TRADCO ENVIRONMENTAL IMPACT ASSESSMENT

ESMP REPORT

PREPARED BY NETSL

October, 2024

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ABBREVIATIONS

AGO	Automotive Gas Oil
AQI	Air Quality Index
BLEVE	Boiling Liquid Expanding Vapor Explosion
^0C	Degree Celsius
CCTV	Closed-Circuit Television
CEO	Chief Executive Officer
CH_2O	Formaldehyde
CLC	Community Lesion Committee
CP	Construction Phase
CSDS	Chemical Safety Data Sheet
dB	Decibel
EAI	Environmental accident Index
EBS	Environmental Baseline Studies
EDSA	Electricity Distribution and Supply Authority
EG	Example Gratia
EIA	Environmental Impact Assessment
EIAPD	Environmental Impact Assessment Procedure
EIAR	Environmental Impact Assessment Report
EO	Environment Office
EMQC	Environmental Management and Quality Control
EMP	Environmental Management Plan
EMM	Environmental Mitigation Measures
ESO	Environmental Safety Officer
ESMP	Environmental Social Management Plan
ESMR	Environmental Impact Assessment Report
ETC	Et Cetera
ET	Environmental Technician
EPA	Environmental Protection Agency
EPASL	Environmental Protection Agency Sierra Leone
Eq.	Equation
EWRC	Electricity and Water Regulatory Commission
FCC	Freetown City Council
FFF	Freetown Fire Force
FMEA	Failure Mode Effect and Analysis
GIS	Geographical Information System
GoSL	Government of Sierra Leone
HAZOP	Hazard Operative Procedure
HRG	High Risk Group
HSE	Health Safety and Environment
HSEMS	Health Safety and Environmental Management System
HSEQ	Health Safety Environment and Quality
HSO	Health Standards Organization
IBP	Industrial Best Practices
IFC	
IMO	International Maritime Organization

ISO	International Organization for Standardization
KM^2	Kilo Meter Square
KW	Kilo Watt
LPG	Liquid Petroleum Gas
Ltd	Limited
M	Million
M^3	Meters Cubic
Max	Maximum
ug	Micro gram
M_{AM}	Hazard Measure
Min	Minimum
M_{RM}	Risk Measure
MT	Metric Tone
MSDS	Material Safety Data Sheet
M_{UM}	Unreliability Measure
NET	Njala Environmental Technicians
No.	Number
OD	Ozone Depletion
OHS	Occupational Health and Safety
OMS	Organization Management Service
OP	Operational Phase
OSHA	Occupational Safety and Health Administration
P	Probability
PhD	Doctor of Philosophy
PPE	Personal Protective Equipment
%	Percentage
PM	Particulate Matter
PMS	Premium Motor Spirit
POPs	Persistent Organic Pollutant
PRA	Petroleum Regulatory Agency
PRO	Proposed Retail Outlets
RFU	Retail Fuel Outlet
RDD	Regional Development Dialogue
SL	Sierra Leone
SLSB	Sierra Leone Standard Bureau
SLMET	Sierra Leone Meteorological Agency
SLNMD	Sierra Leone Natural Meteorological Data
TOM	Technical Operative Management
UNFCC	United Nations Framework Convention on Climate Change
UN	United Nations
UNEPA	United Nations Environmental Protection Agency
US	United States
WHO	World Health Organization
Yr	Year

THE PROPOSED PROJECT

From the project feasibility information, it was revealed that TRADCO Sierra Leone (SL) Limited (Ltd.) is in anticipation of using a newly established special purpose vehicle to incorporate other associate sister companies like the boots trapper (Benco Trading (SL) Ltd) as stated in (Bun Tejan Doherty & Co, 2022 feasibility report). The proposed methodology is to construct storage tanks as the project's main goal. This is to ensure the containment of 15,000 Metric Tons of fossil fuel.

The estimated capacity for the fuel tanks farm will be designed with two separate tanks of 10,000 Metric-Tones (MT) for Automotive Gas Oil (AGO) and 5,000 MT for Premium Motor Spirit (PMS). The entire design will be constructed with considerations on levels connected with switches that will be built-in for frequent "topping-up" of the settling tank (Bun Tejan Doherty & Co, 2022 feasibility report). The technical view on best practices considered reduction of temperature fluctuations at the suction point for the separator feed pump and heating systems can be provided by steam, hot water, thermal oil, or electric coils running through the tanks.

Temperature regulatory devices will be employed to ensure that the oil is maintained at the optimum temperature and allows settling to be effectively enhanced. The settling tanks must ideally be located on sloping bottoms to direct water and heavy sludge toward the drain valves. A separator feed will be located above the water drain point to prevent accumulated water and sludge from being drawn into the fuel treatment system (https://www.cimac.com). Table 1 shows NET-SL experts and contact details. Whereas, Tables 2 and 3 describe the version control and TRADCO (SL) Ltd.

Experts Profile

Table 1. NET-SL experts and contact details

Name of Expert	Affiliation and specialty	Contact detail
Mohamed Dumbuya-Mr	Project team leader and specialized in Environmental Health and Toxicology	Tel:+23278615142 Email: dumbuyamohamed36@gmail.com
Alie J Konteh-Mr	Project Field Coordinator and specialized in Environmental Natural Resources	Tel:+23276124706 Email: aliejoshuakonteh32@gmail.com
Victoria Kamara-Mrs	Project internal coordinator and specialized in Environment and Development	Tel:+23279874240 Email: agbebakuvictoria86@gmail.com
Ibrahim Dumbuya-PhD	Project Editor and specialized in Quality Control and Quality Assurance	Tel:+23278906429 Email: ibrahimdumbuya385@gmail.com
Sandra Ngongor-Miss	Project Health and Safety officer and specialized in Public Health	Tel:+23274177283 Email: sandrasmngongor@gmail.com
Sahid Mohamed Dumbuya-Mr	Project Electrical and Electronic technician	Tel:+23234994803 Email: ramandhandumbuya01@gmail.com
Emmauel Joezzer Koroma-Mr	Project Data Analyst	Tel:+23275723272 Email: jjoezzerekorma@gmail.com
Lucky Agbebaku-Mr	Project Personel Assisstant	Tel:+23274362985 Email: Luckyagbebaku371@gmail.com

Table 2. Version Control

Project title	Environmental Social Management Plan (ESMP) for storing, processing, and marketing of Premium Motor Spirit, also known as petrol (PMS) and AGO, also known as Diesel(AGO)
Document title	Environmental Social Management Plan (ESMP) for TRADCO (SL) Ltd
Version	2024TRADCOESMP001
Status	Environmental Impact Assessment (EIA) license holder for (ESMP)
Date of draft	09/2024
Requirement for tracking changes	Once a final version of the ESMP has been approved by TRADCO management, further modifications to the ESMP will be made visible by either tracking changes or putting the alterations in a different color to aid any subsequent review.

Table 3. TRADCO Profile

Company Information	**Description**	
PROJECT DEVELOPER	**TRADCO**	
Chief Executive Officer (CEO)	**Jihad Swaid**	
Business Certificates Tin No.		
Project Scope	**Operations of 10,000 MT AGO and 5,000MT PMS Tank farm**	
Administrative Office	**1 Wilberforce Street, Freetown Sierra Leone**	
Official email	ops@TRADCO.sl	
Product Name	Premium Motor Spirit (PMS), also known as petrol.	Automotive Gas Oil, also known as Diesel(AGO)
Concession Land Area		

NON-TECHNICAL SUMMARY

DESCRIPTION OF THE PROJECT EIA PROCESS

EPA REVIEW

The Environmental Protection Agency (EPA) review has stipulated the validation of proponents' assets quantification based on legal ownership conditions through “Ground trothing”; a process that will methodologically enhances the confidence of the business-initiated and possible grievance management.

The Environmental Protection Agency Sierra Leone (EPASL) reviews the screening questionnaire that shows TRADCO (SL) Ltd has been in category B’ and obliges proponents with relevance to national standards, policies, and Acts together with international standards, laws, and treaties, such as; the benchmarks on effluents liquids, refrigerant chemicals, used batteries, paints, used hydrocarbon oils and pesticides regulations. The EPASL Geographical Information System (GIS) team after their visibility studies on the location and safety components around the concession and their experts team shall share vitals guidance notes to all.

APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

JUSTIFICATION OF THE EIA STUDIES

This Environmental Impact Assessment Report (EIAR) will set out all proposed scope of work and methods that the TRADCO engineering team proposed to apply to develop an Environmental Impact Assessment Report (ESMR). It will support the EPA license review for the TRADCO facility (hereafter referred to as the project) in Kissy Dockyard of Personage Street Freetown (Eastern part of Freetown). It also provides the proposed structure and contents of the ESMR.

The scoping study is key when determining what information should be included in TRADCO; ESMR and the methodologies that will be required for the collection and assessment of data.

The main objectives of this report are:

I. to recognize and clarify environmental effects that may arise during the construction and operation of the facility, which therefore be addressed in more detail as part of the ESMR;
II. to plan for the proposed assessment methodologies in the main EIA studies and present as likely contents of the ESMR; and
III. Form a basis of common reference regarding the scope and methodology for the ESMR.

ESMR REPORT STRUCTURE

The ESMR report structure is as follows:

Section 1: Provides an overview of the purpose and objectives of this ESMR report.

Section 2: Provides information about the facility under consideration for this ESMR report.

Section 3: Provides an overview of the EIA process and the deliverables of the ESMR.

The remaining sections 4-9 will identify possible effects on the environment and highlight all proposed assessment methodologies to be adopted in assessing any risk prone and effects. The environmental structures in question for the ESMR are listed thereon:

Section 4: Population and Human Health;

Section 5: Soils, Geology and Hydro-geology;

Section 6: Air Quality and Climate;

Section 7: Noise and Vibration:

Section 8: Landscape and Visual;

Section 9: Traffic and Transport;

INTRODUCTION TO THE EIA PROCESS TRADCO(SL) LTD

The EIA process for TRADCO followed a process that forms probable impacts that can threaten environmental existence through the project facility at the site. The qualitative, and quantitative assumptions and trend assessment will be available to judge the effect of project construction. If unacceptable what measures can be taken to prevent the occurrence of hazards and ways of reducing impact figures to smaller values? The EIA directive requires specific developments necessary for the assessment of possible environmental effects before granting planning permission. When submitting a planning application for such a development, the applicant must submit an ESMR.

According to the third schedule (Section 27(1)) EPASL Acts' 2022, An environmental impact shall contain a true statement and description of-

(a) the location of the project and its surroundings;

(b) the principle, concept, and purpose of the project;

(c) the direct or indirect effects that the project is likely to have on the environment;

(d) the social, economic, and cultural effect that the project is likely to have on people and society;

(e) the communities, interested parties, and Government ministries consulted;

(f) any actions or measures that may avoid, prevent, change, mitigate, or remedy the likely effect on people and society;

(g) any alternatives to the proposed project;

(h) natural resources in the locality to be used in the project;

(i) the plans for decommissioning of the project;

(j) such other information as may be necessary for a proper review of the potential environmental impact of the project(Sourced from; https://epa.gov.sl)

HOWEVER, THE EIA PROCESS CAN GENERALLY BE SUMMARIZED AS FOLLOWS:

I. Screening – Is an EIA required, scoping/ESMP – What issues should be considered within the ESMR?
II. Baseline Data Collection – Establishing a robust baseline of the existing environment on and around the facility. This stage includes a review of existing available information and undertaking surveys that helped in the identification during the scoping phase;
III. Assessment of Impact – Assessment of the environmental impacts and establishing their significance;
IV. Mitigation – Formulation of mitigation measures to improve the potential impacts of the facility that cannot be avoided practically through site design;
V. Consultation – With stakeholders' engagement, the public, and other bodies as required;
VI. Decision – The competent authority decides, taking into consideration the results of consultations, and physical, biological, and chemical environmental assessment; ahead of project commencement;
VII. Announcement – The public is informed of the decision; and

VIII. Monitoring – A monitoring plan with a time frame and a responsible person in charge of implementation should be effective when actions are needed for mitigation.

EIA SCREENING OUTCOMES

The screening process facilitated by NETSL is a questionnaire that shares information on project impact prediction, risk evaluation, project methodological framework, associative risk identification; and ownership with maps and business certificates.

As in correspondence and discussions with the EPASL, a consideration on TRADCO (SL) Ltd to proceed with the scoping study report was made after the EPASL team visit on the ground trotting exercise. The report will contain clarifications from the screening process.

Fig. 1. From left to right, EPA Ground trothing team (left) and screening process for TRADCO (SL) Ltd (right)

EIA SCOPING OUTCOMES

Following the approval of the TRADCO screening questionnaire, the detailed pre-information on TRADCO as scoping was mandated. Therefore; the NETSL consultant team were asked to ensure probable risks were carefully identified. The report will highlight all threats and benefits to the community, government, and clients. The process of determining the content was and extent of risk setting that should be covered; will contained in the ESMR. The scoping steps were needed to develop consideration of all environmental facets and their likely scale of the potential impacts probably to arise from the facility. In addition, to these predominant guiding documents for an ESMR, the assessment of each environmental aspect addressed the most important sections such as “4 – 9” which the TRADCO management should be positioned to

initiate with specific consideration on project best practices. key stages of the ESMR guideline were achieved from the basis of the assessment process. These include:

- Establishment of a baseline for the existing environment on and around the facility;
- Assessment of the environmental impacts and establishing their significance (primarily the assessment for residual impacts once mitigation has been adopted); and
- Devising mitigation approaches for potential impacts of the facility that cannot be avoided practically through site design.

BASELINE DATA COLLECTION

The existing environmental baseline for the facility and its surroundings will be established for each aspect under consideration. The scoping process of TRADCO has ensued after the screening process followed by a desktop review of existing data and works of literature. Additionally, a field survey on stakeholder engagement was taken as required to support the establishment of the baseline.

Given the nature of the project within an existing well-established site operated by AFRIGAS (SL) Ltd. management, little development over the last three decades had been done on the concession site specific, therefore; data on physical structures and atmospheric air quality were collected.

POTENTIAL IMPACTS

Potential hazards were evaluated for the construction and operational phases of TRADCO. The impacts were anticipated based on acute and cumulative threats, and significant environmental effects were set with prediction and analyzed for a complete mitigation plan in the next milestone of the TRADCO EIA study report.

