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Challenges and Prospect of Environmental Remediation/Restoration in Niger Delta of Nigeria: The Case of Ogoniland

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Abstract
The Federal Government of Nigeria in July, 2006 instituted an independent study carried out by the United Nations Environment Programme (UNEP) to ascertain the nature and extent of oil contamination in Ogoniland as a precondition for reconciliation between the Ogonis on the one hand, Shell Petroleum Development Company (SPDC) Nigeria and the Federal Government of Nigeria on the other hand. The UNEP's field observations and scientific investigations reveal that oil contamination in Ogoni land is widespread and severely impacting many components of the environment (biophysical & socio-economic). It is noteworthy that oil Production in Ogoni was stopped abruptly in 1993 following agitation by the Ogonis against the Federal Government of Nigeria. .At shut down in 1993, facilities were exposed to frequent sabotage resulting in fires, oil theft and illegal oil refining leading to significant environmental degradation (spills).The Shell Petroleum Development Company (SPDC) Nigeria, a major operating oil trans-national company in Ogoni land has publicly demonstrated commitment towards full implementation of the UNEP Report by embarking on intensive and extensive remediation of impacted sites in Ogoniland. This paper is intended to share with the audience, SPDC's remediation efforts in Ogoniland, the challenges to complete restoration of Ogoniland and the way forward.
Keywords: crude oil theft, illegal refining, hydrocarbon, Ogoniland, oil spillage, remediation, UNEP report, SPDC,

Introduction/ Background

The Niger Delta is a unique ecological zone in Nigeria with an area covering approximately 70,000 km^2 and makes up 7.5% of Nigeria's land mass. It is politically made up of nine (9) states with some 31 million people of more than 40 ethnic groups and about 250 different dialects among which are: the *Bini, and the Ogoni* to mention but a few. It is estimated that about 70% of the region is rural and 30% urban. Poverty is prevalent as about 66% of the people earn less than US$ 75 per month. The region accounts for about 90% of national export earnings and 70% of Federal revenues, but with high level of poverty and Poor socio-economic and infrastructural development (Mmom, 2003).

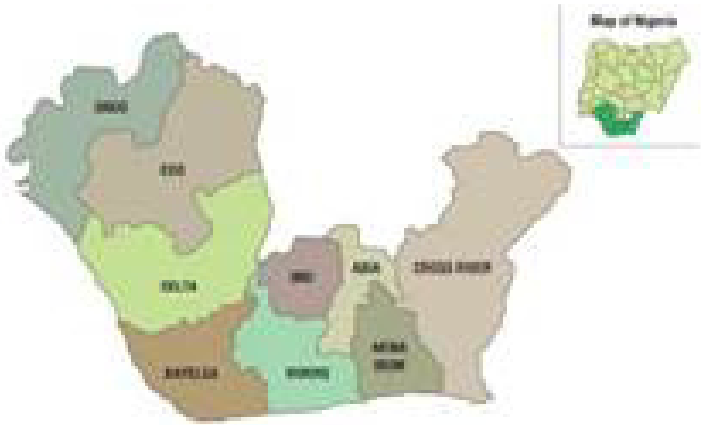

Fig 1: Map of the Niger Delta showing the component states

Ogoni is a tropical wetland in the Niger Delta covering an area approximately 1,000km^2 and occupies about 1% of the Niger Delta total land area, less than 2% of the Niger Delta population. The Ogoni according to oral tradition migrated from ancient Ghana down to the Atlantic coast eventually making their way over to the

eastern Niger Delta. Linguistic are a distinct people who have lived in the Niger Delta for hundreds of years. They live in close-knit rural communities, their livelihoods based on agriculture and fishing. The total population of the four local government areas (LGAs) – Eleme, Gokana, Khana and Tai – according to the 2006 National Census was approximately 832,000.

The Ogoni people gained global prominence in the past two decades as a result of their agitation over acclaimed neglect and deprivation by the FGN as well as the level of environmental degradation in the region. The Ogoni people have been acclaimed to be victims of human right violation for many years. In 1956, four years before Nigerian Independence, Royal Dutch in collaboration with the British government found a commercially viable oil field on the Niger Delta and began oil production in 1958. Exploration and production of crude oil occurred in Ogoniland up till 1992. SPDC operated the Oil Mining Lease (OML 11) since 1956, interfacing with 47 Ogoniland communities. Oil Production in Ogoni was stopped abruptly since 1993 till date as a consequence of the Ogonis agitation and protest against the federal Government of Nigeria for alleged environmental degradation and political alienation. Denial of access to facilities has been a major challenge thereafter and at shut down in 1993, facilities were exposed to frequent sabotage resulting in fires, oil theft and illegal oil refining leading to significant environmental degradation (spills)

However, the Federal Government of Nigeria under the leadership of President Olusegun Obasanjo initiated a reconciliation process and as part of the reconciliation process, an impartial, international agency was appointed to undertake an environmental assessment of Ogoniland. The SPDC JV financed the report and provided required data upon request.

