Environmental Assessment of Ogoniland

UNEP

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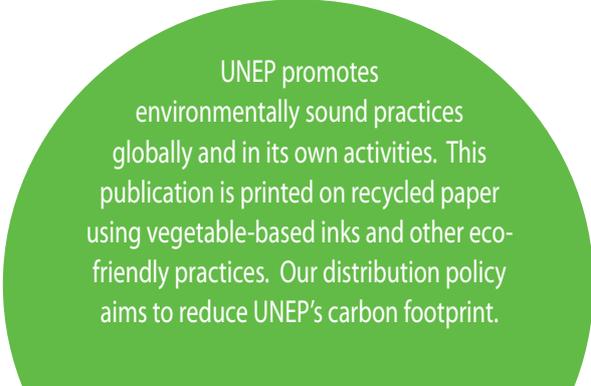
Environmental Assessment of Ogoniland

United Nations Environment Programme

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Foreword

The history of oil exploration and production in Ogoniland is a long, complex and often painful one that to date has become seemingly intractable in terms of its resolution and future direction.

It is also a history that has put people and politics and the oil industry at loggerheads rendering a landscape characterized by a lack of trust, paralysis and blame, set against a worsening situation for the communities concerned.

The reality is that decades of negotiations, initiatives and protests have ultimately failed to deliver a solution that meets the expectations and responsibilities of all sides.

In an attempt to navigate from stalemate to action, the Government of Nigeria, in consultation with many of the relevant actors, invited UNEP to consider undertaking an assessment of oil pollution in Ogoniland.

UNEP has acquired an international reputation for assembling expert teams, coordinating demanding assessments and bringing scientific and empirical evidence to policymakers.

UNEP initially consulted with a wide range stakeholders and the United Nations Country Team in Nigeria in order to consider the scope and indeed the feasibility of the assessment.

We were confronted with a unique challenge: lack of trust between actors; political tensions between communities; regional and national government; gaining access to Ogoniland; security considerations and technical and logistical challenges.

Despite imperfect conditions, UNEP in the end agreed to undertake the study as it represented the only tangible option for possibly breaking the decades of deadlock while providing the government and stakeholders with a potential foundation upon which trust might be built and action undertaken to remedy the multiple health, environmental and sustainable development issues facing millions of people in Ogoniland and beyond.

In order to ensure the independence of the study and provide the logistics necessary, a framework for cooperation was negotiated in which all parties were involved and a recognized team of national and international experts then recruited for the two year assessment.

This report details how that team carried out their work, where samples were taken and the findings that they have made. Over a 14-month period, the UNEP team examined more than 200 locations, surveyed 122 kms of pipeline rights of way, reviewed more than 5,000 medical records and engaged over 23,000 people at local community meetings. Detailed soil contamination investigations were conducted at 69 sites. Altogether more than 4,000 samples were analyzed, including water taken from 142 groundwater monitoring wells drilled specifically for the study and soil extracted from 780 boreholes.

The findings in the report underline that there are, in a significant number of locations, serious threats to human health from contaminated drinking water to concerns over the viability and productivity of ecosystems. In addition that pollution has perhaps gone further and penetrated deeper than many may have previously supposed.

This report represents the best available understanding as to what has happened to the environment of Ogoniland – and the corresponding implications for affected populations – over many years of oil industry operations. It provides the government, stakeholders and the international community with invaluable, baseline information on the scale of the challenge and priorities for action in terms of clean-up and remediation.

It does not address all scenarios and answer all questions which have arisen over the years, particularly in respect to legal questions which were beyond the terms of reference of the undertaking.

But UNEP believes it can provide a firm foundation upon which all the stakeholders concerned can, if

they so wish, draw up a response to the findings presented here.

Before and during the assessment, the consensus that has allowed this work to proceed in the first place was at times fluid and sometimes fractious and fragile. Many questions were raised, not least surrounding how the study was financed and by whom. The report and its long list of annexes needs to speak for itself.

But it is important to point out that from the outset UNEP deemed it right and appropriate that key actors in the petroleum sector should bear the financial costs for this assessment and this was spelt out in the project document which is publicly available.

To date all parties have honoured those commitments and the rigor, independence and impartiality of the study and its conclusions has been maintained which we hereby acknowledge.

This study would not have been possible without the local knowledge and cooperation of the Ogoni people and the support of many other stakeholders in Nigeria. We wish to sincerely thank the members of the Presidential Implementation Committee, under the Chairmanship of The Most Reverend Matthew Kukah, Bishop for the Diocese of Sokoto; the former Federal Minister for the Environment, The Hononourable John Odey; the traditional rulers of Ogoniland, in particular the Paramount Ruler, His Majesty King Godwin N.K. Gininwa; the Executive Governor of Rivers State, the Right Honourable Rotimi Chibuike Amaechi, along with the faculty and students at the Rivers State University of Science and Technology led by Vice Chancellor Professor Barineme Beke Fakae.

We also appreciate the assistance of our colleagues at the UN Nigeria Country Team, in particular the UN Resident Coordinator, Mr Daouda Touré, the Country Director of the United Nations Development Programme, Ms Ade Mamonyane Lekoetje, and the Resident Representative and Resident Security Coordinator in Port Harcourt, Mr Larry Boms.

I would also like to thank the national and international members of the assessment team including UNEP staff members.

For the first time, there is systematic and scientific evidence available in the public arena on the nature, extent and impacts of oil contamination in Ogoniland. The report also provides clear operational guidelines as to how that legacy can be addressed.

The oil industry has been a key sector of the Nigerian economy for over 50 years. But many Nigerians have paid a high price, as this assessment underlines. It is UNEP's hope that the findings can catalyze not only significant environmental and social improvements in the region but a strategic policy on how the oil industry there will function in a way that truly benefits the lives and livelihoods of these communities now and in the future.

Achim Steiner
United Nations Under-Secretary-General
Executive Director
of the United Nations Environment Programme

Executive Summary

Introduction

Covering around 1,000 km^2 in Rivers State, southern Nigeria, Ogoniland has been the site of oil industry operations since the late 1950s. Ogoniland has a tragic history of pollution from oil spills and oil well fires, although no systematic scientific information has been available about the ensuing contamination.

