R., Torto, N., Tchokossa, P., Akinlua, A., 2009. Natural radioactivity and trace metals in crude oils: implication for health. *Environ. Geochem. Health*, **31**, 61–69. https://doi.org/10.1007/s10653-008-9155-z

Ana, G.R.E.E., Sridhar, M.K.C., Bamgboye, E.A., 2009. Environmental risk factors and health outcomes in selected communities of the Niger delta area, Nigeria. *Perspect. Public Health,* **129**, 183–191. https://doi.org/10.1177/1466424008094803

Anifowose, B., Lawler, D.M., van der Horst, D., Chapman, L., 2016. A systematic quality assessment of Environmental Impact Statements in the oil and gas industry. *Sci. Total Environ.*, **572**, 570–585. https://doi.org/10.1016/j.scitotenv.2016.07.083

Anyakora, C., Ogeche, A., Coker, H., Ukpo, G., Ogah, C., 2004. A screen for benzo (a) pyrene, a caranogen, in the water samples from the Niger Delta using GC-MS. *Nig. Q. J. Hosp. Med.,* **14**, 288–293. http://dx.doi.org/10.4314/nqjhm.v14i3.12740

Ayanlade, A., Howard, M.T., 2019. Land surface temperature and heat fluxes over three cities in Niger Delta. *J. African Earth Sci.,* **151**, 54–66. https://doi.org/10.1016/j.jafrearsci.2018.11.027

Ayanlade, A., Howard, M.T., 2017. Understanding changes in a Tropical Delta: A multi-method narrative of landuse/landcover change in the Niger Delta. *Ecol. Modell.,* **364**, 53–65. https://doi.org/10.1016/j.ecolmodel.2017.09.012

Babatunde, B.B., Sikoki, F.D., Avwiri, G.O., Chad-Umoreh, Y.E., 2019. Review of the status of radioactivity profile in the oil and gas producing areas of the Niger delta region of Nigeria. *J. Environ. Radioact.,* **202**, 66–73. https://doi.org/10.1016/j.jenvrad.2019.01.015

Balmes, J.R., 2019. Household air pollution from domestic combustion of solid fuels and health. *J. Allergy Clin. Immunol.,* **143**, 1979–1987. https://doi.org/10.1016/j.jaci.2019.04.016

Bini, C., Bresolin, F., 1998. Soil acidification by acid rain in forest ecosystems: A case study in northern Italy. *Sci. Total Environ.*, **222**, 1–15. https://doi.org/10.1016/S0048-9697(98)00239-3

Borck, R., 2016. Will skyscrapers save the planet? Building height limits and urban greenhouse gas emissions. *Reg. Sci. Urban Econ.*, **58**, 13–25. https://doi.org/10.1016/j.regsciurbeco.2016.01.004

Brambilla, G., Mattioli, F., Robbiano, L., Martelli, A., 2012. Update of carcinogenicity studies in animals and humans of 535 marketed pharmaceuticals. *Mutat. Res. Mutat. Res.,* **750**, 1–51. https://doi.org/10.1016/j.mrrev.2011.09.002

Campbell, D., Cox, D., Crum, J., Foster, K., Christie, P., Brewster, D., 1993. Initial effects of the grounding of the tanker Braer on health in Shetland. *The Shetland Health Study Group. BMJ,* **307**, 1251–1255. https://doi.org/10.1136/bmj.307.6914.1251

Dendup, T., Feng, X., Clingan, S., Astell-Burt, T., 2018. Environmental Risk Factors for Developing Type 2 Diabetes Mellitus: A Systematic Review. *Int. J. Environ. Res. Public Health,* **15**, 78. https://doi.org/10.3390/ijerph15010078

Dennis, A., Romanus, N., 2018. Adoption of Recommended Palm Oil Processing Technology in Isoko North Local Government Area, Delta State, Nigeria. *Asian J. Agric. Extension, Econ. Sociol.,* **24**, 1–8. https://doi.org/10.9734/AJAEES/2018/39987

