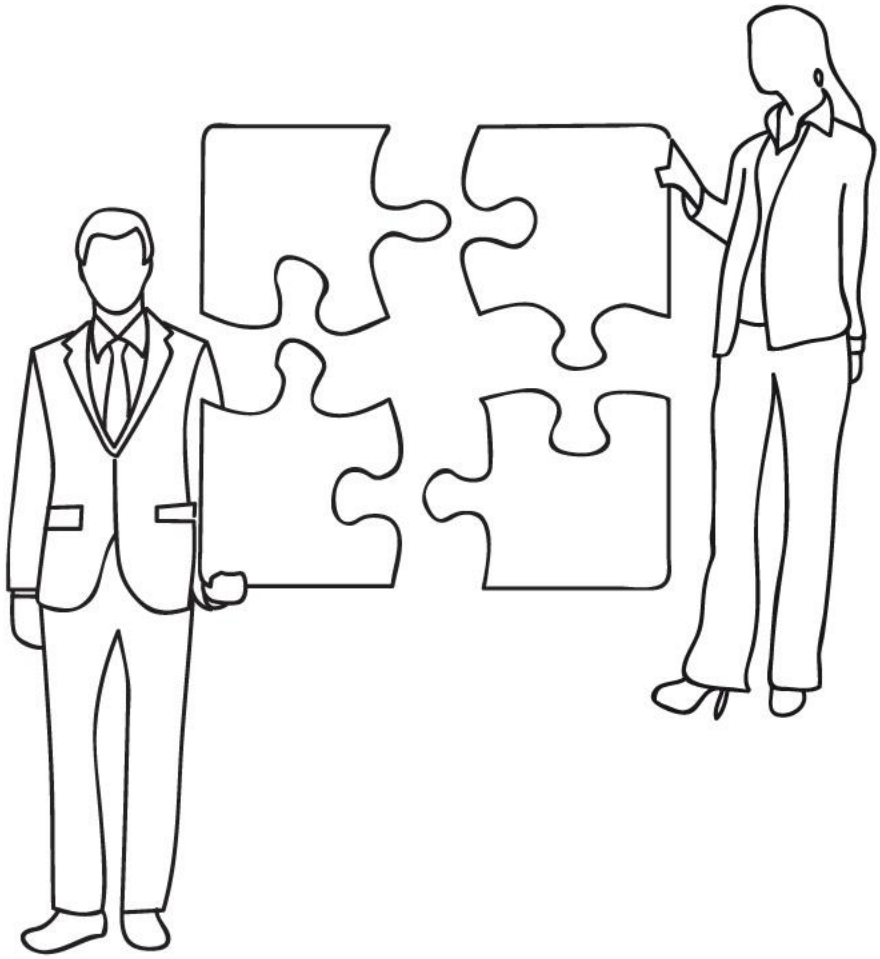
Report

2017 Annual Environmental Report – OCTP Phase 1



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1 OBJECTIVE

This report is in accordance with the requirements of the following documents:

- Environmental Protection Agency (EPA) Permit to undertake installation, commissioning, completions and start-up of production operations for Offshore Cape Three Points (OCTP) Block Phase-1 issued on May 15th, 2017 (Permit no. CE0021780218);
- Regulation 25 of the Environmental Assessment Regulations 1999 (LI 1652)

This annual report presents environmental activities on the Offshore Cape Three Points (OCTP) Block conducted by Eni Ghana Exploration and Production Limited from January, 2017 to December, 2017.

2 SCOPE

The present Annual Environmental Report provides the description of Eni Ghana's environmental activities conducted in 2017.

3 REFERENCES

1	Environmental and Social Impact Assessment Doc. 000415_DV_CD.HSE.0208.000_00
2	EPA - Environmental Permit: CE0021780218
3	EPA Guidelines on Environmental Assessment and Management for Offshore Oil & Gas Development in Ghana (2011).
4	Regulation 25 of the Environmental Assessment Regulations 1999 (LI 1652)
5	Tecnoambiente Marine Environmental Monitoring Program for Offshore Cape Three Points Project (August 2017)

4 ACRONYMS

AER	Annual environmental reports
bbl.	Barrel
CAR	Corrective Action Requested
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
FLET	Flowline End Termination
FPSO	Floating Production Storage Offloading
GNPC	Ghana National Petroleum Corporation
HSE	Health, Safety and Environment
HSEQ	Health, Safety Environment and Quality
HQ	Headquarters
IMS	Integrated Management System
ISO	International Standard Organization
JV	Joint Venture
MOU	Memorandum of Understanding
NAG	Non Associated Gas
OCTP	Offshore Cape Three Points
OSRL	Oil Spill Response Limited
OSCP	Oil Spill Contingency Plan
POD	Plan of Development

PSVs	Platform Supply Vessels
PTW	Permit to Work
SJA	Safe Job Analysis
STMA	Sekondi-Takoradi Municipal Assembly
TBTs	Tool Box Talks
Vs.	Versus
WBG	World Bank Group
WTN	Waste Transfer Note

5 DEFINITIONS

Company	Eni Ghana employees & assets engaged in the oil & gas operations
Contractor	An outside Company awarded a contract by the Company to perform a defined portion of work or to provide services or facilities
Environmental aspects	Elements of an organization's activities or products or services that can interact with the environment
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects
ESHIA	Environmental, Social, Health Impact Assessment. Process for predicting and assessing the potential environmental social and health impacts of a proposed project, evaluating alternatives and designing appropriate mitigation, management and monitoring measures
Incident	Any accident or injury that disrupt the normal operations development. In this definition "near misses" are included.
Near Miss (NM)	An unplanned or uncontrolled event or chain of events that has not resulted in a recordable injury, illness or physical damage or environmental damage but had the potential to do so in other circumstances.

6 INTRODUCTION

The Offshore Cape Three Points (OCTP) development license is located approximately 60 km off the coast of the Western Region of the Republic of Ghana.

The license is for developing oil and gas and the joint venture (JV) is composed of Eni Ghana Exploration and Production Limited ("Operator") holding 44.444% participating interest (PI), Vitol Upstream Ghana Limited ("Vitol") holding 35.556% (PI), and Ghana National Petroleum Corporation (GNPC) holding 20% (PI) with 15% carried and 5% paid.

Figure 1 indicates the block area of the OCTP block.

