

THE 17th

INTERNATIONAL HSE
BIENNIAL CONFERENCE
on the
OIL AND GAS INDUSTRY
IN NIGERIA

BOOK OF ABSTRACTS



Theme

Integrated Security Approach,
New Strategies and the Way to
Go in the Nigerian Oil & Gas Industry

November 28 – 30, 2016

Eko Hotel & Suites,
Victoria Island, Lagos.

MPR



DPR OPTS

IPMAN

DOWNSTREAM
OPERATORS

UPSTREAM
OPERATORS

PEF(M)B NAIPEC

Contents

1	ENVIRONMENT THEME.....	1
1.1	ACUTE TOXICITY OF UNTREATED AND TREATED PRODUCED WATER FROM EA FIELD (<i>Odokuma, L.O. *, Anako, O.C. *, Amos-Ejesi C.O. * & Igbuku, A.O. *</i>).....	2
1.2	ANALYSIS OF THE EFFECTIVENESS OF CURRENT ENVIRONMENTAL LAW FRAMEWORK IN COMBATING ENVIRONMENTAL POLLUTION FROM VANDALISM (<i>Awogbade, S. *, Dasun, J. *, Tokan-Lawal, A. *, Awala-Velly, O. * & Nembe, J. *</i>).....	3
1.3	BIODIVERSITY, HABITAT CONSERVATION AND PROTECTED AREAS/SPECIES: BIODIVERSITY CONSERVATION - A CLARION CALL (<i>Attoye, M. *</i>).....	4
1.4	ENVIRONMENTAL EDUCATION: A KEY STRATEGY IN MANAGING ENVIRONMENTAL CHALLENGES: THE NIGER DELTA IN PERSPECTIVE (<i>Nwogbidi, K.C* & Ikpe, S.C**</i>).....	5
1.5	ETHNO-MEDICINE DIVERSITY OF SOME FOREST RESERVES IN THE NIGER DELTA (<i>Ozumba, C. I*, Ezike, A.C**, Ilondu; E.M* & Nnodim, C. C. *</i>).....	6
1.6	EVALUATION OF CHANGING STAKEHOLDERS' EXPECTATIONS IN THE DELIVERY OF OIL AND GAS PROJECT ENVIRONMENTAL IMPACT ASSESSMENT (<i>Michael, R.M. * & Nwachukwu, E.O. *</i>).....	7
1.7	EVALUATION OF RENA AND MYCOREMEDIATION TECHNIQUES IN THE DEGRADATION OF TPH, PAH AND THC IN CRUDE OIL IMPACTED SOIL (<i>Maduekwe, C. *, Nwachukwu, E.O. **, & Joel, O.F. *</i>).....	8
1.8	FURTHER EVIDENCE OF SEA TURTLE (ORDER: TESTUDINES) NESTING ALONG NIGERIAN BEACHES – THE OLOKOLA LNG (OKLNG) CASE STUDY (<i>Imevbore, V.O. *, Nwadike, E. *, Ezealor, A.U. **, Okafor A. ***, Asuku, T. ***, & Nwankwo, E.C. **</i>).....	9
1.9	HARNESSING THE DERIVABLE BENEFITS OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS FOR EFFECTIVE PROJECT IMPLEMENTATION – A REGULATOR'S PERSPECTIVE (<i>Ayaeze, N.E. (Mrs.) *, Zagi M. M (Dr.) *, & Balogun A. A*</i>).....	10
1.10	MANAGING BIODIVERSITY ISSUES IN GBARAN-UBIE AREA (<i>Igbuku, A. *, Ozumba, C. *, Akani, G. **, Ilondu, E. * & Igwe, O. *</i>).....	11
1.11	METABOLIC CLASS DISTRIBUTION OF BACTERIA ASSOCIATED WITH MICROBIOLOGICALLY INFLUENCED CORROSION IN NIGER DELTA SOIL SITES (<i>Oparaodu, K.O. * & Okpokwasili, G.C. *</i>).....	12
1.12	NIGERIAN ECONOMY AND THE ENVIRONMENT; MODELLING APPROACHES FOR ECOSYSTEM ASSESSMENT AND MONITORING, FOR SUSTAINABLE GROWTH AND DEVELOPMENT (<i>Onwurah, I. *, Ubani, C. * & Otitoju, O. **</i>).....	13
1.13	OIL SPILL RESPONSE IN A BIO-DIVERSE ENVIRONMENT: MANAGING THE TRANSITIONS (<i>Iheagwam, S. *, Braide, O. *, Mbele, N. *, Vandeville, P. * & Anozie, I. *</i>).....	14
1.14	OIL SPILL RESPONSE IN A BIO-DIVERSE ENVIRONMENT: SECURITY CONCERNS AND WAY FORWARD (<i>Iheagwam, S. *, Braide, O. *, Mbele, N. *, Vandeville, P. * & Anozie, I. *</i>).....	15
1.15	ON THE ISSUE OF ENVIRONMENTAL IMPACT STATEMENTS' QUALITY IN THE OIL AND GAS INDUSTRY (<i>Anifowose, B. *¹</i>).....	16

1.16	REGULATORY STYLE IN ENHANCING OPERATIONS IN THE OIL AND GAS SECTOR IN NIGERIA - A RETHINK (<i>Bassey, D. *</i>).....	17
1.17	SPILL TRAJECTORY MODELLING IN THE INTERTIDAL ZONES: INVENTORIES & OPPORTUNITIES (FOR DEFINING THE TIDAL ZONES) (<i>Oladayiye, S.*., Anifowose, B.**., Afolayan, D.***, & Uzor, A.****</i>)..	18
1.18	USE OF GREEN BURNER TECHNOLOGY FOR WELL CLEANING-EXPERIENCES AND LESSONS LEARNT (<i>Okoli, U. * & Awi, H. *</i>).....	19
1.19	WASTE MANAGEMENT –THIRD PARTY WASTE STEWARDSHIP (TWS) STANDARD (<i>Ojo, O. * & Abudu, A. *</i>)	20
2	SAFETY THEME.....	21
2.1	CFD SIMULATION OF LEAKAGE IN CRYOGENIC FLOW PIPELINES AND SOIL FREEZING (<i>Shojaei, S.M. *, Behzadi, M. * & Kharrazi, S. *</i>).....	22
2.2	EFFECT OF VISCOELASTIC FOUNDATIONS ON THE FAILURE OF PIPELINE CONVEYING HPHT FLUIDS (<i>Owoseni, O.D. *, Kamiyo, O.M.** & Oyediran, A.A.**</i>)	23
2.3	IDENTIFYING WORKERS' HEALTH AND SAFETY AS CAUSES OFCONSTRUCTION PROJECT DELAYS IN THE NIGERIAN OIL AND GAS INDUSTRY (<i>Opaleye, O. *, Talukhaba, A. * & Smallwood, J.**</i>).....	24
2.4	IMPERATIVES OF PROCESS SAFETY IN NIGERIA (<i>Erinne, J. *</i>).....	25
2.5	IMPROVING SCAFFOLDING AND WORK AT HEIGHT TRAINING & STANDARDS IN NIGERIA'S OIL AND GAS INDUSTRY – EXPERIENCES AND LESSONS LEARNED (<i>Marc T. *</i>).....	26
2.6	LPG FACILITIES INTEGRITY AND INCIDENT MANAGEMENT – EXPERIENCE AND LESSONS LEARNT (<i>Abayomi, A. * & Azeez, G. *</i>).....	27
2.7	MAKING A CASE FOR A PROACTIVE HEALTH AND SAFETY REGIME IN THE NIGERIAN OIL AND GAS INDUSTRY (<i>Hameed, T. *</i>).....	28
2.8	MANAGING SAFETY RISKS IN THE NIGERIA OIL & GAS SECTOR – CHALLENGES & OPPORTUNITIES (<i>Ola-Ojetola, A. *</i>).....	29
2.9	MANAGING THE INNER DIALOGUE AS A BOTTOM-UP APPROACH TO ENTRENCHING HEALTH, ENVIRONMENT AND SAFETY PRACTICES IN OIL AND GAS FACILITIES – ESCRAVOS GAS PLANT EXPERIENCE (<i>Erhurun, P. *</i>).....	30
2.10	SAFETY IN DOWNSTREAM OPERATIONS: CHALLENGES AND WAY FORWARD (<i>Moriki, U.S. *</i>).....	31
2.11	STRATEGIC INCIDENT PREVENTION IN THE DOWNSTREAM OPERATIONS USING HARM TO ZERO (H2O) CONCEPT (<i>Jamiu, B. *</i>).....	32
3	SECURITY THEME.....	33
3.1	IMPROVING SECURITY IN THE OIL AND GAS INDUSTRY THROUGH EFFECTIVE COLLABORATION A CASE STUDY OF SEPLAT PETROLEUM DEVELOPMENT COMPANY PLC (<i>Osiago, U.S. *</i>).....	34
3.2	INFORMATION TECHNOLOGY SECURITY AND INFORMATION PROTECTION (<i>Balogun, M. *</i>).....	35
3.3	INFORMATION TECHNOLOGY (IT) SECURITY AND INFORMATION PROTECTION: FOSTERING PROCESS SAFETY THROUGH SECURE IT ASSETS (<i>Malokwu, O. *</i>).....	36

3.4	INSTITUTIONALISING AN INTEGRATIVE AND COMMUNITY BASED SYSTEM FOR ASSET CONTROL IN THE OIL & GAS INDUSTRY – OML 18 IN FOCUS (<i>Abare, P. *</i>).....	37
3.5	INTEGRATED PIPELINES SUPERHIGHWAY MODEL FOR MANAGING OIL AND GAS THIRD PARTY INTERFERENCE AND SECURITY CHALLENGES (<i>Ihebuzor, P. *, Nwagboso, C. *, Georgakis, P. * & Eze, J. *</i>)	38
3.6	PIRACY AND COUNTER – PIRACY IMPERATIVE IN THE GULF OF GUINEA (<i>Oyet, G. * & Adeniyi, B. *</i>)	39
3.7	SECURING OUR IT SYSTEMS USING IDENTITY MANAGEMENT ACCESS CONTROL (<i>Chukwu, A. *</i>)...	40
3.8	SECURITY AWARENESS: MY RESPONSIBILITY (<i>Olaniyi, A.O. *</i>)	41
3.9	SECURITY CHALLENGES IN THE NIGERIAN OIL & GAS INDUSTRY (<i>Amachree, D. *</i>)	42
3.10	SECURITY SITUATION IN THE NIGERIAN OIL AND GAS INDUSTRY - A GROWING PUBLIC SAFETY CHALLENGE (<i>Asikaogu, C. *</i>).....	43
3.11	THIRD PARTY INTERFERENCE ON NIGERIAN OIL AND GAS PIPELINES: THE DAMAGES AND SOLUTIONS (<i>Eze, J. *, Nwagboso, C. *, Georgakis, P. * & Ihebuzor, P. *</i>).....	44
4	HEALTH THEME	45
4.1	AN INVESTIGATION OF KNOWLEDGE AND THE USE OF HEARING PROTECTION DEVICE (HPD) AMONG EMPLOYEES OF A LARGE REFINERY (<i>Agada, J. *</i>)	46
4.2	BIRTH DEFECTS IN OIL AND GAS PRODUCING AREAS (<i>Akani, C.I. * & Mkpe, A.M. *</i>).....	47
4.3	CHALLENGES FOR HEALTH RISK MANAGEMENT IN THE WORKPLACE OF THE FUTURE (<i>Ajayi, L. *</i>)	48
4.4	ENHANCING THE POSITIVE IMPACTS OF DEVELOPMENT PROJECTS: HIA AS A TOOL FOR PROMOTING PUBLIC HEALTH IN RESOURCE POOR COUNTRIES (<i>Abah, S.O. *</i>).....	49
4.5	HEALTH IMPACT ASSESSMENT (HIA) IN THE OIL AND GAS INDUSTRY – EXPERIENCES AND LESSONS LEARNED (<i>Okala, C. * Fagade, O. *, Pitan, O. * & Edjere, F. *</i>).....	50
4.6	OCCUPATIONAL HEALTH PRACTICE, LEGISLATION AND REGULATORY COMPLIANCE: WHITHER NIGERIA? (<i>Igwe, R. *</i>)	51
4.7	PROMOTING WEIGHT MANAGEMENT AND THE ADOPTION OF HEALTHIER LIFESTYLE HABITS IN THE WORKPLACE: A CASE STUDY OF OANDO MARKETING PLC (<i>Oyet, G. * & Adejumo, T. *</i>)	52
4.8	REDUCING THE VULNERABILITY OF CARDIOVASCULAR DISEASES AMONGST OIL AND GAS INDUSTRY WORKERS: THE CASE FOR FERMENTED FOODS (<i>Ayo-Lawal, R.A. *, Ilevbare, O.E. *, Oluwatope, O.B. * & Ukwuoma, O. *</i>).....	53
4.9	TRENDS IN HIV SERO-PREVALENCE IN OIL RELATED SETTINGS (<i>Akani, C.I. *</i>)	54
4.10	WORLD HEALTH ORGANIZATION HEALTHY WORKFORCE FRAMEWORK MODEL: A CASE STUDY OF AGBAMI CO-VENTURERS' ENTERPRISE COMMUNITY INVOLVEMENT (<i>Okala, C. * Fagade, O. *, Pitan, O. *, Kabi, M. *, Otuonye, S. *, Kashim, S. * & Egbochukwu, E. *</i>).....	55

1 ENVIRONMENT THEME

1.1 ACUTE TOXICITY OF UNTREATED AND TREATED PRODUCED WATER FROM EA FIELD (Odokuma, L.O. *, Anako, O.C. *, Amos-Ejesi C.O. * & Igbuku, A.O. *)

*The Shell Petroleum Development Company of Nigeria Limited, Port Harcourt.