With this independent study, conducted at the request of the Federal Government of Nigeria, the United Nations Environment Programme (UNEP) reveals the nature and extent of oil contamination in Ogoniland.

The *Environmental Assessment of Ogoniland* covers contaminated land, groundwater, surface water, sediment, vegetation, air pollution, public health, industry practices and institutional issues.

This report represents the best available understanding of what has happened to the environment of Ogoniland – and the corresponding implications for affected populations – and provides clear operational guidance as to how that legacy can be addressed.

Assessment process

Involving desk review, fieldwork and laboratory analysis, the two year study of the environmental and public health impacts of oil contamination in Ogoniland is one of the most complex on-the-ground assessments ever undertaken by UNEP.

UNEP recruited a team of international experts in disciplines such as contaminated land, water, forestry and public health, who worked under the guidance of senior UNEP managers. This team worked side-by-side with local experts, academics and support teams comprised of logistics, community liaison and security staff.

The UNEP project team surveyed 122 kms of pipeline rights of way and visited all oil spill sites, oil wells and other oil-related facilities in Ogoniland, including decommissioned and abandoned facilities, that were known and accessible to UNEP during the fieldwork period, based on information provided by the Government regulators, Shell Petroleum Development Company (Nigeria) Ltd (SPDC) and community members in and around Ogoniland.

Public meetings staged throughout Ogoniland during each phase of the study helped to build understanding of UNEP's project and to foster community participation

During aerial reconnaissance missions, UNEP experts observed oil pollution which was not readily visible from the ground, including artisanal refining sites. Information provided by Ogoniland residents about oil contamination in their communities supplemented official oil spill data supplied by the Nigerian Government and SPDC.

Following its initial investigations, UNEP identified 69 sites for detailed soil and groundwater investigations. In addition, samples of community drinking water, sediments from creeks, surface water, rainwater, fish and air were collected throughout Ogoniland and in several neighbouring areas. Altogether more than 4,000 samples were analyzed, including water drawn from 142 groundwater monitoring wells drilled specifically for the study, and soil extracted from 780 boreholes. The UNEP project team also examined more than 5,000 medical records and staged 264 formal community meetings in Ogoniland attended by over 23,000 people.

The samples were collected following internationally-accepted sample management procedures and dispatched for analysis to accredited (ISO 17025) laboratories in Europe. The analytes examined in the study included certain groups of hydrocarbons that are known to have adverse impacts and which are therefore dealt with selectively in oil-spill assessment and clean-up work. The most important of these are BTEX (benzene, toluene, ethylbenzene and xylenes) and PAHs (polycyclic aromatic hydrocarbons). Volatile organic compounds (VOCs) were the main target of UNEP's air quality investigations.

Extensive remote sensing analyses complemented the fieldwork. Reviews of legislation, institutions, oil industry practices and available remediation technologies were also undertaken by international experts to complete the study.

A selection of the study's key findings and recommendations are summarized below. Given the vast amount of data generated during the assessment, the following content should not be considered in isolation.

Summary of findings

UNEP's field observations and scientific investigations found that oil contamination in Ogoniland is widespread and severely impacting many components of the environment. Even though the oil industry is no longer active in Ogoniland, oil spills continue to occur with alarming regularity. The Ogoni people live with this pollution every day.

As Ogoniland has high rainfall, any delay in cleaning up an oil spill leads to oil being washed away, traversing farmland and almost always ending up in the creeks. When oil reaches the root zone, crops and other plants begin to experience stress and can die, and this is a routine observation in Ogoniland. At one site, Ejama-Ebubu in Eleme local government area (LGA), the study found heavy contamination present 40 years after an oil spill occurred, despite repeated clean-up attempts.

The assessment found that overlapping authorities and responsibilities between ministries and a lack of resources within key agencies has serious implications for environmental management on-the-ground, including enforcement.

Remote sensing revealed the rapid proliferation in the past two years of artisanal refining, whereby crude oil is distilled in makeshift facilities. The study found that this illegal activity is endangering lives and causing pockets of environmental devastation in Ogoniland and neighbouring areas.

Contaminated soil and groundwater

- The report concludes that pollution of soil by petroleum hydrocarbons in Ogoniland is extensive in land areas, sediments and swampland. Most of the contamination is from crude oil although contamination by refined product was found at three locations.

- The assessment found there is no continuous clay layer across Ogoniland, exposing the groundwater in Ogoniland (and beyond) to hydrocarbons spilled on the surface. In 49 cases, UNEP observed hydrocarbons in soil at depths of at least 5 m. This finding has major implications for the type of remediation required.

- At two-thirds of the contaminated land sites close to oil industry facilities which were assessed in detail, the soil contamination exceeds Nigerian national standards, as set out in the Environmental Guidelines and

Standards for the Petroleum Industries in Nigeria (EGASPIN).

- At 41 sites, the hydrocarbon pollution has reached the groundwater at levels in excess of the Nigerian standards as per the EGASPIN legislation.

- The most serious case of groundwater contamination is at Nisisioken Ogale, in Eleme LGA, close to a Nigerian National Petroleum Company product pipeline where an 8 cm layer of refined oil was observed floating on the groundwater which serves the community wells.

Vegetation

- Oil pollution in many intertidal creeks has left mangroves denuded of leaves and stems, leaving roots coated in a bitumen-like substance sometimes 1 cm or more thick. Mangroves are spawning areas for fish and nurseries for juvenile fish and the extensive pollution of these areas is impacting the fish life-cycle.

- Any crops in areas directly impacted by oil spills will be damaged, and root crops, such as cassava, will become unusable. When farming recommences, plants generally show signs of stress and yields are reportedly lower than in non-impacted areas.

- When an oil spill occurs on land, fires often break out, killing vegetation and creating a crust over the land, making remediation or revegetation difficult.

- Channels that have been widened and the resulting dredged material are clearly evident in satellite images, decades after the dredging operation. Without proper rehabilitation, former mangrove areas which have been converted to bare ground are being colonized by invasive species such as nipa palm (which appears to be more resistant to heavy hydrocarbon pollution than native vegetation).

