

**Environmental ‘Post-Impact’ Assessment of Hydrocarbon
Contamination in Ogoniland, Nigeria
(Project Type 3)**

Group 11 Project Members

Muhammad Usman	202293980
Muhammad Hassaan Ali	202293008
Nahidul Kabir Siddiki	202291960
Mohammad Faraji Nejad	202096147
Pan-Okafor Olivia	201794384

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Abstract

Over the years, oil exploitation, exploration, and production activities in the Niger Delta have resulted in severe environmental degradation in the Southern Nigerian region. The Nigerian Upstream Petroleum Regulations mandate hydrocarbon drilling, exploration and processing companies to apply all practicable precautions that would prevent or control pollution to the environment.

Hydrocarbon oil spills recorded originated due to external impact from theft attempts on pipelines transporting processed crude through communities of Ogoniland. The need to remediate these impacted areas swamped by hydrocarbon oil and restore the ecosystem and vegetation is not only national but of international concern. This has attracted several environmental (post-impact) assessments from the government and independent organizations.

This project will evaluate the environmental ‘post impact’ assessment of hydrocarbon contamination in Ogoniland, situated in the southern part of Nigeria. The environmental assessments to review will cover contaminated land, groundwater, surface water, sediment and vegetation. Critical assessment of challenges and opportunities from the environmental assessment processes in the benefit of the impacted communities will be conducted using international best practices. The result of this project will find the best strategies for implementing environmental assessment with beneficial outcomes for impacted communities.

2.0 Details of steps followed in the study

2.1 Geographical scope

The study area, Ogoniland, covers 1,000 km² in Rivers State, southern Nigeria. There are four local government areas in Ogoniland are: Eleme, Gokana, Khana, and Tai. These areas in Ogoniland have been subjected to industrial oil operations, leaving a tragic history of pollution from oil spills and oil well fires. Environmental assessment investigations were conducted on surface water, sediments and aquatic biota focused on two major water systems, namely the Imo River in the east of Ogoniland and the numerous creeks that extend towards Ogoniland from the Bonny River.

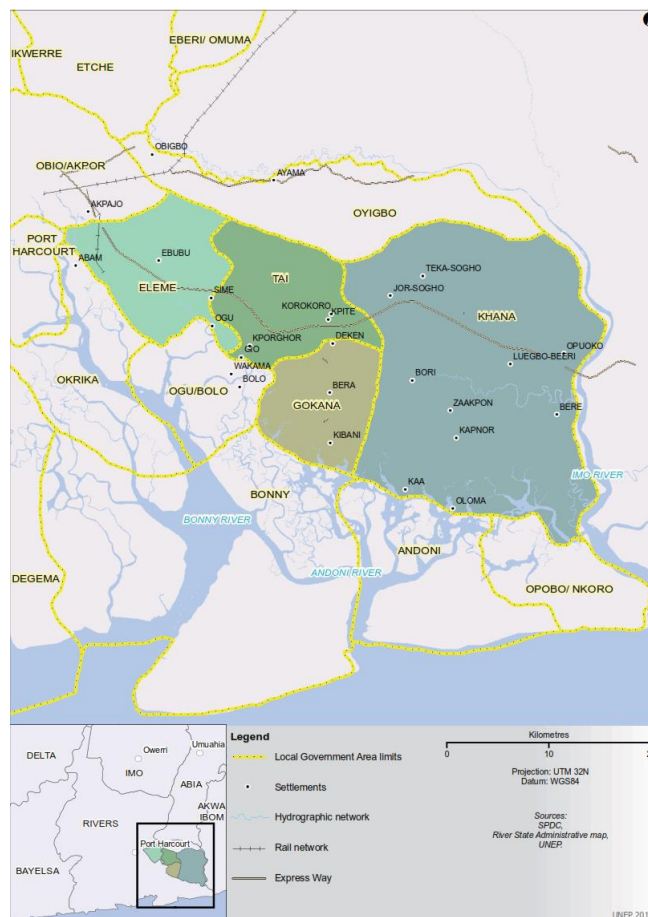


Figure 1: Ogoniland showing the four Local Government Areas (United Nations Environment Programme, UNEP 2011)

2.2 Assessment Process

The environmental assessment of the study area, which covered over 200 contaminated sites, included a desktop review, collection of samples from the impacted sites (soil, surface and groundwater, sediments and aquatic organisms) and laboratory analysis of collected samples. Analysis of the collected samples was in accordance with ISO 17025 procedure. Contaminants of concerns were determined with an established acceptable threshold in line with regulatory requirements and international standards.

