

Analysing Environmental Sustainability Issues and Conflict in Nigeria's Niger Delta Region

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Abstract

This paper analyses the environmental sustainability issues and conflict in Nigeria's Niger Delta region (NDR). Nigeria belongs to the Organisation of the Petroleum Countries (OPEC), it is the sixth-largest exporter of oil. The country which derives more than 90% foreign exchange from petroleum products also undergoes (host communities) more than 90% socio-economic and environmental degradation. The Niger Delta communities continue to suffer from high incidences of oil spills and gas flaring which have grave negative impacts on the environment. The indigenes have taken to protests, agitations, demonstrations and violence to express their dissatisfaction with the deplorable environmental condition. Despite this, the International Oil Companies (IOCs) continue to operate with greater impunity. Oil spillages regularly occur in the Niger Delta region of Nigeria; as of 2018, there had been up to 9500 incidences of oil spill in a decade. Annually, on average about 115, 000 barrels (equivalent to about \$5 million worth) are spilt into the environment. Sustainability has been an overarching theme over the past decades and industries including oil and gas have the responsibility to incorporate sustainable practices in their operations. The 1987 Brundtland emphasises meeting the needs of the present generation without affecting the ability to meet the needs of future generations. It argued that economic development could be achieved whilst protecting the environment. In tackling climate change, the 2015 COP21 Paris agreement called for member countries to implement measures that would keep global temperature below 20C. In 2015, the member states of the United Nations adopted the 2030 agenda for sustainable development, which includes acting on 17 Sustainable Development Goals.

Keywords: Conflict, Environmental, Sustainability Issues, Niger Delta and Nigeria

1. Introduction

The impact Nigeria belongs to the Organisation of the Petroleum Countries (OPEC), it is the sixth-largest exporter of oil. The country which derives more than 90% foreign exchange from petroleum products also

undergoes (host communities) more than 90% socio-economic, and environmental degradation [1]. The Niger Delta communities continue to suffer from high incidences of oil spills which have grave negative impacts on the environment. The indigenes have taken to protests, agitations, demonstrations and violence to express their dissatisfaction with the deplorable environmental degradation [2]. Despite this, the International Oil Companies (IOCs) continue to operate with greater impunity. Oil spillages regularly occur in the Niger Delta region of Nigeria; as of 2018, there had been up to 9500 incidences of oil spill in a decade [3].

Annually, on average about 115, 000 barrels (equivalent to about \$5 million worth) are spilt into the environment [3]. Continuous high incidences of oil spills have destroyed the ecosystem, with adverse effects on marine life and the mangrove. Oil spills pollute farmlands and rivers, thereby destroying the means of livelihood of the indigenes as well as harming human health [4]. Research conducted by the United Nations Environmental Programme (UNEP) showed that drinking water in this region contained carcinogen levels that were 900 times higher than the guidelines recommended by the World Health Organisation [5]. Another major cause of environmental degradation is gas flaring which is a by-product of activities of oil exploration.

The Niger Delta is arguably the region with the highest volume of gas flaring globally, with a daily average of 800,000m³ of gas flare. This causes long term diseases such as cancer and breathing difficulties, it also increases the risk of climate change and global warming. The combustion of associated gas (AG) produces emissions that contain toxins like hydrogen sulphide, benzene, xylene, dioxins and nitrogen oxides which are harmful to the environment and humans [5]. During the drilling of oil and gas, wastes are generated which contain some elements that are classified as hazardous substances. These elements are mutagenic, reactive, toxic, corrosive teratogenic and carcinogenic [6].

Sustainability has been an overarching theme over the past decades and industries including oil and gas have the responsibility to incorporate sustainable practices in their operations and policies. The report titled "Our Common future" chaired by Brundtland (1987) emphasises meeting the needs of the present

generation without affecting the ability to meet the needs of future generations [7]. In 2015, the member states of the United Nations adopted the 2030 agenda for sustainable development, which includes acting on 17 Sustainable Development Goals [8]. Relating this to the Niger Delta scenario, points 3 (good health and well-being), 7 (affordable and clean energy) and 13 (climate action) must be addressed in the management of oil and gas operations in this region.

However, this is yet to be seen as environmental pollution (land, air and water) which impacts negatively on people's health and well-being continues unabated, resulting in conflict and violence. It is against this backdrop that this paper examines the environmental sustainability issues and conflict in the NDR of Nigeria. It uses the Systems Thinking and System Dynamics (ST/SD) methodological tool to understand the inherent complexities [9] of the NDR and to proffer lasting solutions to the unabated environmental degradation and conflict in the region.