- In Bodo West, in Bonny LGA, an increase in artisanal refining between 2007 and 2011 has been accompanied by a 10% loss of healthy mangrove cover, or 307,381 m². If left unchecked, this may lead to irreversible loss of mangrove habitat in this area.

Aquatic

- The UNEP investigation found that the surface water throughout the creeks contains hydrocarbons. Floating layers of oil vary from thick black oil to thin sheens. The highest reading of dissolved hydrocarbon in the water column, of 7,420 µg/l, was detected at Ataba-Otokroma, bordering the Gokana and Andoni LGAs.

- Fish tend to leave polluted areas in search of cleaner water, and fishermen must therefore also move to less contaminated areas in search of fish. When encountered in known polluted areas, fishermen reported that they were going to fishing grounds further upstream or downstream.

- Despite community concerns about the quality of fish, the results show that the accumulation of hydrocarbons in fish is not a serious health issue in Ogoniland but that the fisheries sector is suffering due to the destruction of fish habitat in the mangroves and highly persistent contamination of many of the creeks, making them unsuitable for fishing.

- Where a number of entrepreneurs had set up fish farms in or close to the creeks, their businesses have been ruined by an ever-present layer of floating oil.

- The wetlands around Ogoniland are highly degraded and facing disintegration. The study concludes that while it is technically feasible to restore effective ecosystem functioning of the wetlands, this will only be possible if technical and political initiatives are undertaken.

Public health

- The Ogoni community is exposed to petroleum hydrocarbons in outdoor air and drinking water, sometimes at elevated concentrations. They are also exposed through dermal contacts from contaminated soil, sediments and surface water.

- Since average life expectancy in Nigeria is less than 50 years, it is a fair assumption that most members of the current Ogoniland community have lived with chronic oil pollution throughout their lives.

Contaminated river at Sugi Bodo, Gokana LGA. The report provides baseline information on the scale of the challenge for Ogoniland and priorities for action in terms of clean-up and remediation

- Of most immediate concern, community members at Nisisioken Ogale are drinking water from wells that is contaminated with benzene, a known carcinogen, at levels over 900 times above the World Health Organization (WHO) guideline. The report states that this contamination warrants emergency action ahead of all other remediation efforts.

- Hydrocarbon contamination was found in water taken from 28 wells at 10 communities adjacent to contaminated sites. At seven wells the samples are at least 1,000 times higher than the Nigerian drinking water standard of 3 μg/l. Local communities are aware of the pollution and its dangers but state that they continue to use the water for drinking, bathing, washing and cooking as they have no alternative.

- Benzene was detected in all air samples at concentrations ranging from 0.155 to 48.2 μg/m³. Approximately 10 per cent of detected benzene concentrations in Ogoniland were higher than the concentrations WHO and the United States Environmental Protection Agency (USEPA) report as corresponding to a 1 in 10,000 cancer risk. Many of the benzene concentrations detected in Ogoniland were similar to those measured elsewhere in the world, given the prevalence of fuel use and other sources of benzene. However, the findings show that some benzene concentrations in Ogoniland were higher than those being measured in more economically developed regions where benzene concentrations are declining because of efforts to reduce benzene exposure.

Institutional issues

- First issued in 1992, the EGASPIN form the operational basis for environmental regulation of the oil industry in Nigeria. However, this key legislation is internally inconsistent with regard to one of the most important criteria for oil spill and contaminated site management – specifically the criteria which trigger remediation or indicate its closure (called the 'intervention' and 'target' values respectively).

- The study found that the Department of Petroleum Resources (DPR) and the National Oil Spill Detection and Response Agency (NOSDRA) have differing interpretations of EGASPIN. This is enabling the oil industry to close down the remediation process well before contamination has been eliminated and soil quality has been restored to achieve functionality for human, animal and plant life.

- The Nigerian Government agencies concerned lack qualified technical experts and resources. In the five years since NOSDRA was established, so few resources have been allocated that the agency has no proactive capacity for oil-spill detection. In planning their inspection visits to some oil spill sites, the regulatory authority is wholly reliant on the oil industry for logistical support.

- The oilfield in Ogoniland is interwoven with the Ogoni community. The fact that communities have set up houses and farms along rights of way is one indicator of the loss of control on the part of the pipeline operator and the government regulator.

- The UNEP project team observed hundreds of industrial packing bags containing 1,000-1,500 m^3 of waste, believed to be cuttings from oil drilling operations, dumped at a former sand mine in Oken Oyaa in Eleme LGA. The open disposal of such waste in an unlined pit demonstrates that the chain of custody in the region between the waste generator, transporter and disposal facility is not being followed.

Oil industry practices

- The study concludes that the control, maintenance and decommissioning of oilfield infrastructure in Ogoniland are inadequate. Industry best practices and SPDC's own procedures have not been applied, creating public safety issues.

- Remediation by enhanced natural attenuation (RENA) – so far the only remediation method observed by UNEP in Ogoniland – has not proven to be effective. Currently, SPDC applies this technique on the land surface layer only, based on the assumption that given the nature of the oil, temperature and an underlying layer of clay, hydrocarbons will not move deeper. However, this basic premise is not sustainable as observations made by UNEP show that contamination can often penetrate deeper than 5 m and has reached the groundwater in many locations.

- Ten out of the 15 investigated sites which SPDC records show as having completed remediation, still have pollution exceeding the SPDC (and government) remediation closure values. The study found that the contamination at eight of these sites has migrated to the groundwater.

- In January 2010, a new Remediation Management System was adopted by all Shell Exploration and Production Companies in Nigeria. The study found that while the new changes are an improvement, they still do not meet the local regulatory requirements or international best practices.

Summary of recommendations

The study concludes that the environmental restoration of Ogoniland is possible but may take 25 to 30 years. The report contains numerous recommendations that, once implemented, will have an immediate and positive impact on Ogoniland. Further recommendations have longer timelines that will bring lasting improvements for Ogoniland and Nigeria as a whole.

The hydraulic connection between contaminated land and creeks has important implications for the sequence of remediation to be carried out. Until the land-based contamination has been dealt with, it will be futile to begin a clean-up of the creeks.