Table 1: Comparison of country-specific risk-based screening levels for hydrocarbon-contaminated soil (UNEP, 2011)

Contaminant of Concern	Nigeria	Canada	China	Netherlands	UK
Benzene	1mg/kg	0.0068mg/kg	0.2mg/kg	1mg/kg	0.33mg/kg
Toluene	130mg/kg	0.08mg/kg	26mg/kg	130mg/kg	610mg/kg
Ethyl Benzene	50mg/kg	0.018mg/kg	10mg/kg	50mg/kg	350mg/kg
Xylene	25mg/kg	2.4mg/kg	5mg/kg	25mg/kg	230mg/kg

2.2 Soil and Water Contamination

The primary source of contamination was from operational and abandoned pipelines transporting hydrocarbon oil, otherwise known as crude oil. These crude oil spills impacted soil, surface water organisms, and groundwater quality in various communities within Ogoniland. The geographical extent of the spill and depth of penetration was established using developed sampling strategies.

2.3 Vegetation contaminant

Crude contamination migrated beyond soil and water bodies into the mangrove (beach ridge zone, saltwater zone and freshwater zone), where samples from the substrata of the mangrove vegetation were collected and analyzed.

2.4 Pollutants on public health

The impact of human exposure to identified contaminants of concern was assessed using medical records and questionnaire surveys/interviews.

2.5 Institutional and legal structures

The overall environmental assessment process was governed by Nigeria's environmental and petroleum resources statutory requirements driven by the agencies of the Federal Ministry of Environment and the Department of Petroleum Resources.

Discussion of the results

Environmental consequences of hydrocarbons

The contaminants of concern from petroleum hydrocarbons were commonly identified by different environmental assessments conducted for Ogoniland. As residents of the impacted communities were predominantly farmers and fishermen, established pathways of exposure to the contaminants were ingestion (oral), dermal and inhalation. Figure 2 shows the conceptual site model that highlights the exposure pathways of the identified contaminants of concern.

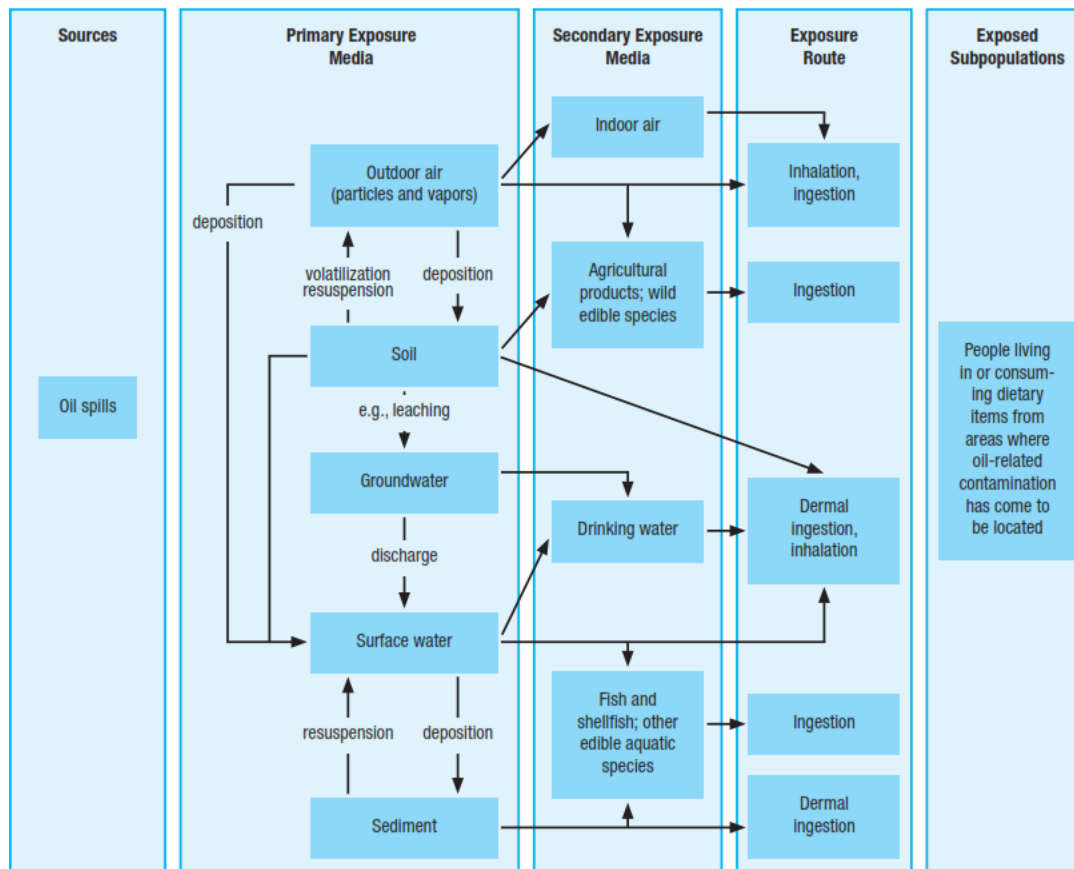


Figure 2: Conceptual Model of Human Exposure(UNEP, 2011)