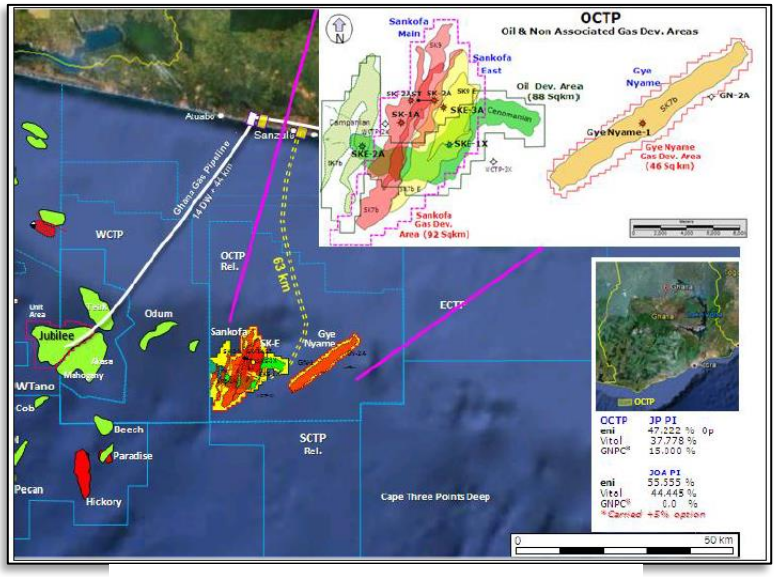

Figure 1: OCTP Block Area

The JV made three non-associated gas (NAG) discoveries: Sankofa Main Field in 2009, Gye Nyame Field in 2011, and Sankofa East Field in 2012. In addition, two oil discoveries were made: Sankofa East Field Cenomanian and Sankofa East Campanian, both in 2012 ("Oil Discoveries"). The estimated volumes in place associated with the discoveries are some 480 MMbbls of oil and 1.5 Tcf of non-associated gas.

The POD approved by the Petroleum Ministry on 30th December 2014 and its amendment approved on 11th May 2015 considered the integrated development of both oil and non-associated gas in 2 Phases:

- Phase 1: Oil Development Project. This phase consists of 14 subsea wells (8 oil producers, 3 water injectors and 3 associated gas injectors), subsea facilities, and a new conversion, double-hull floating production, storage and offloading (FPSO) unit

that will be located about 60 km offshore, south of Sanzule;

- Phase 2: Non Associated Gas (NAG) Development Project. This phase consists of five (5) subsea wells, subsea facilities, gas treating facilities located on the FPSO unit, 63 km subsea gas pipeline, an Onshore Receiving Facility (ORF), and other associated onshore components.

The Phase 1 Oil Development Project Environmental Impact Assessment (EIA) process was undertaken by ESL Consulting (ESL). The Submission of the Final EIS to the Ghana Environmental Protection Agency (Ghana EPA) was done in July, 2015 and the Environmental Permit for the Phase 1 Development released on July 9th, 2015.

The Phase 2 Gas Development Project Environmental Impact Assessment (EIA) process was undertaken by ERM. The Submission of the Final EIS to the Ghana Environmental Protection Agency (Ghana EPA) was done on July 8th 2015 and the Environmental Permit for the Phase 2 Development released on July 24th 2015.

This AER provides the description of the Eni Ghana's environmental activities in 2017 for Phase 1 of the OCTP project.

Eni Ghana's activities on the in 2017 were covered by two (2) separate Environmental permits granted by the EPA. The Permits are:

Permits in 2017

- Environmental Protection Agency (EPA) Environmental Permit to undertake the proposed installation and commissioning of infrastructure for Offshore Cape Three Points (OCTP) Block Phase-1 Field Development issued on February 1st, 2017 (Permit no. CE00217801179). This permit was later annulled and merged with EPA Permit for Installation, Commissioning, Completions & Production of OCTP Phase 1;
- Environmental Protection Agency (EPA) Permit to undertake the installation, commissioning, completions and start-up of production operations for Offshore Cape Three Points (OCTP) Block Phase-1 Field Development (Permit no. CE0021780218).

8 OPERATIONAL SUMMARY AND EVENTS

8.1 WELL COMPLETIONS

Eni Ghana obtained Environmental Permits for Installation, Completions and Commissioning of OCTP Phase 1 (later annulled and merged with EPA Permit for Installation, Commissioning, Completions & Production of OCTP Phase 1) for completion activities on 14 wells as part of the development of the OCTP Phase 1 project. Completion activities on remaining 4 wells are covered under Environmental Permit obtained for Phase 2 of the

OCTP project (CE00217801181 obtained on 1st March 2017 with validity until 27th August 2018). All 18 (Eighteen) wells have been drilled and 15 (Fifteen) have also lower completion installed. 16 (Sixteen) Xmas trees have been installed and 12 (Twelve) wells were re-entered, completed and handed-over to production.

Well completion was conducted without any environment related incident. Monthly reports covering operations of the rig have been submitted to the EPA.

Table 1 below summarizes the main data of the wells operations for 2017.

Name	Type	Reservoir	WD [m]	Start date	Deviated/ Vertical	Total depth [mMD]
WI-1 (XT installation)	Water Injector	Cenomanian	1,009	1st January 2017	Deviated	4,754
GI-2 (Upper Completion)	Gas Injector	Cenomanian	865	1st January 2017	Deviated	3,857
OP-3 (Upper Completion)	Oil Producer	Cenomanian	940	24th February 2017	Deviated	3,909
WI-1 (Upper Completion)	Water Injector	Cenomanian	1,009	11th April 2017	Deviated	4,127
OP-3 Re (Upper Completion)	Oil Producer	Cenomanian	940	1st May 2017	Deviated	3,909
OP-8 (Upper Completion)	Oil Producer	Cenomanian	994.3	15th May 2017	Deviated	4,115
OP-5 (Upper Completion)	Oil Producer	Cenomanian	702.2	15th May 2017	Deviated	3,760
OP-6 (XT installation)	Oil Producer	Cenomanian	703	8th July 2017	Deviated	3,615
OP-7 (XT installation)	Oil Producer	Cenomanian	700.5	9th July 2017	Deviated	3,678
SNKE-1X (Lower and Upper Completion)	Oil Producer	Cenomanian	825	12th July 2017	Deviated	3,730
GI-1 (Upper Completion)	Gas Injector	Cenomanian	627	28th August 2017	Vertical	3,477
GI-3 (XT installation)	Gas Injector	Cenomanian	944.8	30th September 2017	Deviated	4,180
WI-3 (XT installation)	Water Injector	Cenomanian	748.6	6Th October 2017	Deviated	3,771
OP-7 (Upper Completion)	Oil Producer	Cenomanian	700.5	8th October 2017	Deviated	3,678
OP-6 (Upper Completion)	Oil Producer	Cenomanian	703	31st October 2017	Deviated	3,633
GI-3 (Upper Completion)	Gas Injector	Cenomanian	944.8	20th November 2017	Deviated	4,180