Due to the wide extent of contamination in Ogoniland and nearby areas, and the varying degrees of degradation, there will not be one single clean-up technique appropriate for the entire area. A combination of approaches will therefore need to be considered, ranging from active intervention for cleaning the top soil and replanting mangrove to passive monitoring of natural regeneration. Practical action at the regulatory, operational and monitoring levels is also proposed.

It is recommended that the restoration of mangroves be viewed as a large-scale pilot project in which multiple approaches to clean-up and restoration, once proven, can be replicated elsewhere as needed in the Niger Delta.

Emergency measures

The report identifies eight emergency measures which, from a duty of care point of view, warrant immediate action.

Emergency Measures

1. Ensure that all drinking water wells where hydrocarbons were detected are marked and that people are informed of the danger

2. Provide adequate sources of drinking water to those households whose drinking water supply is impacted

3. People in Nsisioken Ogale who have been consuming water with benzene over 900 times the WHO guideline are recorded on a medical registry and their health status assessed and followed up

4. Initiate a survey of all drinking water wells around those wells where hydrocarbons were observed and arrange measures (1-3) as appropriate based on the results

5. Post signs around all the sites identified as having contamination exceeding intervention values warning the community not to walk through or engage in any other activities at these sites

6. Post signs in areas where hydrocarbons were observed on surface water warning people not to fish, swim or bathe in these areas

7. Inform all families whose rainwater samples tested positive for hydrocarbons and advise them not to consume the water, and

8. Mount a public awareness campaign to warn the individuals who are undertaking artisanal refining that such activities are damaging their health.

- To begin prioritizing specific locations to be cleaned up, restored or rehabilitated, the report suggests the following framework:
  - **Priority 1.** All instances where the Ogoni community is known to be at risk
  - **Priority 2.** Instances where contamination could potentially affect the community (e.g. where groundwater, fishing grounds or agricultural land are impacted)
  - **Priority 3.** Instances where a community's livelihood support base is impacted, and
  - **Priority 4.** Instances where there is no immediate risk to people but where there is non-compliance with the law.

Operational recommendations

- Immediate steps must be taken to prevent existing contaminated sites from being secondary sources of ongoing contamination while further risk assessments and investigations are undertaken for detailed planning of the clean-up of Ogoniland during a recommended Transition Phase.

- All sources of ongoing contamination, including the artisanal refining which is currently ongoing in the creeks, must be brought to a swift end before the clean-up of the creeks, sediments and mangroves can begin.

- A campaign in Ogoniland to end illegal oil-related activities should be jointly conducted by the government, oil companies and local authorities. It should include an awareness component highlighting the disproportionate environmental footprint of artisanal refining (borne by all sections of the community) and spell out training, employment and livelihood incentives that will encourage people away from participating in this illegal activity.

Technical recommendations for environmental restoration

- **Surface water**. Clean-up activities of the mangroves and soil should not be initiated before all possible measures are taken to stop ongoing pollution from reaching the creeks.

- **Restoration of swamplands.** The most extensive area in terms of treatment of contamination will be the topsoil from the swamplands. The two main options are manual cleaning of contaminated topsoil and low-pressure water jetting. A portable facility which can be fixed on a barge, move through the bigger creeks and act as a base for decontamination crews, should be considered.

- A proposed **Integrated Contaminated Soil Management Centre** will be a modern industrial enterprise in Ogoniland employing hundreds of people. On-site 'mini treatment centres' for bioremediation and excavation water will also act as staging areas feeding the main soil treatment centre.

- **Treatment of contaminated sediments.** Decisions on intervention for sediment treatment are more complicated than simply basing them on an intervention value. Issues of erosion, vegetation damage and impact on local aquatic ecosystems as well as potential for natural recovery all need to be part of the decision-making process. In some cases, contaminated sediments will have to be dredged as part of the clean-up or they will act as reservoirs of pollution after the ongoing pollution has been eliminated.

- **Decontamination of groundwater.** The issue of hydrocarbon contamination needs to be addressed in a comprehensive manner, but clean-up actions must be site-specific. In making decisions about the clean-up of groundwater, additional factors such as proximity to the community, absorption characteristics of the soil and all possible pathways must be considered, and this will require additional data to be gathered as part of the detailed clean-up planning process.

- **Mangrove restoration.** Local nurseries should be established so that healthy, indigenous plants will be available to regenerate heavily impacted mangrove stands. Rehabilitation will focus on red mangroves along the waterfront and on white mangroves inland – which have been most severely impacted – and also on containing the spread of invasive species.

Recommendations for public health

- Everyone who has consumed water from contaminated sources should be requested to undertake a comprehensive medical examination by physicians knowledgeable about the possible adverse health effects of the hydrocarbons detected.

- A focussed medical study should be initiated to track the health of the Ogoni community over their lifetimes to ensure any possible health impacts are identified early enough and acted upon.

During and following clean-up operations in Ogoniland, a monitoring programme should be put in place which includes monthly monitoring of surface water and quarterly monitoring of sediments

Table E1. Summary of UNEP's recommendations for monitoring

Monitoring sector	Monitoring approach	Frequency
Preventive surveillance	Aerial scouting	Weekly
	Surveillance from boats	Weekly
	Surveillance of facilities and incident sites	Weekly
Groundwater	Household visits in impacted communities	One-off
	Wells around impacted sites and facilities	Monthly
Water bodies	Surface water	Monthly
	Sediments	Quarterly
	Fish	Quarterly
	Benthic organisms	Quarterly
Vegetation	Transects in creeks and oilfield sites	Once a year
	Mangrove fauna	Once a year
	Analysis of satellite imagery	Once a year
Air quality	Particulate measurements, hydrocarbons	Monthly
Public health	Cohort registry of highly exposed communities	Yearly
	Public health registry of entire Ogoniland community	Yearly

Recommendations on monitoring

- During and following clean-up operations in Ogoniland, a monitoring programme should be put in place in consultation with the national institutions mandated to deal with specific environmental issues. All monitoring activities should be communicated to the community and all results should be publicly available.

- Comprehensive air quality monitoring across Ogoniland should be initiated to detect ongoing pollution, to help establish guidelines for protecting public health and to track improvements at sites where clean-up activities are under way.