2. Literature Review

Contextual Theoretical Framework - Adom, Hussein and Joe [10] state that a theoretical framework explains the direction of a research, grounds it in theoretical constructs, and enhances the credibility of the research; making it more meaningful and acceptable. According to the authors, theoretical frameworks stimulate research, ensure generalisability and provides impetus to the research enquiry as well as enhancing its rigour. They further state that theoretical frameworks give life to the research; making it easy for readers to determine the academic position and the hypotheses or assertions of the research. Grant and Osanloo [11] state that a theoretical framework is the blueprint of the research, which gives direction to the research. The authors further state that a theoretical framework serves as the foundation of the research which aids in the construction of both literal and metaphorical for a research study. The authors stress that it provides an anchor and a grounding base which bring together the problem statement, rationale, purpose, significance and literature review of the research.

Kivunja [12] draws a distinction between theory, theoretical framework and conceptual framework. The author defines a theory as a set of constructs or propositions which are interrelated and present a systematic point of view of phenomena in order to give explanation or predict the phenomena. The author further states that a theoretical framework is the synthesis of the thoughts or theories of experts in the field of study of the proposed research, this helps the researcher to have a theoretical umbrella for data analysis and interpretation. While a conceptual framework according to the author, is the totality of the research; comprising of logic, underlying thinking, plan, practice and implementation of the

entire research. On a final note, the author states that a theoretical framework is important to the research as it affords the researcher the opportunity to set out clearly their theoretical assumptions and make the data analysis to be more focused. Therefore, from the foregoing this paper has adopted the following theoretical frameworks as they are pertinent to the topic area.

Resource Curse Theory - The National Resource Governance Institute [13] states that Resource curse which is also referred to as the Paradox of Plenty describes the failure of resource-rich countries to benefit from the wealth of their resources. The study further states that such countries often experience a higher rate of poverty and underdevelopment in comparison to other countries less endowed with natural resources. The study argues strongly that Internal conflicts are common occurrences in resource-rich countries as different groups engage in fighting to control the resources; citing areas such as Congo, Niger Delta and Iraq as examples. The study concludes that Resource curse can be avoided through the appropriate response of policy makers to resource course challenges.

John [14], states that the abundance of natural resources in less developed countries tends to lead to negative developmental outcomes such as political violence, corruption, poor economic growth and weak governance. In an attempt, to bring out salient issues relating to the resource curse argument, the author considers other related theories such as the Dutch Disease and Rentier state. The author states that one implication of the oil boom is that the appreciation of the exchange rate, could render non-oil sectors such as the manufacturing less competitive; thereby having negative impact on the overall growth of the country. Similarly, the author further states that increase in rents from natural resources leads to increase in corruption which consequently impacts negatively on a country's growth and infrastructural development. Thus, the abundance of natural resources in some countries is deemed to be more of a curse than a blessing.

In contribution to the foregoing argument on Resource Curse, Badeeb, Lean and Clark [15] consider the perspective of economists like Adam Smith and David Ricardo who asserted that natural resources play a significant role in the economic development of a country. According to the authors, natural resource endowments enhance the transition of a country from a position of underdevelopment to recording successes in the industrial world; citing examples of Australia the United States and United Kingdom. The authors emphasised that the consensus view of these economists, was that natural endowments would create investments and enhance industrial development.

On the other hand, the authors consider the opposing view that emerged in the 1980's following

the decline of the Dutch manufacturing when natural gas was discovered. According to the authors this was the era of the Dutch disease that preceded the Resource curse. They state further that the prevailing evidence emanating during the oil boom era from countries dependent on natural resources and others, indicate that the economies of countries that are non-dependent on oil grew, whilst those dependent stagnated. The authors through a critical literature review conclude that natural resources such as oil have been a curse rather than a blessing to countries whose economies rely on them, given the attendant economic stagnation, poverty and general underdevelopment such countries are subjected to.

Igbini [16], relating the Resource Curse theory to the Niger Delta situation, in a critical analysis of secondary data collected, argues that the revenue derived from oil and gas operations in the NDR has been a curse rather than a gift. In support of this standpoint, the author catalogues the prevalent environmental degradation, striking poverty, starvation, joblessness and a high death rate due to the health challenges posed by the environmental hazards resulting from oil and gas operations. The author further notes that the oil resource has led to pipeline vandalism and a surge of various militant groups in the NDR in a struggle for a fair share of the ‘national cake’ culminating in the execution of eight indigenes of the NDR including Chief Ken Sarowiwa on the 10th of November 1995. The author in a conclusive note recommends a synergy between the host communities, Nigerian government and International Oil Companies operating in the NDR to foster a sustainable solution to the multifaceted issues in the region as a result of the resource.