Corresponding author's e-mail: lucky.odokuma@shell.com

The acute response of some brackish/marine water organisms (fish -*Tilapia guineensis*; Oyster - *Crassostrea gasar*; Copepod - *Acartia clausi*; Alga- *Skeletonema costatum*; Alga - *Chaetoceros*; Total Heterotrophic Bacteria [THB] and Total Fungi [TF]) to the toxicity of produced water (treated and untreated) discharged into the seawater 90 km southwest of Warri in Delta State Nigeria from the Sea Eagle Floating Production Storage and Offloading (FPSO) vessel was assessed as part of a biological monitoring protocol for The Shell Petroleum Development Company of Nigeria Limited (SPDC) operations. The static with renewal bioassay option was employed for tests involving macro organisms while the static without renewal option was used for microbial bioassays. Untreated and treated produced water was used to determine the efficiency of the produced water-treatment process. Diesel served as reference chemical. Test organisms were recommended by the Department of Petroleum Resources (DPR) and represented different trophic levels within an aquatic food chain. All the organisms except THB and TF were obtained from Nigerian Institute for Oceanography and Marine Research (NIOMR) located in Buguma in Rivers State Nigeria. Sea water from EA field and habitat water of the organisms (from NIOMR) were employed for acclimation. Sea water was employed for dilution of toxicants for toxicity assay. The LC₅₀ at 48 and 96h respectively and toxicity factor were determined. Untreated produced water revealed the following 96h LC₅₀ results: fish (*Tilapia guineensis*), 218.8ppt; Oyster (*Crassostrea gasar*), 1000ppt; Copepod (*Acartia clausi*) 0.01ppt; Alga-phytoplankton (*Skeletonema*), 22.59 ppt; Feed alga-phytoplankton (*Chaetoceros*), 181.77ppt; Total Heterotrophic Bacteria (Bacteria), 1000ppt; Total Fungi (Fungi), 7.0ppt. Treated produced water revealed the following LC₅₀ results; fish (*Tilapia guineensis*), 268.3ppt; Oyster (*Crassostrea gasar*), 1000ppt; Copepod (*Acartia clausi*) 0.01ppt; Alga-phytoplankton (*Skeletonema*), 215.7ppt; Feed alga-phytoplankton (*Chaetoceros*), 30.91 ppt; Total Heterotrophic Bacteria (Bacteria), 1000ppt; Total Fungi (Fungi), 7.0ppt. Using toxicity factor as index for assessing toxicity the effluents were not toxic. Diesel was more toxic to all test organisms than effluents. The toxicity factor ranged from 1 to 14000 suggesting that effluents were generally not toxic. Total Heterotrophic Bacteria recorded the highest toxicity factor of 14000 while *Acartia clausi* recorded the least, 1.0 for the effluents. The LC₅₀ of THB was 1000mg/l indicating that effluents were not toxic to THB. The LC₅₀ for *Acartia clausi* was 0.01mg/l for all the effluents. THBs were the most tolerant to the effluents while the *Acartia clausi* was the most sensitive to the effluents. The efficiency of the TPH, THC and oil and grease removal after treatment was 94%, 93% and 93% respectively suggesting a high efficiency of the treatment process. Toxicity may not be due to water insoluble fractions of TPH, THC and oil and grease levels of test effluents but may be due to water soluble fractions of the effluents which the treatment process successfully removed. The very high tolerance of THB to the effluent suggests that these effluents may be readily biodegradable and may not persist in the marine environment after discharge.

Key words: Toxicity; Bioassay; Produced water; Test Organisms; Brackish water; Marine water

**1.2 ANALYSIS OF THE EFFECTIVENESS OF CURRENT ENVIRONMENTAL LAW
FRAMEWORK IN COMBATING ENVIRONMENTAL POLLUTION FROM
VANDALISM** (*Awogbade, S. *, Dasun, J. *, Tokan-Lawal, A. *, Awala-Velly, O. * & Nembe, J.
))

*AELEX Legal Practitioners and Arbitrators.

Corresponding author's e-mail: sawogbade@aelex.com

The Niger Delta - the geographic area largely responsible for production of Nigeria's crude - has vast ecological zones which have been continuously impacted by decades of oil exploration activities. The implications of petroleum operations and the nefarious activities of saboteurs of petroleum installations and equipment have impaired the environment of the Niger Delta area. Unfortunately, implementing and enforcing sufficient environmental regulations and management of same have been challenging. The current framework for the regulation of activities within the oil and gas industry has been characterized by poor enforcement of environmental regulations by the industry regulators; weak infrastructure for the support of operations and inefficient mechanisms to provide lasting solutions to the environmental issues in the sector. Additionally, distrust among the stakeholders within the industry continues to pose a threat to its optimal functionality.

This paper will highlight the causes of oil spills, which include: an epidemic culture of poor maintenance and third party sabotage of oil exploration, storage and transportation assets. It will also discuss the infrastructural and economic realities in Nigeria which have direct influence on the conduct of petroleum operations. This paper will argue that the existing legal framework is not comprehensive enough to properly contain the environmental issues. It will also examine the attitude of the Nigerian courts to environmental law issues.

Multi-agency working is not a new development. This paper will conclude that no lasting improvement can be made unless all stakeholders within the industry collaborate efficiently to deliver better outcomes. It will recommend that all areas must be addressed adequately, from catering to the needs of the indigenes of the Niger Delta to avoid violence and conflict to ensuring that oil marketers obtain the Forex necessary to fully fund their operations and avoid sabotage. Finally, there should be regular interactions and feedback between the stakeholders to track the progress along the way.

1.3 BIODIVERSITY, HABITAT CONSERVATION AND PROTECTED AREAS/SPECIES: BIODIVERSITY CONSERVATION - A CLARION CALL (*Attoye, M. **)

*Nigerian Liquefied Natural Gas Limited (NLNG), Port Harcourt.

Author's e-mail: mosiwamafa.attoye@nlng.com

The Finima Nature Park (FNP) located in Finima, Bonny Island, one of Nigeria's coastal barrier islands, is a 1000-hectare large wetland made up of sandy beaches, seasonally flooded rainforests, mangrove swamps and mudflats. The park was founded by the Nigeria LNG Limited in 1999, as part of its Environmental Impact Assessment (EIA) and a Corporate Social Responsibility (CSR) project with the aim of giving back to the community and ensuring sustainable development.

Currently, deploying a number of strategies to deal with the challenges of encroachment, degradation, deforestation, flooding and endangerment of indigenous species, as identified by the proactive management of the park. These are caused by various phenomena, ranging from habitat loss due to felling of trees, by inhabitants for lighting, cooking and heating to the inability of the locals especially fishermen to acquire modern fishing equipment resulting in the felling of trees for construction of fishing boats, and the absence of government infrastructure to provide other means of raw materials to discourage the locals from exploiting the environment, other phenomena are; rising water levels within the park leading to flooding which is causing accelerated degradation of the forest trees as well as of the forest trails.

The strategies range from: patrolling of the nature park and adjoining forests to ensure that there are no trees logging, prevention of animal poaching, ensuring the park is an animal sanctuary, and cultivation of a highly treasured nursery that is dedicated to nursing indigenous trees seedlings for planting within the park which are all summed up in the Biodiversity Action Plan upon which park's activities hinge upon. Nigeria LNG and NCF collaborative efforts has led to an increase in the awareness on the need for biodiversity conservation, the gradual return of some indigenous species back to the park, listed by the International Union for Conservation of Nature (IUCN) which are the African Grey Parrot-Psittacus erithacus and Hooded Vulture Necrosyrtes monachus as well as the encouragement to academicians and conservationists to take on studies on biodiversity conservation within the Finima Nature Park.

1.4 ENVIRONMENTAL EDUCATION: A KEY STRATEGY IN MANAGING ENVIRONMENTAL CHALLENGES: THE NIGER DELTA IN PERSPECTIVE (*Nwogbidi, K.C* & Ikpe, S.C***)

*School of Science, Federal College of Education (Technical) Omoku, Rivers State.

**Department of Petroleum Resources, No. 7 Kofo Abayomi Street, Victoria Island, Lagos.

Corresponding author's e-mail: kingsleynwogbidi@yahoo.com

This study examined environmental education as a key strategy in environmental management and pollution control in the Niger Delta. Since crude oil has continued to play a dominant role in the Nigerian economy with its attendant consequences, hence, it became imperative to explore strategy (ies) for protecting the Niger Delta area and the Nigerian environment at large. One of such approaches employed is Environmental Education. Being mindful of the policy goal of the National Policy on environment which emphasizes; securing a quality environment adequate for good health and well-being; raising public awareness and promoting understanding of the essential environmental linkages, encouraging individual participation in environmental improvement efforts. These implies that the importance of Environmental Education cannot be overemphasized as the participatory approaches adopted includes but not limited to effective re-orientation, enlightenment/training and awareness creation on the potential danger associated with environmental pollution and degradation. The research undoubtedly led to enhanced knowledge on environment, attitudinal change, self-reliant and motivation, commitment and skill to protecting the environment. In the light of these, it is imperative that the public be made to understand that it is not only industries that create environment challenges but also each and every one of us that does not dispose his or her waste properly. The concept of environmental responsibility must be inculcated into the citizenry and different arms of the government and community leaders must ensure that society is properly educated in order to create and enhance understanding of some inevitable problems that are likely to occur, and industry to take measures aimed at reducing such problems to acceptable levels.

1.5 ETHNO-MEDICINE DIVERSITY OF SOME FOREST RESERVES IN THE NIGER DELTA (*Ozumba, C. I*, Ezike, A.C**, Ilondu; E.M* & Nnodim, C. C.**)

*Environment Department (Biodiversity Team), The Shell Petroleum Development Company,
Port Harcourt.

**Department of Pharmacology & Toxicology, Faculty of Pharmaceutical Sciences, University of Nigeria,
Nsukka.

Corresponding author's e-mail: c.ozumba@shell.com

The Niger Delta is endowed with different natural ecosystems, rich in biodiversity and many people that live close to the natural environment. The Forest Reserves (FRs) within and around The Shell Petroleum Development Company (SPDC) operational footprints (Upper Orashi, Lower Orashi, Taylor Creek, Lower Imo River, Nun River, Egbedi Creek, Ikebiri Creek, Apoi Creek, Edumanom, etc.) are natural habitats for plants and animals which are useful in community healthcare programme. Despite advances made in modern and orthodox medicine, traditional medicine has gained renewed attention in healthcare services. Traditional medicine knowledge has been endangered by mortality of resource persons / custodians of the knowledge, extinction of plant resources, inadequate scientific research and poor documentation. As part of its corporate social responsibility to host communities and in a bid to conserve biodiversity, SPDC commissioned a pilot study in 2014 to document ethno-medicine and associated indigenous knowledge held by the people of different community forests in the Niger Delta. This was part of the biodiversity validity survey for the Gbaran-Ubie Biodiversity Action Plan (BAP) development. This pilot study was done on Egbedi creek, Lower Orashi, Nun River and Edumanom forest reserves. During the field survey conducted in February to March 2014, individual and focus group discussions, interviews and questionnaires were used to collect relevant information from knowledgeable people in the locality. Data were also obtained by transect walks in and around the forests and other herbal medicine collection areas in the community. Information obtained from respondents included local name, medicinal uses for ailments, part(s) used, mode of preparation and administration. Voucher plant specimens collected were identified using standard taxonomic procedures. A total of about 55 plant genera of remarkable medicinal importance distributed amongst 28 families were identified. The use of animals like snake, fish and monitor lizard for medicinal purposes was documented. Some of the plants had more than one therapeutic use and can be administered singly or in combination for additive or /synergistic effect. In making medicinal preparations, leaves, roots, stems, aerial parts, seeds or the whole plant could be used. Altogether, 38 different health problems including malaria, epilepsy, diabetes, diarrhea, convulsion, measles and pile among others could be treated using remedies from medicinal plants. Documentation of traditional medicines knowledge is essential to preserve the knowledge, ensure that the plants are conserved and sustainably managed and utilized by the local people. As a result of this study, SPDC has not only ensured biodiversity conservation in the Niger Delta, but has promoted the healthcare of the forest communities thereby helping to improve value of SPDC's investment in the communities.

Keywords: Biodiversity, Community healthcare, Ethno-medicine, Forest reserves, Niger Delta Region, SPDC

1.6 EVALUATION OF CHANGING STAKEHOLDERS' EXPECTATIONS IN THE DELIVERY OF OIL AND GAS PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

(Michael, R.M. & Nwachukwu, E.O.*)*

*Corporate Environment, The Shell Petroleum Development Company,

Port Harcourt.

Corresponding author's e-mail: richard.michael@shell.com

It is recognised that today's business environment is characterised by fierce competition and that society's expectations of companies are changing. Increasingly, the success of projects is dependent on achieving endorsement from local communities and other stakeholders, who are concerned about oil and gas exploration and development. To be recognised as the top performer of first choice with 'licence and freedom to operate', oil and gas projects must respond effectively to these expectations and challenges. The first step in meeting these expectations and addressing challenges is via a robust Environmental Impact Assessment (EIA) judging from its position and place in oil and gas developments/activities. This study assessed changing stakeholders' expectations in the delivery of oil and gas projects' EIA. Data were collected via structured questionnaires and administered to four major EIA stakeholders (Communities, Regulators, EIA Practitioners and Project Proponents) in the areas of conformity with laws and standards, sustainable development, stakeholders' involvement, follow-up mechanisms after EIA approvals and public communication of EIA. The responses were analyzed using simple Percentages whilst Student's t-test performed at a significant level of 5% (i.e. $p = 0.05$) was used in the test of hypotheses. It was found out that there was a significant relationship between EIA and conformity with laws and standards ($p=0.019$), as well as contribution to sustainable development ($p=0.024$). However, no significant relationship was found between Oil and Gas EIA and stakeholders' involvement/participation ($p=0.082$), follow-up mechanism after approval ($p=0.064$) and communication of EIA outcomes to the public ($p=0.096$). The findings were further validated by outcome of Focus Group Discussions held with selected stakeholders. Evaluation of the findings with literature and professional judgment, confirmed that EIA meet national laws requirements but cannot stand for international Project financiers due diligence without further requirements. EIAs promote sustainable development by encouraging minimization of adverse effects and enhancement of benefits. Stakeholders' involvement, follow-up mechanisms and communication of results are aspects that should be looked into. Recommendations were made for improvement on the current realities. Further research using larger population and multimodal approaches of data collection is suggested to enhance outcome.

Keywords: Stakeholders' Expectations, EIA, oil and gas projects, 'licence and freedom to operate'

1.7 EVALUATION OF RENA AND MYCOREMEDIATION TECHNIQUES IN THE DEGRADATION OF TPH, PAH AND THC IN CRUDE OIL IMPACTED SOIL

(*Maduekwe, C. *, Nwachukwu, E.O. **, & Joel, O.F. **)

*World Bank African Centre of Excellence for Oilfields Chemical Research, University of Port Harcourt.

**Department of Plant Science and Biotechnology, Faculty of Biological Science, University of Port Harcourt.

Corresponding author's e-mail: eunice.e.nwachukwu@shell.com

Oil exploration and production in the Niger Delta as a source of revenue during the past decades has brought with it devastating environmental consequences. This has had deleterious effect on soil ecosystems which are prime factors in agricultural productivity and major livelihood in the oil-producing Niger Delta. It is a regulatory requirement for oil companies responsible for such environmental consequence to remediate the impacted environment. The oil companies rely mainly on Remediation by Enhanced Natural Attenuation (RENA) for the remediation of impacted soil. RENA has come under increasing knocks by host communities and as reported by UNEP in Ogoni and Amnesty International as not achieving remediation of impacted environment. On the other hand, Mycoremediation using Mushrooms *Pleurotus ostreatus* is a promising bioremediation technology. This study aims to comparatively evaluate the effectiveness of RENA and in addition compare the abilities of RENA technique with mycoremediation technique in the remediation of Petroleum Hydrocarbon impacted soils in the Niger Delta.

The Study area was UNIPORT Research Garden, Abuja campus. Triplicate plots of 1M X 1M size for RENA, Mycoremediation, combination of RENA/Mycoremediation (RENA/MYCO) and control plots were each spiked with 7.5 litres of Bonny Light Crude. At depths 0-15cm and 15-30 cm soil samples were taken for laboratory analyses for TPH, PAH and THC at 0, 4, 8, 12, 16 and 20 weekly intervals. Data collected were subjected to one-way Analysis of Variance (ANOVA) at 5% significant level ($p < 0.05$) and Multiple Comparison Post-Hoc Test.

