

# Investigating the Environmental Sustainability Issues of Oil and Gas Operations in the Niger Delta Region of Nigeria

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## Abstract

*Over the decades, the Nigeria Niger Delta has been bedeviled with environmental issues since the discovery of oil and gas at Oloibiri in 1956. Oil and gas activities in the Niger Delta region have resulted in environmental degradation through high levels of oil spillages and gas flaring. Oil and gas exploration and exploitation damage vegetation cover; causing a high risk of erosion, due to the lack of a robust environmental management plan. The non-standard practices of local refiners result in oil spillages which cause environmental degradation; wiping off more than 50,000 acres of mangrove forest. In the same vein, the unwholesome disposal of wastes like Produced Water (PW), drilling muds and cuttings pose serious environmental health risks]. Gas flaring is another major cause of environmental degradation in the Niger Delta region. Due to the lack of technology to harness flared gas, the practice contributes to climate change, and soil acidity; causing depletion of soil nutrients and loss of crop yields. There have been attempts by researchers and industry players to find a sustainable solution to the unabated environmental degradation but the situation is still ongoing. It is against this backdrop, that this research investigates the environmental sustainability issues of oil and gas operations in the Niger Delta region in Nigeria.*

*Keywords: Oil and Gas Operations, Environmental Sustainability Issues, Investigating, Nigeria.*

## 1. Introduction

Over the years, countries around the world have relied on oil and gas for energy security, economic growth, self-sufficiency and to gain geopolitical advantages [1]. The exploration and production of oil and gas continue to be a priority in producer countries around the globe with regulations being implemented to enhance the sustainability of the industry [1,2]. In 2018, before the pandemic, global energy production was 14 421 Mtoe, an increase of 3.2% compared to 2017; mainly driven by coal, oil and gas [3]. In total, fossil fuels accounted for up to 85% of global energy production the same year [3]. Thus, despite the global sensitisation towards renewable energy, oil and gas continue to play a key role in shaping world economies.

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 report titled "Our Common future" chaired by Brundtland (1987) emphasizes 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 2°C [4]. In 2015, the member states of the United Nations adopted the 2030 agenda for sustainable development, which includes acting on 17 Sustainable Development Goals [5]. 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 climate change and people's health and well-being continues unabated.

Globally, producing countries and oil and gas companies face the increasing demand to explain how they can contribute to the reduction of greenhouse gas emissions and the achievement of Paris Agreement goals [3]. This has necessitated energy companies to carefully consider adapting their operations and business models to reduce the impacts on the environment. On the one hand, the global society is faced with combating climate change, global warming and other negative impacts of oil and gas production on human lives. On the other hand, accessing affordable energy is key to human survival, especially as renewable energy prices are still beyond the reach of the ordinary.

In the 21st century, striking a balance between these two extreme situations is the quest of energy companies, producing countries, policymakers and researchers. Most oil and gas producing countries of the Global North such as the United Kingdom are implementing sustainable measures in energy production [6]. However, on a large scale, the Global South is yet to effectively tackle the attendant environmental and health impacts resulting from oil and gas operations. In the Niger Delta region in Nigeria which is the case study of this research, environmental degradation resulting from oil and gas operations continues at an unprecedented rate [7].

## 2. Literature Review

Okotie, Ogbarode and Ikporo [8] state that in Nigeria, oil and gas exploration and production activities take place majorly in the Niger Delta area. The region has contributed immensely in meeting global energy demand; thus, playing a key role in the global economy. According to the authors, geographically the NDR is located in the south-south region of Nigeria and comprises nine states (Abia, Imo, Ondo,

Rivers, Delta, Bayelsa, Akwa-Ibom, Edo and Cross Rivers). They further state that the population of the region is about 31 million, consisting of more than 40 ethnic groups such as Ijaw, Esan, Itsekiri, Obolo, Urhobo, Yoruba, Kalabari, Eleme, Bonny, Ibeno and others. The authors affirm that the NDR, is situated in southern Nigeria along the Atlantic coast; about 20,000 km<sup>2</sup> in size and has a coastline of approximately 450km- which is the biggest wetland in Africa and the third-largest globally.