Name	Type	Reservoir	WD [m]	Start date	Deviated/ Vertical	Total depth [mMD]
WI-3 (Upper Completion)	Water Injector	Cenomanian	748.6	12th December 2017	Deviated	3,771

Table 1: Wells Completed in 2017

8.1.1 Drilling equipment

The drillship, Maersk Voyager which started operations in July 2015, started completion activities in 2017. It is a double derrick dynamically positioned drilling ship. Its position and location is guaranteed by thrusters and GPS systems. A picture and a summary of the specifications of the drillship are provided in Figure 2 below and Table 2 below.

Figure 2: Maersk Voyager

Name	Owner	Rig Type	Maximum Rated Water Depth (m)	Maximum Drilling Depth (m)
Maersk Voyager	Maersk	Drilling Ship	3, 657	12, 190

Table 2: Specifications of Maersk Voyager

8.2 Oil Production Operations

First oil was achieved on 20th May 2017, with the start-up of the oil wells of Loop 1, in record time for the Industry, 29 months from the approval of the Development Plan, 40 days after FPSO arrival at site, 3 months ahead of plan. First oil lifting was completed on 27th August. All Oil producer wells were put on stream in 2017.

8.2.1 Hydrocarbon Production Volumes

As at end of December 2017, about 5,455,013.47 barrels of oil and 7,214.7 mmscf of associated gas had been produced. 2251.54 mmscf representing 31.21% of the gas produced was used as fuel gas whereas about 4007.17 mmscf representing 55.54% of gas was flared and about 956.98 mmscf representing 13.26% was re-injected. The graph below illustrates the different uses for the gas produced

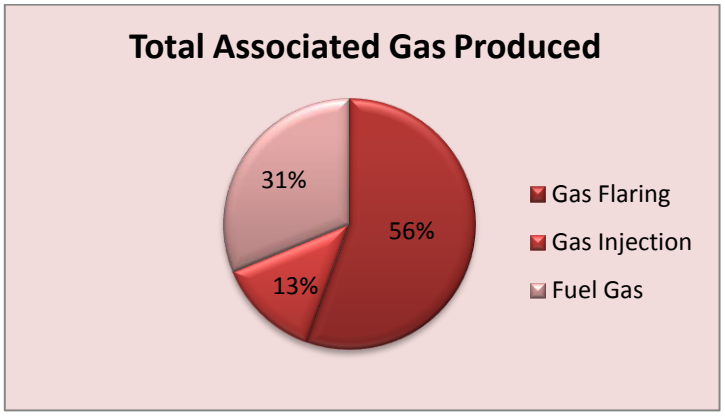

Figure 3: Total Gas Produced

8.2.2 Produced Water

There was no re-injection of produced water as none was received from the reservoir although water injection facility was operational.

8.2.3 Gas Flaring

About 4007.17 mmscf of gas was flared in 2017. This was in compliance to the permit (Permit no.: CE0021780218) issued by the EPA. Re-injection of gas started on 5th December 2017.

8.2.4 Floating, Production, Storage, Offloading (FPSO) Equipment

The FPSO is a new conversion double hull/double balcony unit installed above the main oil and non-associated gas reservoirs inside the OCTP area. It is about 63 km from shoreline (Sanzule), and it is controlled and operated by Eni Ghana.

The FPSO treats all crude oil and associated gas (which is re-injected for reservoir pressure support) produced from the OCTP license. Crude oil is separated from associated gas and water, stabilized and stored into storage tanks in the FPSO unit before being metered and offloaded. Oil producers, gas and water injection wells are connected directly to the FPSO unit through flexible risers and flowlines. Treated oil is delivered to tankers and associated

gas is to be re-injected in the reservoir.

A picture of the of the FPSO is shown in Figure 2 below

Figure 4: FPSO JAK

8.3 ONSHORE SUPPORT BASE FACILITIES

In 2017, the following facilities were used by Eni Ghana as onshore support facilities for offshore operations in Ghana:

- Eni Ghana Logistics Base in Takoradi;
- Dedicated berthing space in the Takoradi Commercial Port;
- GOIL Terminal in Sekondi Naval Base for bunkering operations;
- Takoradi Air Force Base passenger terminal and Inaer helicopter base;

There were several other onshore facilities abroad.

8.3.1 Takoradi Logistics Base

The Takoradi logistics base facility provided support in line with operational requirements. The logistics base provides pipe yard storage, covered warehousing, office accommodation as well as providing the offices for Eni Foundation. Below are some of the activities that continuously occur at the Logistics Base.

- Bundling of casings and pipes;
- Offloading of casings and pipes;
- Loading and Transferring of lifting equipment (mini containers, baskets and other containers) to the Port;
- Offloading of backload (casings, pipes, baskets and mini containers) from the rig;

- Waste collection by Zoil; and
- Oil Spill Response training (Command Package Training, Aerial surveillance training, ATV Familiarization training and Shoreline package training).

The base consists of two yards and one building used as offices. It covers an area of 20,000 m^2 with 4,000 m^2 of warehousing facility, 15,000 m^2 used as pipe yard and 1,000 m^2 used as offices and other amenities (canteen and changing rooms). There is an additional pipe yard that covers an area of 10,000 m2. Casings and other materials such as mud mats, float shoe, mini containers, baskets and slings are stored in the warehouse. An aerial view of the logistics base is seen in Figure 3.

Figure 5: Logistics Base

8.3.2 Takoradi Commercial Port

Takoradi port facilities were used in 2017 for:

- Loading of Christmas Tree from GE Yard unto trailer and transported to the Eni Ghana quayside;
- Loading of Christmas Tree from trailer at quayside unto supply vessel (Pacific Gannet);
- The importation of materials with some dock space to serve as a loading/offloading point for equipment and machinery;
- Dispatching equipment and for temporary storage of materials and equipment;
- Pre-deployment of equipment and materials;
- Transfer of waste produced on rig to waste contractor;
- Loading of supplies for the rigs and support vessels;
- Oil Spill Response trainings;

- Waste collection by Zoil; and
- Bunkering operations at Cirrus Terminals.