The results showed that there was decrease in the concentration of all the parameters within the period of study. Results indicated that TPH mean value decreased in concentration from 3870.7 ± 44 to 1135.8 ± 6.6 , 3862 ± 37.04 to 1517.8 ± 2.5 , 3926.48 ± 32.7 to 383.4 ± 3.67 by RENA, MYCO, RENA/MYCO respectively while the control treatment mean value decreased TPH from 3920.4 ± 17.8 to 2688.6 ± 24.8 . PAH mean concentration decreased from 35.4 ± 0.34 to 12.12 ± 0.19 , 35.5 ± 0.2 to 17.32 ± 2.74 , 35.1 ± 0.33 to 5.2 ± 2.68 for RENA, MYCO, RENA/MYCO respectively while the Control showed a mean value TPH decrease from 35.3 ± 0.23 to 25.72 ± 0.23 . RENA, Mycoremediation and RENA/Myco techniques recorded mean THC concentration reduction from 4319.5 to 1356.78, 4302.7 to 1847.4 mg/kg, 4324.3 to 340.1 mg/kg respectively while the Control plots showed a mean THC reduction from 4290.8 to 3141.9 mg/kg. Among the remediation techniques, RENA/Myco supported the highest reduction of the three hydrocarbon parameters investigated.

Pleurotus ostreatus possesses the ability to biodegrade TPH, PAH and THC and grow in Crude Oil impacted soil, thus it is recommended that mycoremediation using (*Pleurotus ostreatus*) in conjunction with RENA will achieve quicker and more efficient cleanup of soils impacted with crude oil.

Keywords: RENA, Mycoremediation, *Pleurotus Ostreatus*, Crude Oil, Total Petroleum Hydrocarbon (TPH), Polycyclic Aromatic Hydrocarbon (PAH), and Total Hydrocarbon Content (THC)

1.8 FURTHER EVIDENCE OF SEA TURTLE (ORDER: TESTUDINES) NESTING ALONG NIGERIAN BEACHES – THE OLOKOLA LNG (OKLNG) CASE STUDY (*Imevbore, V.O. *, Nwadike, E. *, Ezealor, A.U. **, Okafor A. ***, Asuku, T. ***, & Nwankwo, E.C. ***)

*Environmental Resources Managers Limited, Lagos.

**Department of Forestry and Environmental Management, Michael Okpara University of Agriculture,
Umudike.

***OKLNG Free Zone Enterprise

Corresponding author's e-mail: voi@erml.net

This paper presents methods and findings from a recent sea (or marine) turtle survey along the western axis of Nigeria's outer coastline. The study confirmed nesting beaches for two marine turtle species, the leatherback (*Dermochelys coriacea*) and the green sea turtle (*Chelonia mydas*), along the coastline of the proposed Olokola LNG (OKLNG) Project site. The paper also outlines threats to this exquisite turtle guild and recommends the need for immediate development of national nesting site maps of sea turtles, to enhance their conservation.

**1.9 HARNESSING THE DERIVABLE BENEFITS OF THE ENVIRONMENTAL
IMPACT ASSESSMENT PROCESS FOR EFFECTIVE PROJECT IMPLEMENTATION –
A REGULATOR’S PERSPECTIVE (Ayaeze, N.E. (Mrs.) *, Zagi M. M (Dr.) *, & Balogun A.
A*)**

*Department of Petroleum Resources, No. 7 Kofo Abayomi Street, Victoria Island, Lagos.

Corresponding author’s e-mail: ayaeze.n.e@dpr.gov.ng

The environmental management tool utilized for ensuring the prevention of pollution and negative impact is Environmental Impact Assessment. In line with its regulatory mandate for adequate protection & preservation of the oil and gas operations environment, the Department of Petroleum Resources (DPR) has continued to ensure that reasonable and sufficient impact mitigation measures are put in place by operators prior to the commencement of oil and gas exploration/development activities in Nigeria.

A good EIA requires two ingredients: details of the targeted environment and details of the proposed project.

The Department’s Environment team has a strategic position of proximity to the team of engineers saddled with the monitoring, review and approval of the oil and gas engineering projects.

It has put this position of advantage to maximum use by creating an EIA process that not only requires a detailed understanding of both the environment and the project engineering, but one that has interwoven the phases of the project engineering and the EIA into an inseparable series, making them become interdependent requisites of one another.

Some of the advantages of this approach is that it has enabled the Environment team to make critical inputs to project design while still being conceptualized, eliminate unacceptable operating concepts at early stages of the design, eliminate obsolete or deleterious technology, suggest more environmentally-friendly options of concept, technology, operation and waste management in line with information obtained from the EIA about the peculiarities of the targeted environment, revert to the EIA report to incorporate new learnings or modifications in engineering design, produce an EMP that is fully “aware” of project peculiarities or soft spots.

The paper highlights observations from over the years where lack of adherence to this process has produced various avoidable challenges. The paper therefore recommends further adherence to the DPR EIA process given its enormous benefits and increased productivity.

1.10 MANAGING BIODIVERSITY ISSUES IN GBARAN-UBIE AREA (Igbuku, A. *, Ozumba, C. *, Akani, G. **, Ilondu, E. * & Igwe, O. *)

*Environment Department, The Shell Petroleum Development Company of Nigeria, Port Harcourt.

**Department of Applied & Environmental Biology, Rivers State University of Science and Technology, Nkpolu, Port Harcourt.

Corresponding author's e-mail: c.ozumba@shell.com

The Gbaran Central Processing Facility (CPF) began operations in 2010 with 16 utility systems. This SPDC-JV oil and Gas facility is situated at the eastern bank of the Nun River near the Gbaran 1 & 3 Well locations. The facility lies within a seasonal freshwater swamp rich in biodiversity and is expected to operate for 30 years. It has a Field Logistic Base (FLB) which provides permanent accommodation, recreation, maintenance and office facilities for 200 operation and support staff. The CPF/FLB occupies a total area of approximately 64 ha out of which the FLB occupies approximately 21 ha. Within and around the facility, some biodiversity issues, such as death of trees, and incidents of snakes, lizards and spiders have been observed. Due to loss of biodiversity and the potential threats posed to staff by snakes, lizards and sundry pests, an assessment was commissioned in January 2014 to investigate the reported cases of snakes and pest invasion, identify the species involved and advice on mitigation /control measures, to proffer restoration measures for the forest within the conserved area and propose appropriate tree species for re-forestation of the wetland. The survey covered the perimeter fence walkway and the 100m wide track from the Helipad area towards Administration block area, all buildings, fields and facilities. Results show that the absence of culverts on the perimeter road led to intolerable levels accumulation of swamp water which consequently imposed stress on the vegetation around the facility. The incidence of snakes, lizards and spiders can be traced to elevated temperature usually during dry season which appear to favour their breeding processes. This study is recommending removal of impound water and replanting of the conservation and tank areas of the FLB using some indigenous trees with better stress-resistant record; the construction of a deep and wide cemented trench before the outer perimeter fence round the facility to serve as a pitfall trap for snakes and other reptiles, or making a small mesh size for the perimeter fence uniformly on both sides to prevent the snakes from entering. Additionally, it recommends planting of herbs like garlic, basil, *Eucalyptus*, lavender and rosemary to repel the insects and other reptiles, use insect-repellant light bulbs and application of insecticides. In order to protect the infrastructure from excessive heat of the sun and compensate for biodiversity loss in the course of the facility development, greening the entire facility is necessary. This will promote a safe and healthy environment within and around the facility.

Keywords: Biodiversity management, Gbaran CPF, FLB, Mitigation measures

1.11 METABOLIC CLASS DISTRIBUTION OF BACTERIA ASSOCIATED WITH MICROBIOLOGICALLY INFLUENCED CORROSION IN NIGER DELTA SOIL SITES
(Oparaodu, K.O.* & Okpokwasili, G.C.*)

* NALCO Energy Services Nigeria Limited, Port Harcourt.

Corresponding author's e-mail: kingsley.oparaodu@ecolab.com

Microbiologically influenced corrosion (MIC) in metals in two soil environments of the oil-rich Niger Delta Region of Nigeria was investigated over a period of 190 days. Using quantitative polymerase chain reaction (qPCR) and a Next-Generation DNA sequencing platform for bacterial enumeration and prokaryotic genetic speciation, 86 genera of bacteria were identified, comprising 190 isolates, from 12 corrosion product soil samples from coupons exposed to swampy and sandy soil environments of the area. The qPCR analyses and subsequent classification of the bacteria populations identified the isolates as belonging to the following metabolic classes: acid producing bacteria (APB), general heterotrophic bacteria (GHB), nitrate reducing bacteria (NRB), sulphate oxidizing bacteria (SOB) and sulphate reducing bacteria (SRB). There were also groups of isolates with the capability of multiple pathways metabolism (APB/GHB/NRB/SOB/SRB), and a few unclassified genera. Among the isolates were spore-formers, slime-formers, carbon dioxide producers, hydrogen sulphide and organic acid producers. The presence of these microbial communities were found to have influenced weight loss in the coupons, resulting in as much as 5.4% average percentage weight loss (APWL) after 190 days, which translated to corrosion rate of 5.58mpy. Among the most occurring species identified were: *Pseudomonas* sp., *Desulfomicrobium* sp., *Halanaerobium* sp., *Marinobacter* sp., *Pseudoxanthomonas* sp., *Acetobacterium* sp., *Exiguobacterium* sp., *Halomonas* sp., *Acinetobacter* sp., *Bosea* sp., *Marinobacterium* sp., *Proteiniphilum* sp., *Sphingobium* sp., *Sulfurospirillum* sp. and *Thermovirga* sp.

Keywords: Microbiologically influenced corrosion (MIC), quantitative polymerase chain reaction (qPCR), Niger Delta.

1.12 NIGERIAN ECONOMY AND THE ENVIRONMENT; MODELLING APPROACHES FOR ECOSYSTEM ASSESSMENT AND MONITORING, FOR SUSTAINABLE GROWTH AND DEVELOPMENT (Onwurah, I. *, Ubani, C. * & Otitoju, O. **)

*Pollution Control and Biotechnology Unit, Department of Biochemistry, University of Nigeria, Nsukka, Enugu State, Nigeria

**Department of Biochemistry, Federal University Wukari, Taraba State, Nigeria

Corresponding author's e-mail: ikechukwu.onwurah@unn.edu.ng

Population growth and economic development are key issues in the rapid changes in worldwide ecosystems. In this paper, mathematical modelling approach is established as a scientific basis for actions needed to enhance the conservation and sustainable use of Nigerian's ecosystems, so that the government can supply the services that underpin all aspects of human life. At the *Pollution Control and Biotechnology Unit*, Department of Biochemistry, University of Nigeria, Nsukka, we have evolved some modelling approach to provide strong evidence of the impact of pollution on the environment. The various models we have built show, for example, that over some years, environmental pollutions have changed natural ecosystems more rapidly and extensively as exemplified in the World Bank Report on the Niger Delta Regions of Nigeria. Naturally endowed goods and services have been the ultimate foundations of economic development and health, even though in modern societies this fundamental dependency may be indirect, displaced in space and time, and therefore poorly recognized. The above statement means that we now need to look at environmental pollution issues through a broader lens and one of such lens is modelling. Economic issues are no longer merely a result of localized exposures to "traditional" forms of pollution. Pollution from acid mines, pesticides, gas flaring and endocrine disrupting substances also results to broader pressures on ecosystems, from depletion and degradation of freshwater resources, to the impacts of global climate change on natural disasters and agricultural production. This paper establishes the causal links between environmental pollution and economy in spite of its complexity. This is based on the fact that these links are indirect, displaced in space and time, and dependent on a number of modifying factors. From these models we proffer some mitigation measures and possible solution.

1.13 OIL SPILL RESPONSE IN A BIO-DIVERSE ENVIRONMENT: MANAGING THE TRANSITIONS (*Iheagwam, S. *, Braide, O. *, Mbele, N. *, Vandeville, P. * & Anozie, I. **)

*Total Exploration & Production Nigeria Limited, Port Harcourt.

Corresponding author's e-mail: nnaemeka.mbele@external.total.com

Exploration and Production activities are potential sources of oil contamination of the environment. Regulatory requirements, both national and international make it mandatory for the spiller or the owner of the oil production asset from which an oil spill occurs to bear the full responsibility for the prompt response to managing the spill (repairs, clean-up and other environmental restorative actions). The Niger Delta environment is popular for its diverse ecology with varying sensitivities. What have not been widely presented in field experience especially in the hinterland of the Niger Delta are the sudden transitions that can be encountered during oil spill response operations.

In some areas in the Niger Delta, the ecosystem transits from dry land to seasonal swamp, seasonal swamp to perennial swamp, perennial swamp to surface water system such as swamps and rivers. In the same vein they are habitats to varying plant and animal species. When these plant and animal species are exposed to petroleum hydrocarbon, they become affected in diverse ways ranging from varying physiological and tissue damages to immediate death. Decision making during oil spill response in such environments can be challenging, difficult and also require a multi-pronged response approach to ensure as much as is practicable the plant species are spared the short and long term effects or immediate death due to the contact with the oil.

Oil spill response is very challenging no matter the environment that the response is being executed. The greatest challenge in a diversity rich environment is dealing with the various ecological diversities and their environmental transitions which may be in same location or in different locations within the same environment but with no distinct transitions or boundaries. Environmental transitions in the site being discussed ranged from land to seasonal swamp, to perennial swamp, to surface water ecosystems. The decision making process as to what area to focus response efforts at any given time has to be spot on to avert wide spread damage to these fragile environments. The sensitivities are also seasonal as the level of response of the plant species to the oil depends on the level of contact the plant tissues have with the oil. The whole plant systems are vulnerable from the root system to the shoot systems including the leaves. The liquid phase components of the spilled oil affect the root and stem tissues that come in direct contact with the oil while the leaves and the stems above the migrating oil level are affected by the evaporating volatiles leading to defoliation of the leaves even with no obvious direct contact with the oil. The depth of penetration of the oil down the soil profile also varies from the various transitions. This is also affected by the seasonality of the area. The general impact to the environment is also season dependent which also affects the transition management process.

The sensitivity of the typical Niger Delta environment to oil spills cannot be overemphasized. Understanding the diversities and the sudden transitions in habitat types is critical in the effective management of an oil spill operation in these environments.

1.14 OIL SPILL RESPONSE IN A BIO-DIVERSE ENVIRONMENT: SECURITY CONCERNS AND WAY FORWARD (*Iheagwam, S. *, Braide, O. *, Mbele, N. *, Vandeville, P. * & Anozie, I. **)

*Total Exploration & Production Nigeria Limited, Port Harcourt.

Corresponding author's e-mail: opakirite.braide@total.com

The Niger Delta region has been and is still the hub of oil and gas operations in Nigeria. Exploration and Production activities and their entire life cycles are potential sources of oil contamination of the environment. Statistics have shown that majority of crude oil releases into the environment are as a result of man's activities (Anthropogenic). Regulatory requirements, both national and international make it mandatory for the spiller or the owner of the oil production asset from which an oil spill occurs to bear the full responsibility for the prompt response to managing the spill (repairs, clean-up and other environmental restorative actions). Security issues have made operations in this area more challenging.