MITIGATION MEASURES

As the ESMR addresses potential environmental effects associated with the proposed facility with mitigation that are realistic on benchmarks for implementation were all thought off to be incorporated. All measures proposed as mitigation for the facility will be reported within the relevant Chapters of the ESMR.

The ESMR also included a final chapter that contains all schedules for Environmental Mitigation Measures (EMM) which will bring together the mitigation measures recommended in the various ESMR Chapters for ease of reference.

ESMR STRUCTURE AND CONTENT

The ESMR will be submitted to the EPASL to support the evaluation of the TRADCO EIA license issuance for the proposed facility. Broadly the following key sections will form the content of the ESMR document:

Chapter One

1.0 Introduction

Chapter Two

2.0 Policy, Legal and Administrative Framework

Chapter Three

3.0 Baseline Environmental Information of the Project Area

Chapter Four

4.0 Methods and Baseline Environmental Information

Chapter Five

5.0 Potential Environmental Management Plan

Chapter Six

6.0 TRADCO (SL) LTD Proposed Community Development Action Plan

POTENTIAL IMPACTS ON CONSTRUCTION PHASE

The construction phase for TRADCO company has aligned with some impacts that will tend to cause potential nuisance and disturbance caused by construction activities. These potentially include increases in noise and dust from the construction site and construction traffic on the roads surrounding the facility, such movement are anticipated to cause some potential disturbance to local people and other groups. However; it was also predicted that impacts were caused on human health around the terminal operating area would be possible; though the area was designated for the industrialization of fuel depots.

The local economy will also be impacted during construction; an anticipated increase in sales within Kissy Dockyard will create economic turnover due to the potential increase in project staff as their expenditure will be optimized when the construction and operational phase begins.

POTENTIAL IMPACTS ON THE OPERATIONAL PHASE

With TRADCO management aims to employ approximately 85% of local staff; on a shift basis at the tank farm facility. The process in activity shall be the retrofitting/expanding the scope of operations within the existing establishment of AFRIGAS (SL) Ltd., the assessment revealed that during this process the impacts would largely associated with increasing economic activity and security of employment at the plant.

The likely causes of impacts were assessed and considered as significant and the residual impacts (either adverse or beneficial) as they could potentially occur within the human population and health environment as generally considered lesser threats from the TRDACO (SL) Ltd. proposed operation.

ESMR SCOPE

The assessment of the scoping process comprises a desk-based analysis of publicly available data, a site visit and sample (soil, vegetation, and atmospheric data) collection, and a review of relevant policies and plans. Other critical facets were considered, and their information detailed as relevant to the facility was also determined:

- Population
- Economic Activity
- Employment
- Land Use and Development
- Commuting Patterns

The significance of impacts on receptors such as primary public services and residential buildings located in proximity to the facility were assessed.

Human health will be considered as required by Directive FREETOWN CITY COUNCIL (FCC). This will likely be focused on identifying the environmental topics that have the potential to affect human health and the assessment of those impacts elsewhere within the ESMR. These environmental topics could include the likes of noise and vibration, air quality and traffic.

PROJECT COST ESTIMATE AND EXPENDITURE PLAN

According to information from TRADCO feasibility report, showed that; the proposed investment has a capital outlay of Seventeen million, five hundred thousand dollars $17,500,000, for the execution of the following milestones deliverables as shown in **Table 4**.

Table 4. TRADCO (SL) LTD Expenditure plan

Plant tanks, Machinery, and other hardware equipment	Proposed Retail Fuel Outlets (RFO)	Proposed capital(Stock)	Hauling vehicles
$5,500.000	$5,000,000	$2,000,000	$500,000

However, the analysis of the business plan shows details of projected objectives as they define the higher tiers of raising debt of finance worth $13,000,000 (74%) from the project cost these were scoped to be repaid within 7 years with a moratorium period of two years (Doherty et al., 2023 (unpublished)).

PROJECT TECHNICAL DESCRIPTION

The proposed project will include:

- 1×5000MT storage tank that will be mounted on a skid/frame
- 1×10000MT storage tank that will be mounted on a skid/frame
- Bulkhead
- Piping package
- Filling system
- Operation office and main office
- Tanker offloading and loading point with a deluge system
- Controlled Trucks reversing parking area
- Fire water tank with the required capacity
- Recovery sump
- PMS vapor containment and evaporation pan
- Construct a perimeter fence and gate as per the required standards

DESIGN, ENGINEERING, AND OPERATION SAFETY

The TRADCO project will be guided by its design, construction, and operation methodologies, within the conformance of applicable national and international safety guidelines and standards.

Environmental Health and Safety Practices for storing PMS and AGO will have similar management practices to those set for "Retail Fuel Outlet (RFU)", but ideally tank farm components will be more involved due to the expectation of containment of larger volumes of volatile Organic Compound such as; petrol gas and risk of security. However, form key guidelines that include; information on the performance levels and safety measurements for all fuel storage facilities.

- The guideline outlined that the deliverables concerning time would be achievable when the risk management by safety practices showed reliable information about the site in targets.
- The guidelines are also tailored to the hazards and risks found within the project; based on the results of an environmental assessment, using variables that are limited to site-specific and by Sierra Leone Industrial Safety laws, the continuing sinking of pollutant masses with respect to the capacity of the environment, and other confounding factors that could emerge during construction and operation phases, are all taken into account, (Asare *et al.,* 2024).

health of staff at the facility should be a priority for TRADCO's management, and the protection of other people is not optional but a core part of the process, therefore, TRADCO management has a plan to put in place all mechanisms, and procedures to minimize, eliminate, mitigate or control all probable risks and has agreed to promotes continuous improvement throughout the operational life cycle of TRADCO. Furthermore, the proponent agrees to apply effective Health Safety Environment and Quality (HSEQ) considerations in all planning, decision-making, processes, and practices. Leakages an electronic check scale, standalone gas leak detector, and shut-off valve system. An emergency shutdown system will also be installed to improve the safety situation at the facility. A Hazard Operative Procedure (HAZOP) will be carried out during the facility's design phase to incorporate health, safety, and environmental considerations.

An EMP text has been prepared as inclusive in the studies and contextualized to describe internal and external risk factors with environmental protection laws and recommendations for Sierra Leone and internationally within TRADCO concession and the nearest settlement. This Environmental Management Plan (EMP) will contain the management programs and plans for handling the adverse environmental impacts.

POTENTIAL IMPACTS ON CONSTRUCTION PHASE

The construction phase for TRADCO company has aligned with the main impacts that could associated with potential nuisance and disturbance caused by construction activities. These potentially include increases in noise and dust from the construction site and construction traffic on the roads surrounding the facility, such movement will result in some potential disturbance to local people and other groups. Some impact was predicted to cause human threats to health around the terminal operational area; although it has been designated for industrialization of fuel depot. There may also be valuable impacts on the local economy during construction with some increases in domestic revenue due to business dynamics, as construction staff will use local businesses for items such as food, building materials, fuel, and other Local content products.

POTENTIAL IMPACTS ON THE OPERATIONAL PHASE

With TRADCO management aims to employ approximately 85% of local staff; on a shift basis at the tank farm facility. The process in activity shall be the retrofitting/expanding the scope of operations within the existing establishment of AFRIGASS (SL) Ltd., the assessment revealed that during this process the impacts would largely associated with increasing economic activity and security of employment at the plant.

The likely cause of impacts was assessed as significant with residual impacts consider (either adverse or beneficial) occurring within the human population and health environment generally considered lesser threats from the TRDACO (SL) Ltd. proposed operation.

BASELINE DESCRIPTION OF THE PROJECT ENVIRONMENT (BIOPHYSICAL AND SOCIO-ECONOMIC)

Kissy Dockyard community is home to a population of more than half a million people and sits on an area of 2,069 km². Kissy Dockyard is the popular region of central East Freetown after Mountain Court, Furah Bay, and Blackhall Road community in central Freetown. Its boundaries with other major communities in the east like Low-cost and quarry communities in the South-East of Freetown. It also overlooked the major ferry terminals North-West of Freetown.

Moreover, Parsonage street is the leading road to TRADCO company and it is connected with Queen Elizabeth towards the West part of Freetown, and shares boundaries with West African Refinery and National Petroleum (NP) companies.

The downstream area, though aligned with fences and linking drainage(s) leads to the Rokel River estuary which runs from the interior in-land areas of Sierra Leone and opens to the cape light of Aberdeen waters. The Rokel River has a significant history of biodiversity which qualifies the River as a Ramser site, which indexes Sierra Leone in the World History of Conservation of Birds and other Marine Life Habitats.
The area is fused with different cultures from emerging lifestyles within the proposed area of operation with historical settlement places such as the oil Refinery, the Sierra Leone Government Independent Secondary School, and the orphanage home).

POLLUTION FROM WASTE

During the construction phase, waste will be generated from construction activities, domestic waste generated by construction workers, specifically sewage, waste oil, wood, polyethylene, and plastics packaging material and lubricants, containers of used construction materials, and wastewater from hydrostatic testing.

In the operational phase, waste is expected to be generated; this includes domestic waste by the operation staff and components/parts of the facility to be erected with new buildings that will serve as warehousing and administrative buildings. Modification of existing infrastructure will be imminent during the construction and operational phases meaning there will be e-waste and metal wreckages will be generated.

IMPACTS ON AMBIENT NOISE QUALITY

Throughout the construction phase, the proposed project will utilize machinery like; hydraulic excavators, mobile service cranes, and trucks liable to generate noise. The site contractor engineer is expected to provide Material Safety Data Sheets (MSDS) with complete toolbox talk operation for all subordinates' staff and should make available appropriate Personal Protective Equipment (PPE) with effective management records throughout and well-planned programs for equipment usage.

Throughout the operational phase; noise generation from the generator, compressor, and hauling vehicles is expected to cause moderate to high noise resonance within the operational area, critically; the number and size of pumps to be installed will determine such resonance frequency of noise.

HEALTH AND SAFETY IMPACTS

Heat radiation and explosion by over-pressure are the main threats considered for TRADCO establishment; as the concession already engaged with highly volatile gas called Liquid Petroleum Gas

(LPG), Therefore; the installation of tank farms for PMS and AGO will increase the mass load of flammable gas-like substances in the air, this is expected to cause potential health and safety impacts; this is known as occupational health and safety risks, The operational aspect of TRADCO will be related to the project activities; and its risks could be considered as a public threat (WHO-OMS,1999,141P) manual that risk of accidental propagation and property damage can cause heat radiation as revealed ($23KW/m^2$)when the effect is low as this corresponds to risk criteria of (50×10^{-6}). Explosions due to the over-pressurization impacts will be one key risk that had been anticipated since substances such as PMS can easily influence the gas boiling point levels more than AGO. Therefore, such risk must be managed as the research outcomes considered the possibility of Boiling Liquid Expanding Vapor Explosion (BLEVE), fire outbreaks, and explosions to be imminent when operation commences.

The desk review of the TRADCO engineering design plan shows there will be the possibility of ergonomic impacts risk on humans, especially on those working in high-risk exposure zones, both construction and operation phase; the possibilities of injuries incidence that could result from falling during tank installation, machinery operation, load carrying by human and human disease transfer like due to close interaction between staff every day.

ENVIRONMENTAL MANAGEMENT AND IMPACT MITIGATION

This report intends to inform TRADCO management on the expectation of mitigation and preparedness challenges with an outline framework chapter that contextualizes implementing steps, cost, and technical procedures needed known as an Environmental Management Plan (EMP). The proposed management programs include an air quality management program, a noise management program, a Failure Mode Effect and Analysis (FMEA), and a Hazard Operative Procedure (HAZOP), while the plans will include:

- Construction management plan
- Construction control plan
- Workplace health and safety plan
- Community health and safety plan

EMERGENCY MANAGEMENT AND RESPONSE PLAN

All programs will be subjected to weekly, monthly, and quarterly assessment reviews and monitoring. However; selected methodologies for monitoring will have two elements: compliance in the use of standards or performance criteria; and quarterly evaluation.

ANALYSIS OF ALTERNATIVES

Several alternatives for the proposed project were evaluated. Those with imminent threats include; Location, process activity or operation, layout, risk management expenditures, and restriction of zones. These, however; were the considerations and limitations for the proposed project as it tends to satisfy an overall economic, technical, environmental, and safety criteria.

PUBLIC CONSULTATIONS

Public stakeholder consultations were taken to obtain the views and concerns of the neighbors as stakeholders regarding the proposed project. The stakeholders perceived that the project threats are not considered to be new as the area is known by all residents around, and considered a highly volatile area since it's hosted the country gas terminals, TRADCO since it is expected that TRADCO containment will be highly secured with, intents to go by all environmental roles that will prevent the severity of all anticipating impacts.

CHAPTER ONE

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

The existence of TRDACO came into being on 17th January 2021 after regeneration from Benco Trading Ltd. However, it was qualified under the Sierra Leone Business Act. TRADCO as in operation to establish modern and sizeable tank farms (see **Fig. 1.** of the proposed operational site of TRADCO) within the Eastern end of Freetown has obtained all its registration and has granted licenses for its current operation on the importation, local distribution, and bunkering of petroleum products (sourced from an unpublished document). Please see the organogram of TRADCO in **Fig. 2**.

However; a retrospection of the emergence of TRADCO from its parent company Benco Trading, which constitutes Sierra Leonean entrepreneurs in the oil and gas business since 1994; the management was micro-operational in a retail outlets building where they vendor general merchandise extending from assorted building materials, food and other glossaries. After several developments by the management of TRADCO's mission and vision in business, several gains were harnessed; specifically, was the repositioning of the market into wholesales and distribution of major goods like; building materials (eg. Cement, steel rebar, etc...) other attaching sales were from the running of refer containerized facilities (cool rooms) along the Queen Elizabeth II Quay port in Freetown and the parent company was known for logistic services, clearing and forwarding of goods like break-bulk cargoes and containerized goods, at the present management of TRADCO and shareholding personnel have dual ownership of the business, therefore, proposing to multi-task operation within the same concession of Benco (owners of Afrigass).