Diemuodeke, E.O., Briggs, T.A., 2018. Policy pathways for renewable and sustainable energy utilisation in rural coastline communities in the Niger Delta zone of Nigeria. *Energ. Rep.,* **4**, 638–644. https://doi.org/10.1016/j.egyr.2018.10.004

El-Masri, H.A., Mumtaz, M.M., Choudhary, G., Cibulas, W., De Rosa, C.T., 2002. Applications of computational toxicology methods at the Agency for Toxic Substances and Disease Registry. *Int. J. Hyg. Environ. Health,* **205**, 63–69. https://doi.org/10.1078/1438-4639-00130

Giwa, S.O., Adama, O.O., Akinyemi, O.O., 2014. Baseline black carbon emissions for gas flaring in the Niger Delta region of Nigeria. *J. Nat. Gas Sci. Eng.*, **20**, 373–379. https://doi.org/10.1016/j.jngse.2014.07.026

Idowu, A.A., Lambo, T.M., 2018. Sustainable Exploration of Crude Oil in Nigeria, in: The Political Ecology of Oil and Gas Activities in the Nigerian Aquatic Ecosystem. *Elsevier*, 343–349. https://doi.org/10.1177/092405199901700204

Ihueze, C.C., Onwurah, U.O., 2018. Road traffic accidents prediction modelling: An analysis of Anambra State, Nigeria. *Accid. Anal. Prev.*, **112**, 21–29. https://doi.org/10.1016/j.aap.2017.12.016

Imiete, I.E., Viacheslovovna Alekseeva, N., 2018. Reverse osmosis purification: A case study of the Niger Delta region. *Water Sci.*, **32**, 129–137. https://doi.org/10.1016/j.wsj.2018.04.001

Leschine, T.M., 2002. Oil Spills and the Social Amplification and Attenuation of Risk. *Spill Sci. Technol. Bull.*, **7**, 63–73. https://doi.org/10.1016/S1353-2561(02)00050-6

Lyons, R.A., Temple, J.M.F., Evans, D., Fone, D.L., Palmer, S.R., 1999. Acute health effects of the sea empress oil spill. *J. Epidemiol. Community Health*, **53**, 306–310. http://dx.doi.org/10.1136/jech.53.5.306

Moore, M., Gould, P., Keary, B.S., 2003. Global urbanization and impact on health. *Int. J. Hyg. Environ. Health*, **206**, 269–78. https://doi.org/10.1078/1438-4639-00223

Murphy, D., Gemmell, B., Vaccari, L., Li, C., Bacosa, H., Evans, M., Gemmell, C., Harvey, T., Jalali, M., Niepa, T.H.R., 2016. An in-depth survey of the oil spill literature since 1968: Long term trends and changes since Deepwater Horizon. *Mar. Pollut. Bull.*, **113**, 371–379. https://doi.org/10.1016/j.marpolbul.2016.10.028

Ngokere, A.A., Okoye, J.O., Obi, E., Ibekailo, S.N., Awalu, J.C., Audu, I., 2014. Anti-spermatogenic and estrogenic effects of Escravos crude oil in Chinchilla rabbits. *Int. J. Biol. Chem. Sci.*, **8**, 1969–1975. http://dx.doi.org/10.4314/ijbcs.v8i5.2

Nicholls, R.J., Klein, R.J.T., 2005. Climate change and coastal management on Europe's coast, in: Managing European Coasts. *Springer-Verlag, Berlin/Heidelberg*, 199–226. https://doi.org/10.1007/3-540-27150-3_11

Njoroge, R.W., Macharia, B.N., Sawe, D.J., Maiyoh, G.K., 2015. Effects of crude kerosene on testosterone levels, aggression and toxicity in rat. *Toxicol. Rep.*, **2**, 175–183. https://doi.org/10.1016/j.toxrep.2014.11.017

Obaseki, M., 2019. Diagnostic and prognostic analysis of oil and gas pipeline with allowable corrosion rate in Niger Delta Area, Nigeria. *J. Appl. Sci. Environ. Manag.*, **23**, 927. http://dx.doi.org/10.4314/jasem.v23i5.24

