

RESEARCH PAPER

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

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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.

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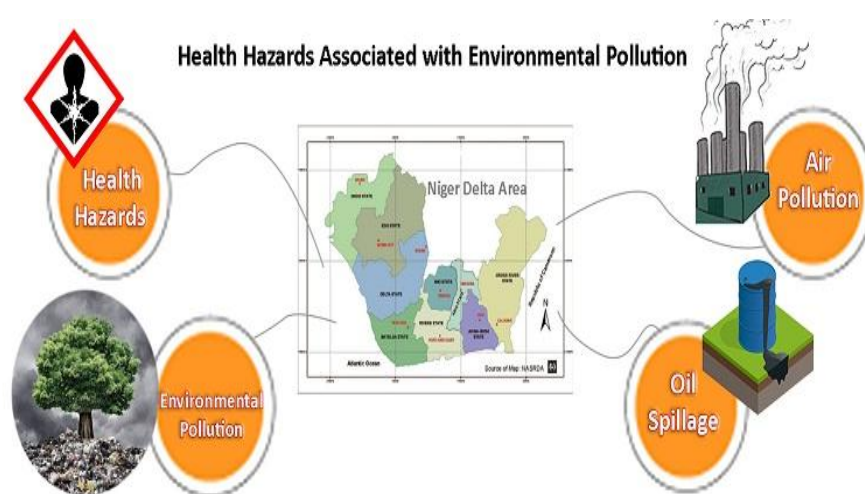
Health effects

Niger Delta

Nigeria

Oil spill

Graphical Abstract



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.

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1. Introduction

The major bulk of Nigeria's economic harvest comes from its Niger River delta region no doubt. The core of the harvest according to widespread belief is its vital oil. Also 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 short many 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, with a view to proffering practical solutions (not punitive measures) to saving people life (Ordinoha 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 producer of palm oil, when 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 which used to be historically made up of present-day Bayelsa, Rivers and Delta states is 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 percentage of the nation's land mass. The region according to a Catholic Relief Services (CRS) Report for Congress Nigeria 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 (Ordinoha 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 geo-political zone only has six states of the Niger Delta region). Major cities of the region 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 very rich 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 to a great extent because of natural contamination which could be viewed as one of the most noticeably awful in examination with comparable delta zones all around (Fig. 1).

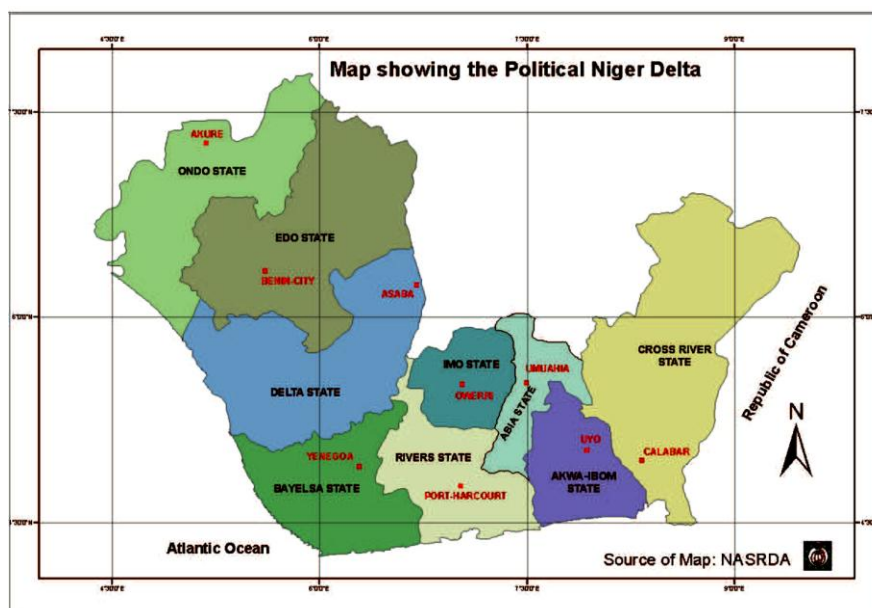


Fig. 1. Political Map of the Niger Delta Area.