Consequently, 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 August 2011, the United Nations Environment Programme (UNEP) published an 'Environmental Assessment of Ogoniland' (popularly referred to as UNEP Report) – a study of oil pollution in Ogoniland in Rivers State, a region of the Niger Delta.

Key findings of the UNEP Report

The UNEP report estimated that it could take up to 30 years to rehabilitate Ogoniland to its full potential and that the first five years of rehabilitation would require funding of about US$1 billion. In fact, the following were major findings as contained in the report:

- Extensive hydrocarbon contamination of soil, vegetation, surface and ground water in parts of Ogoniland
- Extensive illegal activities – illegal refining and crude oil theft; Risk to public health of families around contaminated sites
- Overlap of institutional arrangements for environmental regulation in the industry between Department of Petroleum Resources and Federal Ministry Environment
- Delayed response to clean up and remediation due to denial of access by Ogoniland community
- Control, maintenance and decommissioning of oilfield infrastructure in Ogoniland are inadequate
- RENA technique as applied to environmental remediation in Ogoniland by SPDC has not proven to be effective (UNEP, 2011).

Against the foregoing background, this paper herein focuses on the environmental aspect of the UNEP report, with emphasis on the challenges and Prospect of environmental remediation/Restoration in Ogoniland of Niger Delta, Nigeria.

Remediation in SPDC

The basic remediation techniques used by SPDC in remediation of contaminated sites in the study area is Land farming. Land farming is a bioremediation technique that is performed in the upper soil zone or in excavated stockpiled (bio-cells) cells. In this case, contaminated soils, sediments and sludge were excavated and spread on the ground and periodically tilled and turned to aerate and encourage bacterial growth. Soil nutrients were added to speed degradation of hydrocarbon. Contaminants were degraded, transformed, and immobilized by microbiological processes and by oxidation. Land farming has been proven most successful in treating petroleum hydrocarbons and other less volatile, biodegradable contaminants and is being used because the climatic condition (high temperature & rainfall) in the area was favourable for aeration and microbial growth to quickly take place. More so, the hydrocarbon parametres are not greater than 50,000 ppm, which is the conventional limit for application of Land farming technique. Plates 1 & 2 below show the land farming in process with excavation and spreading on bio-cells.

Plates 1& 2 Land farming & Excavation in progress at one of the remediation sites in B-Dere, Ogoniland

Remediation of Ejama Ebubu complex Site: Background and Justification

The Ejamah-Ebubu spill site measures about 15.6 hectares and is situated at latitude N4 46 23.8 and longitude E7 08 47.9 in Eleme Local Government Area of Ogoni in Rivers State. The site was impacted by a crude oil spill in 1969 during the Nigerian civil war as a result of damage by an external explosive device to the 28 inch Bomu-Bonny Trans Niger Pipeline (TNP) at Ejama, which was accompanied by a fire outburst. At that time of war, Shell operations ceased and as the pipeline was above ground, the impact was significant. The site was impacted at varying depths ranging from 2 m in the clayey swamp area towards the east to 9 m in the western land area consisting of intercalations of clayey sandy silt deposits. About 8.6 hectares of the area around the spill site was purchased by SPDC and fenced with cement blocks, while the other 7 hectares of impacted area is along the Ochani stream.

It took so long to clean and remediate due to access constraints, multiple crises with the communities and ultimately it got entangled in the wider Ogoni Ken Saro Wiwa issues. The different waste streams found at the site include, burnt carbonized residue, 500 barrels of crude oil trapped below the ground surface, bituminous sludge, heavily contaminated soil and polluted shallow groundwater. The various waste streams were remediated by application of multiple remediation techniques suitable for each waste stream to ensure effective restoration of the site to a fit-for-purpose condition.