Rentier State Theory - Kaya et.al. [17] state that the Rentier State Theory (RST) explains the dynamic and unique economic-politic nature of countries endowed with natural resources dating back to the 1970s, whereby a fraction of the society has direct access to the wealth accrued from natural resources. The authors further state that in a rentier state, the rentier government provides services and governmental jobs to the society from the accrued wealth in exchange for the society’s refrain from seeking political power. Thus, a rentier government distributes wealth through extraction and selling of natural resources as directed by the ruling elite. Some rentier states the authors have identified include, Saudi Arabia, Kuwait, Oman and Algeria where the economy is dominated by the exports of oil and gas with an absolutist political system. Amidst climate change, environmental impacts of fossil fuel and the decarbonisation of the global economy, the authors argue for the diversification of the rentier economy towards ‘tradable (non-rentier sectors) in a rentier state.

The authors emphasise that a successful economic diversification of the rentier state would enhance job

seeking in the private sectors which would ultimately reduce the pressure on the rentier state government. Whilst there are notable environmental benefits from the diversification of a fossil-fuel dependent economy, the research has not considered the socio-economic cost of such diversification in view of the prevalent poverty, under-development and insufficient infrastructure that have characterised of the states in the Global South.

Shehab [18] classifies the Rentier paradigm into two namely, the rentier state theory and the resource curse theory which came into existence in the 1970s; explaining the social and political contexts of the Gulf states in the wake of the oil boom of 1971. The authors state that the Rentier state theory states that natural resources which form the major source of income of a country influence its politics and often result in authoritarian rule. While the Resource Curse Theory hinges on the assumption that the dependence of the economy on revenues from one commodity such as oil and gas is counterproductive as it tends to produce a slower economic growth. The authors conclude that the Rentier State Theory gives an explanation to the social and political aspects of the Gulf context following the 1971 oil boom. It came as a response to the failings of the modernisation theory to explain the reason for the long reign of a family-based rulers in the Gulf in the present age of modernisation.

Omeje [19] states that in Nigeria, oil provides wealth to the rentier state and the oil companies. However, the author states that for the oil-bearing communities, the reverse is the case as oil has become a source of anxiety and misery. The author emphasises that dating from the colonial era, the state has consistently deprived the host communities from holding any stakes in the resource by employing paraphernalia of law and public policy. With no choice, the local residents had to resort to violence and protests to express their dissatisfaction. The author argues succinctly that the emergence of the rentier state in Nigeria has further complicated the oil conflict as the state allows the oil companies to operate indiscriminately, backing them with legislations that could be manipulated.

Akintola [20], states that Nigeria depends heavily on oil revenue as well as being a rentier state. The author argues that the country has abandoned the agricultural and industrial sectors as oil constitutes about 90% of foreign exchange revenue and has become the mainstay of the economy. The author further states that despite the huge revenues derived from oil, Nigeria still remains largely underdeveloped with a high rate of poverty and unabated environmental degradation of the host communities. The author concludes that traits of Resource Curse and Dutch Disease are being exhibited by the country; stating further that there is an elusive relationship between resource abundance and economic development.

Agbo and Okoli [21], using content analysis to analyse the secondary data collected examines the nexus between the rentier character of the Nigerian state and the high rate of unemployment. The authors argue that despite the revenues accrued through the collection of oil rent from external clients, the Nigerian government has made little or no efforts to invest the proceeds on infrastructural development and employment creation.

Stakeholder Theory - Freeman and Reed [22] state that stakeholders are the divergent groups that must support organisations for them to succeed. The authors argue that there should be a stakeholder approach to issues relating to corporate governance for effective director behaviour. However, Bryson et.al. [23] expand the scope to include groups or individuals who can affect an organisation as well as those who are affected by the operations of the organisation. The authors argue strongly that for any organisation to achieve its corporate goals, it must attend to the concerns of the stakeholders. Ackermann and Eden [24] in an attempt to give clarity to the discourse on the practice of stakeholder management, argue that organisations should manage their stakeholders in ways that meet their strategic goals. They further state that stakeholders are groups who make demands on the organisations.

The authors laid out succinctly ways by which Top Management Teams can effectively manage their stakeholders in order to realise their strategic goals. They stress that organisations should be proactive in anticipating stakeholders' responses so that measures can be put in place to capitalise on positive responses or reduce or stamp out negative ones. Freeman et.al. [25] states that Stakeholder theory describes how a business or organisation could be run effectively; aimed at solving the problem of value creation, trade ethics capitalism and managerial mindset through stakeholder relationships. The authors further state that businesses must take into consideration in their decisions, the effects of their business on and responsibilities towards stakeholders, harmonising business and ethics. In their discussions on Stakeholder theory, the authors alluded to the argument of Friedman [26], that the purpose of business is to use its resources to maximise profits in an open and free competition without deception or fraud.