Oil and gas activities in the Niger Delta region have resulted in environmental degradation through high levels of oil spillages and gas flaring [9]. Oil and gas exploration and exploitation damage vegetation cover; causing a high risk of erosion, due to the lack of a robust environmental management plan [9]. The non-standard practices of local refiners result in oil spillages which cause environmental degradation; wiping off more than 50,000 acres of mangrove forest [9]. In the same vein, the unwholesome disposal of wastes like Produced Water (PW), drilling muds and cuttings pose serious environmental health risks. This practice also destroys the mangroves and aquatic organisms [9].

Elenwo and Ankali [10] state that in Nigeria, the majority of natural gas is associated which is found in crude oil reserves. Because Nigeria does not have the technology to harness and convert the gas into good use, most of the gas is flared. The authors stress that globally Nigeria flares more natural gas, which is 20% of the world's total and 43% of the total gas produced annually. This is a situation that needs to be addressed; the gas flared in Nigeria should be harnessed through technology to reduce environmental pollution and convert it to good use.

Osuho and Fakutuju [11] expanded on the devastating consequences of gas flaring in the NDR. In the study, the authors succinctly highlight the social, economic, environmental and public health costs of FG to the region. They note that Nigeria, trailing behind Russia flares annually over 60% of its natural gas. Some of the effects of gas flaring highlighted include Green House Gas emission; health problems such as chronic respiratory diseases and immune system dysfunction. They recommend the establishment of Gas to Liquid (GTL) technology to reduce gas flaring by converting flared gas to synthetic diesel.

### 3. Methodological Approach

This research uses the Systems Thinking System Dynamics (ST/SD) methodological approach [12] 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 [13]. 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 [13].

The philosophy that underpins this research is interpretivism as it aligns with the qualitative (subjective) approach of the research; allowing for possible interpretations and analysis of the data gathered. Adopting the interpretivism philosophy enhances the creation of a new and better understanding of the issues surrounding oil and gas operations in the region. This allows the divergent views of the stakeholders including the oil producers, Nigerian government, Niger Delta citizens and environmentalists to be considered.

### 4. Initial Findings

Secondary data analysed reveal that high levels of oil spillages in the Niger Delta region still occur at an unprecedented level. Oil spillages have resulted in the degradation of agricultural lands; consequently, increasing poverty levels and turning otherwise fertile lands into wastelands [14]. The high retention time of oil in the soil causes poor aeration; affects soil structure, nutrients, temperature, and crop yields. Cassava, one of the crops widely planted in the region has been negatively affected by oil spillage; resulting in losses of cassava production in the host communities [14]. Between January 2013 and September 2014, the National Oil Spill Detection and Response Agency (NOSDRA) reported that about 2,000 oil spill incidences occurred in the core of the Niger Delta with negative impacts on the ecosystem [15]. 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 eco-system [15].

Associated gas flared into the atmosphere contained harmful substances such as toluene, benzene, dioxin, Sulphur dioxide as well as Greenhouse gasses [16]. Secondary data analysed, reveal that residents living close to gas flaring stations are at a higher risk of diseases relating to air pollution such as asthma, cough, chest pain, breathing difficulty, dizziness and eye irritation [16]. In the Niger Delta, gas flaring causes severe harm to the health of the people living close to gas flaring stations.

### 5. Conclusion

This research contributes to knowledge by investigating the environmental sustainability issues arising from oil and gas operations in the NDR in Nigeria. It argues for the continuous production of oil and gas in Nigeria, given its economic benefits, affordability and the peculiarity of the Nigerian situation. However, it strongly recommends the deployment of disruptive technologies such as the Carbon Capture Storage (CCS) to capture flared gas and convert to use. This has been deployed on some projects in Norway, Spain and Netherlands and has proved to be effective [17]. The report of the Intergovernmental Panel on Climate Change (2005) affirms that the CCS technology is capable of capturing up to 85%-95% of CO<sub>2</sub> released into the atmosphere. Therefore, the CCS is a game-changing

technology in combating climate change as it enhances sustainable industrial activities. Notwithstanding, the effective use of technology should be backed by a robust environmental law and strong political will.

## 6. References

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