Obida, C.B., Alan Blackburn, G., Duncan Whyatt, J., Semple, K.T., 2018. Quantifying the exposure of humans and the environment to oil pollution in the Niger Delta using advanced geostatistical techniques. *Environ. Int.*, **111**, 32–42. https://doi.org/10.1016/j.envint.2017.11.009

Okafor, I.F., Unachukwu, G.O., Odukwe, A.O., 2014. Measuring energy efficiency of the public passenger road transport vehicles in Nigeria. *Transp. Policy*, **35**, 319–325. https://doi.org/10.1016/j.tranpol.2014.05.014

Olajire, A.A., Azeez, L., Oluyemi, E.A., 2011. Exposure to hazardous air pollutants along Oba Akran road, Lagos – Nigeria. *Chemosphere,* **84**, 1044–1051. https://doi.org/10.1016/j.chemosphere.2011.04.074

Ordinioha, B., Brisibe, S., 2013. The human health implications of crude oil spills in the Niger delta, Nigeria: An interpretation of published studies. *Niger. Med. J. J. Niger. Med. Assoc.*, **54**, 10. http://doi.org/10.4103/0300-1652.108887

Ordinioha, B., Sawyer, W., 2009. Acute health effects of a crude oil spill in a rural community in Bayelsa State, Nigeria. *Niger. J. Med.*, **19**, 140–144. http://dx.doi.org/10.4314/njm.v19i2.56500

Ordinioha, B., Sawyer, W., 2008. Food Insecurity, Malnutrition and Crude Oil Spillage in a Rural Community in Bayelsa State, South-South Nigeria. *Niger. J. Med.*, **17**, 304–309. http://dx.doi.org/10.4314/njm.v17i3.37400

Orisakwe, O.E., Akumka, D.D., Njan, A.A., Afonne, O.J., Okechi, O.O., 2005. Hepatotoxic and haematological effects of Nigerian Bonny light crude oil in male albino rats. *Toxicol. Environ. Chem.*, **87**, 215–221. https://doi.org/10.1080/02772240400026823

Osuji, I., Achugasim, O., 2010. Trace Metals and Volatile Aromatic Hydrocarbon Content of Ukpeliede-I Oil Spillage Site, Niger Delta, Nigeria. *J. Appl. Sci. Environ. Manag.*, **14**. http://dx.doi.org/10.4314/jasem.v14i2.57826

Perner, J., Seeliger, A., 2004. Prospects of gas supplies to the European market until 2030—results from the simulation model EUGAS. *Util. Policy*, **12**, 291–302. https://doi.org/10.1016/j.jup.2004.04.014

Rosenlieb, E.G., McAndrews, C., Marshall, W.E., Troy, A., 2018. Urban development patterns and exposure to hazardous and protective traffic environments. *J. Transp. Geogr.*, **66**, 125–134. https://doi.org/10.1016/j.jtrangeo.2017.11.014

Sam, K., Coulon, F., Prpich, G., 2017. Use of stakeholder engagement to support policy transfer: A case of contaminated land management in Nigeria. *Environ. Dev.*, **24**, 50–62. https://doi.org/10.1016/j.envdev.2017.06.005

Suárez, B., Lope, V., Pérez-Gómez, B., Aragonés, N., Rodríguez-Artalejo, F., Marqués, F., Guzmán, A., Viloria, L.J., Carrasco, J.M., Martín-Moreno, J.M., López-Abente, G., Pollán, M., 2005. Acute health problems among subjects involved in the cleanup operation following the Prestige oil spill in Asturias and Cantabria (Spain). *Environ. Res.*, **99**, 413–424. https://doi.org/10.1016/j.envres.2004.12.012

Uzoekwe, S.A., Achudume, A.C., S.A, Uzoekwe, A.C., A., 2011. Pollution Status and Effect of Crude Oil Spillage in Ughoton Stream Ecosystem in Niger Delta.

How to cite this paper:
Nnaemeka, A.N., 2020. Environmental pollution and associated health hazards to host communities (Case study: Niger delta region of Nigeria). *Cent. Asian J. Environ. Sci. Technol. Innov.* **1**(1), 30-42.