Nonetheless, they take a slightly different position from Friedman by stating that stakeholder management enhances profit maximisation if business is carried out by synergising the interests of the suppliers, employees and the community. The authors argue succinctly that stakeholder theory is predicated on the mindset that different groups have interest or stakes in the activities that make up a business. They emphasise that Stakeholder theory involves the creation of a platform for customers, suppliers, employees, financiers, communities and managers to

interact in value creation; such that these relationships are effectively managed, taking into consideration the interests of all parties as shown in Figure 1.



Figure 1. Stakeholders Concept [25]

As shown in Figure 1, for any business organisation to succeed, it is pertinent to carefully consider and address the divergent interests of the stakeholders.

Chinweze, Echetebe and Onyeri [27], in a critical examination of the importance of stakeholders' engagement in the oil and gas industry in Nigeria, categorise the stakeholders in the NDR as the International Oil Companies (IOCs), organised labour, host communities, regional interests and government. The authors further state that due to the marginalisation of the stakes of the host communities, there has been constant protests, agitations and unrest in the NDR. The authors define stakeholders as a group, individual or organisation that are potentially affected by the operations of a business or whose interests are affected by the business. They emphasise that the host communities are most affected by the oil and gas operations due to the incessant environmental degradation and social alienation they are constantly subjected to. The authors further highlight that for a meaningful sustainable development in the NDR, given that the needs of the host communities are being neglected, there is need for a stakeholder's engagement that consider the interests of all the affected parties.

Adewunmi and Olatunbosun [28], contend that over the years attempts to solve the developmental challenges associated with oil and gas exploration in the NDR have not yielded the desired results. According to them, this has been the perception of the local stakeholders that they have been excluded from

the decision-making process on issues concerning their well-being, sustenance and existence. The authors further emphasise that over the years, the Nigerian government has failed to foster a broad-based participation and stakeholder engagement in the Niger Delta region.

The authors argue strongly that the problem of a broad-based stakeholder's engagement in the NDR could be addressed through the ratification of the International Labour Organisation (ILO) Convention 169 by the Nigerian Government. They further contend that the ILO Convention 169 is a viable tool in enhancing participatory rights in the NDR due to the alteration in the Nigerian constitution. The authors stress that sustainable objectives in the NDR can only be achieved through a process of constructive consultation and inclusive participation of the stakeholders. According to them, this process is instrumental in resolving conflicts resulting from the increased exploitation of natural resources in the NDR.

Prpich, Sam and Coulon [29] state that energy development and economic growth in Nigeria have come at cost to the environment of the host communities, resulting in hydrocarbon contaminated lands. The authors argue that constructive stakeholder engagement is a tool that can be used to understand and integrate interests of the host communities which could inform environmental regulation and sustainable development. The authors further state that years of neglect and mismanagement in the NDR have resulted in high levels of oil pollution with no remedy due to the limitations of regulations; stressing that stakeholder engagement is a viable alternative method to solving the prevalent issues.

The authors define stakeholders as a group of individuals that are affected by the operations of an organisation or could hinder the achievement of an organisation's objectives. Going a step further, they consider stakeholder engagement as the process of consultation or collaboration with individuals who are affected by the decisions, policies or operations of an organisation. They affirm that stakeholder engagement could be used to build trust, promote transparency, and understand the concerns of all parties involved.

Environmental Sustainability Issues in the Niger Delta Region - Sustainability as described by the Brundtland Commission [7] is meeting the needs of the present generation without compromising the ability to meet the needs of the future generation. Oka [30], analysing data collected from secondary sources, notes that the rich mangroves, tropical rainforest, and the aquatic environment of the Niger Delta region, have been devastated by oil spillages. The author highlights that between 1986 and 2003, more than 50,000 acres of mangrove forest were wiped off. The author states further that between 1976 and 2000, oil spill incidences affected 6% of the landmass, 25%

swampy area and 69% of the offshore environment. Also, the water resources, arable lands and plant species that support a population of more than 20 million communities including Ogoni, Ughelli and Oyakama have been battered. The author concludes that despite the scale of environmental degradation, it is business as usual for oil companies operating in the region, with no implementation of effective sustainable measures.

Giwa et al. [31], state that gas flaring occurs when natural gas is oxidized rapidly which results in the release of gases, heat and particulates into the atmosphere. Through a forensic analysis of data from secondary sources, they conclude that over a period of 50 years, 917.7×10^9 m³ of 1.78×10^{12} m³ of gas produced in the region was flared. This has constituted immensely to the environmental health risk of the people. In the study, they highlight that flared gas (FG) does not only contribute to global warming and climate change but is also a source of volatile organic chemicals, greenhouse gases, particulate matter and black carbon.