1.1.1 TRADCO MARKET STRUCTURE AND LINKAGES

Fig. 1. Shows photo images illustrating key areas of operations. From left to right, (A) Main Administration, (B) Proposed Terminal Site, and (C) Retail Fuel Outlet. The main administration building considered as the organ program linked in to support the proposed project functionality, and a key area to maintaining financial structuring. Therefore, the main administration will provide the fund to construct and support the operation of the proposed terminal site, and the retail fuel outlet as stated in the project feasibility documents.

1.1.2 TRADCO ORGANOGRAM

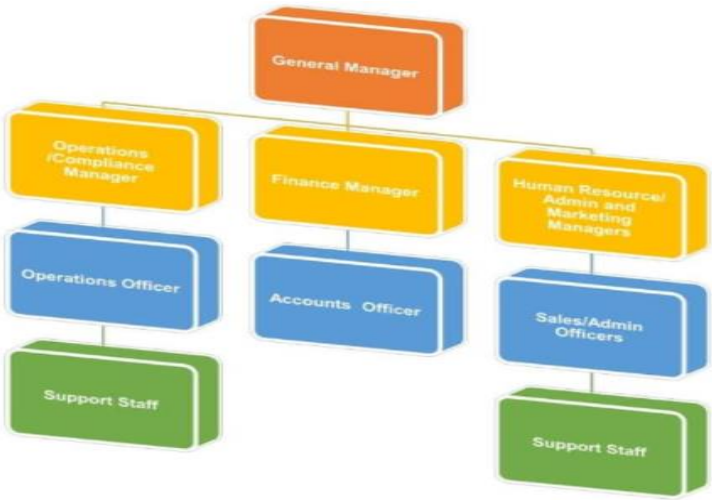


Fig. 2. Proposed organogram for TRADCO

1.1.3 PROJECT JUSTIFICATION

Based on the most recent available data (courtesy of the Petroleum Regulatory Agency (PRA) and the U.S. Energy Information Administration), Sierra Leone imports more than two 350,000 tons per year of diesel and petrol fuel, mostly sold in fuel stations. From data published

by the Petroleum Regulatory Agency shows a sales trend between 2014 to 2019 of 150,000 MT to 200,000 MT yearly in service/fuel stations. There has been continuous industrial growth since the setting of the fuel price liberalization scheme in Sierra Leone between 2018 and 2019. The industry is expected to grow by 500,000 tons' capacity by 2025 due to the influx of mining companies and other Foreign Direct Investments, foreign aid, and other government expansionary policies. The emerging markets such as the general markets are inadequately served by a dominant state-owned oil marketing company (National Petroleum-NP) with 80% shares; in the market with an expected remaining sum to be occupied by Total now Connex Holdings (SL) Ltd. It is also estimated that an inadequate storage system in the country may hamper growth potential, hence supply is unable to meet future demand. The need for more independent establishment of an Oil Marketing Company (TRADCO) to match growing demand with self-owned independent storage tanks to serve targeted and undeserved markets among others (Nationwide mining companies, corporate firms, diplomatic missions, embassies, and private petrol stations

1.1.4 PURPOSE OF THE ESMR

1.1.4.1 GENERAL NEEDS ASSESSMENT

EPASL and United Nations Environmental Programme Agency (UNEPA) promulgate best practices for hydrocarbon oil (Fossil fuel) handling, transporting, and processing for marketing through statutory regulations of the EPASL Act. 2022. The need for an EIA prompted the Chief Executive Officer (CEO) of TRADCO company to hire the services of private consultants approved by EPASL to undertake the study, including a preliminary investigation known as the Environmental Base Line Study. An engagement between the consultants and proponents identified integrals of project values as comprehensive terms.

The Environmental Baseline Studies (EBS) for the project have spanned from the screening to ground trotting observation since its inception stages, as data from the study revealed, to comply with the EPASL agency and other ministries in charge of facility best industrial management in Sierra Leone. The main goal for the process of TRADCO is to purchase PMS and AGO fuel products from refineries outside the country and store and distribute the products to RFO in Sierra Leone.

With the volatility and surfactant nature of the products; the facility design and location require proper assessment of product physical and chemical properties that could be linked to risk-prone factors; like BLEVE and environmental toxicity. The need for ESMR in establishing TRADCO can be of great significance as it supports the link between the project's adverse impacts versus management strategies (mitigation) that would help avert the occurrence of effects during project implementation at Kissy Dockyard terminal area. The ESMR would be divided into stages: Project background, standard regulations and policy matching, risk assessment, and mitigation planning.

1.1.4.2 DEMAND VS. QUALITY ASSURANCE

Global Climatic change and environmental pollution concerns have been a huge focus for investors who are mindful of hazardous risk management such as; fuel gas misappropriation and its pollutant waste control on the environment.

Petroleum and diesel businesses are considered lucrative commerce in Sierra Leone; RFOs establishment in the rural and urban towns, wards, and regions; are well known to almost every Sierra Leonean as local perception realizes the push for more RFOs, the reason could be on the demand factor of both petroleum and diesel fuel. Different opinions of people on product risk settings exist in Sierra Leone, most of which are aligned with the containment and transporting of products. Management of TRADCO company requires robust hazard management and control operational staff for its operation process since the hauling process of fuel gas is considered a higher risk in Freetown due to the tight road network system and lack of security coordination with fuel companies and the state police or national fire force services, which the research recommends.

Batch testing for appropriate moisture and octane rating value should also serve as product validation steps; as the management is required to record at least the physical properties of their products received and before any distribution to RFOs

1.1.4.3 SOCIAL MOBILIZATION FOR SUSTAINABLE HYDROCARBON-OIL MARKETING

In anticipation of project ESMR pursuance, key identification from the site and community reconnaissance visits, key stakeholders' groups' identification before the calling of pre-focus group engagement with ten stratified groups (as; school representative, security, religious group, fuel tanker drivers, Bike riders, settlers, fuel oil companies, hospitality homes, and petty traders). The study also involved critical infrastructure and opportunity requirements in the operational area.

Areas of community involvement through employment, volunteerism, and other services that can be monetarized as cost benefits were identified as inclusion criteria for Kissy Dockyard. In addition, an inventory of current social and cultural values has also been conducted for remote sensing documentation. This is why the study adapted various guidelines on relevant national policies, legislation, Environmental Impact Assessment Procedures (EIAPD, 2004), International Standards, and General Industrial Best Practice (IBP) guidelines on oil handling.

1.2 DISASTER AND VULNERABILITY MANAGEMENT

1.2.1 EXPLOSION OF FUEL TANKS

According to the model of Regional Development Dialogue (RDD: Vol. 24, No. 1, Spring 2003) a research publication on studies that capture community challenges and their lessons observed during disasters; was conceptualized as a work on "Disaster to Sustainability of a community". Sharma *et al.,* (2003) chapter publication on (RDD: Vol. 24, No. 1, Spring 2003) state the need for disaster preparedness and management since its severity is felt now than before, and the reasons contributing to this need are obvious. Disasters in recent decades have been causing more deaths than they did in earlier times due to the increased vulnerability of the people. Therefore, **Fig. 3.** Shows images of recent disasters with environmental impact.

Picture of case studies of explosion	Cause of the explosion	Lessons learned
	This incident of a petroleum hauling tanker colliding with a stone hauling truck happened at Wellington Industrial Estate East of Freetown Sierra Leone causing a huge catastrophic explosion that left 154 people dead and 304 injured(https://www.google.com/search)	Lack of education on hazards and risks associated with BLEVE for road traffic officers. There was no schedule for transporting such a High Risk Good(HRG); as the population at the time of the incident was much.
	The incident of tanker explosion caused by head-on collision with another truck and the circumstance led to the loss of 52 people in Abuja-Nigeria. The fuel tanker was also carrying cattle in the Agaie area in North-central Niger State. (https://www.cbsnews.com/news/nigeria-truck-accident)	No road caution signage for vehicle carrying HRG

Fig. 3. Fuel gas explosion case studies

1.2.2 VULNERABILITY AND HAZARD RISK MANAGEMENT

The study uses approaches that helped to estimate hazards from varied facets of project interaction and risk perception concerns the relationship between hazards, knowledge, and people's attitudes. The concept of hazard risk identification will be impossible to objectionable when assessing vulnerability or developing emergency plans for operations of such nature (Hydrocarbon fuel tanks), without understanding some of the different ways people approach the subjects or scenarios.

1.2.2.1 SCENARIO ONE:

This would be the case wherein the population to be screened will have different views on how peoples' perceptions and attitudes can measure vulnerability, the use of assessment can be significant, but their perception can be of strong influence on their actions on mitigation and preparedness. Inevitably there could be questions on how the different perceptions can relate to risk or not.

1.2.2.2 SCENARIO TWO:

The impact assessment process identifies environmental aspects and impacts on the property and the exposed population. All associated impacts of TRADCO during construction and operation were analyzed as an intuitive survey that specifically serves as significant steps in assessing risk and hazard margin; therefore; the consulting approach to risk identification adopts the setting of rating and codes systems. Then each variable had to be numerically placed with a defined criterion. The concept involved in the rating scale was to understand clearly the influence and associative impacts surrounding the proposed tank farm operation at Kissy Dockyard. The calculation of the order of risk was based on; the severity, spatial scope, and duration of the impact. Two domains were considered; consequences and likelihood were used as risk probability hazard factors total scale of consequence has a total scale of 15. The occurring frequency of the activity and the frequency of the impact together comprise the likelihood of the risk occurring and can obtain a maximum value of 10 (https://www.nema.go.ke/images/Docs/EIA_1550-1560/EIA_1554%20Topline%20Report.pdf)

1.2.3 ANTICIPATING RISK MANAGEMENT PLANNING

Kaup *et al.,* (2022) steps in solving risk for petroleum and diesel tank farm construction and operation construction projects can use the identification and assessment of risk factors that initiate the occurrence of threats and classification of those threats, as its mostly impossible to eliminate cumulative hazard factors in larger investment project. The significance of identifying and examining the origins of undesirable events and conditions of their formation and consequences remain prominent in similar construction processes; given that territory will mostly involve land and water areas as two strategic environments.

A traditional approach to risk investment for the project on land will define with combination of risk probability as occurrence and can be depicted as (P) and the magnitude of the consequences as (S), all values were assumed for the basis of estimation of hazards.

Acceptance, correctible, and rejecting criteria are established to maintain and regulate an appropriate level of safety using several risk management operative procedures that include; among others, the identification of threats and risk assessment by occurrence (Budiyanto, 2020). NETSL expertise uses reviews that are aligned with various risk management approaches with the intent to regulate the degree of safety, which include the following methods:

I. Identification of threats,

II. Risk assessment,

III. Risk analysis,

IV. Risk propagation,

V. Risk management policies.

Safety assessment is conducted using selected measures, with the level of safety usually expressed indirectly through risk measures as done by; Liew *et al.,* (2019).

A mathematical model for measuring events of risk and level of hazards has been adopted;

$M_{RM} = M_{UM} \times M_{HM}$ .....**equation (1)**

where: M_{RM}—Risk measure, M_{UM}—Unreliability measure, M_{HM}—Hazard measure.

it has worked with the most important measures for the proposed tank farm; project risk considered to occur with the relative frequency of events in the assumed unit of time that is liable to causing losses greater than a certain fixed level. The value of this measure is one of the basic criteria based on which social acceptance of the design, construction, and operation of a particular system can take place (eq.1) The acceptable level of the risk measure assumes different values depending on the assessor (Pitilakis *et al.,* 2019; Trbojevic *et al.,*2000).

CHAPTER TWO

2.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This section comprises national and international acts, policies, and regulations that trigger the project including; their relevance to the proposed project's development (**Table 1**). It points out the strategies to put in place during the project's implementation for compliance with these acts, policies, and regulations; the administrative/institutional framework with the sole responsibility to enforce them (please see **Table 1** for more details).

Table 1. Describing the national legislation, policies, and acts with the responsible agencies working on main purpose that is relevant to the proposed project.

National Legislation/ Policies and Acts	Responsible Institution/Agency	Main Purpose	Relevance to the Proposed Project
Legislation: *The constitution stated in section 7.1 presses the pursuit of social protection and prosperity for all; the natural resources of the nation, are to be harnessed in such a manner that could promote national prosperity and an efficient, dynamic, and self-reliant economy. The constitution in section 8(3) states that the health, safety, and welfare of all persons in employment is safeguarded and not endangered or abused, and, having regard for state resources. The constitution also emphasizes the acts of equal pay for equal jobs without discrimination on account of sex, and that adequate and satisfactory remuneration is paid to all persons in the employment.*			
The Constitution of Sierra Leone (1991**)**	Parliamentary over-site committee	the institute summoned criminal proceedings for the contravention of this Act (No. 6 of 1991)	To adhere to the constitution of Sierra Leone which serves as the supreme law that governs policies, and acts. To follow relevant guidelines with the implementation of the projects geared to promote national prosperity and self-reliant economy.
Policies: *A course or principle of action adopted or proposed by an organization or individual*			
National Climate Change Policy (2017)	Ministry of Environment	Mitigation and adaption of Greenhouse gas emissions and Sustainable	The policy will enhance community resilience, especially the vulnerable

		development. To promote public awareness, and education.	population within the TRADCO operational area. While it will help in promoting institutional capacity building for effective climate governance.
National Energy Policy (2009, Revised 2016)	Ministry of Energy	The policy aims to ensure reliable, affordable, and sustainable energy access for all citizens. The policy also seeks to modernize and expand the energy infrastructure to meet growing demand while fostering private-sector investment in the energy sector.	The policy aims to enhance energy access in rural areas, improving the quality of life and supporting poverty alleviation efforts. Additionally, it focuses on strengthening the regulatory framework, encouraging private sector investment, and ensuring the efficient management of energy resources.
National Petroleum Policy (2014)	Ministry of Mines and Mineral Resources	The Policy aims to guide the exploration, development, and management of Sierra Leone's petroleum resources for the nation's benefit. Its established regulatory framework will help TRADCO (SL) Ltd to operate within the	The policy is critical for ensuring that the company is managed efficiently and transparently, and to providing a significant source of revenue. It aligns with the national goal of economic diversification by

		laws of Sierra Leone. To attract investments, ensure sustainable exploration, and maximize economic benefits.	promoting local content and capacity building within the management sector.
The Sierra Leone National Plastics and Plastic Waste Management Policy of 2023	The Ministry of Environment	The purpose of the policy is to promote sustainable plastic use, regulate plastic production, and encourage alternatives to single-use plastics. It aims to establish a comprehensive framework for plastic waste management, including recycling and waste reduction strategies.	This policy is critical in addressing the growing environmental challenges posed by plastic waste, which contributes to land and marine pollution in Sierra Leone. Additionally, the policy helps reduce the negative impacts of plastic on biodiversity, human health, and tourism, which are vital for profitability and economic growth.
Acts: *A formal decision or law enacted by the legislative body for the promotion and protection of energy, environment, etc.*			
Environment Protection Agency (EPA) Act, 2022	The Environmental Protection Agency of Sierra Leone; Ministry of the Environment and Climate Change.	This act sets out the continued existence of the Environmental Protection Agency Sierra Leone for the provision of more effective and efficient protection and management of the environment. It also provides the directives of related matters as in	This act has endowed the responsibility of conducting an environmental impact assessment on the project management of TRADCO with the full consensus of the Environment Protection Agency of Sierra Leone through the provision of a valid EIA License. ensuring