In the past two decades or so there has been an increase in incidents of willful damage to oil and gas facilities by both armed militants and product theft syndicates. Oil and Gas Company's in recent times have had to battle with incidents of production infractions due mostly to third party interferences "sabotage" on the facilities leading to oil spillages with concomitant damage of the environment. The burden of *duty of care* borne by Exploration and Production companies compels them to take immediate steps to stop the spill and commence intervention and response actions in order to reduce the very often ensuing environmental damage.

Oil spill response operations pose a lot of challenges even when the environment is devoid of obvious extraneous bottle necks. In the Niger Delta region, the difficulties thrown at the 'spiller company' are multi-pronged and in certain cases create an almost war-like situation. Before the escalation of militancy activities, security and related issues were not key factors in the risk assessment considered for daily E&P operations. But the dynamics have changed making security issues a major determinant in the activity of operators. The presence of security personnel in all operational sites including oil spill response sites is a *sine qua non* to ensure a reasonable peaceful operation. This approach however, is not sustainable and a vigorous and pragmatic effort needs to be employed to make routine operations less worrisome in E&P activities. This may involve continuous stakeholder engagements and peaceful co-existence between the communities and the operating companies. The use and deployment of armed security personnel (military and police) as part of operating personnel in the day to day operations of E & P companies in Nigeria's oil and gas activities is not sustainable. However, in most instances their absence stalls, delays or makes an activity come to a dead end. The situation that led to the present state is not abating and may be there for a very long time and will continue to make smooth operations in the Niger Delta with respect to E&P activities dependent on the continuous presence of security personnel support. More pragmatic stakeholder engagements should be carried out to make operations less war-like.

1.15 ON THE ISSUE OF ENVIRONMENTAL IMPACT STATEMENTS' QUALITY IN THE OIL AND GAS INDUSTRY (*Anifowose, B. ^{*1}*)

^{*}School of Geography, Earth & Environmental Sciences, The University of Birmingham, Birmingham
B15 2TT United Kingdom.

¹Faculty of Engineering, Environment & Computing, Coventry University, Coventry CV1 5FB United
Kingdom.

Corresponding author's e-mail: b.anifowose@coventry.ac.uk

The oil and gas industry, globally and locally, is at a crucial moment. There are suggestions that vast oil and natural gas reserves along with capital expenditure (CAPEX) could be left in the ground amidst rising concerns for climate change and oil pollution impacts. But despite numerous Environmental Impact Statements (EISs) to identify and mitigate such impacts, no study has specifically assessed the quality of EISs for both onshore and offshore oil and gas projects especially in Nigeria. To address this research gap, a modified Lee and Colley evaluation model was developed to assess the quality of sampled oil and gas project EISs produced (1998-2008) in Nigeria. Study findings show that project description and communication of results are the main areas of strength. However, Mann-Whitney tests suggest that there is no evidence that the quality of EISs for the latter period (2004-2008) is higher than that of the earlier period (1998-2004). Environmental impact prediction and decommissioning were among the key areas requiring enhanced attention. We suggest that periodic systematic review of the quality of submitted/approved EISs (c. every 3-5 years) should henceforth be mandated to monitor EIS quality trend. This would enhance continual improvement (e.g. as linked to ISO 14001:2015 EMS) in both the EIA processes and the resultant EISs of technical engineering projects. Such reviews have the potential to illuminate some of the underlying problems of, and solutions to, oil and gas exploration, production and transportation related environmental impacts. This suggested change would be useful internationally, particularly given the rising concerns for oil and gas industry's perceived contribution to climate change and environmental pollution incidents. Perhaps, a systematic periodic quality review of EISs is a much better option than the suggestion to turn valuable hydrocarbon reserves and CAPEX into stranded assets.

Keywords: Oil and gas projects; Project decommissioning; Environmental Impact Assessment (EIA); Environmental Impact Statement (EIS); Lee and Colley review model; environmental impacts; Nigeria.

1.16 REGULATORY STYLE IN ENHANCING OPERATIONS IN THE OIL AND GAS SECTOR IN NIGERIA - A RETHINK (*Bassey, D. **)

* Department of Petroleum Resources, 7 Kofo Abayomi Street, Victoria Island, Lagos.

Author's e-mail: dorothybassey@yahoo.com

All over the world, oil and gas sector regulators are mandated to ensure compliance with laws, regulations and guidelines governing the sector's activities. They develop regulations, guidelines and monitor the oil and gas operations including compliance with laid down requirements. They are in essence, the 'watch dog' of the sector. In Nigeria, this function is carried out by the Department of Petroleum Resources (DPR).

Over the years, the DPR has witnessed significant non-compliance of oil and gas operators with a number of its regulations and guidelines. Such non-compliance sometimes leads to unnecessary project delays and higher costs of operations and project-implementation.

This paper presents the outcome of a research conducted to understand reasons for non-compliance among operators particularly in Nigeria. It involved the administration of questionnaires, interviews with key industry personnel and a review of specific cases.

The results show that the style of regulation is largely responsible for the sub-optimal compliance and suggests a different approach. Case studies indicate that a more collaborative approach between the regulator and operator will improve the regulators' capacity, guide the development and implementation of compliance requirements and ultimately improve overall compliance of the operators. A paradigm shift in the regulators' approach to conducting its functions is advocated.

**1.17 SPILL TRAJECTORY MODELLING IN THE INTERTIDAL ZONES: INVENTORIES
& OPPORTUNITIES (FOR DEFINING THE TIDAL ZONES) (*Oladayiye, S*. , Anifowose,
B. **, Afolayan, D. ***, & Uzor, A. *****)**

*Chevron Nigeria Limited, Lagos

**Faculty of Engineering, Environment & Computing, Coventry University, Coventry CV1 5FB United
Kingdom

***GIS Konsult Limited

****National Institute for Root Crops Research Institute, Umudike

Corresponding author's e-mail: steve.oladayiye@gmail.com

The coastal environment, especially the intertidal zone, supports different species of flora and fauna through some intricate ecosystem services. The public awareness of this fact and the publicity surrounding the recent Macondo oil spill disaster have put further pressure on regulators and operators on the need to minimize the probability of oil spill incidents. A fundamental aspect of spill response preparedness is the ability to account for the trajectory of the spill and the environmental receptors at risk. However, several parameters are crucial in modelling oil trajectory and fate; and they include the physicochemical properties of the spilled oil, the quantity spilled, the universal movers and other environmental variables. Of primary significance are the currents and motion of water, temperature, diffusion coefficient, bathymetry, suspended sediment, wave height and wind vector. Nevertheless, there appears no workable strategy in place for the systematic collection and utilization of these datasets despite their importance in ensuring efficient and effective oil spill response in the onshore areas of Niger Delta. This is a serious problem given that onshore areas tend to record higher frequency of spills than offshore. Therefore, we highlight the key data gaps and possible measurement strategy for better response planning in the littoral zone of the Niger Delta. We also suggest potential funding mechanism to sustain this idea.

1.18 USE OF GREEN BURNER TECHNOLOGY FOR WELL CLEANING-EXPERIENCES AND LESSONS LEARNT (*Okoli, U.* & Awi, H.**)

*Addax Petroleum Nigeria.

Corresponding author's e-mail: ugochukwu.okoli@addaxpetroleum.com

Conventionally, during clean-up and well-testing operations, it is required to receive fluid from the wellbore to the drilling rig. Due to the unavailability of adequate storage facilities on these rigs, it is typical to flare the hydrocarbons received from the clean-up and testing operations. The problems involved with burning the hydrocarbons during offshore well clean up and testing has been the discharge of hydrocarbon emissions into the air. These gases are a by-product of the incomplete combustion of hydrocarbons, and recent studies have shown deleterious climatic effects of these gases.

Due to the poor efficiency of some conventional burners, there are also “fall-outs” during the flaring operations which leave thin oil sheen on the water surface. The oil sheen on the water surface prevents oxygen to get to the phytoplankton, and in extreme cases asphyxiates the sea animals and causing further pollution issues to the marine environment.

To mitigate climatic and the environmental issues and ensure conformance to the Nigerian regulatory laws, an optimized burner technology (Green Burner), which addresses incomplete combustion of hydrocarbons and fallout conditions was identified. It was used by Addax Petroleum for flaring hydrocarbons during clean up and testing operations.

This paper discusses the effects of flaring with poor systems with low efficiency burning disposal systems, and highlights the advantages of using the Green Burner technology for flaring operations.

1.19 WASTE MANAGEMENT –THIRD PARTY WASTE STEWARDSHIP (TWS) STANDARD (*Ojo, O.* & Abudu, A.**)

*Chevron Nigeria Limited, Lagos.

Corresponding author's e-mail: olubunmiojo@chevron.com

Waste management is an integral part of the Oil and Gas Industry. Effective management of waste by competent third party providers is important to ensure appropriate cradle to grave waste management philosophy. The deployment of new technologies in the industry comes with new waste types requiring capable service providers to handle on behalf of the industry, and the country as a whole continues to face some challenges regarding this.

While a regulatory framework for waste management providers is in place, Chevron Nigeria Limited (CNL) has gone the extra mile with its Third Party Waste Stewardship (TWS) Standard to ensure a systematic and efficient approach towards evaluating waste facilities and ensuring they meet specified environmental, safety, compliance and financial criteria.

This Standard is applicable to Company generated waste sent to third party facilities for handling including waste material designated for recycling, reuse, recovery, storage, and treatment. There are existing statutory guidelines provided in the Environmental Guidelines and Standards for The Petroleum Industry in Nigeria issued by Department of Petroleum (DPR) for the management and disposal of waste generated from oil and gas activities.

The TWS Standard has systematized evaluation procedures and Selected-for-Use criteria to reduce the potential long-term liability associated with disposal of waste while achieving minimum environmental impact through responsible waste management; it is not intended to fully eliminate the generation, treatment, or disposal of waste materials from CNL operations.

CNL utilizes third party treatment facilities to manage some of its specialized waste. The facilities of third party waste management providers are pre-qualified within the prescribed regulatory framework and also with Company TWS Standard requirements before their services are engaged. During the validity of their contracts, an Annual Evaluation Plan (AEP) is developed with routine checks performed on the third party treatment facilities by certified evaluators to ensure that the treatment facilities and waste management practices are consistently in line with regulatory and TWS Standard requirements. The application of the TWS Standard alongside applicable regulatory requirements has immensely sustained the responsible management of waste from cradle to grave.

2 SAFETY THEME

2.1 CFD SIMULATION OF LEAKAGE IN CRYOGENIC FLOW PIPELINES AND SOIL FREEZING (Shojaei, S.M. *, Behzadi, M. * & Kharrazi, S. *)

* Sazeh Pardazi Iran (SPI) Consulting Eng. Co., Tehran, Iran

Corresponding author's e-mail: smhshojaee@yahoo.com

Liquid products from the Mokran Petrochemical Complex, located along the Mokran coast, Iran, are stored in plant daily tanks, and transferred to the shore tanks inside the Shahid-Beheshti port. The transfer distance is about 22 kilometers from the battery limit of the complex to the entrance of the port. Refrigerants ammonia, propylene and ethylene are among liquid petrochemical products. This study, conducted by the *Process Safety Department at SAZEH PARDAZI IRAN (SPI) Consulting Eng. Co.*, describes the consequences of hazard events for the three cryogenic pipeline leaks, which can be used for Risk Assessment to provide safe distances with regards to acceptable risk zones. Three cryogenic pipe-lines of ammonia (34 barg, -30° C), propylene (22 barg, -54° C) and ethylene (18 barg -104° C) are buried 2 meters under the ground separated from each other. Assuming a specific range of amount of leakage (according to QRA), the refrigerant fluid leaks into the ground and causes frost heave of soil around the zone of leakage. According to the technical considerations, and to prevent frost-induced stress accompanied by cold embrittlement of the other pipes next to the (likely) leaking pipe, a minimum distance between these pipelines is required to be observed. To have a reassuring and safe assessment of the consequences of this effect, a finite-element CFD simulation of the transient leakage of the three pipelines was performed using the Brinkman equations, which deals with fluid flow in porous media coupled with equations of heat transfer in porous media. To be ensured about the correctitude of the simulation, the actual case of a steady-state leakage in West-Ethylene pipeline was simulated and the result was properly validated. A wide range for possible hole-sizes on the pipe, 3 mm to 75 mm, was considered for each three lines. Assuming 3 minutes for complete action of LBV, our results predicted the maximum radius of soil frost from 0.53 to 0.95 m for ethylene, 0.42 to 1.0 m for propylene, and 1.05 to 2.25 m for Ammonia. Although flash evaporation does not occur for the ammonia due to its initial condition, its freezing radius is about twice bigger than ethylene and propylene because of its higher line pressure.

Key Words: pipeline leak, cryogenic, soil frost heave, cold embrittlement, CFD Simulation

2.2 EFFECT OF VISCOELASTIC FOUNDATIONS ON THE FAILURE OF PIPELINE CONVEYING HPHT FLUIDS (*Owoseni, O.D. *, Kamiyo, O.M. ** & Oyediran, A.A. ***)

*Nigerian Gas Company, Warri, Nigeria.

**Department of Mechanical Engineering, University of Lagos, Nigeria.

Corresponding author's e-mail: ayooyediran@hotmail.com

Recent advancement in offshore oil and gas exploration has led to the occurrence of high-pressure, high-temperature (HPHT) fluids. These fluids are conveyed with pipes either lying on sea beds, buried or partially buried. These pipes when laid on sea bed follow the topology of the sea bed and are hence slightly curved. The sea beds act as viscoelastic foundations and it helps to dampen out the accompanying flow induced vibrations. The aim of this study therefore is to analyse the effect of viscoelastic foundations on the failure of pipeline conveying HPHT fluids. The governing equations were derived using energy method. The resulting partial differential equation was solved using eigenfunction expansion method. These resulting ordinary differential equations were truncated after the fourth mode and solved numerically using eight-seventh order Runge-Kutta code in MATLAB. Two types of foundations were investigated. Both with viscous damping but one is with linear spring, while the other is with nonlinear spring. Physically these represent hard and soft viscoelastic soils respectively. Bifurcation and orbit diagrams with their corresponding phase portraits showing periodic and chaotic motions of the system trajectories are generated and presented. These results show that the presence of foundation and curvature stiffen the pipe, while pressure and temperature are of softening effect. Nonlinear stiffness makes the pipe to undergo chaotic oscillation which may result in soil trenching or upheaval which is absent in the linear case meaning that linear foundations enhance the life span of pipelines than the nonlinear ones. The route of the chaotic motion was through periodic doubling bifurcation.

Keywords: Viscoelastic Foundations; Simply Supported Pipe; Critical Flow Velocity; Bifurcation; Orbit Diagrams; Chaos; Dynamic Stability

**2.3 IDENTIFYING WORKERS' HEALTH AND SAFETY AS CAUSES
OF CONSTRUCTION PROJECT DELAYS IN THE NIGERIAN OIL AND GAS
INDUSTRY (Opaleye, O. *, Talukhaba, A. * & Smallwood, J. **)**

*Department of Building Science, Tshwane University of Technology, Pretoria, South Africa.