The authors further note that toxins such as sulphur dioxide, toluene, benzopyrene, xylene and hydrogen sulphide are associated with FG which cause air, water and soil pollution. This has an irreversible negative impact on vegetation, ecosystem, public health and environment. The study has succeeded in highlighting the magnitude of gas flaring in the NDR as well as demonstrating its devastating impact on the environment and public health.

Edwin and Ugbomeh [32] analysing data collected from secondary sources state that annually Nigeria flares over 17 billion m³ of natural gas with negative effects on biodiversity and wildlife, human health and climate change. The authors note that the benefits of biodiversity include cultural conservation, air and water purification. They argue that gas flares which contain more than 250 toxins contributed to about 100% loss of crops yields cultivated within the vicinity of the Izombe station in the NDR. Furthermore, they state that gas flaring contains contaminants like hydrogen sulphide, hydrocarbons and ash which acidify the soil, resulting in the depletion of soil nutrients. Other effects of gas flaring on crops noted by them include stunted growth, withering and scorched plants. The study has succeeded in highlighting the negative impacts of gas flaring generally, however, it does not proffer any solution to the problem.

Yakubu [33], states that oil and gas exploration and exploitation involve amongst others tree-felling, seismic activities, drilling, equipment installation and the application of explosives to produce sub-surface maps. This results in the damaging and critical alterations of vegetative cover, soil structure, flora population and areal fauna which lead to high risks of erosion. The author affirms that some of the waste

products generated from petroleum activities include, Produced Water (PW), drilling muds and cuttings. According to the author, PW composes of hazardous chemicals and radioactive materials which are environmentally unfriendly. The unwholesome disposal of these wastes has further aggravated the already deplorable environmental condition of the NDR. The author further states that in 2011, the UNEP assessment of the Ogoni land reported that industrial wastes of about 1000-1500m³ were indiscriminately and unhygienically disposed of; causing severe environmental health risks. This situation continues unremedied with serious negative consequences on the health of the people. The author proposes a robust environmental management plan/system and compliance with environmental laws to remedy the situation.

In agreement, Temilola et al. [34], analysing data collected on the effect of PW, note that it contains huge amounts of crude oil pollutants and by-products such as metal derivatives, polycyclic aromatic hydrocarbons (PAHs), naphthenic acids, phenols and other chemicals. These substances are toxic to the ecosystem; thereby destroying the mangroves and aquatic organisms. The study has succeeded in highlighting to a high degree, the toxicity of PW on the eco-system.

Environmental Sustainability and Conflict in the Niger Delta Region - Osagie et.al. [35], describes conflict as a situation that occurs when there are incompatible interests, feelings or actions amongst a group of people which cannot be resolved. The author states that most times conflicts are expressed through physical assault, threats, violence and vandalism. Analysing data using ANOVA statistics from questionnaires on the causes of conflicts in the Niger Delta region, the author argues that the deprivation of the indigenes of proceeds from oil despite the large-scale environmental degradation accounted for the greatest cause of conflict in the region. The author further states that conflicts between ethnic groups and the Multinational oil companies have been an ongoing issue dating back decades majorly on the issue of ‘resource control’. The following examples of such conflicts were cited: Umuechem vs Shell (October 1990), Uzere vs Shell (July 1992), and Ogoni vs Shell (1990 till date).

Demirel-Pegg and Pegg [2] using the Dynamics of Contention framework, examine the demobilisation of the Ogoni protest campaign in the mid-1990s. The authors succinctly highlight the brutal and indiscriminate repression by the Nigerian military government of moderate and non-violent activists in the NDR against environmental degradation and determination to gain greater control of oil exploitation in their land, leading to the execution of Ken Saro-Wiwa in 1995. Mai-Bornu [36], in a comparative study of Ogoni and Ijaw movements, states that the bases of conflict in the NDR have been

resource exploitation, marginalisation and neglect. The author argues that oil exploitation in the NDR has been utilized to benefit a few to the detriment of the vast majority; given its negative impacts on the environment.

Yahaya and Zango [37], state that conflicts arise from opposing views in interests and ideologies. The authors argue that conflicts in the NDR span over decades, which initially were protests against injustice, but in recent times, ‘resource control has been the root cause. The activities of the Multinationals have increasingly damaged the environment through high levels of oil spills and gas flaring, resulting in grave developmental defects and gross human neglect. The author notes that despite the revenues derived from the NDR, through oil exploration, the resource has been a curse rather than a blessing to the host communities as they continue to suffer untold hardship through poverty and environmental degradation. The authors stress that the NDR has been a tale of poverty, environmental degradation, and underdevelopment amidst plenty; resulting in conflicts for over four decades.