- A public health registry should be established for the entire Ogoniland population in order to determine health trends and take proactive action individually or collectively where impacts related to long-term exposure to hydrocarbon pollution are evident.

Recommendations for changes to regulatory framework

- Transfer oversight of the EGASPIN legislation from DPR to the Federal Ministry of Environment, with the concurrent transfer of staff or by recruiting and training new staff.

- Comprehensively review existing Nigerian legislation on contaminated site clean-up considering recent international developments in regulation and incorporating community consultation to determine remediation closure levels so that decisions on new legislation are seen as both transparent and inclusive.

Recommendations for Government

- The report recommends that the Government of Nigeria establishes an **Ogoniland Environmental Restoration Authority** to oversee implementation of this study's recommendations. With a fixed initial lifespan of 10 years, the Authority will have a separate budget which will accrue from an Ogoniland Environmental Restoration Fund and its staff will largely be seconded from relevant national and state institutions.

- The overall cost of the clean-up should not be an obstacle to its implementation. Therefore, an **Environmental Restoration Fund for Ogoniland** should be set up with an initial capital injection of USD 1 billion contributed by the oil industry and the Government.

It is UNEP's hope that the findings can catalyze significant environmental and social improvements in the region

To be managed by the Authority, the Fund should be used only for activities concerning the environmental restoration of Ogoniland, including capacity building, skills transfer and conflict resolution.

- A **Centre of Excellence for Environmental Restoration** should be established in Ogoniland to promote learning in other areas impacted by oil contamination, in the Niger Delta and elsewhere in the world. Offering a range of activities and services, the Centre could run training courses in environmental monitoring and restoration and ultimately become a model for environmental restoration, attracting international attention.

- Build the capacity of government agencies to enable them to fulfil their mandates, through such actions as increasing human resources and equipment, and improving the technical skills of staff.

- A public awareness campaign should be mounted to improve the community's understanding of the environmental and health impacts arising from hydrocarbon contamination in Ogoniland. This should include a formal education component in the academic curricula in the Niger Delta.

Recommendations for oil industry operators

- SPDC procedures for oil spill clean-up and remediation need to be fully reviewed and overhauled so as to achieve the desired level of environmental restoration. In addition to procedures and clean-up methods, contracting and supervision also need to be improved.

- SPDC should conduct a comprehensive review of its assets in Ogoniland and develop an 'Asset Integrity Management Plan for Ogoniland' and a decommissioning plan. These plans should be communicated to the Ogoni people.

- It is recommended that SPDC works with the Nigerian regulators to clarify the paradox of remedial intervention and target values being the same. The parties should also agree on a consultative approach to setting site-specific clean-up values.

- In the event that a decision is made to restart oil exploration and production activities in Ogoniland, the region should be treated as a green-field site of high environmental and social sensitivity. This would mean applying the latest technologies and environmental guidelines, such as re-evaluating pipeline routes to minimise environmental damage and allocating a percentage of all project costs for environmental and sustainable development initiatives in Ogoniland.

Recommendations for the Ogoniland community

- The Ogoni community should take full advantage of the employment, skills development and other opportunities that will be created by the clean-up operation which is aimed at improving their living conditions and livelihoods.

- Community members should avoid protracted negotiations over access by oil spill response teams as this means that responses to spills are delayed, resulting in a far greater environmental impact.

- The community should take a proactive stand against individuals or groups who engage in illegal activities such as bunkering and artisanal refining.

The way forward

Restoring the livelihoods and well being of future Ogoni generations is within reach but timing is crucial. Given the dynamic nature of oil pollution and the extent of contamination revealed in UNEP's study, failure to begin addressing urgent public health concerns and commencing a clean-up will only exacerbate and unnecessarily prolong the Ogoni people's suffering.

A Transition Phase is recommended to maintain momentum and begin detailed planning in the intervening period between the release of UNEP's environmental assessment and the commencement of a clean-up operation guided by an Ogoniland Environmental Restoration Authority.

While fishing was once a prime activity in Ogoniland, it was evident from community feedback and field observations that it has essentially ceased in areas polluted by oil

Introduction

Introduction

This report presents the results of an environmental assessment undertaken by the United Nations Environment Programme (UNEP) in Ogoniland, Nigeria. The study covers thematic issues of contaminated land, groundwater, surface water and sediments, vegetation, air pollution and public health.

Ogoniland has witnessed recurrent social unrest during the past several decades over concerns related to oil industry operations, its revenue and petroleum-related contamination. Although oil industry operations were suspended in Ogoniland in 1993, widespread environmental contamination remains. Upon a request from the Federal Government of Nigeria, UNEP undertook an independent study to determine the extent of the environmental impacts arising from oil industry operations in Ogoniland. This report sets out the background and context to the present-day conditions in Ogoniland, provides a synthesis of UNEP's findings, and gives a set of overarching recommendations to deal with the multi-faceted environmental challenges currently facing the Ogoni people.

1.1   Nigeria and the Niger Delta

Nigeria, one of Africa's largest countries and its most populous, is situated in West Africa. The country covers an area of 923,768 km², with an estimated 4,049 km of land boundaries, shared with Cameroon in the east, the Republic of Niger in the north, Chad in the north-east and Benin in the west. In the south, Nigeria's 853-km long coastline opens onto the Atlantic Ocean.

The southern lowlands merge into the central hills and plateaus, with mountains in the south-east and plains in the north. The country's largest river is the Niger, which joins with the Benue River to form a confluence at Lokoja. The Niger Delta, located in the southernmost part of Nigeria and covering an area of some 70,000 km², is the largest river delta in Africa and the third largest in the world (Map 1). From a coastal belt of swamps, stretching northwards the land becomes a continuous rainforest which gradually merges with woodland and savanna grasslands in central Nigeria. The swamp, forest and woodland areas occupy about 12 per cent of the delta's land surface.

Nigeria gained independence from the United Kingdom in 1960. With a population in excess of 158 million people, Nigeria is a multi-ethnic federation divided into 36 states and the Federal Capital Territory, within which lies the capital city of Abuja. More than 250 ethnolinguistic groups are scattered across the country, but the three dominant groups are the Hausas living in the north, the Ibos in the south-east and the Yoruba mainly in the south-west [1].