8.3.3 Sekondi Naval Base

The GOIL Terminal in Sekondi Naval Base was used in 2017 for bunkering operations carried out on the supply vessels.

8.3.4 Takoradi Air Force Base

Eni Ghana leases part of the Takoradi Air force base as its logistical support base. The Takoradi Air Force base was used to facilitate efficient onshore storage and support facilities for ongoing offshore and onshore operations.

8.3.5 Main Project activities for 2017

- First oil achieved on 20th of May 2017: 3 months ahead of plan , with the start-up of two oil wells of Loop 1;
- FPSO: Construction and commissioning works completed in January 2017. FPSO naming ceremony held in Singapore on the 3rd of February 2017 and on the 28th of February 2017 the FPSO sailed away from Singapore to Ghana where arrived the 10th of April 2017. After been moored to the 12 suction anchors, FPSO was declared ready for SURF Hook-Up on the 26th of April 2017;
- SPS (supply): All completion systems, umbilicals, FLETs, SSIVs, Riser bases and Structure Systems have been delivered;
- R&F (Riser & Flow-lines Supply): All first 3 LOTs of risers and flowlines were completed as per plan. Last LOT planned to be loaded out on the 11th of January 2018, and the riser hold back anchors, fabricated in Ghana, to be ready by end of January 2018;
- SURF T&I (Transportation and Installation): The Offshore installation campaign started on the 22nd of March 2017. To optimize the whole offshore installation campaign risers and umbilicals wet storage activities proceeded until FPSO arrival on the field. The installation campaign for Loop 2 and 3 has been also optimized and accelerated to take advantage of the good performance of the drilling and of the first installation campaign;
- Sea-line (Transportation and Installation): Main Construction Vessel left Bintan yard (Indonesia) in mid-December 2017 and expected to be ready for Pull-in on site by early February 2018. Horizontal Directional Drilling for shore approach started on the 21st of December 2017.

9 ENVIRONMENTAL MANAGEMENT

9.1 ENVIRONMENTAL MANAGEMENT STRUCTURE

Eni Ghana is committed to follow and comply with all applicable legal and regulatory requirements on its operations. Above that, Eni Ghana considers environmental protection as an engine of a continuous improvement process that guarantees achievements over time. For this reason, Eni Ghana has developed a set of guidelines that clearly include Company's principle on managing Environmental matters. The HSE Department is in charge of Environmental Management. In order to manage environmental related risks, the Company implements a series of practices from the identification of risks and assessment of impacts to developing appropriate standards, the implementation of environmental management plans, procedures, work instructions and control of effectiveness of these through continual monitoring and periodic auditing and inspections of procedures and operational sites to ensure compliance, communicate responsibilities and monitoring.

The environmental management plans are implemented through the Company's HSE Integrated Management System (IMS). Eni Ghana's HSE IMS is applicable to all Company's activities and within this framework, all Environmental Impact Assessment (EIA) studies, Environmental Management Plans and programmes (including specific procedures and plans) and other formal documentation are implemented in order to assure that all requirements contained in these documents are adequately managed. Since December 2010, Eni Ghana has been certified in accordance with the Environmental Management System-EMS (ISO 14001) standard. ISO 14001, is an internationally agreed standard that sets out the requirements for an environmental management system and helps organizations improve their environmental performance. This permits Eni Ghana to implement proactive environmental objectives and manage activities through the best practice tools. The EMS regularly confirms compliance by an independent authorized certification body which verifies and endorses full alignment with the requirements of international standards for Environmental Management. In 2017, a surveillance audit for verifying if the system is still in compliance with ISO 14001 requirements was conducted.

Further, in 2017, top management provided leadership and direction to ensure the company was operating in an environmentally responsible manner.

A number of management plans have been developed for specific environmental issues. Examples of these include the following:

- Environmental Management Plan;
- Waste Management Plan;
- Environmental Monitoring Program;
- Marine Mammal and Sea Turtle Policy Protection Program;
- Offshore Hazardous Material Management Plan;
- Oil Spill Contingency Plan;
- Blowout Emergency Response Plan (BOERP).

Among others, these plans generally deal with the under-listed environmental issues:

- Emissions to air and ambient air quality;
- Liquid Discharges (produced water. bilge water, wastewater, sewage effluent etc.);
- Chemicals Management;
- Waste Management;
- Oil and chemical spills (spill prevention and response); and
- Noise Management.

9.2 ENVIRONMENTAL MONITORING

Eni Ghana's operations have environmental aspects that have associated environmental impacts which have to be adequately monitored to ensure local environmental quality and ecological conditions are preserved. Monitoring programs were necessary to ensure discharges and emissions from operational activities meet regulatory limits for various environmental parameters and where there are exceedances, measures are put in place to achieve compliance. In order to efficiently carry out this essential environmental function, two contractors were in place to conduct offshore environmental monitoring. This was done in order to ensure compliance with regulatory requirements, comply with WBG (World Bank Group) requirements as well as evaluate the effectiveness of operational controls and other measures intended to mitigate potential impacts. Monitoring data was analyzed to identify trends in the quality of operational emissions and discharges and its associated impacts on the environment.

In 2017, monitoring included:

- Seawater quality;
- Sediment quality;
- Air quality;

- Water consumption;
- Chemical usage;
- Waste management;
- Sewage discharges; and
- Marine mammals and Sea Turtles observations and trainings

9.2.1 Offshore Monitoring Campaign

The first 3 (three) above listed aspects were part of the offshore campaign carried out from 1st and 31st May 2017 to define sea water, air and seabed sediment quality status of the marine environment through geomorphological, chemical, physical, and biological analyses.

9.2.1.1 Seawater quality

The monitoring of the seawater quality had the goal of characterizing the seawater column and to assess potential alterations that may be attributable to project activities. The network of monitoring points for sea water quality was defined considering the various offshore areas (FPSO, wells and flowlines, offshore pipeline and nearshore pipeline) and also considering the need for the various types of monitoring related to changes due to mobilization of sediments and cuttings and area potentially affected by sewage/oily discharges, etc.