3. Methodological Approach

This research uses the Systems Thinking System Dynamics (ST/SD) methodological approach [9] to investigate the environmental sustainability issues arising from oil and gas operations in the NDR in Nigeria. This informs the environmental sustainability framework that could be developed to manage the operations. Qualitative data collected from journal articles, online archives, textbooks and oil and gas journals are analysed to understand the prevailing pertinent issues. Also, semi-structured interviews with key industry players will be carried out. The Systems Thinking System dynamics (ST/SD) tool is suitable for the Niger Delta situation because traditional econometric and linear programme techniques cannot analyse the non-linear relationships that exist between the system variables in energy systems. Delays which are inherently present in energy systems need to be captured and the interaction of the feedback loops that interact amongst each other must also be captured for modelling to be effective.

4. Discussion and Findings

Oil and Gas Exploration and Exploitation - Hydrocarbon exploration is the process of searching for deposits of oil and natural gas underground and international oil companies need exploration licenses to be able to extract oil and gas in commercial quantities from a geographical location [38]. In the Niger Delta region, oil exploration and exploitation have destroyed large areas of the mangrove ecosystem due to oil spills which have made the habitat toxic

[39]. Marine life, ground and drinkable water have been adversely affected by oil exploitation in the host communities as shown in Figure 2.

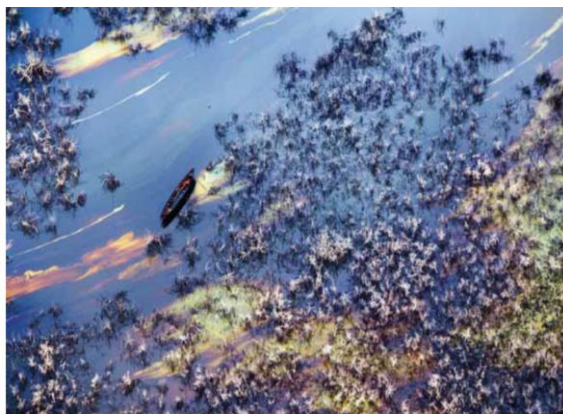


Figure 2. Hydrocarbon Pollution of Surface Water – Ogoni land [39]

As shown in Figure 2, most surface water in Ogoni land has been contaminated by oil pollution, thereby destroying the habitats, and endangering the health and safety of the people.

Mangroves are important and invaluable to humanity, providing habitat to fishes, improving water quality, enhancing coastal stabilization, serving as a source of fuel and medicinal ornaments, and enhancing carbon sequestration. Overexploitation of oil in the Niger Delta region has resulted in the continuous depletion of the mangroves despite its economic and environmental benefits [40]. Mangroves cover most tropical and subtropical coasts; approximately occupying 137,760 km² – 152,360 km² of the surface of the globe and in total, about 73 mangrove species across 123 countries are dispersed [41]. Oil exploration involves dynamiting for geological excavations, seismic lines clearing and the explosion of dynamite in aquatic environments, these have negatively impacted the mangrove area in the Niger Delta region [42].

Effects of Oil Spillages and Gas Flaring

The NDR has been subjected to environmental degradation due to oil and gas activities, resulting from oil spillages, gas flares, unwholesome disposal of wastes, erosion, etc. This has led to the pollution of farmlands, fishponds, consequently, causing the destruction of properties, human lives, including aquatic and biodiversity [43]. Despite the huge contribution of the NDR to the economic prosperity of Nigeria through oil revenues, the oil host communities, continue to suffer untold hardship. Environmental degradation in the oil-rich region poses a serious threat to human survival; unleashing excruciating pains in terms of poverty and deprivation [43].

Over the years, this has resulted in the people engaging in different forms of agitation and conflicts as the only avenue of seeking the attention of the government for even development and socio-economic emancipation of the region. According to the World Bank report on the region the state of environmental degradation of the region, all indices of development seriously fell short of acceptable standards [44]. Gas flaring is one of the major causes of environmental degradation in the NDR, with about 36.79 bcm of natural gas flared annually [30] resulting in health implications for the people living in the region.

In the Niger Delta, high levels of oil spillage have resulted in the degradation of agricultural lands, consequently increasing poverty levels and turning otherwise fertile lands to waste lands [44]. High retention time of oil in the soil causes poor aeration, affects soil structure, nutrients, temperature, pH and crop yields. Cassava, one of the crops widely planted in the region has been negatively affected by oil spillage. Secondary data analysed shows that causes of loss of cassava production include pest incidence, flooding insufficient processing facilities, poor transportation and oil spillage which is a major factor. Table 1 shows that oil spillage is a major factor in the losses of cassava production in the host communities.