**Department of Construction Management, Nelson Mandela Metropolitan University, Port Elizabeth,
South Africa.

Corresponding author's e-mail: oladele.opaleye@gmail.com

The oil and gas construction and maintenance fatality rate is 2.5 times higher than the fatality rate in the construction industry, and 7 times higher than the fatality rate general industry. Due to the high fatality rate in the oil and gas construction industry, there are concerns that the rapid growth in the oil and gas industry might result in the experience of delays in the delivery of the expected outputs in the industry. Therefore, there is a need to characterize workers' risks, identify solutions, and identify gaps in previously published research. This study used a survey of the literature to ascertain the actual causes of workers' health and safety (H&S) risks, which eventually lead to fatalities in the industry, and proffer suggestions in terms of mitigating the menace that also affects prompt project delivery in oil and gas industry in Nigeria.

Key words: fatalities, Risks, Construction, Health & Safety.

2.4 IMPERATIVES OF PROCESS SAFETY IN NIGERIA (*Erinne, J.**)

* Chex & Associates, Lagos

Author's e-mail: ceo@matrixpetrochem.com

This paper examines the impetus given to the concept of Process Safety following the catastrophic Bhopal Incident in India in 1984. It highlights the thrusts and advances in Process Safety knowledge and practice internationally, thereafter, with particular reference to the USA and UK models. It further examines Process Safety activities in the Nigerian Process Industries, with particular focus on the Petroleum Sector and identifies disturbing gaps, despite recent Process Safety occurrences with multiple fatalities. A suggestion is proffered for a Process Safety Initiative in Nigeria, spearheaded by the Nigerian Society of Chemical Engineers, which will provide a platform to assist close the identified gaps and drive the advancement of Process Safety knowledge and practice in the country.

2.5 IMPROVING SCAFFOLDING AND WORK AT HEIGHT TRAINING & STANDARDS IN NIGERIA'S OIL AND GAS INDUSTRY – EXPERIENCES AND LESSONS LEARNED (*Marc T. **)

*Simian Skill, c/o Falck Prime Atlantic, 9 Younis Bashorun Street, Victoria Island, Lagos.

Author's e-mail: nkechi.ezekwe@falckprimeatlantic.com

Falls from height account for a large proportion of fatalities and accidents on construction sites around the world. Factors contributing to falls from height include the lack of knowledge & appropriate training, the lack of safe working procedures, faulty work equipment and Human factors such as the lack of perception of risk, inattention and complacency.

Many countries throughout the world provide vital statistics for accidents & incidents on an annual basis. For example, the United Kingdom through the Health and Safety Executive (HSE) produce and distribute these statistics to all interested parties. In the USA statistics are produced by the Occupational Safety and Health Association (OSHA) while in Australia statistics are produced and distributed by Safe Work Australia.

Based on research into worldwide accident statistics it is clear that Nigeria either does not produce its own statistics or do not keep records which are readily available.

In the UK alone it is estimated that 10 million workers are working at height on a regular basis and these kinds of numbers evidence that managing the risks is essential. Since the need for working at height cannot be eliminated, one of the best ways to manage these risks is to provide sufficient information to the workers in the form of training. Another remedy beyond the use of correctly trained scaffolders will be to ensure scaffold operatives have quality materials for construction under the supervision of competent persons. In Nigeria, the use of bamboos and substandard equipment is common sight at most of our construction sights, and this has continued due to an absence of regulatory guidelines, sensitization and enforcement. It is also important that these guidelines consider incorporating design management for scaffold as this would guarantee that scaffolds are designed by competent persons, such as structural engineer, to ensure that it is capable of carrying the loads applied to it.

A step in the right direction will be taking responsibility - each company must take the first step to start the process of improving its standard. The gradual process of improvements will ultimately achieve the goal of improving standards within the industry. The biggest changes or improvements that can be made will be entering into training schemes and apprenticeship programs to offer the young unskilled Nigerian the chance to begin a career based on the right foundation of training in scaffolding. Additionally, existing scaffolders will be better able to improve their skills, knowledge and capabilities. With a fully trained workforce operating in Nigeria, this can only lead to improvements in the nations' scaffolding industry and the benefits will be seen throughout.

In the future, as standards improve then accident are reduced and in other cases statistics may well become available for review and lessons learned.

2.6 LPG FACILITIES INTEGRITY AND INCIDENT MANAGEMENT – EXPERIENCE AND LESSONS LEARNT (*Abayomi, A.* & Azeez, G.**)

* Oando Marketing PLC, 8 Kayode Street, Marine Beach, Apapa, Lagos.

Corresponding author's e-mail: azganiyu@oandoplc.com

Liquefied Petroleum Gas (LPG) is a key component of the downstream petroleum sector, and it has a lot of uses and applications. LPG predominantly refers to Propane – Butane mixture. It can be transported and stored as liquid but when released it will vaporize and burn as gas. LPG is a gas at atmospheric temperatures and pressure. LPG is highly flammable. It is odourless and colorless, but a mild odourant Ethyl Mercaptan is added to produce odour for detection in case of leakage. LPG in gaseous state is nearly twice as heavy as air. In case of leakage, LPG tends to settle down at floor level. LPG is used primarily for cooking in Nigeria. It can also be used for power generation and as fuel for cars. In industry, LPG is widely used in workshops and laboratories, for metal cutting, non-ferrous welding, brazing and flame clearing, for generating special atmospheres required in heat treatment processes, textile industry, and glass industry and for numerous other industrial applications. Similar with most petroleum products, there are a lot of hazards associated with the use of LPG, which if not properly managed could be released. These hazards can be broadly classified into health hazards and fire hazards and have been properly explained in the body of this paper. To properly manage LPG, there are a lot of equipment and facilities across the LPG value chain designed to enable its proper handling to ensure safe operation and usage. Some of these facilities include LPG bulk storage depots, LPG cylinder filling plants, LPG add-ons, storage tanks and cylinders used for domestic and commercial purposes. Choice of these equipment is a function of the intended use and is governed by policies and guidelines enacted by regulatory authorities such as Standard Organization of Nigeria (SON). The key considerations for the design, installation and operation of LPG facilities have been reviewed in this paper. They include site selection, fire protection and emergency response, product quality specification, operating procedures and operator competence and they form the basis for safety in the operation of these facilities. Some major LPG accidents recorded in Nigeria have also been reviewed. These include the explosion at Inter Corp Oil Limited Gas Plant Nnewi on 24th December, 2015; Allen Gas Isolo explosion on 26th April, 2015 and the LPG Skid Plant Akure explosion on 13th December, 2014.

The learnings from these accidents especially the explosion at Nnewi have been captured. These highlight the probable consequences of poor facilities and handling and the key steps to be taken in ensuring safety in the LPG industry in Nigeria.

The key responsibilities of the LPG regulatory bodies are to work with industry stake holders to set guidelines and ensure the safe installation and operation of LPG facilities in Nigeria. These roles have been briefly reviewed alongside recommendations on the way forward.

Key Words: Liquefied Petroleum Gas (LPG), of equipment and facilities, Hazards, Incident, and Learning's.

2.7 MAKING A CASE FOR A PROACTIVE HEALTH AND SAFETY REGIME IN THE NIGERIAN OIL AND GAS INDUSTRY (*Hameed, T.)**

* Safety Legal Consults

Author's e-mail: tihameed@yahoo.com

The significance of a good occupational health and safety culture in enterprises is not an issue that can be deemphasized. The major part of incomes of most, if not all economies, is dependent on its labour force. It would therefore be stating the obvious that preserving the health and safety of workers in any economy makes good business sense. Nigeria as a nation has been largely dependent on oil and gas for several decades and for several decades too, oil and gas has been the main stay of the Nigerian economy. Even in the face of dwindling global oil prices, it still accounts for a significantly large percentage of Nigeria's exports. It is distressing to find that this sector poses one of the largest health and safety threats to workers.

It is the position of this paper that the Legislature be given a more significant role to play than is currently the case. This paper contends that law cannot be relegated to the background in Health, Safety and Environment (HSE) management and practices. The interdisciplinary nature of the subject area must take Law into consideration and be given equal prominence along with other science and social science subjects which occupational safety and health cuts across. In drafting such laws, they must be proactive, rather than a set of reactive laws which only address health and safety issues that could have been prevented in the first place.

The Factories Act 1987 is the major legislation governing health and safety regardless of the economic sector. A cursory look at the Act would reveal that it is anachronistic as most of its provisions are unrealistic in today's world of work and the contents spell out prescriptive provisions and confer strict liability on offenders. There are also health and safety laws specific to the oil and gas industry such as the Petroleum Act 1969, Mineral Oils (Safety) Regulations 1997, Oils in Navigable Waters Act 1968, Oil Pipelines Act 1958, Petroleum Refining Regulations 1974, etc. They in general share similar attributes as those identified in the Factories Act and are therefore likely to experience similar shortcomings in the course of their application. It would appear that the outcomes of their applications would keep an operator on the defensive so as to avoid prosecution, rather than preventing and protecting the interest of the workers under his care.

The United Kingdom for instance had similar styled legislation and discovered that such legislation was not achieving the desires of Parliament. A total overhaul of their health and Safety legislation was executed. Parliament established prescriptive and goal-setting provisions which put the control of the health and safety of the worker in his hands and the hands of others working with him. It is now, for the employer to prove that the work environment is kept hazard-free, after a risk analysis has been carried out, and everything reasonably practicable has been done to mitigate or eliminate hazards. This method of law-making has been made applicable to the UK oil and gas sector and the country is the better-off for it. It is proposed that the foregoing be taken into consideration when drawing up HSE laws for the Nigerian oil and gas industry.

2.8 MANAGING SAFETY RISKS IN THE NIGERIA OIL & GAS SECTOR – CHALLENGES & OPPORTUNITIES (*Ola-Ojetola, A. **)

* HAMFAZ Safety Consulting Inc. Canada & Nigeria

Author's e-mail: azeez.olaojetola@gmail.com

All over the world, the Oil and Gas industry is associated with series of hazards and risks that could be either health, safety, security, environmental, social, or reputational. In all aspects of Nigeria economy, with special focus on the oil and gas industry, safety continues to be a very serious and worrisome concern as it has always been in the exploration and production business many years ago. Whether operating upstream or downstream, oil and gas companies have a fundamental role to safeguard the lives of their employees and they rely on having a robust HSE Management System to demonstrate due diligence.

Effective implementation of any HSE Management System determines how the success or otherwise of any company can be measured and this is well entrenched in the oil and gas business. There are many HSE MS models outside there but the most common ones are either based on the UK HS(G) 65, the American OSHA, ANSI Z10-2012, or OHSAS 18001 models. Whatever model one follows, the main goal is to ensure all workers, contractors, visitors and stakeholders are protected against every work-related hazards and covering all job holders. However, experience has shown that some jobs are inadvertently omitted while developing the risk register and this has made the implementation of HSE MS less than adequate. This paper is to demonstrate how the use of a simple Job Task Hazard Sheet can be helpful in managing safety of workers in the oil and gas industry.

Keywords: HSE MS, HSG 65, OSHA, ANSI

2.9 MANAGING THE INNER DIALOGUE AS A BOTTOM-UP APPROACH TO ENTRENCHING HEALTH, ENVIRONMENT AND SAFETY PRACTICES IN OIL AND GAS FACILITIES – ESCRAVOS GAS PLANT EXPERIENCE (*Erhurun, P. **)

* Chevron Nigeria Limited

Author's e-mail: perhurun@chevron.com

An organization with entrenched Health, Environment and Safety (HES) culture is one where inner dialogue amongst personnel leads to consistent safe decisions. Taking a cursory look at incident reports in the oil and gas industry, we see how actions of 'the individual' affect 'the collective'. Analyses from high value learning incidents in the Oil and Gas industry suggest that the human factor accounts for most incidents.

The devil is in the 'routine'! Operators typically become unconsciously complacent during routine activities and lose their sense of vulnerability to hazards. Incident investigators with the opportunity of hindsight wonder about the simplicity of errors that lead to catastrophes. Observation has shown that inner dialogues swing from elements of safe operations to mental ruminations about avoiding production impact and heroism. Reforming the inner dialogue becomes a veritable approach in achieving and sustaining an ingrained HES practice.

A bottom-up approach of managing inner dialogue develops HES leaders at the level of process execution. It creates employees with some level of autonomy, authority, responsibility and goals. A gas processing facility studied, employs the 'Process Champion' approach of growing HES leaders at the very bottom. Process Champions in the Facility include representatives for, Standard Operating Procedures, Process Safety – Hazard Hunt/Behavioural Based Safety, Emergency Shutdown, Permit to Work, Compliance Assurance, Surface Equipment Reliability Improvement Process/Operator Driven Reliability, Asset Integrity and Incident Investigation and Reporting. Other processes that mould the Operator's inner dialogue include participation in HAZOP/PHA (Hazard and Operability/Process Hazard Analysis) studies, secondment to project groups for pre-commissioning, commissioning and start-up.

Every Operator in the Facility has the opportunity of engaging in inner conversations as a process leader towards making safe decisions for himself and the collective. The value derived from this approach can be summed up in the Facility's twelve years of operating a complex gas processing facility without a day away from work, and numerous projects executed without incident and injury including; Facility Tie-in and Turn Around Maintenance (TAM), Facility expansion Project construction, pre-commissioning, commissioning and start-up, Sales Gas Compression/delivery debottlenecking.

This paper applies qualitative research to demonstrate the potential value derivable from managing inner dialogues using bottom-up approach for entrenching HES practices in oil and gas facilities.

2.10 SAFETY IN DOWNSTREAM OPERATIONS: CHALLENGES AND WAY FORWARD (*Moriki, U.S. **)

* Department of Petroleum Resources, 7, Kofo Abayomi Street, Victoria Island, Lagos.

Author's e-mail: moriki.u.s@dpr.gov.ng

The continuous rise in the cases of incidents (both fatal & non-fatal) in the Downstream subsector of the oil & gas industry within the past 18 months have brought to the fore, the need to make in-depth analysis of their causes and bring up measures that will stem the tide and keep the industry safe.

In examining the problem, this paper adopted the examination of modern accident investigation techniques, alongside the use of statistical & trending analysis to identify the root causes of the incidents and their impacts. furthermore, this paper takes a look at the measures that must be put in place to allow for expansion in the downstream subsector especially substitution of domestic energy sources vis-à-vis the assurance of safety.

The findings revealed the following;

- i. 27 fatalities were recorded in various LPG related incidents alone between January 2015 and June 2016 (18 months), representing an increase of 2600% when compared to the 1 fatality from the preceding period (July 2013 and December 2014).
- ii. Similarly, 41 fatalities were recorded in various other Downstream related incidents (at Depots, Petrol stations, Pipelines, Jetties and Refineries) between January 2015 and June 2016, representing an increase of 272% when compared to the 11 fatalities from preceding period.
- iii. Major identified causes include; inadequate hazard identification and mitigation, lack of (or deviation from) Standard Operating Procedures (SOP), inability to identify Unsafe Acts / Unsafe Conditions, insufficient training and relegation of safety in operations.

The significance of this paper is to alert and sensitize the industry of the trend of these incidents and their root causes. The aim is to come up with possible solutions that will address and ultimately reduce the trend as well as correct certain negative impressions about the safety of some downstream operations.