The results of samples collected and analyzed from spill areas were checked against Nigerian standards for contaminated soil. Acceptable concentrations of the contaminants of concern in soil are required to be below the interventional level in accordance with the Environmental Guidelines and Standards for the Petroleum Industries in Nigeria (EGASPIN). EGASPIN, when benchmarked with other countries' intervention levels, meets the Netherlands' standards for contaminated soil. The study findings also highlighted that the concentration of benzene in air within the study area was 10% above the specification levels of global standards from the World Health Organisation (WHO) and the United States Environmental Protection Agency (USEPA). This concentration corresponds to a 1 in 10,000 cancer risk.

According to Petroleum (Drilling and Production) Regulations, oil companies are obliged to “adopt all practicable precautions including the provision of up-to-date equipment” to prevent pollution and must take “prompt steps to control and, if possible, end it”, if pollution does occur (Yakubu,2017). A crucial finding from the environmental assessments highlighted non-conformance to operating organization Standard Operating Procedures, as per industry best practice, intended to ensure the safe operation of hydrocarbon activities. Also, environmental assessment results pointed out that failure to fully implement Nigerian environmental protection laws, such as the EIA Act, is the primary cause of the Niger Delta environmental degradation.

The following are proposed strategies for implementing environmental assessment with beneficial outcomes for impacted communities.

Environmental Management System Model (EMS) Model

The EIA Act (Decree No. 86 of 1992) mandates an EIA to be carried out “where the extent, nature or location of a proposed project or activity is such that it is likely to significantly affect the environment.” This act is consistent with the requirements of the Canadian Environmental Assessment Act, 2012. An EIA is obligatory in certain cases, including oil and gas field development and construction of oil refineries, some pipelines, and processing and storage facilities. For strict implementation, EIAs are policed by the Federal Environmental Protection Agency and by state environmental protection agencies. According to Barry (2010), Environmental management transcends achieving sustainable development, one of its primary goals, but in addition, it promotes awareness, recognition and informed decisions to mitigate hazards to communities, the environment, including plant and animal life, as well as recovery of damaged ecosystems. In addition to the promotion of sustainable development, environmental management offers environmental public health security.