		"Section 24(1) and 25(1)". The act states that a person shall not undertake or cause to undertake activities set out in the First Schedule unless he holds a valid environmental impact assessment license.	proper mitigation of the project's risks and impacts on the environment and society.
National Electricity Act, 2011	Ministry of Energy and Electricity Distribution and Supply Authority (EDSA)	The act aims to regulate the generation transmission and distribution of electricity in Sierra Leone.	It serves as a crucial guide for the modernization of Sierra Leone's energy sector and addresses the country's electricity supply and challenges
Petroleum (Exploration and Production) Act, 2011	The Petroleum Directorate of Sierra Leone	The Petroleum (Exploitation and Production) Act (2011) provides the legal framework for granting licenses to companies, ensuring transparency and accountability that seeks efficiency in petroleum resources safeguarding the environment, and ensuring economic benefits for the country.	To provide a sustainable and economic benefit within Sierra Leone. To support national economic growth by attracting foreign investment and generating revenue from petroleum production. To follow the environmental protection policies that align with international standards to minimize the environmental impact of petroleum activities. To promote transparency and accountability, ensuring that petroleum exploitation benefits the country's development.

Electricity and Water Regulatory Commission (EWRC) Act, 2011	The Ministry of Energy	The Electricity and Water Regulatory Commission (EWRC) Act, 2011, was established to regulate and oversee the provision of electricity and water services in Sierra Leone. To operate with the primary objective of product availability, affordability, and reliability of essential services.	The Electricity and Water Regulatory Commission (EWRC) Act, 2011, will be implemented to ensure accountability and transparency within the electricity and water sectors, which are vital for public health and economic growth. To work towards enforcing service quality and pricing standards of EWRC.
Petroleum Regulatory Agency Act, 2014	The Sierra Leone Petroleum Regulatory Agency	The agency licenses and regulates the efficient importation, storage, transportation, and distribution.	To adhere to the petroleum regulatory policy. To ensure its regular availability to consumers at reasonable prices and to provide for other related matters.
The Factories Act(1974)	Ministry of Labour Factory Inspectorate Division; Environment Protection Agency of Sierra Leone.	The Act makes provision for the protection of workers by their employers in aspects such as the cleanliness of the work environment, and handling of all injuries, accidents, diseases, and death during work. It also requires documentation of all accidents and injuries that take place and the reporting of such to the labor office.	To adhere to the act necessary for the protection of the health and safety of workers in the project. To maintain demands that promote health and safety measures for (factory) workers; machine safety; safe working conditions; sanitary amenities; periodic inspections; and factory registration be adhered to by the project management.

Local Content Agency Acts(2016)	Ministry of Labour; Local Content Agency	This act was promulgated to ensure Sierra Leone's development in a wide range of economic sectors including manufacturing, industrial, mining, petroleum, marine resources, agriculture, transportation, maritime, aviation, hotel and tourism, procurement of goods and services; public works, construction, and energy sectors; to promote the ownership and control of productive sectors in the economy by citizens of Sierra Leone; and to provide for other related matters.	To focus on more employment of people for the development of Sierra Leone.
National Land Policy Act(2015)	Ministry of Lands; Freetown City Council; Western Rural Area District Council.	This policy works towards effective and efficient land management and administration systems in Sierra Leone. This policy aspires to move towards a clearer, more effective, and just land tenure system that shall provide for social and public demands, and stimulate responsible investment.	To follow guidelines on the construction of the warehouse and auxiliary facilities shall be done on land not occupied by people. This policy shall therefore inform the project proponent of the means to get the land justly without any problems.
National Health Policy (2002)	Ministry of Health and Sanitation;	This policy aims to motivate and guide the health sector	The activities of TRADCO management shall require

	The Environment Protection Agency of Sierra Leone.	in its effort towards effective and efficient delivery of health services while considering the emmerging and broader cross-sectorial challenges as well as the patterns of disease distribution (such as the HIV/AIDS, TB, and hepatitis, and Malaria) and more general problems associated with the epidemiological and demographic transitions.	the employment of workers; this policy therefore urges the project proponent to ensure the health and safety of their workers and the project-influenced communities.
Ministry of Trade and Industries	Ministry of Trade and Industries	The Ministry has the sole mandate of developing policies and programs to stimulate local and export trade as well as to enhance private sector investment and industrial and economic growth.	Ensure that the socio-economic needs of the citizens are met through private sector development, job, and wealth creation. It liaises with other Ministries, Departments, and Agencies of the Government to provide an enabling environment for the Private Sector to thrive.
Integrated National Waste Management Strategy (2012)	The Ministry of Health and Sanitation	Strategically used to establish a comprehensive framework for managing waste in Sierra Leone, to reduce environmental pollution and promote	To follow the Ministry's strategy by addressing waste management challenges within the proposed project. To promote environmental sustainability by reducing

		public health. It seeks to enhance waste collection, recycling, and disposal systems while encouraging sustainable practices to minimize waste generation.	pollution and improving sanitation, which is crucial for public health and ecosystem protection. Also, to develop goals by creating opportunities for green jobs through recycling and sustainable waste practices.

Internal Treaties Relating to Petroleum and Products as Environment

Aspect one:

1. United Nations Framework Convention on Climate Change (UNFCCC): Sierra Leone is a signatory to this treaty, which addresses the global impact of fossil fuel emissions, including those from petroleum, on climate change. The country is committed to reducing greenhouse gas emissions and implementing climate adaptation measures.

2. Kyoto Protocol and Paris Agreement: These agreements, under the UNFCCC, further commit Sierra Leone to sustainable practices in the petroleum industry to limit global warming and protect the environment from the adverse effects of fossil fuel use.

3. International Maritime Organization (IMO) Conventions: These include the MARPOL Convention (International Convention for the Prevention of Pollution from Ships) which regulates pollution from ships, including oil spills, and the London Convention (Convention on the Prevention of Marine Pollution by Dumping of the industry in Sierra Leone.

4. African Convention on the Conservation of Nature and Natural Resources: This regional treaty encourages the sustainable management of natural resources, including petroleum, and the protection of the environment from harmful practices related to oil extraction and production.

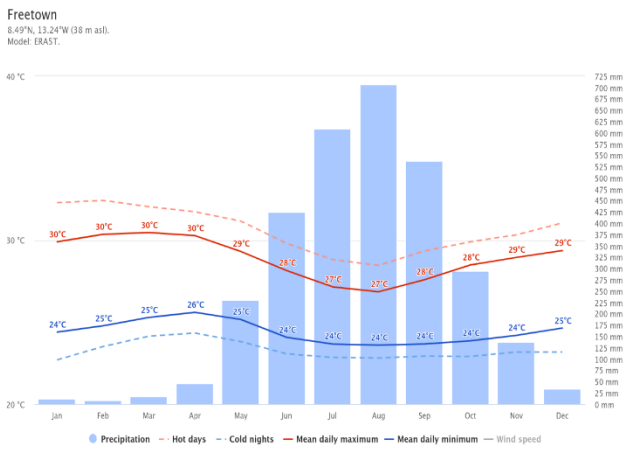
Aspect two:

World Bank Policies on Environmental and Social Standards

- Cultural properties (OD 4.25) - protection of archaeological sites, historic monuments and historic settlements.
- Indigenous people (OD 4.25) address the traditional rights of people including land and water rights and ensure that indigenous people benefit from development projects.
- Induced development and other socio – cultural aspects; Involuntary resettlement (OP 4.12) – describes how to proceed when involuntary resettlement is unavoidable.
- Land settlement (OD 4.31); Occupational health and safety guidelines;
- Environmental assessment (OP 4.01) – policy and procedures for environmental assessments whereby potential impacts are taken into account in selecting, sitting, planning and designing projects.
- Designed to ensure that IFC projects are environmentally and socially sound and sustainable;
- Water Resources Management (OD 4.07) - policy to promote economically viable environmentally sustainable and socially equitable water management;

2.1.1 METROLOGICAL INFORMATION FOR URBAN FREETOWN

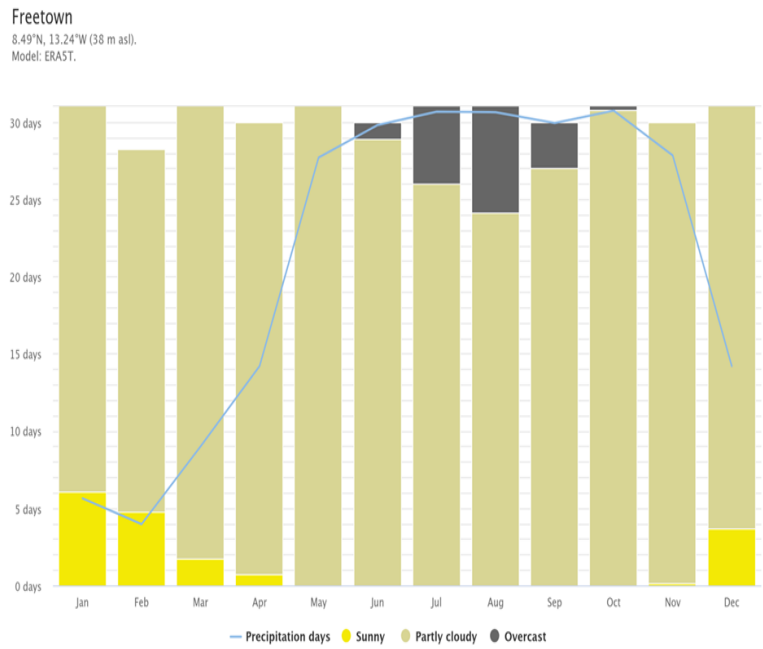
Statistical representation



Average temperatures and precipitation

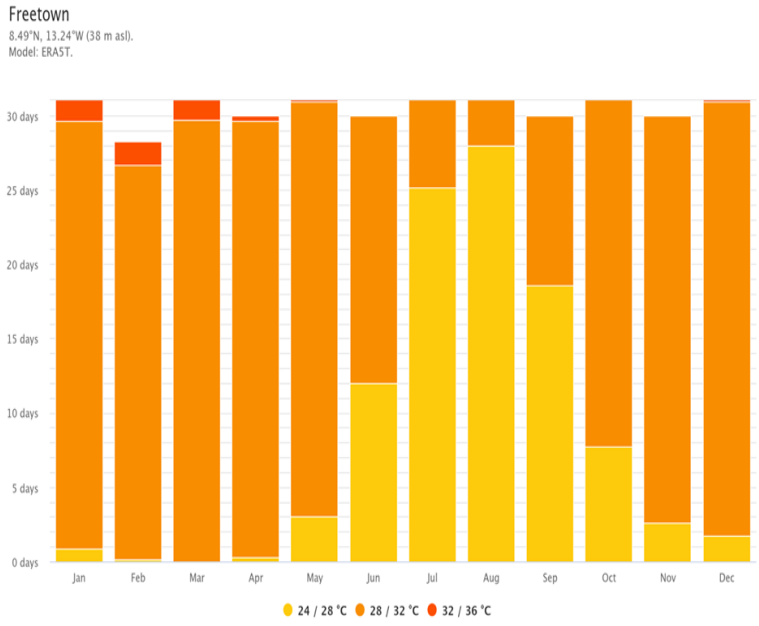
Relevance to the project

Fig. 1. Indicating published meteorological information of average temperature, and precipitation readings for 2024 within the urban areas of Freetown. These readings are used as a baseline guide or reference to compare and contrast the differences in average temperature, and precipitation readings that were taken at the proposed operational site, Kissy Dockyard. This image was taken from the below link of the Sierra Leone Meteorological Agency (SLMET) website. https://slmet.gov.sl/



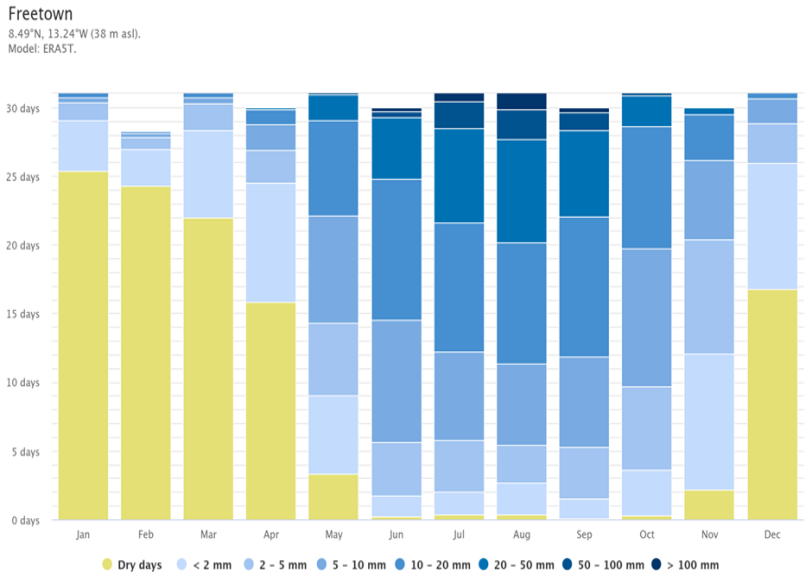
Cloudy, sunny, and precipitation days

Fig. 2. Shows the monthly average readings of cloudy, sunny, and precipitation for the year 2024, in urban areas of Freetown. Similarly, Fig. 1b will be used to reference the readings that were taken from the proposed operational site, Kissy Dockyard. This image was taken from the below link of the Sierra Leone Metrological Agency (SLMET) website. https://slmet.gov.sl/