The Department has perfected plans to introduce new measures which will help improve safety, and it will require safety clearance to be issued for downstream facilities prior to issuance of operations license.

2.11 STRATEGIC INCIDENT PREVENTION IN THE DOWNSTREAM OPERATIONS USING HARM TO ZERO (H2O) CONCEPT (*Jamui, B. **)

* Safety Advocacy and Empowerment Foundation

Author's e-mail: jamtunj@yahoo.co.uk

Safety and health awareness is a vital constituent of oil and gas activities because most of the operational conditions, chemicals, and end products are known to pose serious threats.

Therefore, all employers, employees and contractors within all three segments of the oil and gas industry (upstream, midstream, and downstream) are responsible for ensuring safe, healthy and environmentally friendly work sites.

However, despite the regulations and their implementation by the Department for Petroleum Resources (DPR), accidents in the downstream sector especially the distribution channel (Tank farm, logistics and petrol stations etc.) had claimed several lives and assets worth millions of dollars destroyed as a result of motor vehicle accidents, contact injuries, fires and explosions Slips, trips, and falls and confined spaces amongst others.

Workers in this sector are exposed to chemical hazards (toxics, corrosives, asphyxiates, and irritants); physical hazards (noise, vibration, and extreme temperatures); biological hazards (viruses, parasites, and bacteria); ergonomic hazards; and psychosocial hazard (occupational stress and fatigue). These exposures lead to an array of possible safety and health effects but with a strategic and engaging safety technique and best practice, as well as creation of a new safety mindset and culture.

This presentation therefore reviews the downstream value chain with special reference to the distribution channel and looks at the different incidents in the past two years with a view to bring about a paradigm shift in the way and manner companies in the downstream deliver services to customers so as to promote and protect the overall well-being of staff, customers, other stakeholders, and the general public, that may be impacted by their activities.

In order to achieve a sustainable safety culture that could yield operational excellence in this sector, Harm to Zero (H2O) Concept which was developed and implemented in some organizations in the telecommunications, construction and power sector of the economy and has added value to their safety excellence is hereby proposed.

This innovative strategy, H2O concept is very simple to implement and brings occupational safety and health to the level of all the workers irrespective of their academic qualification.

3 SECURITY THEME

3.1 IMPROVING SECURITY IN THE OIL AND GAS INDUSTRY THROUGH EFFECTIVE COLLABORATION A CASE STUDY OF SEPLAT PETROLEUM DEVELOPMENT COMPANY PLC (*Osiago, U.S. **)

*Seplat Petroleum Development Company PLC, Lagos.

Author's e-mail: uosiago@seplatpetroleum.com

The challenge of securing assets and facilities in the oil and gas industry has become a daunting task for various operators, service providers and inhabitants of the Niger Delta region. Whereas oil and gas operations are significantly hazardous, the added challenge of intractable insecurity has made the operations very daunting and nightmarish for the operators and their employees. A key problem today is that cost of security is rising yet, more expenditure is not guaranteeing a secure and conducive operating environment. Another aspect of the problem is that government and operators are spending more time and resources on the symptoms rather than the root cause, which is basically neglect, poverty and underdevelopment.

This research uses the qualitative method. The author visited websites of various organizations and development agencies including the oil majors such as SPDC, CHEVRON, TOTAL, ENI, NDDC, and so on, reviewed published magazines and reports. He also consulted text books on the Niger delta and development generally, including the 1963 Nigerian Constitution. The author also engaged players in the industry such as security practitioners to ascertain their various security policies, strategies, approaches, successes and challenges.

This paper addresses the genesis of the Niger Delta agitation and the resultant insecurity in the Niger Delta region, the various strategies adopted to manage these challenges. It also highlighted a success story of collaboration and partnership by Seplat that has worked in the industry.

A key finding is that the federal government and the IOCs have made genuine efforts at developing the Niger Delta region. These efforts were however, unsuccessful because of the uncoordinated approach, policy inconsistency and lack of continuity and political will.

The paper has proffered solutions and made far reaching recommendations with emphasis on stakeholder collaboration and partnership using holistic approach to the fundamental issue of underdevelopment and the twin brother of insecurity in the region.

3.2 INFORMATION TECHNOLOGY SECURITY AND INFORMATION PROTECTION

*(Balogun, M. *)*

*Chevron Nigeria Limited, Lagos.

Author's e-mail: obkg@chevron.com

Information Technology (IT) security is the process of implementing measures and systems designed to securely protect and safeguard information (utilizing various forms of technology developed to create, store, use and exchange such information) against any unauthorized access, misuse, modification, and destruction etc., thereby preserving their value, intended use and the ability to perform their permitted critical functions. Information security which is sometimes shortened to INFOSEC, is a risk management discipline that has to do with the preservation of confidentiality, integrity and availability of information. In addition to this, other features include authenticity, accountability, non-repudiation and reliability. Lack of adequate information security could lead to undue financial, regulatory and reputational risks. If these risks materialize, the damage done to the organization and its stakeholders are usually colossal.

Information security presents a major challenge in the oil and gas industry due to several reasons. Chief among them is the predominant use of external vendors, consultants and contractors in information technology projects. The contractors are well skilled in their area of expertise however they often times don't necessarily have adequate knowledge of information security. Added to that is the use of technology solutions with known vulnerabilities without well documented solutions. The oil and gas employees also often times have deficiency in technology product configuration knowledge, thereby resulting in projects with wrongly configured information technology solutions that expose the organization to INFOSEC risks.

Our findings suggest that poor approach to IT Solutions Procurement, budgetary lapses and low levels of awareness are top amongst issues around IT Security effectiveness. The solution to most of the identified threat to information security is adequate and continuous education and enlightenment. The training and awareness on information security should be extended well beyond the employees of the organization to all its various stakeholders especially information technology vendors, contractors and consultants. Internal employees should not also be left out however as they are usually saddled with the responsibility of supervising information technology projects and project teams.

The common belief that "bad things will not happen to me" only makes one vulnerable. Therefore, there is a need to raise the security standard around IT and to continuously sensitize the labour force in the oil and gas industry on IT security and Information protection.

3.3 INFORMATION TECHNOLOGY (IT) SECURITY AND INFORMATION PROTECTION: FOSTERING PROCESS SAFETY THROUGH SECURE IT ASSETS (*Malokwu, O. **)

*Chevron Nigeria Limited, Lagos.

Author's e-mail: omalokwu@chevron.com

The global focus on Process Safety within the oil and gas industry cannot be overemphasized, especially in this current climate of fluctuating crude oil prices and growing challenges in oil and gas exploration and production operations. It is even more so crucial now that production operations in many International Oil Companies (IOCs), as well as indigenous oil companies depend considerably on Information Technology (IT) systems and Process Control Networks (PCN) to support and enforce Process Safety standards and controls across the entire oil and gas value chain.

However, with the progress of technology, growing threats of Cyber Security and the enactment of more stringent HSE regulations by government, companies are constantly seeking to achieve that fine balance between the drive for automated process safety solutions and ensuring that these IT components/assets are protected from cyber-attacks, while maintaining a manageable cost overhead. The German steel mill meltdown incident and the 'Energetic Bear' virus, which struck hundreds of European and US energy firms, all in the year 2014, are hallmarks of the harsh reality of cyber-attacks on industrial systems.

It is therefore the principal goal of this paper to:

- Outline the impact of PCNs on process safety in the oil and gas industry
- Highlight some current trends in cyber-attacks on PCNs
- Explore industry best practices and lessons learned for preventing and mitigating industrial cyber security threats vis-a-vis process safety
- Propose a cyber security strategy around process safety for the Nigerian Oil and Gas industry.

In conclusion, the establishment of a robust IT security and information protection, through the strategic deployment of secure IT solutions, will go a long way in averting process safety incidents as caused by industrial cyber security breaches as well as support the Nigerian Oil and Gas industry in its journey to achieving the highest standards in HSE and taking its pride of place in the world.

3.4 INSTITUTIONALISING AN INTEGRATIVE AND COMMUNITY BASED SYSTEM FOR ASSET CONTROL IN THE OIL & GAS INDUSTRY – OML 18 IN FOCUS (*Abare, P. **)

* Eroton Exploration & Production Company Limited

Corresponding author's e-mail: pere.abare@erotonep.com

The security challenges in Nigeria, especially in the Niger Delta poses great impediment to businesses, more so for oil and gas related activities, operating within the riverine corridor. Militancy, armed robbery, kidnapping, sea piracy, crude oil theft and pipeline vandalism are some of the common security threats that impacts negatively on business operations. Therefore, for the oil and gas sector, managing security has become more complex, costly and vital to business sustainability. This presentation seeks to examine the security challenges, proffers a strategy to manage same, with a view to making recommendations. The presentation is limited to OML 18 as its focus.

The Niger Delta Region as we are aware is home to the oil and gas sector and has become a central element in the history of Nigeria, with a story of the violence attached to the exploration of crude petroleum oil and gas. Some political and environmental rights activists sympathetic to the Niger Delta cause have alleged economic exclusion, poverty, environmental degradation, in-effectiveness of government intervention measures and lack of holistic/effective development framework as some of the issues that have given rise to agitation by the oil-bearing communities of the Niger Delta. Given the grim realities on ground which correctly reflects the assertions by the activists, criminal elements posing under the guise of pursuing the cause of the region have taken to outright criminality thus holding the oil companies hostage as the point of impact of their illegal acts as enunciated.

A sure way to finding lasting peace and security in the oil and gas sector, should recognize the tripod on which the industry stands...which is the Government, Community and Company. This tripartite relationship, must be built on a mutually beneficial basis, taking into cognizance the felt needs of each party, with a resolve to promoting joint ownership of the processes and procedures. When one party, most often, the community is alienated from the mainstream of activities, it is the Company being its closest partner that suffers the vicious attack from the community. The rise in militancy and other forms of criminality that poses great security threat to oil businesses originates from this gap.

Therefore, one approach to formulating a security strategy in this context, is the integrative approach, which marries both the Government, Company and Community security apparatus into one whole. This will foster a common purpose; providing credible alternative for erstwhile aggrieved community stakeholders to participate and take ownership of the processes. This forms the foundation on which the security structure in OML 18 is built, using community youths and aggrieved stakeholders to take ownership of the processes in providing the first line of security for the Company's production assets.

3.5 INTEGRATED PIPELINES SUPERHIGHWAY MODEL FOR MANAGING OIL AND GAS THIRD PARTY INTERFERENCE AND SECURITY CHALLENGES (*Ihebuzor, P. *, Nwagboso, C. *, Georgakis, P. * & Eze, J. **)

* Oil and Gas Pipeline Security and Transportation Research Group, Faculty of Science and Engineering,
University of Wolverhampton, United Kingdom

Corresponding author's e-mail: p.c.ihebuzor@wlv.ac.uk

With the current spate of vandalism and theft of oil and gas resources through the pipeline window and its serious negative impact on the economy and security, there cannot be a better time to come up with a pipeline management model that seeks to mitigate third party interference (TPI) through an integrated pipeline superhighway than now. The downward trending the prices of oil and gas products globally mean that the industry would be open to cost sensitivity and compression throughout its value chain. Such cost compression could be through minimisation of waste and redundancy by implementing an integrated pipeline superhighway model.

The paper presents the concept of integrated pipeline superhighway model to be implemented as part of management of oil and gas supply chain architecture. This entails setting up a structured oil and gas pipelines product transmission infrastructure mode devoid of ownership and management by the individual international oil companies (IOCs). The pipeline superhighway infrastructure could be managed by an Oil and Gas Highway Agency (OGHA) separate from users and owners of the products. Pipeline management structure similar to this has been adopted in some other countries which this paper would present as case study. The studies presented in this paper show that the countries that have adopted pipeline management style akin to the superhighway model have been successful in highly mitigating TPI and security incidences.

3.6 PIRACY AND COUNTER – PIRACY IMPERATIVE IN THE GULF OF GUINEA (Oyet, G. * & Adeniyi, B. *)

* OVH Energy Marketing PLC, 8 Kayode Street, Marine Beach, Apapa, Lagos.

Corresponding author's e-mail: goyet@ovhenergy.com

Nigeria contains half of the population of the Gulf of Guinea and contributes more than half of the region's GDP. Oil contributes up to 95% Nigeria's foreign exchange earnings and up to 80% of her budgetary revenues. It is the single most important industry in the entire region and for two decades has been threatened by transnational organized crime and very recently by many militant groups within the country. Nigeria's natural resources wealth is diverted in a variety of ways, including bunkering, kidnapping, extortion, national embezzlement, smuggling and most recently, piracy.

Much of the piracy and sea robbery in the Gulf of Guinea which affects West Africa, is a product of the disorder that surrounds the regional oil industry. A large share of the recent piracy attacks targeted vessels carrying petroleum products. These vessels are attacked because there is a booming black market for stolen oil in West Africa. Without this ready market, there would be little point in attacking these vessels. There are indications that oil may also be smuggled outside the region.

Reports of Oil Spill Investigations in the oil-rich Niger Delta region of Nigeria, for example, indicate a direct link between oil spills and oil theft by petroleum pipeline vandals or saboteurs. This has resulted in huge economic losses, health hazards, unfavorable social economic conditions and environmental pollution, amongst other issues. Some of these vandals or oil thieves are career sea pirates in the Gulf of Guinea. In the absence of robust responses, the pirates are likely to consolidate and expand their activities.

Effective counter piracy action must, therefore take into account the modus operandi of pirates, the piracy profile, and emerging trends. Effective responses should therefore assume the scope of the broader maritime security context, with particular attention on the evolving piracy track and criminal networks. These efforts must include improved governance, effective regional and international cooperation, effective legal frame work and enhanced capability.

Key Words: Piracy, oil theft, economic Losses, Counter piracy, environmental pollution

3.7 SECURING OUR IT SYSTEMS USING IDENTITY MANAGEMENT ACCESS CONTROL (*Chukwu, A. **)

* Chevron Nigeria Limited, Lagos.

Author's e-mail: achukwu@chevron.com

Security of Information Technology (IT) systems has become a key business function due to rising cases of information breaches and losses occasioned by the activities of hackers and other factors internal to an organization. Challenges often encountered with securing IT assets and information are with the physical security of the IT assets and in handling/managing of information hosted by these assets.

The purpose of this paper is to identify a solution for managing physical and personnel access to IT assets in the oil and gas industry through the use of a controlled system of identity access management to aid in capturing, recording, managing and reviewing of access to these systems. Poor management of access controls to IT systems could lead to compliance issues, loss of control, information breaches and litigations in the oil and gas industry.

The paper identifies a system of directory that can be used for capturing personnel information and the type of information required; it then enumerates the features of three identity management access control tools. A survey with focus on key features of these tools was sent out to oil company workers to assist in choosing the most suitable tool from amongst the three. Benchmarking is performed and control measures used for are enumerated and their needs and areas of application discussed.

Key findings in this paper shows that for proper management of access control, there must be a system of records listing personnel attributes that will be plugged in to the tool, also there must be control measures in place to ensure the system of record is evergreen thereby ensuring personnel access is promptly revoked where necessary and that access to the IT assets are reviewed regularly. Poor control of an identity management access control tool leads to the IT assets being compromised, hence the need for setting up an access review or audit process where findings are properly documented and presented to the management of the organization. The identity manager implemented should be easy to deploy and integrate into an organization's system of records.