2. Materials and Methods

2.1. Environmental Pollution

Pollutants constitute major threats to both plant and animal life. In man's living space, health and wellness are often determined by the safety of the environment, often affected by their activities. Environmental pollution simply implies issues with pollutants that alter the natural course of (and adversely affect) the environment. Pollution 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 predominant economic activity of the region daily produce tons of environmental nuisance. And poor management of these wastes coupled with neglect for the sanctity of human life and other regrettable factors have seen the region clamouring for survival in more ways than one. These have become a grave threat to the region. 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 report, a normal of 240,000 barrels of unrefined petroleum are spilled in the Niger Delta consistently, mostly because of obscure causes (31.85%), outsider movement (20.74%), and mechanical disappointment (17.04%) (Ordinoha and Brisibe, 2013).

(Ordinoha and Brisibe, 2013). The spills sullied the surface water, ground water, encompassing air, and yields with hydrocarbons, with realized cancer-causing agents like polycyclic sweet-smelling 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 show 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 at 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 because of obscure causes, while 20.74% were ascribed to outsider movement (Obaseki, 2019). The oil slicks frequently brought about defilement of surface water with hydrocarbons and follow 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 follow metal defilement 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 Ughoton stream during an oil spill (Uzoekwe et al., 2011).

Trace mineral	Range (mg/l)	Average 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 oil slick locales, yet the centralizations of the unstable segments of the unrefined petroleum are regularly extremely high, as appeared by the qualities recorded 2 months after the spill was halted (Table 3).

Table 3. The groupings of fragrant in an oil slick site, 2 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 unrefined petroleum of the locale contains some normally happening radioactive materials (NORM); the rot arrangement of normally happening 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). The unrefined petroleum spills decreased soil ripeness (Osuji and Achugasim, 2010). They additionally covered monetary trees and nourishment crops, totally executing them or decreasing 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 nature of the staple nourishment prompted a 24% expansion in the pervasiveness of youth lack of healthy sustenance in the influenced networks (Table 6). 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 the leaves of pumpkin by 90 and 94.29%, separately (Table 8).

Table 4. 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, and compound pneumonitis were accounted for in a 2-year-old treated for febrile spasm with a 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 (water leaf)	550	352

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
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	(%)	(%)
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

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 for applying some intense and long haul unfriendly wellbeing impacts. Realized cancer-causing agents like benzo (a)pyrene and polycyclic sweet-smelling hydrocarbon (PAH) were individually, 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). The movement of these realized cancer-causing agents 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 showed that raw petroleum spill raise 45% expansion in radiation level which is 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 9. Side effects 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

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, (Ordinoha and Brisibe, 2013) as detailed in the creature examines. The period pervasiveness of the side effects announced in the Niger Delta locale were distinguished to be greater than the commonness detailed in the grounded oil big haulers, (Campbell et al., 1993; Lyons et al., 1999) showing more noteworthy degrees of presentation in the Niger Delta district. For example, pervasiveness of sore eyes in 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 looseness of the bowels was likewise noted to be altogether greater in the Niger Delta research in light of the fact that the fish and creatures murdered by the spill were consumed.

No predictable information of the amount of raw petroleum spilled in the Niger Delta are 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 reasons such as difficult accessibility of some spill sites limited access; safety issues. Another reasons noted that 1) some spills were certainly 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).

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 treatment facility, petrochemical, Liquefied Natural Gas (LNG), concrete, paper, concoction compost, 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 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 foremost 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/m³ respectively at the PHRC. The highest Pb and Ni levels were recorded 0.16 and 0.05 mg/m³, 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, pipeline explosion can also be accidental. In any case, 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 issue. Furthermore, the items in many occurrences incorporate carbon dark, carbon dioxide, ash, nitrogen oxide and substantial metal deposits.