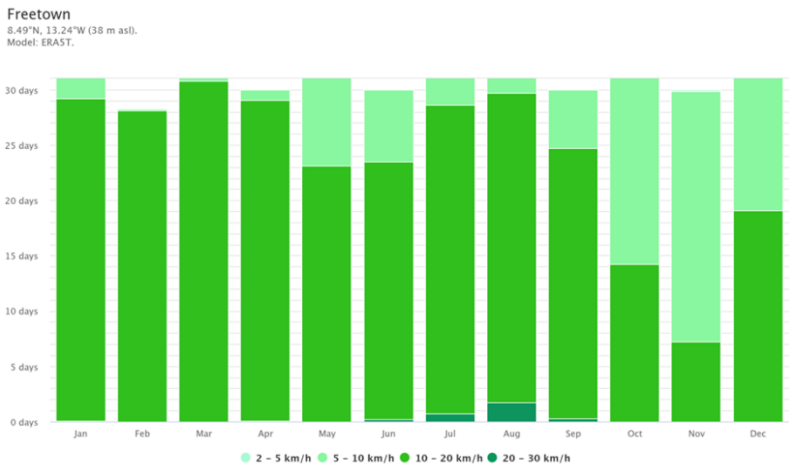
Maximum temperatures

Fig. 3. Average maximum temperature monthly readings for 2024 will reference the readings generated from the proposed operational site. The purpose of such readings is to detect the effect of heat due to extreme temperatures at the proposed operational site at Kissy Dockyard. This image was taken from the link below to the Sierra Leone Metrological Agency (SLMET) website. https://slmet.gov.sl/



Precipitation amounts

Fig. 4. Indicating the effect of precipitation amounts in the urban of Freetown. These readings will be used to compare and contrast the difference of the readings taken at the proposed site at Kissy Dockyard. The purpose of using such readings is to serve as a decisive factor for the proposed site at Kissy Dockyard location. It will help to provide an understanding of climate change such as heavy rainfalls. Also, lack of precipitation will lead to droughts (droughts also leads to increasing thermal effect), or possibly destroyed habitats. This image was taken from the below link of the Sierra Leone Metrological Agency (SLMET) website. https://slmet.gov.sl/



Wind speed

Fig. 5. Demonstrated monthly readings of wind speed for 2024. Wind speed serves as an indicator for weather forecasting affecting construction projects. The readings taken at the proposed site at Kissy Dockyard will be used to compare and contrast. Therefore, when humidity increases it affect the project engineering damping effects. This image was taken from the below link of the Sierra Leone Metrological Agency (SLMET) website. https://slmet.gov.sl/

CHAPTER THREE

3.0 BASELINE ENVIRONMENT INFORMATION OF THE PROJECT AREA

The baseline environmental condition of the proposed project is described in terms of the project location, and physical, biological, and social environment (**Fig. 1**).

3.1.1 PROJECT LOCATION AND EXITING SPACE

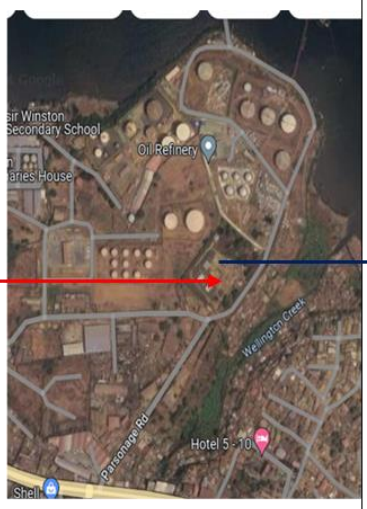
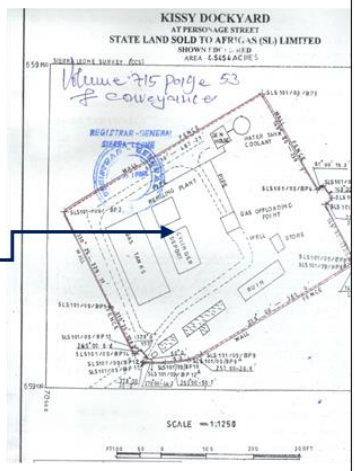
Plate 1: Map of Sierra Leone with a project located in the Western Area of Urban	Plate 2: GIS except showing the TRADCO proposed site	Plate 3:Proposed area survey plan for TRADCO concession in Kissy Dockyard
		
Source: Google Earth	Source: Google Earth	Source: Proponent survey plot

Fig. 1. Satellite Image showing the location and plot space for the proposed project.

The proposed site of TRADCO company will be located in a leased concession of Afrigas company within a colonial heritage area known as Kissy Dockyard (see **Fig. 2 and 3**); which strategically has served Sierra Leone and is well known for its gas terminal companies station in the country. The immediate critical resources that TRADCO will be neighboring are the Rokel River, the surrounding human environment, and key infrastructure, the characteristic features of the Rokel River been revealed that the Seli River was known as Pamoronkoh River which is defined as the largest river in the republic of Sierra Leone in West

Africa. The human population is in clusters and their settlements are towards the hillside slope area, the middle and elevated zones and now spreading rapidly towards the industrial designated zones around the Queen Elizabeth Road Dockyard area. Most human settlers within the terminal operations are known to have informal dealings with the availability of petroleum, diesel, and other hydrocarbon products; others survive through petty trading. Other; utilities of major assets are the national electrical grades, hydrant networking, schools, hospitality homes, technical trading centers, and hydrocarbon fuel and gas companies, all of which are strategically situated with the proposed location of TRADCO.

PICTURES OF ROAD

Fig. 2. Road leading to the proposed TRADCO compound.

PICTURE OF PROPOSED TRADCO COMPOUND

Fig. 3. Road leading to the proposed TRADCO compound.

3.1.2 PROPOSED PROJECT ENGINEERING DESIGNS

3.1.2.1 QUALITY ASSURANCE AND CONTROL SYSTEMS BASELINE FOR THE TANK FARM MATERIAL AND INSTALLATIONS SPECIFICATIONS

Table 1. Fuel oil product quality information

General Specification	AGO	PMS	Standard Ref
Service	AGO	PMS	SLPU
Location			
Number of Tanks			
Equipment Tag Number	Safe Capacity m^3(22,000)	Safe Capacity m^3(11,000)	SLPU
	Design capacity m^3(24,350)	Design capacity m^3(12,600)	SLPU
Operational Specification			
Medium	AGO	PMS	SLSB
Specific Gravity	0.820 - 0.880	0.720-0.780	SLSB
Viscosity	2.2 – 5.3 @40^oC	0.5-1.0@38^0C	SLSB
Flash Point	62	<10	SLSB
Storage Temp.^0C	40	40	SLSB
Design (Vacuum) Pressure MM WC	25	25	SLSB
Design Temp. °C	80	80	SLSB
Reid Vapour Pressure(Kg/cm^2)	Nil	0.61@38^0C	SLSB
Material Specification			
Design Liquid Sp. gr.	1.00	1.00	Eng.Conslt
Uses Water Draw off Sump	Yes	Yes	Eng.Conslt
Tank Gauging	One Servo Gauge		Eng.Conslt
Ambient – Temp °C	40	40	Eng.Conslt
Vapour Space mm	5 %	5 %	Eng.Conslt
Design & Const. Code	API 650	API 650	Eng.Conslt
Mechanical Specification			
Tank Corrosion Allowance in mm	2.0 mm (Shell, Bottom) & 1.0 mm (Roof	2.0 mm (Shell, Bottom) & 1.0 mm (Roof	Eng.Conslt
Tank Bottom Type	Cone down to Centre	Cone down to Centre	Eng.Conslt
Tank Roof Type	Fixed Cone roof		Eng.Conslt
Inspection & Testing	Hydro Test Level	Hydro Test Level	Eng.Conslt
Operating Weight (MT)	5077	5077	Eng.Conslt
Empty Weight (MT)	195	195	Eng.Conslt

Design Specification		
Level Gauge	To be available	Eng.Conslt
Spiral Stairway	To be available	Eng.Conslt
Hand Railing (On Roof)	To be available	Eng.Conslt
Earth Connection	To be available	Eng.Conslt
Foam Pourer Platform	To be available	Eng.Conslt
Water Sprinkler	To be available	Eng.Conslt
Gauge Hatch	To be available	Eng.Conslt
Atmospheric Vent Assembly	To be available	Eng.Conslt

3.1.2.2 TRADCO INSTALLATION BLOCK DIAGRAM

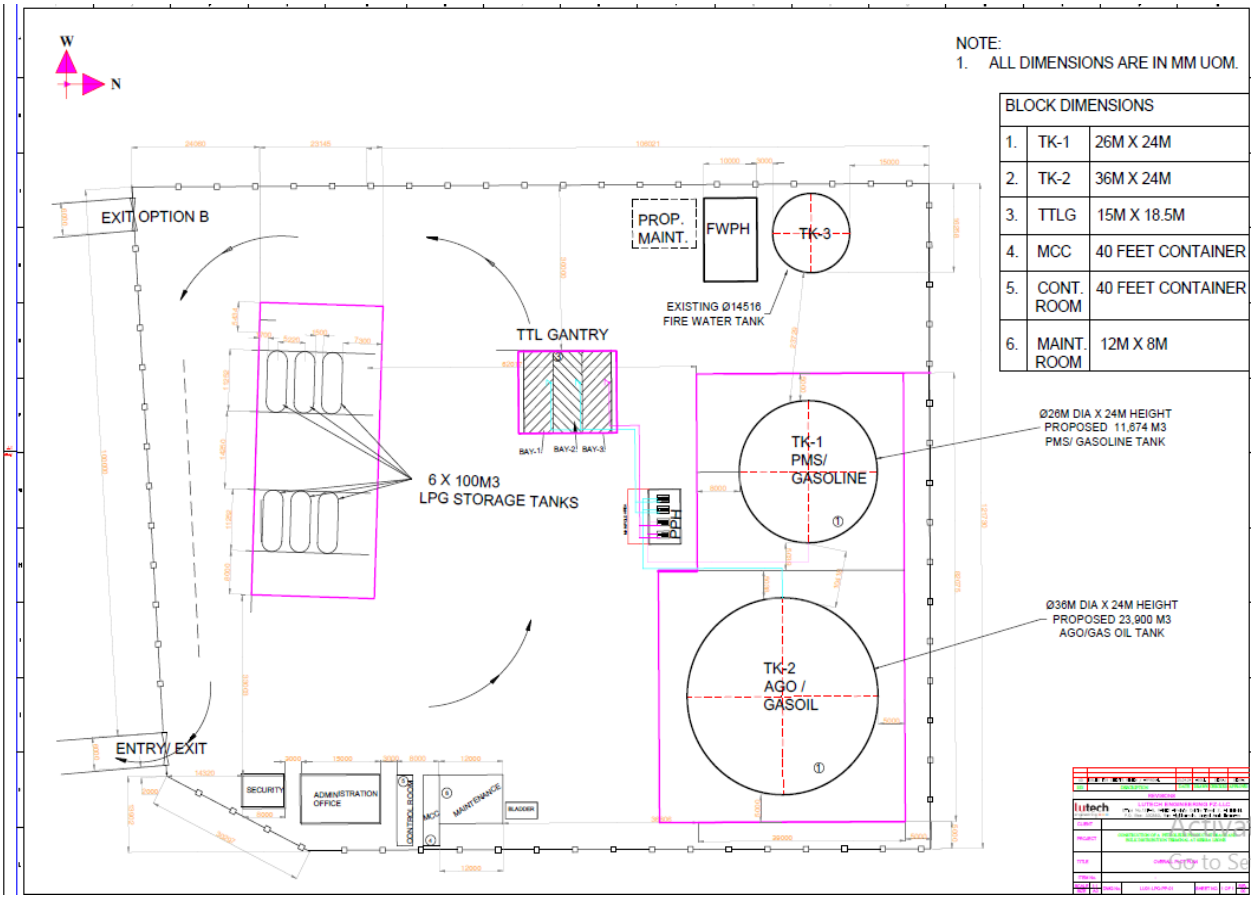


Fig. 4. Shows installation block diagram

3.1.2.3 TRADCO INSERTED BLOCK DIAGRAM

Fig. 5. Google Earth image with inserted block diagram

CHAPTER FOUR

4.0 METHODS AND BASELINE ENVIRONMENTAL INFORMATION

4.1.1 METHODS AND INSTRUMENTATION

4.1.1.1 ATMOSPHERIC DATA MEASUREMENT

Environmental standard requirements for project interfacing in the environment require the quality of the existing air within TRADCO concession, while carrying out its main objectives, as implied to the TRDACO (SL) Ltd. project at the Kissy Dockyard community. Basic atmospheric data were collected throughout the visitation phase around TRDACO (SL) Ltd. concessional area to ensure adequate information was met for comparative analysis. All atmospheric data were collected in situ with the specified equipment below (**Fig. 1**). Wind speed, relative humidity, temperature, and noise were determined.

Model: HT-80A	**Model: LKC 1000E/1000S+**	**ETEKCITY Infrared thermometer 774**

Fig. 1. Atmospheric measuring equipment

4.1.2 GEOLOGICAL ASSESSMENT OF PROPOSED SITE

4.1.2.1 SPATIAL STRATIFICATION OF THE LANDSCAPE

Spatial Stratification of the landscape was used as a conjoint approach for describing the landscape of the terrain, the process involves the division of landscape homogeneous and mutually contrasting landform units as stated by Mulder *et al.,* (2011). The idea of remote sensing offered a great deal of help in locating soil data sets. Mulder *et al.,* (2011), the information is expected to be valuable in various ways including landscape segmentation for which soil composition can be assessed, and remote sensing can also be analyzed using physically based data or empirical. This methodology was designed due to the difficulty in collecting soil sampling around the proposed concession.