REMEDIATION PROCESSES

1. Biodegradable Contaminants such as crude oil soaked soil: These were treated by in-situ and ex-situ (Engineered Biocell) bioremediation techniques. Bioremediation, involved systematic tilling and application of microbial nutrient amendments– Contaminants at depths of 6m to 10m below ground surface were removed by deep excavation and treated by ex-situ process.
2. Non-Biodegradable waste stream (burnt carbonized residue): These were handled through fixation and stabilization into cement blocks. About 40,000 blocks were produced.
3. Oily-bituminous sludge: These were handled by Thermal desorption process.
4. Impacted Shallow Groundwater. Free phase oil on shallow groundwater trenches was removed by skimming of oil and application of bio-degrader to remove the oil.

Plate 3: Pre-remediation view of Ejama site.

Plate**:** 4 Free phase oil removal

Plate 5: Deep excavated at the site.

Plate 6: Systematic tiling and nutrient application on biocells

Remediation of Deep-seated Hydrocarbon Impacted Soil by Bioremediation

Deep seated contaminated soil is being tackled by use of heavy equipment to excavate and remediate by either ex-situ bioremediation in an Engineered Biocell or on-site ex-situ.

Deep seated impacted soils with relatively light contaminants are excavated and remediated on-site in-situ using bioremediation process as shown in Plate. 5

Deep seated impacted soil with heavy contaminants is excavated and remediated using bioremediation process in an Engineered Biocell as shown in Plate. 6.

The basic principles in bioremediation process are that hydrocarbon compounds in the spilled oil undergo biodegradation under suitable bio-physico-chemical conditions. This is a world-wide accepted fact.

Atmospheric aeration by tilling accompanied by addition of nutrient amendment and maintenance of appropriate moisture content promotes biodegradation, and the hydrocarbon compounds biodegrade gradually to give rise to carbon dioxide and water.

The genetic machinery needed to make these oil-degrading enzymes is most commonly found in bacteria (although many fungi and some other organisms can also degrade oil). The bacterial cell then harnesses the energy released by degrading the compounds to support its own life processes. The situation is exactly analogous to the way our bodies break down the chemical energy in food to provide the energy and raw materials for maintenance, growth, and repair of our tissues.

From the human point of view, what the microbes are doing is degrading—or breaking down—the oil, which results in cleaning up the environment that has been contaminated by the spill. From the microbial point of view, what they are doing to the oil is "eating"—or metabolizing—or consuming it to provide the energy and materials needed to live and grow. This process continuous as long as food, suitable conditions such as oxygen and water are available for the microbes.

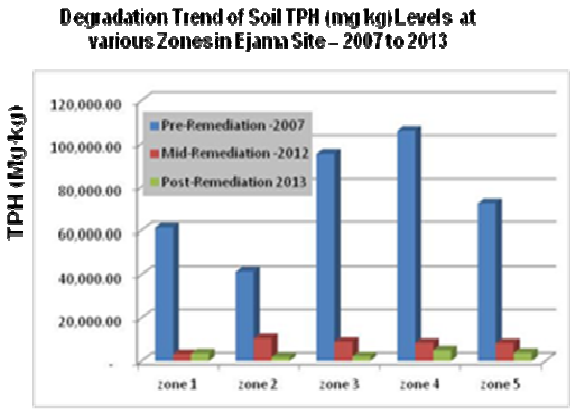

Fig 2 degradation trend of soil TPH

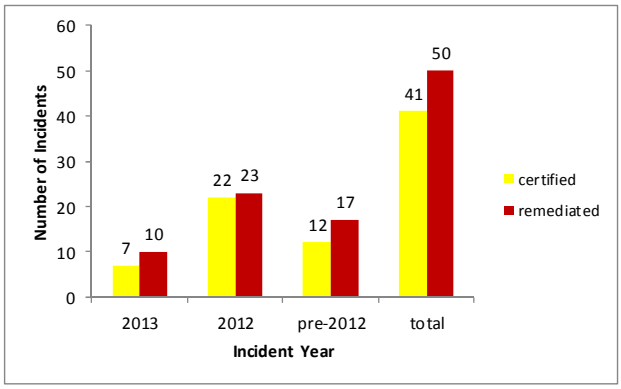

Fig. 3 *Remediation success between 2012-2013*

The remediation of Ejama Ebubu is a clear demonstration of effective partnership with host community which has earned the trust and mutual respect of all parties. It is also an expression dogged commitment and capability of SPDC to bring about environmental restoration of impacted areas within the Niger Delta, in particular where we have unfettered access and no recontamination. So far, between 2012 and 2013, SPDC has remediated 50 sites and 41 of these remediated sites have been certified by the regulatory agencies and independent verification teams in Nigeria (see fig.3) Serious work is on-going and it believed that by the end of 2014, additional total of 100 sites would have been remediated and at least 80 of such sites certified.