2.1.2.3. Gas Flaring

Petroleum gas is 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 comparable to 40% of African gaseous petrol utilization. This sum establishes the sole biggest 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 all around and is answerable for around 46 % of Africa's all out gas flared per ton of oil created (Perner and Seeliger, 2004). Other work found that until present there are at the very least 123 flaring destinations in the area making Nigeria one of the most elevated producer 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 normal 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 an average of 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

Major sources of cooking fuel 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, residue is generated daily in large tonnage from domestic, agricultural and industrial sources, etc. However, the main challenge facing its people daily (especially in its urban centers) is handling and disposal processes which has ultimately 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. Oftentimes, 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

Owing to its farming and land cultivation practices which forms a major 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 issue. Contingent upon the fuel organization and power of the fire, the gas stream is regularly stacked with unstable organics and oxides of CO₂, SO₂ and NO₂. The burning procedure additionally regularly delivers particulate issue ordinarily inside the 10µm size range.

2.1.2.7. Traffic Emissions

As per a few reports, contamination because of traffic comprise 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 perilous degree of traffic – created toxins. In worldwide view, 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 are on the increase, after a comparative study of the emission levels from automobiles in Lagos and the Niger Delta (Rosenlieb et al., 2018).

The TSP focuses were likewise high for the two areas when contrasted with 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 vehicles (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 normal discharge focus from engine vehicles and cruisers in the nation keeps on rising (Ihueze and Onwurah, 2018).

1.1. Health Hazards

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

1.1.1. 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.

1.1.2. Acid Rain

Clearly, a few instances of fermented downpour happen in the locale because of the arrival of huge centralization of oxides of nitrogen and sulfur in nature. One investigation, announced that 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 has 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 disturbing rates.

1.1.3. Air Quality Impairment

In an air quality appraisal of the Niger Delta, Ayanlade and Howard demonstrated that the degrees of unstable oxides of carbon, 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).

1.1.4. 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 development of blossoming plants, general reduction in farming life and wildlife biodiversity. After an investigation of this factor in the Niger Delta zone, Ayanlade and Howard indicated that flares effectly affect vegetation development, creature life and natural harmony (Ayanlade and Howard, 2017).

1.1.5. Thermal Conditions of the Region

From flare locales in Isoko, Delta State temperature about 400 °C at a normal separation of 43.8 meters have been recorded. Diemuodeke and Briggs informs 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 are released into the climate of the Niger Delta from 1.8 billion cubic feet of gas each day (Babatunde et al., 2019).

1.1.6. Coastal Erosion and Flooding

The anticipated effects of ocean level ascent (SLR) on the Nigerian seaside zone and assets include: huge scope immersion, expanded waterfront disintegration, salt water interruption into beach front springs, natural surroundings adjustment with direct impacts on untamed life conveyance, expanded recurrence of high power precipitation occasions and related expanded run off, raised disintegration rates, streak floods and expanded recurrence of sea storm floods (Nicholls and Klein, 2005). In sum, these issues daily manifest in the negative effects on especially the rural peoples' major occupations—fishing and farming— with destruction of farmlands and rivers on the rise. Also, there is lack/poor development of sanitary systems, schools, unemployment, flooding, oil spillage destruction, poor road networks, and pitiable condition of creek dwellers, high risk transport systems especially by seas and rivers, and neglect of the region/underdevelopment by oil drilling and affiliate production companies.

1.2. Health effects on the people

Severe health challenges are faced by residents and workforce of Niger Delta communities. After a survey on the health conditions of these people, Ana and group, announced basic medical issues in the general Population. There are 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 regular medical issues 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% detailed respiratory issue, 24.4% announced skin issue and 22.6% revealed eye issue. There were solid affiliations ($p < 0.05$) among eye and respiratory issue and the mechanical exercises completed by the laborers. 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 with presentation to vapor and splashes. There were reports of respiratory indications related with presentation to residue and smoke, prompting disturbance among 65.7% PHRC and 57.1% EPCL laborers. Both the eyes and the skin were among different pieces of the body 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 issue ($p = 0.000$), 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 perception which is steady with the specialists' previous investigations, which showed expanded lung malignant growths in the Port Harcourt condition due prone to presentation to air affronts. Likewise, the higher level of skin malignant growth in Port Harcourt over that documented in Ibadan could be clarified however 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, despite the fact that their situation as potential significant supporters of the ailment trouble in oil-bearing networks isn't in question.

3. Conclusions

After a thorough review of these studies the conclusion there from 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.

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