4.1.3 SOCIO-ECONOMIC ASSESSMENT OF PROPOSED SITE AND NEIGHBORHOOD

Kissy Dockyard community has experienced huge migration and informal settlements over the past two decades, and it also faced the impact of the non-urban planning process, which had caused the closure of access routes and the spanning of makeshift buildings. The study on socio-economics however considered the constraints in reaching groups of people. A statistical method best employed by NETSL uses stratified random sampling; to enable the team of researchers to obtain the precise population that best represents the entire population. Representative sub-groups were formed from the selected project risk zone; ten main groups were established including; Bike riders, security (police unit), humanitarian groups, residents, community heads, educational groups, religious groups, fuel tanker drivers, clinics, and petty traders.

4.1.4 ENGINEERING INSTALLATIONS AND MODE OF FAILURE ASSESSMENT

With the basis of real pictorial evidence, the approach to establishing the Failure Mode Effect and Analysis (FMEA) uses site visitation and visual inspection that follows the documentation of all electrical appliances that were originally installed within the establishment of the proposed site; the exercise was approved because there is an existing operation and office/ admin building, which requires to know the amount of energy expected to consume at peak and non-peak electricity supply. The advantage of such assessment in an EIA study remains meaningful when determining the risk factors that can cause property damage and economic misuse, which can help guide the company for quality assurance of appliances and the prevention of electrical power outage loss and damages.

4.1.5 RISK EVALUATION AND HAZARDS MANAGEMENT

Kaup *et al.,* (2022) steps in solving risk for petroleum and diesel tank farm construction and operation construction projects can use the identification and assessment of risk factors that initiate the occurrence of threats and classification of those threats, as it is mostly impossible to eliminate cumulative hazard factors in the larger investment project. The significance of identifying and examining the origins of undesirable events and conditions of their formation and consequences remain prominent in similar construction processes; given that territory will mostly involve land and water areas as two strategic environments.

A traditional approach to risk investment for the project on land will define with combination of risk probability as occurrence and can be depicted as (P) and the magnitude of the consequences as (S), all values were assumed for the basis of estimation of hazards (**Table 1 to 3**).

Acceptance, correctable, and rejecting criteria are established to maintain and regulate an appropriate level of safety using several risk management operative procedures that include; among others, the identification of threats and risk assessment by occurrence (Budiyanto, 2020). NETSL expertise uses reviews that are aligned with various risk management approaches with the intent to regulate the degree of safety, which include the following methods:

I. Identification of threats,
II. Risk assessment,
III. Risk analysis,
IV. Risk propagation,
V. Risk management policies.

Safety assessment is conducted using selected measures, with the level of safety usually expressed indirectly through risk measures as done by; Liew *et al.,* (2019).

A mathematical model for measuring events of risk and level of hazards has been adopted using (**Eq.1**)

$$\mathbf{M_{RM} = M_{UM} \times M_{HM}} \quad \textbf{.....Equation (1)}$$

where: M_{RM}—Risk measure, M_{UM}—Unreliability measure, M_{HM}—Hazard measure.

Tables … and … were used as guidelines to measure the consequences and likelihood of hazards for the proposed fossil fuel tank farms at Kissy Dockyard, Freetown.

Consequences

Table 1. Demonstrates the guideline to measure the consequences of potential hazards happening

Magnitude of Impact	Rating
Negligible	1
Minor	2
Marginal	3
Significant	4
Catastrophic	5
Spatial Scope/Geographic Extent of Impact	Rating
Activity specific	1
Site-specific	2
Local area (within 5km of the project site)	3
Regional	4
National	5
Duration of Impact	Rating
One day to one month	1
One month to one year	2
One year to ten years	3
ife of operation	4
Post-closure/permanent	5

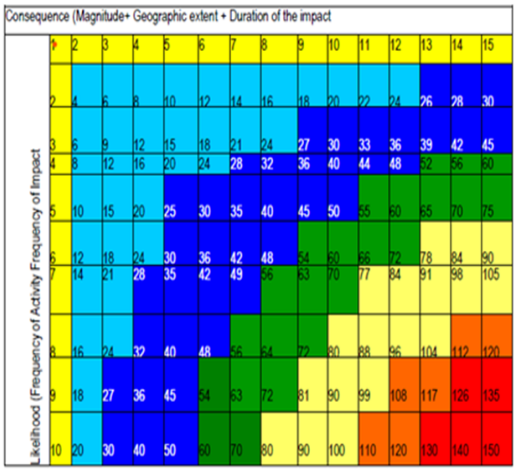
Likelihood

Table 2. shows the likelihood of hazards happening.

Frequency/duration of activity	Rating
Annually or less	1
6 monthly/temporary	2
Monthly/infrequent	3
Weekly/life of operation	4
Daily/permanent	5
Frequency of impact	Rating
Rarely/Impossible	1
Very seldom/highly unlikely	2
Infrequent/ unlikely seldom	3
Often/regularly/likely/possible	4
Daily/highly likely/definitely	5

Table 3. Indicates the significance rating of positive or negative impact liable to be mitigated, and not be mitigated with their color coding. The images were taken from https://www.nema.go.ke/images/Docs/EIA_1550-1560/EIA_1554%20Topline%20Report.pdf

Significance rating	Value	Colour Code	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very high	126-150		Propose mitigation measures	Maintain current management
High	100-120		Propose mitigation measures	Maintain current management
Medium-high	77-105		Propose mitigation measures	Maintain current management
Low medium	52-75		Maintain current management	Improve current management
Low	25-50		Maintain current management	Improve current management
Very low	4-24		Maintain current management	Improve current management



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4.1.6 BASELINE ENVIRONMENTAL INFORMATION

4.1.6.1 ATMOSPHERIC DATA MONITORING

Table 4. Atmospheric baseline data for the proposed site

Baseline Atmospheric data for TRADCO concession at Kissy Dockyard					
Parameter	**Garage**	**LPG filling area**	**Central between tank farm &Admin building**	**Maximum Permissible Limits**	**Permissible Limit References**
PM2.5 µg/m³	17.2	20.0	8.5	15 (µg/m³, 24-hour average)	WHO(2021)
PM10 µg/m³	32.5	32.8	13.7	15 (µg/m³, 24-hour average)	WHO(2021)
AQI	67.0	67.0	35.0	0-50	
Temperature(^{0}C)	28.3	31.1	32.8	32.0	SLNMD
% Relative Humidity	89.0	79.0	73.0	80%	SLNMD
HCHO	0.01	0.01	0.01	0.75	ACGIH
Sound (Max) dB	73.3	67.1	68.0	70dB	Compendium of WHO and other UN guidance on health and environment 2022
Sound (Min) dB	65.3	61.1	63.6	65.0dB	

4.1.7 DISCUSSION OF RESULTS

The atmospheric data provided in the table above (**Table 4**) shows the measurements of various parameters in different locations. The parameters measured include PM2.5, PM10, temperature, relative humidity, formaldehyde (CH_2O), and sound.

PM2.5 is a measure of fine particulate matter in the air that can cause respiratory problems. The maximum permissible limit for PM2.5 is 15 µg/m3 for a 24-hour average, according to the WHO Air Quality Standards and SLNMD (**Fig. 1 to 5**). The highest PM2.5 measurements in the table are 17.2 µg/m3 and 20.0 µg/m^3 respectively, which were recorded in the garage and LPG filling area. These values are shown to be higher than the WHO limit and indicate poor air quality in that location.

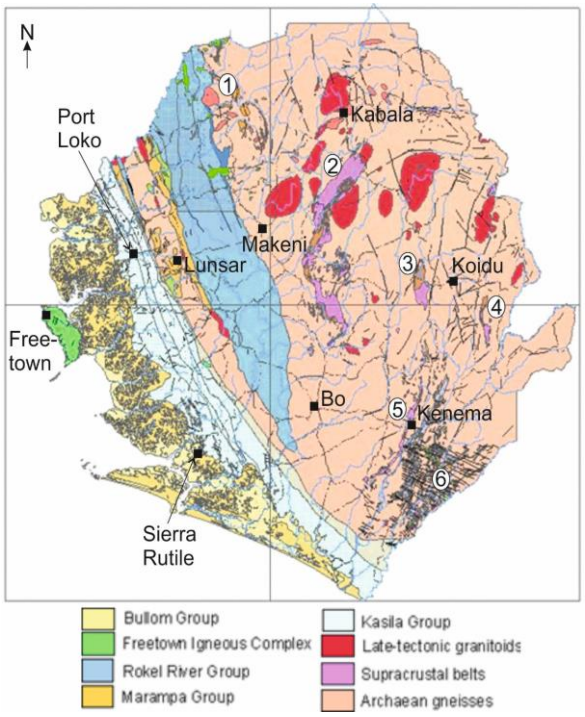
PM10 is a measure of larger particulate matter in the air that can also cause respiratory problems. The maximum permissible limit for PM10 is 45 µg/m3 for a 24-hour average, according to the Air Quality Communication Workshop in El Salvador.

The highest PM10 measurements in the table are 32.8µg/m3 and 32.5µg/m3, which were recorded in the LPG filling area and garage, respectively. These were found below the permissible limit, according to the Air Quality Communication Workshop in El Salvador.

The temperature measurements in the table are all within range of Sierra Leone National Meteorological Data (SLNMD), while the relative humidity measurement of 89.0% (**Fig. 3**) has been high compared with SLNMD. These values are of risk with the acceptable range for human comfort and health.

Sound levels are measured in decibels (dB) and can affect human health and well-being. The highest sound measurement in **Table 4** is 73.3 dB on a maximum reading scale, depicting very high resonance beats, and 65.3 dB on a minimum reading scale depicts a moderate to high value of resonance from the garage working area as compared with WHO and other UN guidelines on health and environment.

4.1.7.1 GEOLOGICAL ENVIRONMENTAL INFORMATION



Information on remote sensing revealed that the western margin of the craton in Sierra Leone was identified by a Pan-African deformation zone known as the
Rokelidesand stripp kinds were identified as palaeoproterozoic genesis, with the Kasila group having all been accreted with craton by Goodenough *et al*., (2018). With early days of geological studies on landscaped along the Rokel river, the soil stratification embedded with Mesozoic mafic intrusions with associates of continental rifting and opening of the Atlantic that are present in geological soil structure throughout in Sierra Leone.
Most important of all is the information on the Freetown complex; which underlines the capital city the capital city with youngest ecology name a lithostratigraphic group known as the Bullom Group, comprising onshore Cenozoic sediments deposited along the coastal margin, Goodenough et al, {2018}

Fig. 2. Soil geological information in Sierra Leone (Source from; https://nora.nerc.ac.uk/id/eprint/519869/1/or18004.pdf)

4.1.7.2 SOCIO-ECONOMIC INFORMATION ON THE PROPOSED ENVIRONMENT

4.1.7.3 GENDER

The population is slightly male-dominated, with 55% male and 45% female (**Fig 3**). This gender distribution suggests a fairly balanced population but with a slight male majority, which could have implications for gender-targeted programs or policies in the community.

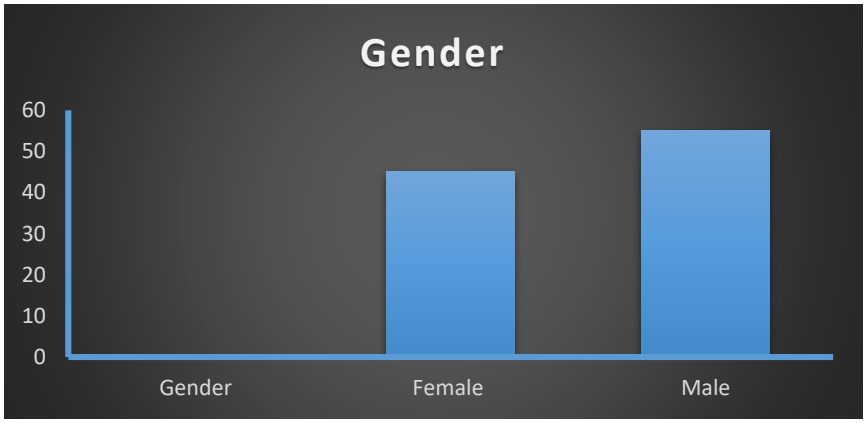
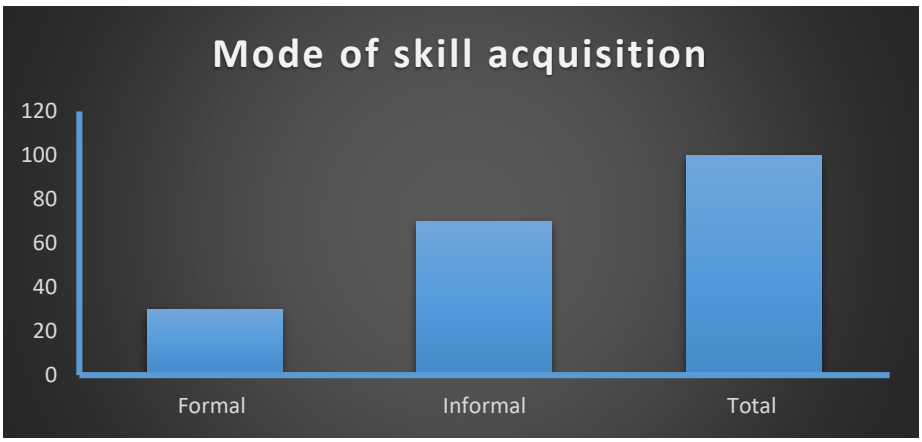


Fig. 3. Gender population in the community.

4.1.7.4 MODE OF SKILL ACQUISITION

A significant majority (70%) of the population acquires their skills informally, while only 30% go through formal channels (**Fig. 4**). This indicates a heavy reliance on informal learning and on-the-job training, pointing to a potential need for more formalized vocational training programs to improve skill acquisition and professional development.

Fig. 4. Population of skills on the job training programs set up for professional development.



4.1.7.5 LEVEL OF EDUCATION

The highest level of education attained by most of the population is secondary school (40%), followed by primary and junior secondary levels (both at 20%) (**Fig. 5**). Only a small fraction of the population has access to higher education, with technical education at 10% and university education at a very low 3%. This reflects a significant educational gap, particularly in tertiary education, and suggests the need for improved access to higher learning opportunities to advance the community's socioeconomic development.