The paper recommends that oil companies embrace the use of sophisticated identity management tools that are fully automated and the management team should be fully committed to supporting this process.

3.8 SECURITY AWARENESS: MY RESPONSIBILITY (*Olaniyi, A.O.**)

* Chevron Nigeria Limited, Lagos.

Author's e-mail: aezo@chevron.com

Security awareness is a fundamental component of all security programs. All security programs require the core element of awareness which is behavioral based. Knowledge brings about responsibility; hence the need to create a forum that enables people to be aware of security situations at all time. Awareness is the key word in this piece. It involves the knowledge and attitude people imbibe in the protection of all tangible and intangible assets including information.

This paper is aimed at addressing the high rate of insecurity among oil and gas workers in Niger Delta Area of Nigeria and to emphasize the individual responsibilities for personal security through determined efforts to raise the level of awareness by the oil and gas workers.

A survey was carried out among some oil and gas workers in Nigeria with the instrument of interview and questionnaire that was administered on the stated population through random sampling technique. Eight questions were asked based on the two problems identified.

It was revealed that sixty percent (60%) of the respondents in the oil and gas industry read security advisories; twenty-five percent (25%) read at times while fifteen percent (15%) do not read security advisories sent out by their companies and in the media. Conclusively, majority of oil and gas workers read security tips. However, the ability to identify a potential security threat is less than adequate. This has to do with individual sense of judgment of prevailing situation at a particular time, and mere fact that some personnel are too busy or engrossed in business activities therefore not minding security risks they may be exposed to.

It is recommended that behavior and belief which is critical to education has to be improved through individual action plans. Just the way fatality rate reduced among oil workers through constant training and coaching on personal safety; oil and gas workers could step up security consciousness if the companies give the same awareness training and coaching programs regularly. Companies may draw up some security programs for employees to make them commit to taking actionable plans concerning themselves and their families.

3.9 SECURITY CHALLENGES IN THE NIGERIAN OIL & GAS INDUSTRY (*Amachree, D.**)

* Aiteo Eastern E&P Company, Lagos.

Author's e-mail: dennis.amachree@aiteong.com

Unlike other oil producing countries in the world where the exploration and production of hydrocarbon have become a blessing and changed the general well-being of the citizenry, with a keen eye on keeping the environment clean and healthy, the Nigerian story has been a sweet and sour story. There has been when being an oil worker is a fulfilling and enjoyable undertaking. As demanding as the work also entails, the situation where oil workers have to look over their shoulders while doing their work becomes unacceptable. The Oil & Gas working environment can best be described as dangerous. Oil workers face daily threats of kidnapping and attacks by militants. Facilities are exposed to vandalism and theft. The environment suffers from pollutions arising from oil spillages and gas flaring. There is a rampart socio-cultural and occupational displacement of the inhabitants of the areas where oil exploration takes place. All these culminate into serious security challenges.

This paper looks at the history of oil exploration in the Niger Delta and review the root causes of the problems that have bedevilled the oil and gas industry. The gradual rise of militancy in the Niger Delta and events leading to the amnesty program. Examine the pros and cons of the application of security measures in the protection of assets and personnel of oil producing companies. Security of the supply chain. The community relations approach to securing oil and gas assets. The three-layer mix of asset protection. The failure of government to take ownership of the producing fields and the introduction of the Joint Military Task Force on oil (Pulo Shield – JTF, later Operation Delta Safe).

The security problem in the Niger Delta takes its roots from several conflicts, within, between and among the oil bearing communities, the host communities, the government (State and Federal), the oil companies and sometimes between adjoining States. As much as these security problems persist, the Federal Government is still not looking at the root causes of the problem to address it.

To overcome the security challenges in the Niger Delta, there is need for the Federal Government to take a deliberate stand in taking ownership of the oil infrastructures and declare them as critical national security infrastructures. The responsible government agencies should strictly enforce compliance of oil companies to acceptable environmental standards. The immediate vicinities of oil producing areas should be declared exclusion zones as done in other countries. As a palliative, there should be visible rapid development of the oil producing areas. The oil companies should also as a matter of priority review the Memorandum of Understanding that should be administered through a Foundation.

3.10 SECURITY SITUATION IN THE NIGERIAN OIL AND GAS INDUSTRY - A GROWING PUBLIC SAFETY CHALLENGE (Asikaogu, C. *)

* Chevron Nigeria Limited, Lagos. - *HND Ind. Safety Eng. Tech. (PTI) PGD Evt. Mgt. Tech, M.Tech, Evt. Mgt. Tech, (FUTO). MSc
Pub. Safety Leadership with concentration on Emergency Management. Capella University, Minneapolis, USA.*

Author's e-mail: asic@chevron.com

There have been challenges with the security situation in Nigeria in recent years. Militancy, kidnap for ransom, piracy, carjacking, cultism, secessionist agitations, ethnic crisis and attack on major oil and gas installations are on the increase with the attendant adverse impact on safety of the public, the environment and economy amongst others.

Nigeria's economy being heavily dependent on the oil and gas industry has been negatively impacted by these security challenges with the associated public safety concerns resulting in loss of lives, revenue, internal displacement, extensive damage to the environment, power outages, petroleum products scarcity, loss of useful man hours, increase in cost of living, internal displacement etc.

The security situation has attracted much media attention and several solutions have been deployed by the government and the oil and gas industry to address the security situation. However, there are still opportunities to manage the associated public safety challenges.

This paper therefore, examines the security situation in the Nigerian oil and gas industry with focus on its impact on public safety.

3.11 THIRD PARTY INTERFERENCE ON NIGERIAN OIL AND GAS PIPELINES: THE DAMAGES AND SOLUTIONS (*Eze, J. *, Nwagboso, C. *, Georgakis, P. * & Ihebuzor, P. **)

* Oil and Gas Pipeline Security and Transportation Research Group, Faculty of Science and Engineering,
University of Wolverhampton, United Kingdom

Corresponding author's e-mail: johnson.eze@wlv.ac.uk

Nigeria has experienced the problem of oil and gas pipeline sabotage and Third Party Interference (TPI) for over a decade. This has on many occasions resulted in oil spillage which often leads to fatalities, environmental pollution of water bodies, as well as fire out-breaks that destroy properties and arable farm lands. Most importantly, the Nigerian economy is negatively affected as a result of these menaces. In order to ascertain the extent of the problem of pipeline sabotage and TPI on the Nigerian pipelines, incident data collected from various sources including Department of Petroleum Resources (DPR), Nigerian National Petroleum Corporation (NNPC) National statistics bulletin and Shell online incident database were analysed for risk assessment.

Following a Quantitative Risk Assessment (QRA) and categorisation of various segments of Nigerian pipelines, a framework for “Integrated Oil and gas Pipeline Monitoring and Incident Mitigation System (IOPMIMS)” is presented as a solution to assessing and mitigating pipeline sabotage and TPI. The security framework presented comprises four modules including Threat Detection, Leak Detection, Risk Assessment and Advisory modules. The findings from the QRA conducted show that four out of the five segments of Nigerian pipelines are categorised in “Very High” risk level while the fifth and the least is categorised in “High” risk level. This means that the risks associated with all Nigerian pipeline segments are intolerable. Consequently, adequate risk control and management measures need to be adopted to eliminate or reduce risks to “Very Low” or acceptable level. This paper then focuses on the integrated solution of using Drones as the Unmanned Aerial Vehicles (UAVs), with various sensors including wireless communication, motion, and video cameras sensors to detect threats and leakages to pipelines.

Keywords: Quantitative Risk Assessment; Oil and Gas Pipelines; Third Party Interference; Wireless Sensors; Unmanned Aerial Vehicles; Drone

4 HEALTH THEME

4.1 AN INVESTIGATION OF KNOWLEDGE AND THE USE OF HEARING PROTECTION DEVICE (HPD) AMONG EMPLOYEES OF A LARGE REFINERY (*Agada, J. **)

* Nigerian National Petroleum Corporation (NNPC) Industrial Hospital, Abuja

Author's e-mail: james.agada@nnpcgroup.com

Noise is an unwanted sound; an undesirable by-product of society's normal day -to- day activities (Hassal and Zaveri 1979). The World Health Organization (WHO) described noise as the most pervasive of all industrial pollutants (Concha-Bariento et al 2004). Occupational noise is a widespread risk factor, with a strong evidence base linking it to many important health outcomes including hearing loss, tinnitus, annoyance, hypertension, disturbance of psychological well-being etc (Concha-Bariento et al 2004).

Hearing protection devices are useful for tackling the immediate noise risk while other control measures are being developed. They should not be used as an alternative to control noise by technical or organisational means (HSE 2005).

This study was done on the staff of Port Harcourt Refinery, Nigeria's prime petroleum refinery. It is located in Port Harcourt, the capital city of Rivers State in the southern region. The Refinery is a complex installation. It has a combined capacity to process 200 barrels of crude per stream day. At the time of this study the refinery employed 859 staff who were distributed in the various departments such as Human Resources & Administration, Finance & Accounts, Production, Maintenance, and Safety. The aim was to assess workers' knowledge and attitudes towards the use of hearing protection device (HPD).

The knowledge and practice of the refinery staff on the use of hearing protectors was assessed using a HPD questionnaire.

Ninety per cent of the refinery staff are aware that noise at work leads to hearing loss, but only 38% of them regularly use hearing protection. As much as 31% of the refinery staff do not use hearing protection because they cannot find a pair to use.

The staff of the refinery have a high knowledge of the risk of noise, but this is not accompanied by positive behaviour change towards noise control. There is need for noise control programme in the refinery. The approach to noise control in the refinery should therefore begin with simple control measures that can be put in place. Hearing protectors should be used in the refinery in all the areas that are designated as hearing protection zones based on a noise map. The employees should be trained on proper use and maintenance of hearing protective device. Management should be encouraged to provide suitable and acceptable hearing protectors for all the employees who need them.

4.2 BIRTH DEFECTS IN OIL AND GAS PRODUCING AREAS (*Akani, C.I.* & Mkpe, A.M.**)

* University of Port Harcourt, Port Harcourt, Rivers State, Nigeria.

Corresponding author's e-mail: ciakaniph@gmail.com

Over years, air and sea pollutions, have thrived with little notice on the effects of dwellers in adjacent communities. Many health hazards equally were dismissed with little concerns of causes and consequences. Environmental teratogens can cause congenital abnormalities through preconception mutagenic action giving rise to chromosomal abnormalities or postconceptional teratogenic action depending on the nature of the teratogen and the precise timing of exposure - embryonic or fetal period. The purpose of this review is therefore to analyze the aetiology and the prevalence of teratogens-induced fetal abnormalities in oil and gas environments.

A literature search was carried out on the subject. Particular attention was paid to countries that have the same environmental terrain like the Niger Delta. Sources of the search were Pub med (MEDLINE), Biomed central, Google and Cochrane Database. We extrapolated the findings of the studies from different countries to the prevailing condition in the Niger Delta. Telephone communication with consultants and visits to various University Teaching Hospitals and companies in the Niger Delta were conducted with a view of finding out the aetiology, prevalence, diagnostic procedures and management of birth defects.

There has been a catastrophic environmental degradation in the Niger Delta area of Nigeria for the past 58 years. The environmental teratogens of interest are as following: air pollutants (NO₂, SO₂, CO, particulate matters), water pollutants (waste waters from petroleum extraction which contain heavy metals and NORM), other water pollutants (industrial solvents and acids, volatile aromatic hydrocarbon, chlorination by-products, high levels of nitrates and aluminum as a result of gas flaring and acid rain). Toxic waste dumps, landfills of dangerous chemicals and usage of old incinerators are also implicated. The teratogens cause different abnormalities of fetal organs and systems.

Few reviews in the past on the degree of pollution have shown strong correlations on reproductive health. These findings however have not reflected on corporate policies in these areas. The strong message here is that research findings of this nature should generate interest in reducing pollution and addressing calamities.

In the oil and gas areas of Nigeria, there is prominent presence of teratogen-associated fetal abnormalities of both chromosomal and multifactorial origin. Unfortunately, statistics are scanty on the magnitude of pollutants in the air and the water, even so on the plants. There might be need for an increased interest and commitment on cooperate organizations to show concern in the research and evaluation of these challenges even as we clean up the water ways of oil spillages.

4.3 CHALLENGES FOR HEALTH RISK MANAGEMENT IN THE WORKPLACE OF THE FUTURE (*Ajayi, L. **)

*Total Exploration & Production Nigeria Limited

Author's e-mail: isaac.ajayi@external.total.com

Whereas the subject of adverse health exposures in the workplace is not new, the challenges that the workplace of the future will contend with, in terms of the nature of the hazards as well as the exposure dynamics, will altogether present new risks.

The world of work will continue to change as we go further into the century in response to multivariate drivers - globalization, large-scale transitions towards knowledge economy, information technology and automation, redistribution of global wealth and neocolonialism. This change will ultimately translate to more prosperity and advancement for humanity.

The organization and workplace of tomorrow will be enmeshed in a dense matrix structure characterized by adult-to-adult transactional relationships between management and shop floor, autonomy and ever-changing organizational structures. High job intensification, multi-skilling, emergence of entrepreneurs and “intrapreneurs” and finally, poor delineation between work, home and leisure will all typify the future of work. In short, workplaces of tomorrow will not necessarily be within the four walls of an office or noisy shop floor of a processing plant, but will be ubiquitously located in individual's cars, personal dining tables, bedrooms and all sorts of hand-held gadgets operated on the go!

As mankind prospers in his new society adapting to the new way he must work, he may well be doing so at the expense of unidentified exposures at work. Musculoskeletal disorders, psychosocial risks, stress, substance use, cancers and pandemics have all been recognized as potential outcomes from multiple and concomitant exposures.

Thus, employers and health and safety advisors in the workplace of the future will require new hazard identification techniques, a re-imagination of existing risk management methodologies, early and continued worker engagement, keep abreast of research into toxicology of new process and materials (e.g. nano-scale materials), review legal provisions within employment contracts and adopt effective risk communication strategies.

4.4 ENHANCING THE POSITIVE IMPACTS OF DEVELOPMENT PROJECTS: HIA AS A TOOL FOR PROMOTING PUBLIC HEALTH IN RESOURCE POOR COUNTRIES (*Abah, S.O. **)

* Department of Community Health, Faculty of Clinical Sciences, College of Medicine, Ambrose Alli University, Ekpoma, Edo State, Nigeria.

Author's e-mail: drsteveabah@yahoo.co.uk

In Nigeria and many poor countries in Sub-Saharan Africa, major development projects are taking place in areas of low socio-economic development and less than optimum health status. Health Impact Assessment (HIA) provides useful information on existing health services, their capabilities and the health status of the local communities, which are otherwise often unavailable. The HIA by exposing existing health inequities in project communities provides the tool needed by development proponents to act (by way of corporate social responsibility) to provide or improve health services and to implement health promotion activities, such as malaria prevention, HIV awareness, and immunization of children under the age of five. Often these services go beyond mitigation of negative impacts of the project. Using experiences from HIA of development projects in the Niger Delta area of Nigeria, this paper presents the various opportunities for the enhancement of positive impacts of projects through the HIA process, highlights deficiencies in current practices and recommends ways of improving HIA practice to ensure the enhancement of positive impacts of a project as a mechanism to promote public health, particularly in resource poor countries.