Plate: Extended View of Site. March 2014.

Plate: View of Site Showing Vegetation. March 2014

Challenges and prospects

The Shell Petroleum Development Company Limited through it Ogoni Restoration Project has made a lot visible commitment towards total restoration of Ogoni land. However, the success is being constrained by the myriads of problems confronting it. In the first instance, there has been the continuous challenge of increasing incidence of oil spillage and re-pollution of already remediated sites due to oil bunkering and artisanal crude oil refining activities. For instance, in 2013 scorecard, 50 contaminated sites were remediated and 47 new incidents were reported in SPDC's operational area. This is not a good omen for the restoration project as these incidences are on the increase daily. In other words, there is the challenge of stopping of sources of contamination occasioned by oil theft and illegal refining.

Plate 7: illegal refining activities

Plate 8 : oil theft

The Government, in line with UNEP recommendations, established an agency - Hydrocarbon Pollution Restoration Project (HYPREP) to drive the implementation of the report.

Regrettably, HYPREP has not been able to take off properly. Their continuous absence has led to negative perception of the uninformed public about the sincerity of the restoration project in Ogoniland.

Another major challenge to restoration effort has to do with the series of community leadership tussles, multiple factions and leadership strata. Internal and unnecessary rift in the Ogoni communities holds back the wheel of progress and development. Multiple factions have led to a lot of internal crises that have prevented remediation activities from commencing and progressing in some areas.

Alternative livelihood for the youths in Ogoniland is also perceived as a challenge to the remediation in the area. Most of the youths in the area are unemployed and have found illegal activities as means of employment. This has been the reason for the increasing incidents of oil theft, environmental contamination and re-contamination of already remediated sites. It is feared that until alternative livelihood opportunities is created, these youths may not get out of the oil pipelines.

The issue of security of workers and activities of criminals on the one hand and community wars, and disagreements creates a lot of tension and in most cases stalls the remediation works in the area.

Fear of kidnap and violence from the communities pose a lot of threat to remediation works in Ogoniland.

Finally, the challenge of poor surveillance of oil facilities in the area has been a burning issue of concern. The Ogoni communities are to protect oil and gas facilities in their area, but this has not been successful as there are high reported cases of pipeline vandalization leading to continuous spill incidents. SPDC is currently is devising strategy of improving surveillance of her facilities as well as discouraging youths from the illicit activities of pipelines vandalism through youth capacity building and empowerment.

Prospects:
There is serious interfaces/stakeholders engagement between the youth, regulators, and legislators, HYPREP, NGOs and UNEP. It is expected that the outcome of these interfaces will strengthen the remediation activities in the region. Shell Petroleum Development Company is committed to influencing HYPREP with integrity by supporting it to get its boot on ground. A lot of meetings are being held with HYPREP in this regard.

Global Memorandum of Understanding (GMoU) is being signed in these communities with new surveillance arrangements on oil facilities in the area. This is expected to strengthen security of oil and gas facilities and protecting them from vandals.

SPDC is committed to continuous process improvement, leveraging external verification. There is also in place, plans to integrate with HYPREP on Pilot remediation in Ogoniland as well as close out all SPDC Specific Actions as contained in the UNEP report.

Conclusion
The role of industry stakeholders in the implementation of the report will be best articulated on the basis of a plan that should be developed and shared by the implementing government agency with the mandate for overall implementation i.e. HYPREP. The key requirement is yet to be fully developed by HYPREP and this is related to variance in both organisation's operating principle and view point. Unfortunately, the lingering debate on the funding mechanism and work plan presentation before funds are released has dire consequences on SPDC's reputation globally. The failure of the communities in providing security for oil facilities has led to increased cases of oil theft and spill incidents. However, the Shell Petroleum Development Company Limited (SPDC) as a responsible organization is committed to complete restoration of Ogoni land. Aggressive grassroots campaign against illegal bunkering activities and the consequences thereof is on-going by SPDC. Although remediation activities in the region is being plagued with a lot of challenges, but the strategies being put in place is capable enhancing remediation and restoration activities in Ogoniland.

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