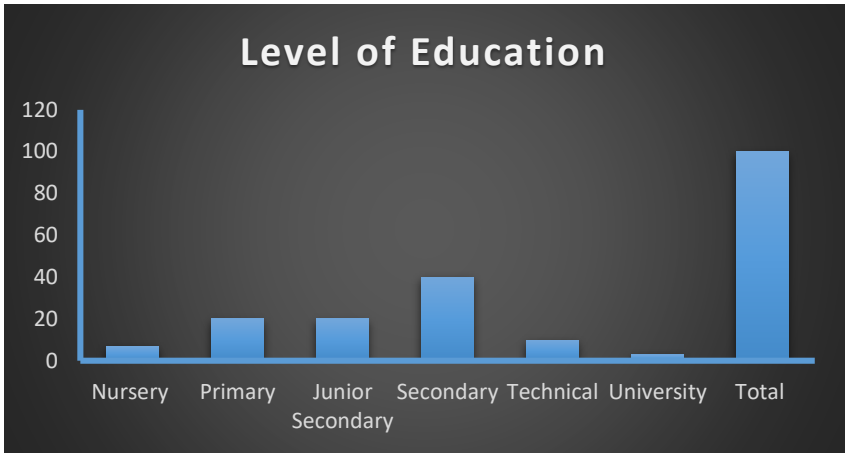


Fig. 5. Shows gap in the level of education within the ethnicity of Kissy Dockyard community.

4.1.7.6 ETHNICITY

The community is predominantly Temne (60%), followed by Mende (30%). Minority ethnic groups include Fullah (5%), Kono (3%), and Limba (2%) (**Fig. 6**). This ethnic diversity, though dominated by two main groups, underscores the need for inclusive policies that recognize and respect cultural differences while fostering unity.

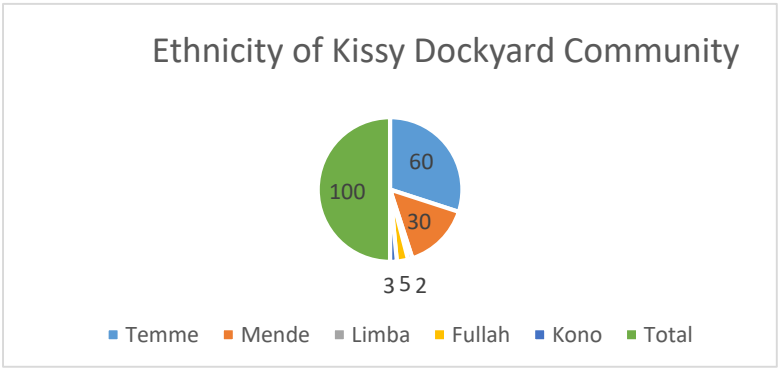


Fig. 6. Ethnic diversity of Kissy Dockyard Community.

4.1.7.7 AFFORDABILITY OF MEALS

The majority of the community (81%) finds meals unaffordable, while only 19% can afford them (**Fig. 7**). This highlights a serious issue of food insecurity and suggests that poverty and lack of economic opportunity may be significant challenges in the community. Addressing food affordability should be a priority in any development or support initiative.

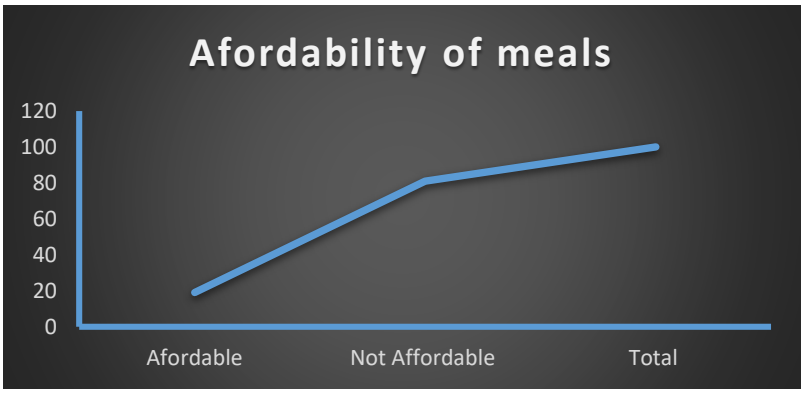


Fig. 7. Economic disposition in the community of Kissy Dockyard.

4.1.7.8 MOST DOMINANT RELIGION

Islam is the predominant religion in the community (66.25%), with Christianity making up 33.75% (**Fig. 8)**. This religious composition indicates that most community activities, leadership, and traditions are likely influenced by Islamic practices, and any development programs should be sensitive to religious dynamics.

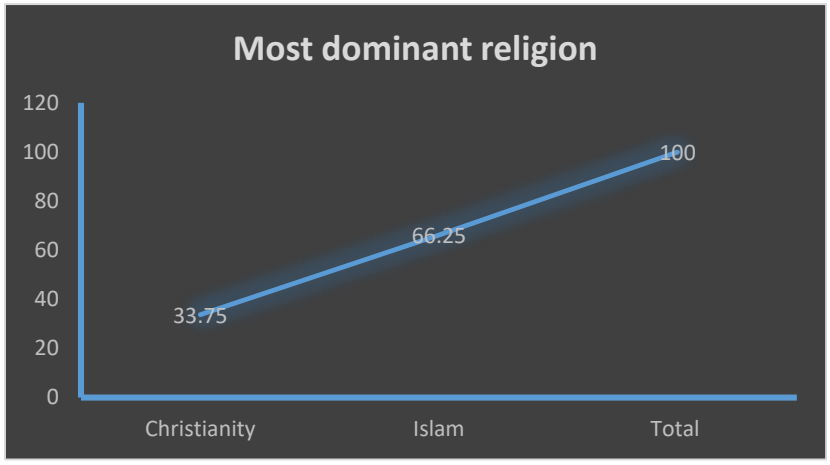


Fig. 8. Impact in religion influencing development program.

4.1.7.9 KEYS FOR THE RESPONSES

Table 5. Summary of qualitative data analysis

Variables	Codes
Type of Population	Sparsely =1, Moderately=2, Densely=3
Age Class	children<youth<Aged=1, Aged<Youth<children=2
Sex Ratio	men < women=1, women< men=2
Mode of Transportation	Vehicle=1, By foot=5
Describe road network	poor=1,moderate=2, good=3
Skills of people	1= construction, mechanic, tailoring, fittings, carpentry, 2=welding, machinery
Any means of communicating hazard	Yes=1,No=2
What are the means of communicating hazard	0=No response
Report of hazard in Kissy	Yes=1,No=2
Vulnerable groups in Kissy	1= blind, deaf, amputee, mental disorder; 2=Deaf, others
Any measure to cater to vulnerable	Yes=1,No=2
health facilities available	1=Governement Hospital, 2=clinic, 3=private hospital,Drug stores
prevailing diseases	1=measles, 2=Malaria,Typhoid, malnutrition, tuberculosis, 3=Cholera,Hepatitis
Rate of infant mortality	1=Low,2=moderate,3=High
rate of maternal mortality	1=Low,2=moderate,3=High
System of education	1=co-education,2=same sex,3=Both
challenges of education	1=Lateness
cultural society	1=Poro society, 2=Bodo society, 3=lantern festival, 4=wende, 5=Hunting, 6=Oregeh society, 7=others
Social values	1=Alcoholism, 2=tribal rules, 3=No stealing
most occurring social value	1=Alcoholism, 2=tribal rules, 3=No stealin'
Leadership pattern	1=president,2= honorable, 3=councilors, 2=Honorable, councilors, 3=Honorable, councilors,chiefs, headmen
Type of Trade	1-luma, 2=Regular community market, 3=Petty trading
Type of Agriculture	1=subsistence farming, 2=commercial farming
Type of crop grown	1=vegetables
communication network	1=orange, 2=africell, 3=Qcell,4=orange and africell, 5=africell and Qcell, 6=Qcell and Orange, 7=Orange, africell and Qcell
Transportation network	1=road, 2=rail,3=sea
essential services	6=Electricity, water, manufacturing, education
community assets	0= no any community asset
government structure	1=school

4.1.7.10 FMEA INFORMATION ON THE PROPOSED TRADCO SITE

Table 6. Information on FMEA analysis for TRADCO terminal sites

©	Appliance	Quantity	Model	Item Type	Power (W)/Unit	Total Watt	Voltages	Current (mA)	Total Voltages	Total Current	Power Rating
Security Post	Bulb	2	Energy Saver	Fluorescent	50	100	100	0.66	200	1.32	66
	Socket	1		Double Socket	4600	4600	220	40	100	40	8800
Manager Office(Open Office)	Bulbs	1	Energy Saver	Fluorescent	600	600	100	0.33	100	0.33	33
	Socket	1		Double Socket	4600	4600	220	40	100	40	8800
Manager Office(Open Office)	Fan	1	Royal		40	40	220	0.2	100	0.2	44
	TV	1	Toshiba	Plasma	600	600	220	3	100	3	660
Manager Office(Open Office)	Heater	1	scarlets		2000	2000	220	10	100	10	2200
	AC	1	BRUHM		3500	3500	220	10	100	10	2200
	Tactical Radio Charger	1	Gravel		2	2	240	500	100		120000
Manger Office(Toilet)	Bulb	1	Energy Saver	Fluorescent	600	600	100	0.33	100	0.33	33
Closed Office 1	Bulb	1	Energy Saver	Fluorescent	5	5	100	0.33	100	0.33	33
	Socket	1		Double Socket	4600	4600	220	40	100	40	8800
	Phones	1	Infinix		10	10	5	3	100	3	15
Closed Office 1	Laptops	2	hp, Dell		90	180	20	4.5	200	9	90
	AC	1	BRUHM		3500	3500	220	10	100	10	2200
Closed Office 1	Fan	1	Uosbuo		100	100	230	0.5	100	0.5	115
	Extension	2	West Point		3120	6240	220	13	200	26	2860
Closed Office 1	Power Pack	2	hp, Dell		90	180	20	4.5	200	9	90
	Desktop	1	Dell	Monitor	90	90	240	3.33	100	3.33	799.2
	Printer	1	hp		50	50	220	4.17	100	4.17	917.4

Closed Office 2	Bulb	1	Energy Saver	Fluorescent	5	5	100	0.33	100	0.33	33
	Socket	1		Double Socket	4600	4600	220	40	100	40	8800
	AC	1			3500	3500	220	10	100	10	2200
Closed Office 2	Router	1				0			100	0	0
	Tv	1			600	600	220	3	100	3	660
Closed Office 2	Step-up UPS	1			3000	3000			100	0	0
	Assistant Security Camera	1			24	24	12	2	100	2	24
Closed Office 2	Decoder (Star track)	1			24	24	12	2	100	2	24
	Backup System	1			50	50	24	2	100	2	48
Closed Office 2 (toilet)	Bulb	1	Energy Saver	Fluorescent	5	5	220	13	100	13	2860
Maintenance Room	Bulb	3	Energy Saver	Fluorescent	5	15	220	13	300	39	2860
	Socket	1	Double Socket		4600	4600	220	40	100	40	8800
Maintenance Room	Phone	1			10	10	5	3	100	3	15
	Bluetooth	1			5	5	5	1	100	1	5
	Extension	1	West Point		3120	3120	220	13	100	13	2860
Site Manager Parlor	Bulb	1	Energy Saver	Fluorescent	40	40	120	3.33	100	3.33	399.6
	Socket		Double Socket		4600	0	220	40	0	0	8800
	TV	1			600	600	220	3	100	3	660
Closed Office 1	System Unit	1	Dell		600	600	220	4	100	4	880
Site Manager Kitchen	Bulb		Energy Saver	Fluorescent	20	0	120	0.17	0	0	20.4
	Socket	2	Double & Single Socket		7590	15180	220	53	200	106	11660

Site Manager Kitchen	Microwave	1			1500	1500	240	10	100	10	2400
	Freezer	1			400	400	220	2	100	2	440
Bathroom	Bulb	1	Energy Saver	Fluorescent	20	20	100	0.33	100	0.33	33
	Socket	1	Single Socket			0	220	13	100	13	2860
	Fan	1	Enkay	Heat Expeller Fan	100	100	220	24000	100	24000	5280000
Site Manager Room	Ac	1	Samsung		3500	3500	220	10	100	10	2200
Site Manager Room	Bulb	1	Energy Saver	Fluorescent	5	5	100	0.33	100	0.33	33
	Socket	1	Single Socket			0	220	13	100	13	2860
Fire Exit Point	Bulb	1	Energy Saver	Fluorescent	30	30	120	0.25	100	0.25	30
	Socket	1	Double Socket		4600	4600	220	40	100	40	8800
	AC	1	Sharp		3500	3500	220	10	100	10	2200
Fire Exit Point Kitchen	Socket	1	Double Socket		4600	4600	220	40	100	40	8800
	Bulb	1	Energy Saver	Fluorescent	5	5	100	0.33	100	0.33	33
	Fridge	1	West Point		400	400	220	2	100	2	72.6
Spring Session	Bulb	1	TSP		400	400	120	3.33	100	3.33	240
	Socket	2	Double & Single Socket		7590	15180	230	53	200	106	765.9
Spring Session	Bulbs	4	Energy Saver	Fluorescent	20	80	100	0.33	400	1.32	33
	Socket	1	Double Socket		4600	4600	230	40	100	40	9200
Total					92515	106495	9493	25171.58	6800	25287.06	5531365.1

Energy Consumption (kW/h)	$9.51129\times10^{+11}$

Table 7. Potential Failure Modes and Effects:

Failures	Impacts of failure
Overload	**Failure Mode:** Excessive power consumption leading to circuit overload or breaker tripping. **Effects:** Disruption of operations, equipment damage, and potential safety hazards. **Severity:** High
Short Circuit:	**Failure Mode:** Faulty wiring or equipment causing a short circuit. **Effects:** Fire, equipment damage, and potential injuries. **Severity:** Critical
Voltage Fluctuations:	**Failure Mode:** Unstable power supply leading to voltage fluctuations. **Effects:** Equipment damage, premature failure, and reduced performance. **Severity:** Medium
Equipment Failure:	**Failure Mode:** Individual appliances failing due to wear and tear, defects, or improper usage. **Effects:** Disruption of operations, increased maintenance costs, and potential safety hazards. **Severity:** Varies depending on the appliance and its criticality
Power Factor Issues:	**Failure Mode:** Low power factor leading to increased current draw and potential equipment damage. **Effects:** Increased energy consumption, reduced efficiency, and potential equipment overload. **Severity:** Medium.