9.2.1.2 Sediment quality

The monitoring of the seabed quality component was drawn up with a view to characterize the properties of the seabed and to assess potential alterations that may be attributable to future project activities. The network of monitoring points for seabed sediment quality has been defined taking into account the various offshore areas (wells and flowlines, offshore pipeline and nearshore pipeline) and also considered the need for the various types of monitoring

9.2.1.3 Air quality

The air quality parameters measured during the field works included NO_x, SO_2, SH_2 and organic compounds. The sorbent tubes (for NO_x, SO_2 and SH_2) were properly located in the survey vessel, far from the vessel's engine exhaust plume and other potential sources of contamination: venting pipes, chemicals storage, etc. The organic compounds were sampled with carbon absorption tubes. Air was pumped through the tubes with a portable pump at a rate of 50 cubic centimetres per hour.

Figure 5 below illustrates some of the survey equipment used during the surveys, being deployed and retrieved from the deep ocean.

Figure 6: Sampling Equipment and methodologies

In summary the following areas were sampled:

- Nearshore: 23 sampling stations, with a maximum water depth of 20 m.
- Pipeline corridor: 6 sampling stations between the coast and the FPSO. Each sampling point separated by 10 km, and at water depths between 39 and 959 m.
- Wells/FPSO area: a total of 187 sampling stations (including water and sediment) around each of the 19 wells projected and the FPSO, between 522 and 1,136 m water depth.

and the monitoring works performed included:

- Water sampling and analysis.
- Water column physico-chemical profiling.

- Plankton sampling and analysis.
- Sea currents profiling (in the nearshore area).
- Sediment sampling and analysis.
- Benthos sampling and analysis.
- Air quality sampling and analysis.

9.2.2 Water Used and Discharged

Table 3 below illustrates quantities of water used and their disposal methods.

Location	Type of Withdrawal	Source	Use	Quantity Used	Type of Discharge	Quantity Discharged
Rig	Seawater	Sea	Cooling systems	12,410,000 m^3	Sea	12,410,000 m^3
Rig	Freshwater	Town	Drilling	2,377	N/A	N/A
FPSO	Seawater	Sea	Cooling systems	26,930,506 m^3	Sea	26,586,025 m^3
FPSO	Seawater	Sea	Freshwater Production	902,400 m^3	Sea	894,191 m^3

Table 3: Water Consumption

9.2.3 Offshore Chemical Usage

Table 4 summarizes the offshore chemical usage for completion and production operations in 2017.

Chemical Product Name	Function Group	HOCNOF	Total Quantity Used/unit
Rig			
BARACARB 150	Lost Circulation Material	Green	3700 kg
BARACARB 25	Lost Circulation Material	Green	1700 kg
BARACARB 5	Lost Circulation Material	Green	2850 kg
BARACARB 50	Lost Circulation Material	Green	4100 kg
BARACARB 600	Lost Circulation Material	Green	2600 kg
BARACOR 100	Corrosion Inhibitor	Yellow	44713.2 kg
BARAKLEAN-648	Well Bore Clean-up Chemical	Yellow	15150 kg
BARAVIS	Viscosifier	Yellow	425 kg
BARAZAN	Viscosifier	Green	1950 kg
BARAZAN D	Viscosifiers	Green	16825 kg
CITIRIC ACID	Solid Salt	Yellow	1250 kg
CAUSTIC SODA	Acidity Control	Red	3850 kg
GUAR GUM	Viscosifiers	Green	3325 kg

LIQUI-VIS	Viscosifier	Not Classified	321601.95 kg
MONO ETHYLENE GLYCOL	Hydrate Inhibitor	Green	1154.4 kg
OXYGON	Oxygen Scavenger	Yellow	2150 kg
POTASSIUM CHLORIDE	Salt	Green	32000 kg
SARALINE 185V	Synthetic Drilling Base Fluid	Yellow	24450618.46 kg
SODA ASH	Calcium Remover	Green	350 kg
STARCIDE P	Biocide-Control sulfate reducing bacteria	Yellow	8770. 688 kg
FPSO			
ANTI FOAM	Defoamer, Anti-foaming agent	Yellow	125 ltr
AUTO TREAT	Multifunctional boiler water treatment	Not classified	265 kg
BIOCIDE	Biocide	Red	699.9 ltr
DEMULSIFIER	Demulsifier	Black	1198 ltr
DESCALING LIQUID	Descaler	Not classified	25 ltr
ELECTROSOLV-E	G.P. cleaner & degreaser for elect.	Not classified	250 ltr
ENVIROCLEAN	General purpose cleaner	Not classified	625 ltr
GAMAZYME 700N	Sewage Plant Activator / Cleaner	Not classified	119 ltr
GAMAZYME BTC	Biological Toilet Cleaner	Not classified	207 ltr
GAMAZYME DPC	Sewage drain pipe cleaner	Not classified	23 ltr
GAS CORROSION INHIBITOR	Corrosion inhibitor	Black	510 ltr
LIQUID CORROSION INHIBITOR	Corrosion inhibitor	Red	6626 ltr
METHANOL	Oil/gas treatment	Green	1516942.45 kg
RO BISULPHITE	De-chlorinating agent	Not classified	425 kg
ROCOR NB	Corrosion inhibitor	Not classified	375 ltr
SCALE INHIBITOR	Scale inhibitor (water)	Red	1141 ltr
SEACARE OSD 2	Oil Spill Dispersant	Not classified	150 kg
SCALE INHIBITOR	Scale inhibitor (water)	Red	1141 ltr
UNITOR USC 12	Ultrasonic cleaner detergent	Not classified	4 kg
VERSALIS e®-anfo H03A01	Defoamer, Anti-foaming agent	Yellow	4678 ltr
VERSALIS e®-bioc W03C02	Membrane Biocide	Red	1950 ltr
VERSALIS e®-cori H03D01	Corrosion inhibitors (gas stream)	Black	10116 ltr
VERSALIS e®-embr H03G01	Demulsifier	Black	10720 ltr
VERSALIS e®-oxsc W03N01	Oxygen Scavenger	Green	5283 ltr
VERSALIS e®-pour H03R03	PPD (subsea), Pour point depressant	Yellow	132540 ltr
VERSALIS e®-scin W03S01 WI	Scale inhibitor (water)	Red	4763 ltr

Table 4: Chemical Usage

9.2.4 Reservoir Flows

Blowout Emergency Response Plan (BOERP) was in place to be activated in the event of a blow-out. The plan has the below objectives:

- To protect personnel at well site preventing further accident during the first stage of the emergency;
- To prevent further environmental and/or facility damage while adequate equipment and personnel for the response are being mobilized;
- To reduce response time for the intervention by locating the critical equipment and planning for its mobilization, identifying in advance critical issues and properly address them into the Company organization;
- To reduce the overall event time by determining the proper response structure and prioritizing response activities.