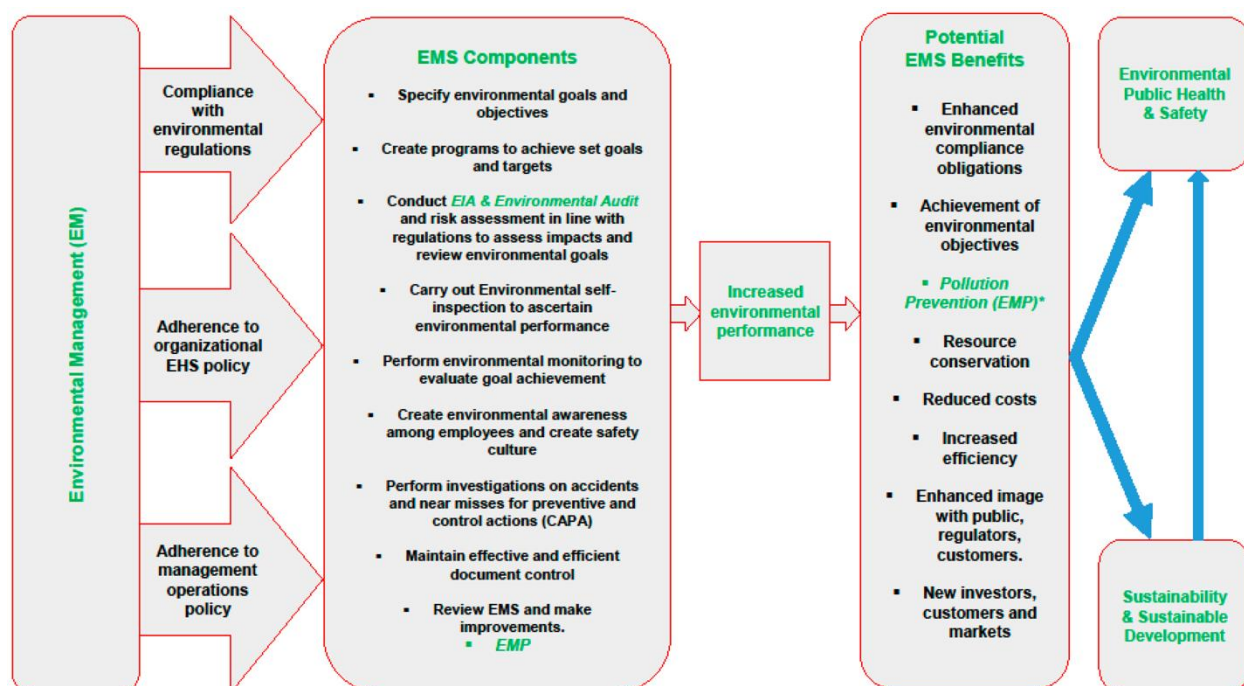


Figure 3: Environmental Management System Model (Yakubu, 2017)

According to the USEPA, Environmental Management System (EMS) refers to the structure that presents an organization with the potential for achieving its environmental goals by making adequate provisions for the evaluation, review, and improvement of its environmental performance in a planned and systematic way. This proposed structure is represented in Figure 3. EMS, as a proactive process, promotes an organization's compliance with statutory requirements in a cost-effective manner, thereby reducing the risks associated with non-compliance to enhance public health and safety. Environmental Impact Assessment, as a component of EMS, systematically identifies and assesses the potential effects of proposed prospective legislative actions, plans, programs, or projects, relative to the biological, chemical, cultural, physical, and socioeconomic elements of the environment (Council on Environmental Quality, 2016).

With respect to pollution prevention, ISO 14001, the International Organization for Standardization on Environmental Management Systems, defines pollution prevention as the adoption of processes, practices, techniques, materials, products, services, substances or energy that avoid or minimize or control (separately or in combination) the creation, emission or discharge of any type of pollutants or wastes thus reducing adverse environmental impacts (International Organization for Standardization, ISO, 2015). Based on this definition, an organization's level of implementation of EMS determines the extent to which pollution is prevented.

EMP, which provides a description of the methods and procedures for mitigation of impacts as part of the EIA process, should be profoundly embedded in considerations of resource prevention and pollution abatement, including air pollution, liquid effluents, solid wastes, environmental responsibilities, house-keeping, recovery/reuse of waste products, maintenance and operation

of environmental control systems. In practice, organizations that implement environmental management best practices are considered to avoid the cost of liability on the safety, environment and reputation of the organization.

Commitment to environmental preservation will proactively avert environmental degradation by preventing pollution once appropriate measures are taken by the responsible parties to do what is needed. Oil companies operating in the environment of the impacted communities undoubtedly have a best-in-class EMS incorporating EIA and EMP. However, the governance and compliance processes that would drive the implementation of the EMS is either considered as 'weak' or a totally inefficient process.

The overall intent of having an environmental system that is designed to prevent pollution of the environment during hydrocarbon processing and transporting is jeopardized. Failure on the part of the Nigerian government cannot go unnoticed. The government must empower existing regulatory bodies and ensure that they adopt established environmental laws in overseeing the operations of oil companies. It is important that existing laws requiring updates should be reviewed and validated to address the prevailing issues. For the proposed Environmental Management System to be viable, the oil company must undergo an organizational change in terms of obligations to the environment. Implementation of EMS with emphasis on pollution prevention and obligatory commitment would reduce reactive implications as compensations, cost of clean-up and overall business reputation.

While compensation is undertaken to effectively remedy pollution and affected community members who suffer from the ravaging consequences of oil pollution, it is not the best option.

The best approach is to be proactive and prevent the release of hazardous materials to the environment, which is the design intent of an environmental management system.

No amount of money can buy back a lost life. In the same vein, there is no open market value for such situations as psychological impairment and terminal diseases such as cancer. Damaged environments may take donkey years to fully recover, involving huge amounts of financial expenses that could have been productively invested elsewhere.

The operating oil companies need to commit to implementing their environmental management system throughout the entire duration of their operation. On the other hand, the Nigerian government, through its Ministry of Environment and Ministry of Petroleum agencies, should be saddled with the responsibility of driving compliance with EIA Act and environmental protection regulations and standards with oil companies. The proposed EMS model will provide a structured approach to preventing pollution during crude oil processing and transportation and would also increase the environmental performance of the organization.

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