Nigeria is rich in natural resources, including natural gas, petroleum, tin, iron ore, coal, limestone, niobium, lead, zinc, timber and extensive arable land. Prior to the discovery of oil in the 1950s, agriculture was the mainstay of the economy, with agricultural produce exported to the more industrialized regions of the world. By 1971 there had been a shift from agriculture to petroleum production, such that between 1973 and 1981 the value of agricultural exports fell from more than USD 1.5 billion to about USD 0.3 billion [2]. Currently, oil provides 80 per cent of budget revenues and 95 per cent of foreign exchange earnings.
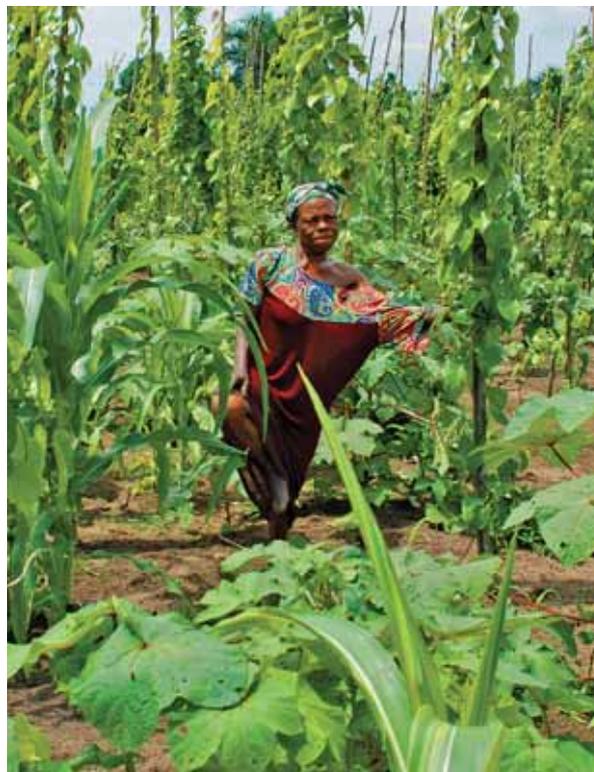
A farmer tends her maize crop in Horo, Tai LGA. Prior to the discovery of oil in the 1950s, agriculture was the mainstay of Nigeria's economy

Map 1.   The Niger Delta, showing Ogoniland

Figure 1.   Mean monthly rainfall in Port Harcourt
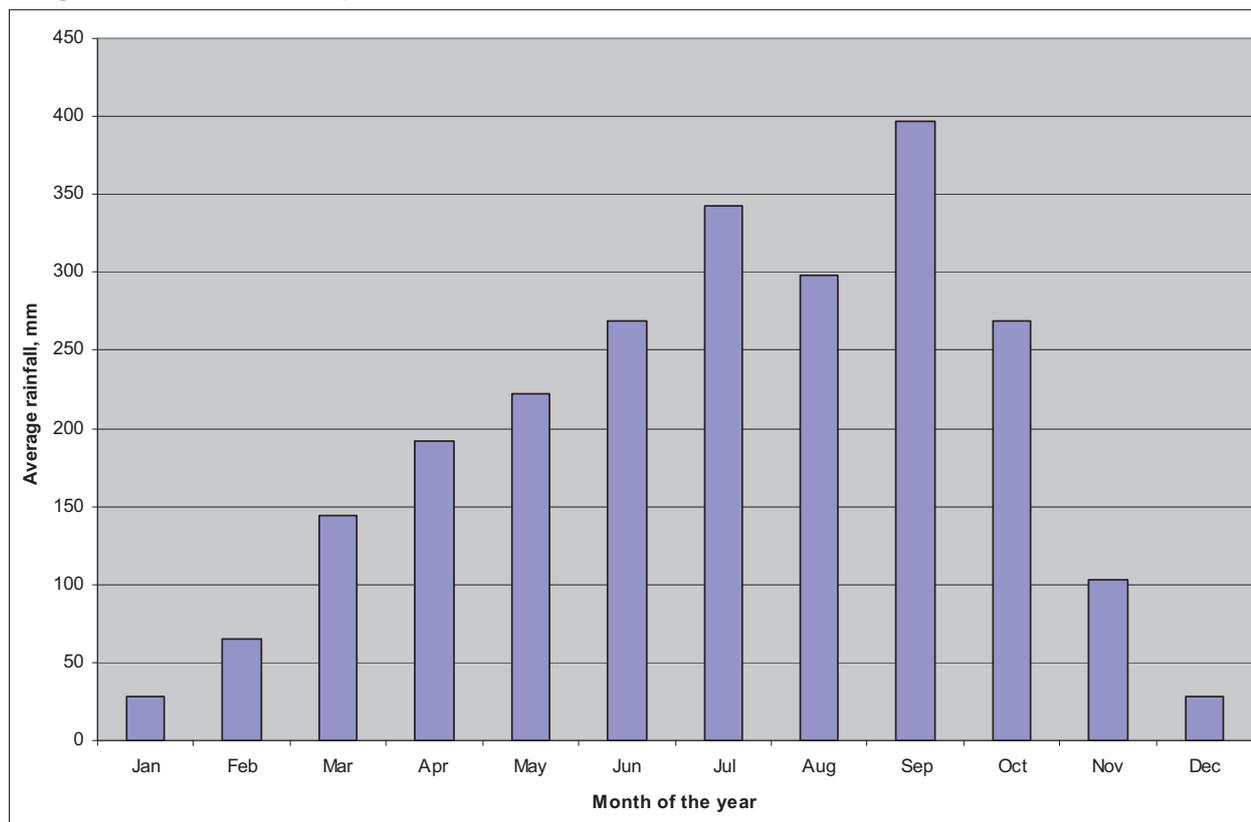
Rivers State

Rivers State – in which Ogoniland, the study area for this report, is located – is situated in the coastal plain of the eastern Niger Delta. Its topography is mainly characterized by rivers, lakes, creeks, lagoons and swamps of varying dimensions. The land surface can be grouped into three main divisions from north to south: the freshwater zone, mangrove swamps and the coastal sand ridge zone.