9.2.5 Waste Management

Waste generated during 2017 was managed as stated in the Eni Ghana Waste Management Plan. MARPOL regulations on offshore waste management were complied with as stipulated in the permit conditions. Waste generated is segregated into six (6) waste categories i.e. (food, oily waste, plastic, metal, paper and hazardous). At the logistics base however, segregation is done to include wood waste and spill kits. Segregation is carried out at source. As per MARPOL requirements, food waste is discharged after maceration to achieve a size of <25 mm. The Waste Management Contractor, Zoil Services Limited, authorized by EPA provided waste management services for both Rig and FPSO. Table 8 below shows the types and volumes of waste generated. There is currently a recycling system (with facilities for recycling plastic waste generated) in place adopted by Eni Ghana's waste management contractor to minimise environmental impacts caused by disposing of plastics to landfills. Shredded plastics are transported to a plastics recycling company in Accra for remolding into waste bins. Bulk of Eni Ghana hazardous waste comprising oily water were sent to shore to be managed via high temperature thermal desorption unit by Zoil Services Limited.

Waste management hierarchy used at all sites is depicted in Figure 13. To ensure effectiveness of the waste management hierarchy, appropriate identification and segregation of waste streams was adhered to. To facilitate this, color coded containers as described in Figure 14 below was at all operational sites. However, colour codes for

containers are adjusted from one site to site depending on availability of particular types of colors.

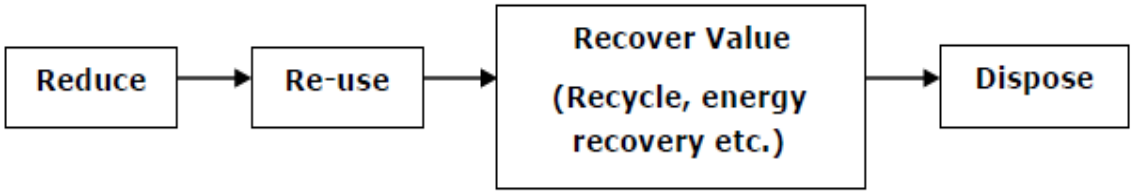

Figure 7: Waste Management Hierarchy

Colour	Collection Location
BLUE	FOOD WASTE
BLACK	OILY WASTE
RED	PLASTIC WASTE
YELLOW	METAL WASTE
GREY	PAPER WASTE
ORANGE	HAZARDOUS WASTE

Figure 8: Colour Coding for Waste Management

9.2.5.1 Waste Quantities Generated and Discharged

Wastes generated from operational activities were very diverse in their characteristics, large in their amounts and some of which were hazardous in nature. Thus, quantifying and characterizing the generated amounts in association with their types, sources, and their chemical and biological characteristics was critical to evaluating possible management practices.

On the rig, the wastes produced on the platform by all contractors are stored temporarily in suitable bins and skips placed at vantage points. The crew then fills out the manifest with the different types and volumes of waste. The Company HSE supervisor on board prepares Waste Transfer Note (WTN) from the waste manifest and according to Waste Management Plan. The WTN prepared has the following details:

- Details of the waste in transit (classification, description, characteristics, quantity and mode of transport);
- Transport operator with business name and details of permits (the condition of the

vehicle and its preparation will be his responsibility);

- Identification of the vehicle and the person responsible for the waste (e.g. the driver, in the case of road transport);
- Addressee (business name, destination plant, location and details of permits) and intended route; The quantity of waste transported (a directly weighted quantity or, at least an estimation.

The waste is shipped onshore where the waste management contractor receives the waste, ensures further waste segregation according to Eni Ghana's waste management plan before transporting the waste for final disposal/treatment. A waste register (waste log) and copies of all WTNs that have been produced from the site are maintained by an HSE personnel in the office. The Waste Register includes, as a minimum, the following information:

- Source of waste (e.g. rig, vessel, Logistics Base, etc.);
- Waste description (e.g.: oily rags);
- Classification of waste streams (i.e. hazardous or non-hazardous);
- Quantity (weight (kg) or volume (in liters or in m3));
- WTN numbers;
- Dates of transfer;
- Mode of transport.

Communited or ground food waste with particle size no greater than 25 mm is discharged at sea as defined by "MARPOL" (Marine Pollution) international standards.

Civil sewage discharged from W.Cs, washbasins, showers and camboose are treated in a purification system before being dumped to sea. Discharge is compliant with "MARPOL" international standards. All discharges into sea and to a reception facility are recorded in a Garbage record book.

In Table 5 below, total quantities of waste generated in 2017 and the treatment/disposal options is presented. Main treatment options used were:

- Recycling;
- Disposal To Landfill;
- Treatment.

Waste Type	Quantity (tonnes)	Contractor In Charge of Disposal	Method of Recycling, Reuse or Disposal
Oily waste and Rags	39.063	Zoil	Incineration
Non-Contaminated Wood waste	14.126	Zoil	Landfill & Reused
Scrap Metals	66.372	Zoil	Recycling(Scrap)
Plastic drums	2.415	Zoil	Recycling
Metal drums	8.0856	Zoil	Recycling
Waste Oil	41.8	Zoil	Treatment by ATDU
Oily Water	577.45	Halliburton	Treatment
Oily Water (From Engines)	11.3	Zoil	Treatment
Oily Sludge	31.3	Halliburton	Treatment
Oily Muddy Water	35.15	Halliburton	Treatment
Plastic	8.408	Zoil	Recycling
Chemical Bags	17.41	Zoil	Incineration
Rig Mixed Waste	103.11	Zoil	Landfill
General Waste	146.847	Zoil	Landfill
Waste Batteries	2.544	Zoil	Treatment
Septic Waste	733.92	Zoil	Treatment
Paper	5.66	Zoil	Landfill
Waste Water	29.5	Zoil	Treatment
Non- Hazardous Filters	3.17	Zoil	Incineration
Hazardous Filters	7.25	Zoil	Incineration
Neutralized Acid	26.9	Halliburton	Treatment
Scrap Hose	1.3	Zoil	Recycling
Oil Polluted Concrete/Soil (Cement)	20.4	Halliburton	Treatment by ATDU

Table 5: Waste Generated

9.2.5.2 Completion and Well Workover Fluids

Well completion fluids are discharged by the Rena Unit on board the drilling ship to achieve an average of < 29 mg/L.