Table 1. Major Causes of Loss of Cassava Production [45]

Causes	Host Communities- Frequency (51)	Non-host Communities – Frequency (51)
Pest/Disease	20	20
Flooding	22	21
Oil Spillage	51	0
Transportation Issues	20	18
Poor Facilities	15	17
Poor Market	5	2

As could be seen in the data presented in Table 1, the frequency of occurrence for each factor that causes loss of cassava production is 51. It is interesting to note that in the host communities, on every occasion of oil spillage, farmers record total loss.

Oil spill incidences in the Niger Delta region is one of the highest globally; with the region experiencing about 10,000 incidences in ten years in comparison to 10 experienced in the Eurozone in the same period [1]. The oil companies that operate in the region, continuously denigrate the environment with impunity through incessant high levels of oil spills, with no effective sustainable practice. In 2012, Chevron's gas rig in Southern Ijaw caused accidental oil spillage and severe gas fire which lasted 46 days [46]. In 2013, between January 2013 and September 2014, NOSDRA reported that about 2,000 oil spill incidences occurred in the core of the Niger Delta with negative impacts on the ecosystem [46]. Mobil Producing Nigeria Limited was penalised 10m naira for not cleaning up the Qua Iboe terminal oil spill in 2015. In the same year, Shell spilt about 40,000 barrels of oil through leakages along the Niger Delta coast which had negative impacts on the offshore ecosystem [46].

Gas flaring in the Niger Delta region has negatively impacted bio-diversity, contributed to global climate change and led to serious health challenges [47]. During the production of oil, associated gas is flared. Globally, the Niger Delta ranks 4th in bio-diversity hot spot and in Africa, it is the largest wetland, richly endowed with biological diversity. World bank data [48] on gas flaring by top 20 countries analysed shows that as of 2019, Nigeria ranks 7th.

In the NDR, gas flaring causes severe harm to the health of the people living close to gas flaring stations. Associated gas flared into the atmosphere contained harmful substances such as toluene, benzene, dioxin, Sulphur dioxide as well as Greenhouse gasses. Secondary data analysed, reveals that residents living close to gas flaring stations are at a higher risk of diseases relating with air pollution such as asthma, cough, chest pain, breathing difficulty, dizziness and eye irritation [49]. Gas flaring causes the release of greenhouse gases such as carbon dioxide and methane into the atmosphere which impact on the ozone layer and causes climate change, which affects mostly low-lying coastal areas such as the Niger Delta region [50]. This results in flooding, coastal erosion, raised temperatures, and rise in sea level; favouring proliferation of pests, spread of diseases and low agriculture productivity.

The greenhouse gases released into the atmosphere as a result of flared gas also contribute greatly to global warming by the trapping of long-wave infrared radiation in the atmosphere, which warms the earth and thus making the average temperature of the earth to rise [50]. Methane is the major component of

natural gas; in Nigeria, natural gas composes of about 90% methane, 2% carbon dioxide, 3.4% propane, 5.3% ethane and 2.4% heavier hydrocarbons [51]. About 52% of the Nigerian total proven gas reserve is associated natural gas which is trapped alongside with crude oil in the reservoir. The effect of gas flaring on the people and environment has also been vividly captured in the causal loop diagram (see Figure 3).

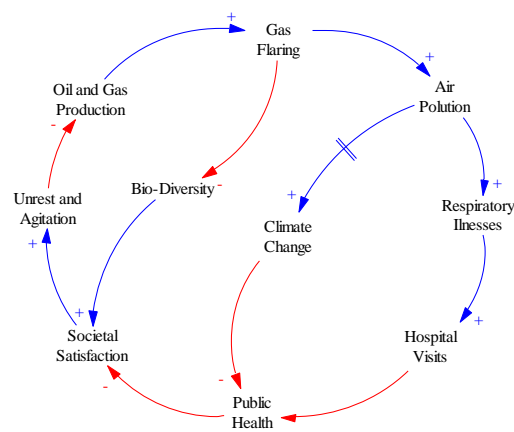


Figure 3. The Effect of Gas Flaring Drawn using Vensim PLE

Figure 4.2 demonstrates that gas flaring in the NDR causes air pollution, respiratory illness, climate change and an increase in hospital visits. It also impacts biodiversity, climate change and public health and ultimately results in agitation and disruption in oil and gas operations. Thus, there is a need to address the issue of gas flaring in the region.