The riverine area, with a land surface between 2 and 5 metres above sea level, covers about 40 per cent of the state, while drier uplands occupy the remainder. Most water channels in the freshwater zone are bordered by natural levees that provide the basis for settlements and agriculture. The upland area varies in height from 10 to 45 metres above mean sea level (msl), but the majority is below 30 metres asl. Its surface is interspersed by small ridges and shallow swamp basins, as well as by gently sloping terraces intersected by deep valleys that carry water intermittently. The southern part is subject to tidal influences and is highly susceptible to recurrent inundation by riverine flooding. These flow patterns are responsible for the deposition of fine-grained sediments in the delta.

Rainfall, which is variable but heavy across much of the country, occurs throughout the year, decreasing from around 4,700 mm/year in the south to around 1,700 mm/year in the north of the state. The rainy season, which in coastal and south-eastern parts of Nigeria begins in February or March, lasts about 330 days, with 250 mm or more of rain per day at times. The state's capital, Port Harcourt, has about 180 rainy days per year (Figure 1). Temperatures range from 28°C to 33°C. The hottest months are February to May, with high relative humidity throughout the year, decreasing slightly in the dry season.

Ogoniland

Ogoniland is a region covering some 1,000 km^2 in the south-east of the Niger Delta basin (Map 2). It has a population of close to 832,000, according to the 2006 National Census, consisting mainly of the Ogoni people. The region is divided administratively into four local government areas:

Map 2.   Ogoniland, showing the four Local Government Areas
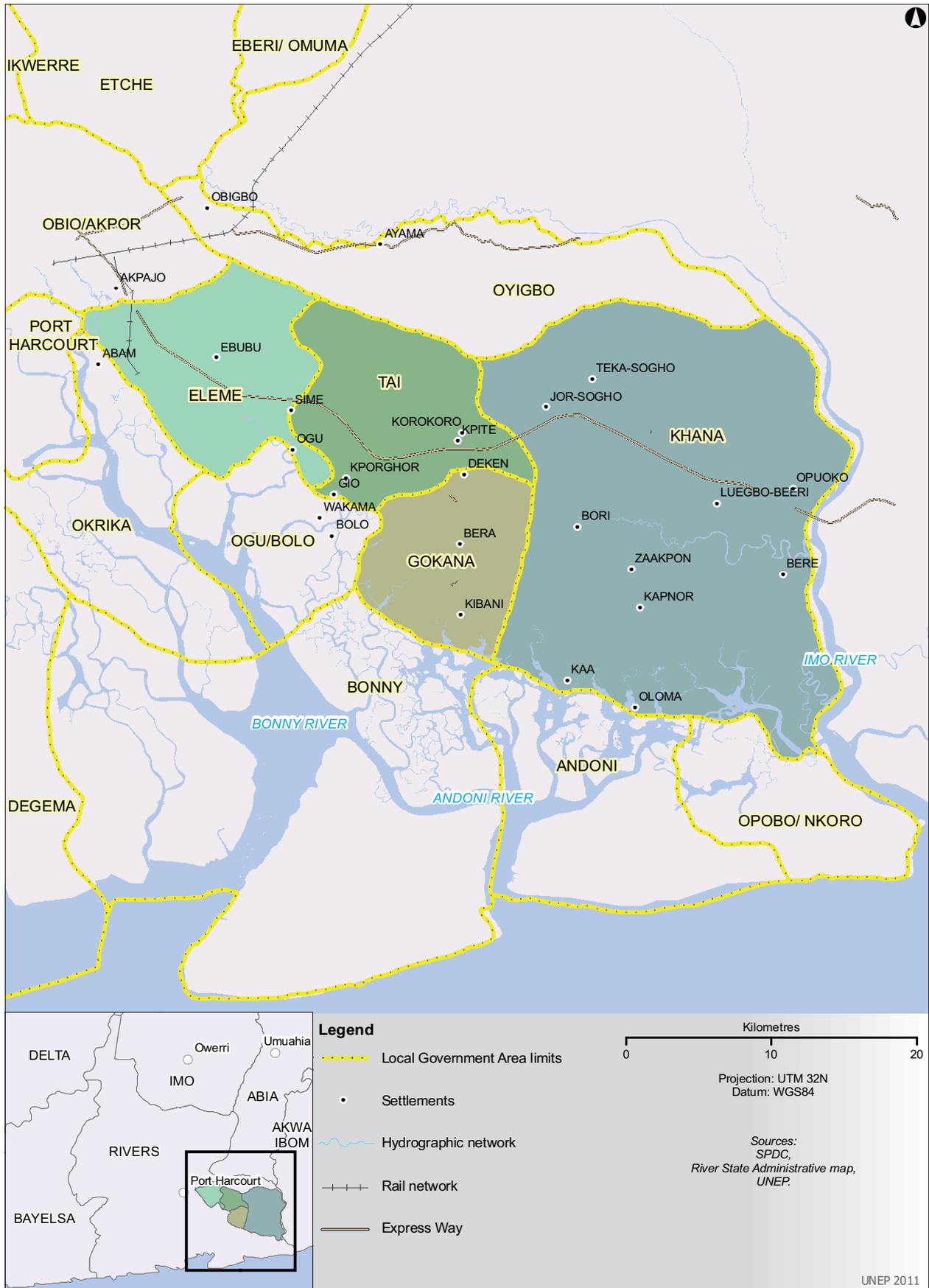
His Majesty King Godwin N.K. Gininwa, Ogoniland's Paramount Ruler

Eleme, Gokana, Khana, and Tai. Traditionally the area is formed by six kingdoms (Babbe, Eleme, Gokana, Ken-Khana, Nyo-Khana and Tai) with His Majesty King Godwin N.K. Gininwa as the area's Paramount Ruler. While to the outside world the communities of Ogoniland may appear similar, they have distinctive differences, including traditional institutional structures, languages and cultural features.