Table 6 below gives a summary of the average well completion parameters achieved in 2017.

Month	Volume of Discharged (m^3)	Completion and Well Work-over Fluids - Oil on water (mg/l)-30 Day Average
January	157.00	4.6
February	502	4.4
March	413	3.4
April	654	4.34
May	243	1.59

June	228	2.43
July	477	3.74
August	436	5.57
September	460	3.56
October	361	5.43
November	502	5.81
December	279	5.95

Table 6: Completion and Well Workover Summary

9.2.6 Emissions to air and ambient air quality

During the reporting year, Eni Ghana monitored hydrocarbons consumed by the rig, FPSO and other supporting vessels. Emissions generated were calculated using SHERPA, an excel based tool developed by the Eni Upstream for accounting air emissions. The SHERPA tool collects, manages and consolidates air emissions allowing accounting for GHG emissions, in addition to other air pollutants (SOx, NOx, nmVOCs) on the basis of activity data (e.g. diesel consumptions, fuel gas consumption, flaring volumes, production rates). Table 7 below indicates emissions generated by the FPSO, rig and supporting vessels in 2017.

Site	Emission Source	Parameter					
		NOx (t)	SO2 (t)	CO2 (t)	CO (t)	nmVOCs (t)	CH4 (t)
FPSO	Flare Stack	623	0	252148	587	508	1003
FPSO (Gas Fuel)	Turbines & Boilers	212	0	144979	139	0	8
FPSO (Diesel Fuel)	Turbines & Boilers	8	2	2536	0	0	0
FPSO PSVs	Turbines	236	24	9665	22	7	0
Rig	Flare Stack	3	9	10,891	143	7	3
Rig	Turbines	297	108	3558	95	12	2
Rig PSVs	Turbines	285	32	4870	15	6	1
Takoradi Logistic Base	Generator	0	0	0	0	0	0

Table 7: Air Emissions

9.3 ENVIRONMENTAL INITIATIVES

In 2017, new initiatives and additional managerial efforts were implemented to affect positively environmental aspects. These initiatives included:

- Oil Spill Response Tactical Maps Development – Completed during the year involving Oil spill Response Limited (OSRL) UK;
- Oil Spill Response Trainings (IMO II & IMO III) were carried out for both employees and some regulatory staff;
- A level 3 oil spill drill (Tier 3) was carried out with equipment deployment for FPSO.
- Environmental Coordinator employed and in place;
- Rena slop water treatment unit was installed that helped in minimizing the generation of oily waste during completion activities;
- Substantial efforts were put in place to address EPA Audit findings carried out in June 2017;
- Offshore Environmental Campaign conducted before start of oil production;
- Following efforts were put by eni management to ensure early rectification of Anaerobic Thermal Desorption Unit (ATDU) of Zoil Services Ltd;
    - Weekly reports reviewed to closely monitor the efforts done by contractor to get ATDU operational
    - Follow up visits were done to Zoil facilities to get ATDU operation
    - After ATDU became operational other visits were carried out to ensure operation is conducted within the required parameters.
- Minivans introduced for personnel transportation – This initiative served to minimize the number of vehicles on roads and thus minimized fuel consumption and GHG emissions;
- All aged (old) vehicles were replaced with newer ones which are fuel efficient;
- HSE observation and stop work cards system also introduced; and
- Effective utilization of IVMS (In-Vehicle Monitoring System) – This allowed good control of vehicles by reducing unnecessary km driven thereby reducing the fuel consumption, dust generation and emissions.

9.4 INSPECTIONS AND AUDITS

In line with ESHIA Phase 1, Eni Ghana provided periodic audits and inspections. HSE inspections were conducted on a regular basis at all operational sites. These included both

physical condition inspections as well as procedural audits. Eni Ghana assigned HSE supervisors at the rig, FPSO, Logistics Base and other operational sites to ensure that Eni's expectations, compliance activities, and HSE procedures were adhered to. Tasks performed by HSE supervisors at rig, FPSO and Logistics included the following:

- Area inspections conducted on a daily and weekly basis on rig floor, chemical storage area, service companies units, mud processing and treatment units, welding and cutting areas, emergency evacuation and mustering equipment, work and accommodation areas and high pressure equipments;
- Risk assessment process including Project Risk Register, Permit to Work (PTW), Safe Job Analysis (SJA), Tool Box Talks (TBTs), and Pre Job Meetings;
- Safe Job Analysis (SJA) done on activities such as drilling, casing, lifting, completion, chemical mixing, mud processing, work at height, and working in confined spaces;
- Waste Management (Waste Segregation, Waste Inventories, issuing of WTN, monitoring and implementation of legal requirement for compliance;
- HSE daily and bi weekly meetings with contractors;
- Chemical Management (Handling, Storage, MSDS, Transportation, etc.);
- On-board solids control equipment for cuttings cleaning;
- Housekeeping;
- DROPS (hunting for potential dropped objects);
- Supervision of loading of Christmas Tree from trailer at quayside unto supply vessel (Pacific Gannet); and
- Monitoring of Operational Health and Safety standards.

Beyond routine inspection and monitoring activities conducted, audits were carried out by both internal and external auditors to ensure compliance with regulatory requirements as well as with internal HSE standards.

9.4.1 Internal Audit

The following internal audits were conducted in 2017:

- Waste Management Audit performed on Zoil & Halliburton - April 2017
- Building and Compliance Audit Bradley Tower – September 2017
- Legal & Compliance Review for FPSO, Bradley Towers, Log Base, Rig - November 2017;
- HSE Audit performed on FPSO - November 2017;
- HSE Audit performed on all SRI EMAS facilities – November 2017;

9.4.2 External Audits

- In June 2017, Ghana EPA conducted an Environmental Audit on operational activities;
- In September 2017 Eni HQ TEAM performed an EMERG operational Audit to assess the Emergency Preparedness & Response of eni Ghana;
- In November 2017, RINA surveillance audit (ISO 14001 & OHSAS 18001) was conducted for the Maersk Voyager and also included Offshore production activities of the FPSO;
- In February & September 2017, WBG independent auditors conducted 2 audits of OCTP project.