Environmental Degradation and Conflict

Nigeria is a major player in the global energy market, the Niger Delta region is where the country's hydrocarbon reserves are located. Oil and gas operations in this region have resulted in unabated environmental degradation, causing colossal destruction of the means of livelihood (farming and fishing) of the people [51]. Aside from the large-scale environmental degradation in the area, the oil resource has been a curse rather than of any economic benefit to the people. The host communities live in squalor, abject poverty and deplorable condition, despite the huge revenues Nigeria derive from the exploration and exploitation of oil and gas in the region.

This situation has led to the region being embroiled in resistance, insurrection, conflicts and armed rebellion against the Nigerian government and the multinational oil companies. Consequently, the NDR is characterised by intense hostilities, conflicts and violent confrontations [2]. Youth groups and other interest groups often make demands from the multinational oil companies and when such demands are not honoured, they protest to stop production,

vandalise oil facilities, take hostages and seize properties. Sometimes, these conflicts are violent and could result in fatalities. The major concern of the people of the NDR has been high scale environmental degradation which has led to the destruction of their means of livelihood. Other concerns include unemployment, poverty, health problems and the overall underdevelopment of the region. This has often led to conflict and brutal repressions by the Nigerian government.

This unabated environmental degradation often results in protests and conflicts to gain the attention of the government and the international oil companies (IOCs). The NDR situation is such that there is high scale unemployment, poverty, and under-development, despite the huge revenues realised from oil and gas operations. Again, as this situation continues without any solution, the citizens resort to vandalism, disruption of operations and taking people hostages. The government would sometimes intervene with repression, brutality, arrests which could lead to the execution of some militant members. This has been vividly captured in a causal loop diagram (see Figure 4.).

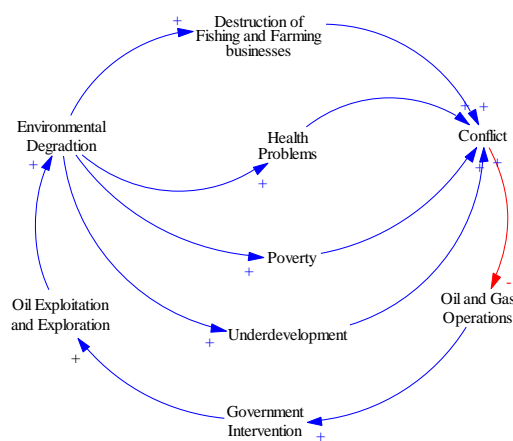


Figure 4. The NDR Conflict Web Drawn using Vensim PLE

Figure 4. demonstrates vividly that oil spillages, gas flares and unwholesome wastes disposal resulting from oil and gas operations in the NDR, cause environmental degradation which affect the means of livelihood of the people. This consequently leads to agitation and conflicts, hindering the smooth flow of oil and gas operations.

5. Recommendations

To enhance the environmental sustainability of oil and gas operations and tackle the conflict in the NDR, this paper makes the following recommendations:

- A complete overhaul of the Nigerian environmental laws and regulations should be carried out; such that violators are held accountable for their actions.
- The Nigerian government energy policy makers need to incorporate robust sustainable measures in energy planning and development for oil and gas companies and other industry stakeholders to adhere to.
- The Nigerian government should take pragmatic steps to encourage investment in technologies such as Carbon Capture and Storage (CCS), Carbon Capture and Utilization. The application of the CCS technology in a small plant in Norway proves to be 80-90% efficient, capturing about one million metric tons of CO₂ annually and could be deployed on a large-scale to mitigate the environmental impacts of oil and gas operations in the Niger Delta region.
- Digitalizing the Nigerian oil and gas industry to include the deployment of disruptive technologies such as robotics, drones, global positioning system, horizontal drilling technology, cloud computing, Internet of Things (IoT) storage technologies and digital platform would improve operational efficiencies as well as reduce environmental impacts. For example, Canada uses advanced vitalization, virtual and augmented reality combined with steam-assisted gravity drainage (SAGD) to manage complex reservoirs. This enhances performance and reduce environmental impacts.
- Lastly effective stakeholders' engagement involving the government, host communities and IOCs should be carried out in a bid to address concerns from all parties and proffer lasting solutions to environmental degradation and conflict in the NDR.

6. Conclusion

Given the foregoing discussions, it is evident that environmental sustainability issues in the Nigeria NDR have continually caused environmental degradation through incessant oil spillages and gas flaring. This has affected the farming and fishing businesses (major sources of income) of the people. It has also impacted negatively on their health and quality of life in general. Despite the huge revenues the Nigerian government derives from oil and gas operations in the NDR, poverty, squalor, conflicts, and underdevelopment have been the order of the day.

7. References

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