Key words: Health Impact Assessment, Environmental Impact Assessment, Integrated Impact Assessment, Environmental Management Plan, Health promotion, Enhancement, positive impacts, public health, resource poor.

4.5 HEALTH IMPACT ASSESSMENT (HIA) IN THE OIL AND GAS INDUSTRY – EXPERIENCES AND LESSONS LEARNED (*Okala, C.* Fagade, O.*, Pitan, O.* & Edjere, F.)**

* Chevron Nigeria Limited, Lagos.

Corresponding author's e-mail: COBF@Chevron.com

According to the European Centre for Health Policy a Health Impact Assessment (HIA) is a combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population.

This paper explores experiences and lessons learnt in the conduct of HIAs in the Oil and Gas Industry utilizing findings from the International Association of Oil & Gas Producers (IOGP) and the global oil and gas industry association for environmental and social issues (IPIECA) Health Committee report – “Health Leading performance assessments in the Oil and Gas Industry indicators – 2015 data”. In addition to these reports, anecdotal and practical experience gained in the practice of HIAs by the authors provides insight to performance in the area of health impact assessment and potential areas for improvement.

An analysis of the findings and appropriateness of the tools used in preparing the IOGP and IPIECA Health Committee report was undertaken. The analysis was carried out using as a framework the industry guideline on the conduct of HIAs - OGP-IPIECA Health Committee “Guide to Health Impact Assessments in the Oil and Gas Industry”.

The report “Health Leading performance assessments in the Oil and Gas Industry indicators – 2015 data” was derived from the results provided by 29 companies. Participating companies conducted self-assessments of their performance in relation to standardized statements about the level of implementation of eight elements of the company’s health management system. Health impact assessments were assessed along with 7 other elements - Health risk assessment and planning; Public health interface and promotion of good health; Health reporting and record management; Fitness for task assessment and health surveillance; Management of ill-health in the work-place; Medical emergency management; and Industrial hygiene and control of workplace exposures.

Percentage and gap analysis tools were utilized in providing data from the assessments. When all eight elements in assessing companies’ health management systems were compared (using both tools), HIA elements consistently scored lowest, while the management of medical ill-health and emergencies scored highest. For the two years shown (2014 – 2015) the gap analysis tool standardized statement recording the lowest outcome was that “Prior to the start of a new project, baseline data are established on community health status (e.g. nutritional status, disease prevalence, vulnerable groups)”. The statement “External stakeholders are identified” in Health Impact Assessments, showed the highest score.

The data from this report demonstrates that opportunities for improvement still exist particularly in the area of establishing robust baseline data on community health status. Addressing these opportunities will facilitate the improvement of the process effectiveness and relevance. The analysis of the tools highlights the need to utilize common definitions around terms like Health Impact Assessment and baselines if more robust comparisons across companies are to be made. What is needed is a framework which can be used to develop a common understanding of principles and practices of HIA across diverse projects. The Guide to Health Impact Assessments in the Oil and Gas Industry” provides such a framework, which can be adapted to fit the needs in various locations and circumstances.

Several best practices and lessons learnt which companies working in this area can benefit from were proffered; these include the value of undertaking prospective HIAs and adopting an integrated Environmental, Social and Health impact approach. The need to involve appropriately trained personnel in evaluations was also identified as a critical component for success.

Conduct of HIA is a relatively new aspect of company health management systems that is rapidly evolving, compared to other aspects like the management of medical ill-health and emergencies which already have well defined standards of practice and technical methodologies in place. It is therefore no surprise that this relatively new area has consistently scored lowest. A call for adoption of strategies which have led to the current levels of development in the field of medical ill-health and emergencies is recommended. Although the report does not provide details as regards current practice, another recommendation would be that companies with high scores in their implementation of HIAs could offer advice to those companies with less mature systems.

4.6 OCCUPATIONAL HEALTH PRACTICE, LEGISLATION AND REGULATORY COMPLIANCE: WHITHER NIGERIA? (*Igwe, R. **)

* The Shell Petroleum Development Company of Nigeria Limited, Port Harcourt.

Corresponding author's e-mail: rufus.igwe@shell.com

Occupational Health practice deals with the recognition of workplace hazards, their effects on workers, compliance with governing legislation and regulations, among others. This field of practice has existed in Europe and the USA for over four centuries but is yet to receive adequate attention in Nigeria even in the 21st century.

This paper examined Occupational Health practice, legislation and regulatory compliance in general and in Nigeria in particular. The paper also looked at how legislation and regulatory compliance, a critical driving force in the development of Occupational Health practice, has changed the practice in developed countries as compared to Nigeria.

This study was conducted through the extensive review of existing literature of original works, historical data, and existing legislations in Nigeria and in developed countries. The study also took a comparative review of evolutionary trend of Occupational Health practice, legislation and regulatory compliance in some developed countries and developing countries like Nigeria.

The study found that the development of Occupational Health practice in developed countries to its present level was hugely attributable to the existence of, and compliance with legal and regulatory framework, and periodic reviews. Although this very important aspect of medical practice is currently developing as seen in the recently passed Safety and Health Bill by the Nigerian National Assembly (NASS), it remains largely unrecognized and underutilized. The practice of Occupational Health in Nigeria is currently led by The Shell Petroleum Development Company, among other multinational oil and gas companies. Developing countries like Ghana and Kenya have witnessed similar but earlier developments in occupational health practice, legislation, and regulatory compliance, leading to more advancement in this area.

Without a legal and regulatory framework, Occupational Health practice will remain in its pre-1st industrial era stage. Adequate attention to governing legislation and regulatory compliance will not only boost Occupational Health practice but will also raise awareness of its importance to labour workforce. However, such evolution is dependent on the integration of this area of health practice into the national social, economic and political framework. In other words, the development of occupational health practice requires more of a national than notional commitment.

Key words: Occupational Health, Practice, Regulatory Compliance, Legislation, and Underutilized.

4.7 PROMOTING WEIGHT MANAGEMENT AND THE ADOPTION OF HEALTHIER LIFESTYLE HABITS IN THE WORKPLACE: A CASE STUDY OF OANDO MARKETING PLC (*Oyet, G. * & Adejumo, T. **)

* OVH Energy Marketing PLC, 8 Kayode Street, Marine Beach, Apapa, Lagos.

Corresponding author's e-mail: goyet@ovhenergy.com

Workplace is a complex and dynamic environment. Programs that promote physical activities enhance workers' performance and support positive business outcomes. The promotion of physical activity should be an integral part of any business strategy. Obesity is more often regarded as a personal health issue than a workplace concern. It however becomes a source of concern in the workplace when it begins to affect productivity and job performance. If strategies are not put in place to tackle rising obesity in the workplace, there could be significant consequences for both employers and employees. To reduce obesity and promote the adoption of healthier lifestyle habits in the workplace, Oando Marketing PLC launched a weight loss challenge amongst her employees. The challenge was a physical activity intervention promoted as part of the organization's overall employee wellness program. This was accomplished using the company fitness center alongside non- equipment based activities to serve as an interactive behavioural change tool which included goal setting, activity logging, team-based campaigns, progress reports, feedback loops etc. Physical activities included aerobic exercises, jogging, skipping rope, strength training, walking and biking, amongst others backed up with good nutrition. The intervention was simple, relevant, personal, socially and financially rewarding. The challenge ran for 12 weeks with a total of 29 participants whose body mass indices were all above 25kg/m². At the beginning of the challenge, their individual weights were measured using a calibrated digital scale, their heights were measured using a rigid tape measure, their BMI was estimated as a ratio of their weight (kg)/height (m²) and their blood pressure was measured using a mercury sphygmomanometer. Upon completion of the challenge, it was found that 93% of participants lost weight while 7% maintained their previous weight. 24% of participants decreased their BMI and moved up the BMI category chart, 69% decreased their BMI but remained in the same BMI category while 7% had no change in their BMI. There was also a 100% decrease in blood pressure amongst participants whose blood pressures were monitored. In terms of outcomes, the challenge increased the overall employee wellbeing of participants and encouraged all employees to prioritize their health by adopting healthier lifestyle habits both at work and at home (health perception, life satisfaction, smoking, body weight, and overall risk status improved.). This led to a conclusion that there is a need for organizations to invest in employee health and wellbeing as employees feel valued and employee satisfaction and engagement is sacrosanct to the performance of any organization.

Keywords: obesity, employee wellness and wellbeing, workplace, weight management, healthy lifestyle habits, fitness, health

4.8 REDUCING THE VULNERABILITY OF CARDIOVASCULAR DISEASES AMONGST OIL AND GAS INDUSTRY WORKERS: THE CASE FOR FERMENTED FOODS (Ayo-Lawal, R.A. *, Ilevbare, O.E. *, Oluwatope, O.B. *& Ukwuoma, O. *)

* National Centre for Technology Management (NACETEM),
Federal Ministry of Science and Technology, Obafemi Awolowo University, Ile – Ife.

Corresponding author's e-mail: ayoronkelawal@gmail.com

Cardiovascular diseases (CVDs) are now recognized globally as significant, universal public health burden and the most important cause of disability and premature death. Amongst other presentations of CVDs, heart attack and strokes have been identified as the main causes of death among people working in the oil and gas industry today. Global trends suggest that the oil and gas industry's future workforce may be more susceptible to lifestyle choices that can increase the incidence of CVDs. Consequently, any dietary intervention that could mitigate indices of CVDs will be helpful in its prevention and associated conditions in this workforce. Modulation of the large microbial community in the gut by probiotics and prebiotic foodstuffs has been considered as an important opportunity to positively influence human health. To this end, medicinal importance of many fermented foods has been established. This paper explores major scientific reports of four fermented foods which may be useful in the treatment and prevention of CVDs among oil and gas workforce. Major indices measured include levels of serum or plasma triglycerides, high-density lipoprotein, and low-density lipoprotein. This paper concludes that regular intake of these fermented foods is an important means of mitigating lifestyle choices leading to CVDs; which consequently are likely to have adverse effects on the industry's output.

4.9 TRENDS IN HIV SERO-PREVALENCE IN OIL RELATED SETTINGS (*Akani, C.I.)**

* University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State.

Corresponding author's e-mail: ciakaniph@gmail.com

Nigeria now has the second highest number of people living with HIV in the world after South Africa. Nigeria; with about 3.45million persons living with HIV, accounts for about 9% of the global HIV burden. National prevalence of the disease is 3.4%. Nigeria is home to 32% of the global mother to child transmission of HIV and 60% annual new Infant Infections. Nigeria has the highest pediatric HIV burden globally. However, Antiretroviral and prevention of mother to child transmission coverage is about 27%. In Nigeria, HIV/AIDS is the second commonest cause of death between ages 15-45, after violence and accidents.

Despite huge investments by international agencies, public and private sectors to combat this epidemic by sponsoring interventional programmes, the spread of the disease has resisted mitigation. This review attempts to assess the trend in the prevalence of the HIV challenge in regions where oil operations take place compared with regions without these activities, and to relate this prevalence to behaviour patterns and response of the government, corporate organizations and health authorities to the HIV crisis.

This review, examines the trends in HIV prevalence across the South-south, South-west, South-east and North-west regions of Nigeria over the past ten years (2005-2015).

The distribution of HIV prevalence varies with geopolitical regions with the South-south having the highest prevalence of 5.5% and the South west the lowest prevalence of 1.8%. The top five oil producing states are in the South-south and of these 3 states are found in the top ten states in Nigeria with the highest incident of HIV; Rivers with 15.2%, Akwa Ibom with 6.4% and Cross River state with 4.4%. The highest prevalence in the South East are; Abia state with 3.3%, Imo state with 2.5% and Enugu state with 1.3%, in the South West; Oyo with 5.6%, Ondo with 4.3% and Osun with 2.6%. The prevalence of HIV in the northern region are relatively higher than the south however, the cluster of cases in the South-south gives a higher prevalence of the disease than in any other geopolitical region. The highest prevalence is found in the North East and North Central regions; Taraba state with a prevalence of 10.5% and Nasarawa state with a prevalence of 8.1% respectively.

The prevalence of HIV infections in the Southern regions of the country is adversely skewed towards oil producing states. Further studies are necessary to determine whether there is a significant association between the activities or behavioural practices of the oil workers and persons living in regions with oil related practices. There is a need for companies exploring in these region to ensure their workers adhere to the National workplace policy on HIV and AIDS as well as make significant contribution towards the fight against the spread of HIV in the region.

**4.10 WORLD HEALTH ORGANIZATION HEALTHY WORKFORCE FRAMEWORK
MODEL: A CASE STUDY OF AGBAMI CO-VENTURERS' ENTERPRISE
COMMUNITY INVOLVEMENT (Okala, C.* Fagade, O.*, Pitan, O.*, Kabi, M.*,
Otuonye, S.*, Kashim, S.* & Egbochukwu, E.*)**

* Chevron Nigeria Limited, Lagos.

Corresponding author's e-mail: COBF@Chevron.com

The World Health Organization (WHO) framework for a healthy workplace identifies four 'avenues of influence' that should be considered and addressed by organizations in order to create a working environment that promotes, supports and protects the mental, physical and social wellbeing of employees. The avenues of influence identified are: the physical working environment, the psychosocial work environment, personal health resources and enterprise community involvement.

This paper explores the experiences of the Agbami Co-venturers with a focus on the company enterprise community involvement in tuberculosis (TB) prevention and health systems strengthening in Nigeria, in the context of the WHO Healthy workforce framework model.

The program's objective is to achieve early detection and proper management of tuberculosis in the community: through leveraging on in-house best practices, building human resource capabilities, improving health infrastructure, partnering with credible non-governmental organizations and providing state of the art technology to enhance service delivery.

Methodology: A desk review and benchmarking was undertaken to ascertain whether the program model conceptually aligns with the WHO healthy workplace framework and existing good practice models of healthy organizations.

Twenty-three (23) chest clinics were built in state hospitals, and provided with medical supplies. These clinics have wards, fully-equipped laboratories, mobile X-ray units and GeneXpert machines (18). With the NTBLCP over 100 laboratory workers received comprehensive training on TB molecular diagnosis. In 2014, 14,352 presumptive TB cases were screened; 2126 cases were found. Contact tracing among 701 smear positive cases yielded 321 extra smear positive contacts. 92 MDRTB patients were identified; 53 were treated. Community Awareness Raising campaigns are ongoing in Kano, Kaduna, Lagos and Rivers State. Over 1,000 jobs were generated in the communities. 15,000 Medical graduates have benefited from the scholarship scheme, 32 Science laboratories and 10 libraries were built in secondary schools as a channel for providing future health manpower.

The program model aligns with the WHO 8-step cyclic process of implementation that plans, acts, and evaluates to improve program activities and outcomes. In addition, the model incorporated common elements of existing best-in-class models for healthy organisations including: Worker participation and involvement, Management commitment, engagement and leadership. The program model has several best practices; lessons learnt which other companies working in this area can benefit from.