10 ENVIRONMENTAL INCIDENTS

Environmental incidents which include unintended contained spills are logged on the INDACO incidents reporting tool. A summary of environmental incidents recorded for 2017 are presented below:

1)	**Incident Type:**	**Non Injurious Incident (Contained spill)**
	Date:	April 2017
	Company:	Maersk Rig
	Location:	Maersk Voyager, OCTP
	Description of Event:	On 29.04.2017 at approx. 00.30 hrs, a gasket failure occurred on the Knuckle Boom Crane #2 Return manifold resulting in approx. 40 liter loss of hydraulic oil in crane machinery space. No loss to the environment.
	CAR:	Manifold isolated, hydraulic mechanics notified and gasket replaced immediately. Area cleaned by deck crew. The gaskets is replaced on a 5 year survey basis which includes inspection/replacement of the hydraulic hoses. The crane is inspected on weekly basis by the hydraulic mechanics and prior to use by the crane operator.
2)	**Incident Type:**	**Near Miss (NM - Contained Spill)**
	Date:	July 2017
	Company:	Maersk Voyager
	Location:	Maersk Voyager, OCTP
	Description of Event:	At 3:50 hrs, whilst recovering the burner boom from open position, it has been notified a leakage of oily

		water coming from the line connected to the burner, which due to the wind, it sprayed on crane pedestal and Well test deck areas. No evidence of overboard spill.
	CAR:	Area cleaned up by Schlumberger and Maersk crews. It should be written in the SJA that in future flaring operations all residue liquid in the line should be burnt off and confirmed as such. It should be written in the SJA that before moving the flare boom the Well Test Supervisor on shift should confirm to MSL or AMSL that the line has been drained of all liquid. It should be written into the SJA that the Shut Off valve is checked both before and after flaring operations to ensure it is fit for purpose and operating correctly. The Well Test day and night Supervisors should produce comprehensive written handovers and these should be retained for the duration of the well.
3)	**Incident Type:**	**Oil Spill (metering skid)**
	Date:	August 2017
	Company:	Yinson
	Location:	FPSO, OCTP
	Description of Event:	At about 11:39 hrs, during commissioning and pressure testing of metering skid a Leak @ 6 bar using COP1 was observed by a crew member on a 36" flange. Less than 20 lit was spilled on deck during the testing and operation.
	CAR:	On observing the leak the CCR was informed and all operations was stopped and the Oil spill recovery clean up teams was activated to clean up the spill from the metering skid area and deck. No oil was spilled overboard and all overboard plugs was installed and in place at the time. All area of spill was cleaned up and washed down. On investigation it was found that the flange gasket was leaking. Scaffold was erected and the removal and replacement of gasket was completed. The Flange and metering skid was pressure tested and pressure on hold until 07h00 on 02/08/2017.

4)	**Incident Type:**	**Near Miss (NM -Contained chemical Spill)**
	Date:	August 2017
	Company:	Yinson
	Location:	FPSO, OCTP
	Description of Event:	At about 02.13: Chemical spill of approximately 2liters was observed underneath the MI2 chemical injection module, but did not spill overboard into the sea/environment. It is well contained on the FPSO within the chemical injection module. Investigation revealed that the leak is coming most probable from chemical injection pipes on the above module.
	CAR:	The spill has been cleaned and disposed Further investigation currently ongoing to identify the actual source of leak Routine checks to be done by production department under the process pump module, on main deck, for early identification of any spill. Additional tray has been provided to ensure appropriate containment of spill

All raised corrective actions have been closed formally.

11 EMERGENCY PREPAREDNESS

In 2017, Eni Ghana put in place an Emergency Response Plan to:

- Minimise negative consequences to human life, environment, eni ghana assets and business in case of an emergency situation, and eni reputation by an effective and efficient response;
- Ensure the availability of adequate information on emergency situations through a good communication system and at all levels;
- Ensure efficient management of the emergency through all available and dedicated resources.

The ERP covers all stages and phases of the emergency response, from initiation until the emergency is over and the normalization phase has started.

The Oil Spill Contingency Plan (OSCP) was also in place to offer guidance on the necessary actions to prevent and/or minimise any oil spillages and to mitigate any negative effects. Eni Ghana also utilized the services of Oil Spill Response Limited (OSRL) to carry out

training exercises and inspections to further improve oil spill awareness and capability for both in house personnel, third party contractors, regulatory bodies and community members. Below is a summary of activities conducted on oil spill response during 2017:

- Ariel surveillance/oil quantification;
- IMO3;
- IMO2;
- Dispersant Package training;
- 3Ter (vessel tracking);
- Oil Spill Contingency and Response (OSCAR)

12 SAFETY EXCLUSION ZONE

Consistent with industry practice and acquired Environmental Permits, a 500m radius safety exclusion zone was established around the FPSO and Rig during operational activities. However, the safety exclusion zone was not kept clear of fishermen. There were several instances where fishing boats using fishing lines were spotted at both starboard and port side. Recording of boats were done in the morning and evening. Eni Ghana with the support of its chase vessels, is trying to keep these Fisherman boats out of the safety exclusion zone. Discussions are ongoing in an attempt to draw up a Memorandum of Understanding (MoU) with the Ghana Navy.

13 CONCLUSION

In 2017, Eni Ghana worked to:

- Decrease the negative impact and/or reasonably minimize environmental impacts from operations offshore,
- Comply with Company standards, EPA permit conditions and WBG requirements.

This achievement is reflected by the fact that only minor environmental incidents were recorded despite the high level of operational activity (Well Completions, Oil Production, Oil Offtakes) that Company was engaged in.

Eni Ghana worked with a number of regulators and parastatal organisations to further improve capacity in relation to the oil industry. The efficiency of the Rena unit permitted

very minimal oil on water contents to be achieved.

Planning for oil spills, putting in place OSRL secondee to help with readiness of the company in the event of oil spill, procurement of oil equipment were undertaken in 2017. A wide range of environmental monitoring activities was conducted throughout 2017.

14 PLANNED ENVIRONMENTAL ACTIVITIES FOR 2018

Activities to be undertaken on 2018 which will aim at ensuring the Company compliance with environmental regulations and maintaining a good environmental performance within Company´s operations. These will include following:

- Conduct offshore environmental monitoring campaign to help build a strong database and monitor key performance indicators in regards to impacts to the offshore environment;
- Maintain active engagement with Ghana EPA in relation to Environmental matters;
- Undertake environmental awareness campaigns for company staff and contractors;
- Continue with Biodiversity Monitoring as well as monitoring of other environmental aspects;
- Adapt and fully migrate unto Environmental Management System, ISO 14001-2015;
- Continue improvement waste segregation at the Eni HQ office in Accra;
- Continue implementing and maintain the environmental best practices and World Bank Group requirements in the activities planned to be undertaken in 2018.