1.2 Impacts of oil exploration and production

Oil exploration in Ogoniland commenced in the 1950s and extensive production facilities were established during the following three decades (Table 1). These operations were handled by Shell Petroleum Development Company (Nigeria) Ltd

Table 1. Oilfield facilities in Ogoniland at the cessation of oil production, 1993

SPDC facility	Number
Oilfields	12
Wells drilled	116
Wells completed	89
Flow stations	5
Flow station capacity (barrels per day)	185,000

(SPDC), a joint venture between the Nigerian National Petroleum Company (NNPC), Shell International, Elf and Agip.

Oil exploration and production projects may have impacts on the natural environment long before any oil is actually produced. These are complex, multi-faceted projects, with many different phases, including: land survey, land clearance for seismic lines, establishment of seismic and drilling camps, site preparation, infrastructure construction, drilling for oil (even when the effort is unsuccessful) and development of transportation infrastructure. Once a facility begins operating other issues have to be dealt with, such as spills caused during oil production and the disposal of water (often salty and known as 'produced water') and flaring of gas ('produced gas') generated alongside the oil. All of these activities and their effects leave an environmental footprint.

The oil industry's environmental awareness and standards in the 1960s were very different and lower compared to those of the present day. This impact was exacerbated by the Nigerian Civil War (known widely as the Biafran War) in the late 1960s, during which oil industry infrastructure was targeted and a number of facilities were damaged, with consequent spillage of oil and widespread pollution.

1.3 The Ogoni struggle and the cessation of oil exploration and production

While oil exploration and the associated social and environmental consequences in Ogoniland began prior to Nigeria's independence, the situation did not improve when the country gained independence in 1960. Environmental incidents, such as spills and uncontrolled flares, continued to occur in the area and responses were slow and inadequate.

Partly in response to the environmental consequences of oil production, the Movement for the Survival of the Ogoni People (MOSOP) was founded under the leadership of the Nigerian author Ken Saro-Wiwa. A staunch defender of the rights of the Ogoni people, Saro-Wiwa criticized oil companies and the government's oil policy and brought international attention to the Ogoni cause.

In 1990, MOSOP presented the Ogoni Bill of Rights to the Federal Government of Nigeria [3]. The Bill included a number of references to environmental issues. In 1993, Saro-Wiwa joined 300,000 Ogoni on a march to demand a share in oil revenues and greater political autonomy [4]. The conflict within the region, however, was not resolved in a peaceful manner. As a consequence of the ensuing violence, oil exploration and production activities in Ogoniland ceased in 1993.

In November 1995, following a trial by a military tribunal, Saro-Wiwa and eight other Ogoni leaders were hanged in Port Harcourt. Continued social upheaval in the area further alienated the Ogoni community from SPDC, and MOSOP has since been campaigning for the total expulsion of Shell from Ogoniland.

While no oil production has taken place in Ogoniland since 1993, the facilities themselves have never been decommissioned. Some oil pipelines carrying oil produced in other parts of Nigeria still pass through Ogoniland but these are not being maintained adequately. Consequently, the infrastructure has gradually deteriorated, through exposure to natural processes, but also as a result of criminal damage, causing further pollution and exacerbating the environmental footprint.

A UNEP project team member at a wellhead at Ebubu Ejama, Eleme LGA, typical of the oil infrastructure progressively installed in Ogoniland since the late 1950s

1.4 Reconciliation process

In 1999, democracy was re-established in Nigeria and legislation to increase revenue sharing within oil-producing regions soon followed. However, as the Ogoniland oilfield lay dormant, the Ogoni people were unable to benefit from these reforms. The country's political leadership therefore decided to establish a mechanism whereby the oil industry operator could enter a process of reconciliation with the Ogoni community, enabling oil production to recommence and the community to benefit from the new revenue-sharing legislation.

In 2005, His Excellency Olusegun Obasanjo, President of the Federal Republic of Nigeria, appointed Reverend Father Matthew Hassan Kukah as mediator between the Ogoni and Shell. As part of the reconciliation process, an impartial, international agency would be appointed to undertake an environmental assessment and supervise the clean-up of the areas damaged by the effects of oil operations in Ogoniland.

Accordingly, in July 2006, UNEP received an official request from the Federal Government of Nigeria to conduct a comprehensive assessment of the environmental and public health impacts of oil contamination in Ogoniland, Rivers State, together with options for remediation. In response, the Executive Director of UNEP deployed a high-level mission to Nigeria in order to gain a fuller understanding of the background to the request and the expectations of the Nigerian Government. Extensive discussions took place with various stakeholders, including the President of Nigeria, local government officials and SPDC management. The UNEP team also conducted field visits to Ogoniland and met with the key Ogoni stakeholders. A series of pre-arranged, well-publicized and well-attended public meetings helped the mission to understand local community perspectives and expectations.

Following these preparatory consultations, UNEP presented a proposal (including workplans and budgets) to the Nigerian Government in January 2007 for a two-phase project:

A typical market in Ogoniland

A community meeting in Ogoniland, 2006. UNEP representatives consulted the community prior to commencing the environmental assessment

1. A comprehensive Environmental Assessment of Ogoniland, and

2. An environmental clean-up to follow, based on the assessment and subsequent planning and decisions.

The President agreed with UNEP's proposals and made two suggestions:

• A Presidential Implementation Committee, under the chairmanship of Bishop Kukah should be formed to oversee the work, and would consist of HM King Gininwa, the Paramount King of Ogoniland, and representatives of the Federal Environment Ministry, the Rivers State Ministry of Environment, the National Oil Spill Detection and Response Agency (NOSDRA), SPDC and MOSOP, and

• All expenses relating to the environmental assessment should be borne by SPDC under the 'polluter pays' principle.

These suggestions were agreed to by all parties. UNEP also made it clear that the assessment would be completely independent, and this too was accepted by all parties.

While the project was approved in 2007, administrative delays meant that fieldwork could not start until late 2009. Fieldwork and laboratory analysis were completed in January 2011. The study resulted in tens of thousands of analyses and photographs, all illustrative of the environmental situation in Ogoniland. The many separate reviews and findings have been synthesized in this final report – the main output of the Environmental Assessment of Ogoniland component of UNEP's work – to present the information in a relevant and useful manner. Before discussing the scientific findings, a series of field observations are described. The data on which this report is based are being made available online (www.unep.org/nigeria) to enable those who wish to undertake more in-depth analyses to do so.