4.1.7.11 ANTICIPATED HAZARD RISK ASSESSMENT SCORING FOR THE PROPOSED FOSSIL FUEL TANK FARM AT KISSY DOCKYARD, FREETOWN

Construction Phase

Impact without mitigation: Risk of large significance scale incident

Consequence

Table 8. Aspects related to consequence without mitigation

Magnitude of impact	5
Geographical extent	3
Duration of impact	2
Total	**10**

Likelihood

Table 9. Aspects related to the Likelihood of risk happening without mitigation

Duration of activity	2
Frequency of impact	2
Total	**4**

RESULTS	**10 x 4=40(low)**
(Consequences*likelihood**)**	

Comments

The mitigation measures for the potential Occupational Health and Safety (OHS) impacts, should be included in the construction safety management plan as shown in **Tables 8 and 9**. The implementation of the proposed project will follow both EPASL guidelines and other International Best Practices such as OSHA 2007 and all other relevant health and safety legislation.

Impact with mitigation: Risk of large-scale incident

Consequence

Table 10. Aspects related to consequences with mitigation

Magnitude	4
Geographical extent	3
Duration of impact	2
Total	**9**

Likelihood

Table 11. Aspects related to the Likelihood of risk happening with mitigation

Duration of activities	2
Frequency of impact	2
Total	**4**
RESULTS	**9 x 4=36(low)**
(Consequence*likelihood**)**	

Table 12. Aspects related to consequence without mitigation

Impact without mitigation: Risk of large-scale incident	**Significance**
Consequences	
Magnitude	5
Geographical extent	3
Duration of impact	2
Total	**10**
Likelihood	
Duration of activity	**5**
Frequency of impact	**3**
Total	**8**
Results (**consequences*Likelihood)**	**10 x8=80**

Operational Phase

Table 13. Aspects related to consequence and likelihood of risk happening with mitigation for operational phase

Impact with mitigation: risk to public safety	
Consequences	
Magnitude	4
Geographical extent	3
Duration of impact	2
Total	**9**
Likelihood	
Duration of activity	**5**
Frequencies	**3**
Total	**8**
Results (**Consequences*likelihood**)	**9x8=72**

Comments

The proposal ESMP covers mitigation measures for public safety related impacts. This risk assessment evaluates the potential Occupational Health and Safety (OHS) risks during the construction and operational phases of the proposed project as shown in **Table 9 to 13**. The focus is on identifying the risks associated with large-scale incidents before and after mitigation measures are applied. The calculated results from the aforementioned tied are crucial to the proposed TRADCO project.

Construction Phase

- **Without Mitigation:** The risk of a large-scale incident during the construction phase is assessed with a high consequence of magnitude (5), a geographical extent of 3, and a duration of 2, resulting in a total impact score of 10. The likelihood factors include a duration of activity of 2 and a frequency of impact of 2, giving a total likelihood score of 4. The overall risk significance is calculated at 40 (indicating low-risk occurrence).

  Comments: Mitigation measures will be incorporated into the construction safety management plan, adhering to OSHA 2007 and other relevant health and safety regulations.

- **With Mitigation:** After applying mitigation measures, the magnitude of the risk remains high but decreases slightly to 4, and the overall consequence score is reduced to 9. The likelihood of the incident remains the same, resulting in a slightly; lower total risk score of 36 (low).

Operational Phase

- **Without Mitigation**

During the operational phase, the potential risk of a large-scale incident is rated with a consequence magnitude of 5, a geographical extent of 3, and a duration of impact of 2, resulting in a total score of 10. The likelihood during the operational phase is rated higher, with a duration of activity score of 5 and a frequency score of 3, leading to a total likelihood score of 8. The overall risk significance is 80, indicating a significant risk.

Comments

Mitigation measures outlined in the Environmental Management Plan (EMP) aim to address public safety-related impacts.

- **With Mitigation**

After implementing safety measures, the risk to public safety is reduced to a consequence magnitude of 4, leading to a reduced overall score of 9. The likelihood factors remain the same, resulting in a mitigated risk significance score of 72 (low medium of risk occurrence).

CHAPTER FIVE

5.0 POTENTIAL ENVIRONMENTAL MANAGEMENT IMPACTS AND MITIGATION MEASURES FOR TRADCO COMPANY

5.1.1 OVERVIEW

An Environmental Management Plan (EMP) for TRADCO has captured the proposed conditions expected to be followed by TRADCO management throughout the construction and operational phase of the company. It seeks to respond to associated threats that are liable to impede the company's effectiveness and with great concern of risk that could upset the environment when once attended to can also optimize the functionality and tranquility of the company and its neighborhood (**Table 1**). Within the context of the EMP, an approach that critically explained the adoptions of internal mitigation and preparedness on risk and hazards was well developed; and called the Environmental Management Plan (EMP). The plan has identified the positive, negative, and intercepting components of TRADCO Company for both external and internal operations.

Table 1. Environmental Management Plan for TRADCO.

List of Impact	Category of Impact	Rating of Impact	Mitigation approach
Product Processing and Handling of PMS and AGO			
Processing steps	Hydrodynamics and Chemical	Very high	Effective use of PPE
Product chemistry	Physical and Chemical	Very high	Disclose of Material Safety Data Sheet(MSDS)
Energy requirement	Overheating causing unusual pressure and temp	Very high	Create alternative energy use(Solar)
Storage	BLEVE and theft	High	Create CCTV cameras to monitor stores in 24hrs bases and enforce products MSDS
End use of product	Soil, Air, water and human toxicity	Very high	Create recycling opportunities and improve drainages
Waste generated	Soil, air and biota	Very high	Effect sorting and appropriate disposal
Infrastructure	Social infrastructure and Environnemental Béatifications and increase mass load	Very high	Effective use of material test and media for adverts

Socio-Economic	National Revenue	High	Monitoring regular payment of tax and EPASL compliances
Underground water	Chemical leaching in drainage ways	Moderate	Regular hydrograph test and use installation specifications
Ambient Air	Emission from chemicals and radiation	Moderate	Improve maintenance of machines
Soil environment	Waste from trash plastics and liquid chemicals	Very high	Apply appropriate sorting and use the 3Rs systems
General Toxicology	Chemical toxicity	Very high	Screen workers' health system through regular staff health check-ups

5.1.2 SEVERITY IMPACTS, CAUSE, AND MITIGATION APPROACH

Anticipated Water Pollution Impact, Cause, and Mitigation Approaches

5.1.2.1 OVERVIEW

As from the baseline visitation; it was found that TRADCO (SL) LTD terrain as it defines constitutes much of industrial settlements with absolute historical water pipelines that basically; require TRADCO (SL) LTD to use water supply systems through Guma Valley Water supply systems in tanks; however, the settlements around the facility; downslope have mainly relied on the following water sources or water bodies (Rain harvesting, boreholes, and near-by surface stream waters) (**Table 2 to 5**).

Table 2. Anticipated Water Pollution Impact

No	Cause	Effects	Mitigation Approach
1	Industrial waste(construction and fossil fuel wastes)	Destruction of water species	Keep track of MSDS, handling, and disposal by competent authority
3	Fossil Fuel waste on water	This causes film on water layers that will impact ecological survival.	Create specialized monitoring and collaboration with community stakeholders for inclusive surveillance.
4	Diversion of drainages	Increase inflow rates of run-off waters with sedimentation load increase and inorganic residues on water bodies	New drainages must have continuity and flow with existing ones.

5.1.3 Anticipated Air Pollution Impact, Cause and Mitigation Approach

5.1.3.1 OVERVIEW

As from the baseline visitation; TRADCO (SL) LTD terrain as it constitutes much of industrial settlements with historical engagement of mass land space by industries of varied sorts of productivity that basically; requires TRADCO (SL) LTD to effectively operationalize its air monitoring and threats controls systems throughout its life-cycle processing; but however, the settlements around the facility; towards down slope are mainly receiving the loads of dust, smoke and fumes from factories, garages and settlements.

Table 3. Anticipated Air Pollution Impact.

No	Cause	Effects	Mitigation Approach
1	Vehicle exhaust	Health Hazard on humans and animal	Enforcing company inspection laws for all vehicles that runs the affairs of TRADCO company and signage with illustrative animation
2	Dust from excessive wind blowing on atmosphere by land clearing activities	Health Hazard on humans and animal	Enforcing air monitoring exercises with consultant and improve tree planting along roads and project vicinity
3	High Population density	Uncontrolled burning of papers, plastics, hydrocarbon materials etc.	Create restrictions and environmental laws through signage and awareness around company environs
4	Smoke from plant operation	Emission of greenhouse gases and will poses threats on human and animals around	Create plume controller and regular service of machines with enforce monitoring

5.1.4 ANTICIPATED LAND POLLUTION IMPACT, CAUSE AND MITIGATION APPROACH

5.1.4.1 OVERVIEW

As from the baseline visitation; TRADCO(SL)Ltd concession constitutes much of the industrial settlements of historical land space that were owned by indigenes basically; from the garages and vehicles due to industrial engagement, there are spots of hydrocarbon oil spills, bulks, and silt materials. These are forms of pollutants that can be released when triggered by water, air, or physical.

Table 4. Anticipated Noise Pollution Impact.

No	Cause	Effects	Mitigation Approach
1	Transporting vehicles	Unusual hearing of beat frequency that causes impairment of easy listening and affects animals	Enforcing vehicle check agreements for all vendors and or partners. Do business with licensed vehicles with road compliance certifications
2	Factory operation	Health Hazard on humans and animal	Employ Environmental Officer (EO) and Technical Operation Manager (TOM) for enforcing factory laws and data gathering for auditors
3	High Population density	Human nuisances with music and entertainment booming	Create restrictions and environmental laws through signage and awareness around company environs

5.1.5 ANTICIPATED NOISE POLLUTION IMPACT, CAUSE, AND MITIGATION APPROACH

5.1.5.1 OVERVIEW

As from the baseline visitation; TRADCO(SL)Ltd terrain as it constitutes mixed or diffused decibels as an alteration to any effective monitoring; due to influences by industrial settlements and other anthropogenic activities basically; it requires TRADCO(SL)Ltd to properly delimit its land space with tress and consent to use all signs and Personal Protective Equipment (PPE) to always when in process and must plan for in its EMP document.

Table 5. Anticipated Visual Pollution Impact

No	Cause	Effects	Mitigation Approach
1	Excessive advertising of signs	Create obscurity view that can negatively impact social values	Maintain land scape by restricting signage post on one side only and create buffers for beautification on view.
2	Littering	Induces soil infertility as bulks eliminate soil nutrients and microbes with possible leaching effect of POPs related contaminants in soil and Food Chain.	Introduce SORTING by colour coding on waste bins and illustrate anticipations by animation and postal on billboard on the appropriate way for dumping/trashing
3	Design and structure	Increase fatality and property damage	All constructed forms must be conformed with standard regulations on building that should enforce and commission with conceptual design as postal on signage

5.1.6 ENVIRONMENTAL MANAGEMENT PLAN OF ACTION ON TRADCO PROJECT FOOTPRINT AT KISSY DOCKYARD COMMUNITY FREETOWN ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN (EMP) FOR TRADCO OPERATION

Table 6. Matrix on Tradco Environmental Management Plan of action

		Anticipated impacts	Impact Rating			Monitoring type	Responsibility for enhanced development
			CP	OP	DP		
1	TRADCO Project Impact rating and Monitoring on constructional phase(CP), Operational Phase(OP) and Decommissioning Phase(DP)	Stock piles of industrial waste				Continues Monitoring	TRADCO and FCC
2		Human generated waste				Monthly Monitoring	TRADCO and FCC and EPA-regional units
3		Noise				Daily Monitoring	TRADCO
4		Landscape removal				Intermittent Monitoring	TRADCO and Ministry of Lands and Country Planning
5		Vibration				Daily Monitoring	TRADCO and EPASL
6		Sanitary waste				Monthly Monitoring	TRADCO and FCC
7		Radiation				Quarterly Monitoring	TRADCO and Ministry of Energy

8		Increase wind speed/velocity				Daily Monitoring	TRADCO and EPASL
9		Smoke from ignition machine				Monthly Monitoring	TRADCO and Factory inspectorates
10		Fumes				Daily Monitoring	TRADCO and EPASL
11		Chemical leaching				Quarterly Monitoring	TRADCO and EPASL
12		Vehicle				Daily Monitoring	TRADCO

5.1.7 CHEMICAL SAFETY DATE SHEET

5.1.7.1 SAFE HANDLING AND USAGE OF CHEMICALS

A systematic approach to safety requires an efficient flow of information from the suppliers to the users of chemicals on potential hazards and correct safety precautions. In addressing the need for a written hazard communication program, the ILO Code of Practice Safety in the use of Chemicals at Work (ILO1993) states, "The suppliers should provide an employer with essential information about hazardous chemicals in the form of a chemical safety data sheet. "This Chemical Safety Data Sheet (CSDS) or Material Safety Data Sheet (MSDS) describes the hazards of a material and provides instructions on how the material can be safely handled, used and stored. By all indications; TRADCO requires to do the following:

a) Information on ingredients (Composition)
b) Hazard identification
c) First-aid measures
d) Firefighting measures
e) Suitable extinguishing
f) Accidental release measures
g) Handling and storage
h) Exposure controls and personal protection
i) Physical and chemical properties
j) Stability and reactivity
k) Toxicological information
l) Ecological information
m) Disposal Considerations
n) Transport information
o) Regulatory information
p) Other information

5.1.8 TRADCO(SL)LTD CHEMICAL USES, STORING AND TRANSPORTING

5.1.8.1 OVERVIEW

Hazard communication on chemical substances requires the chemical safety data sheet or the material safety data sheet (MSDS); which is systematic approach to safety requires an efficient flow of information from the suppliers to the users of chemicals on potential hazards and correct safety precautions. Distributors of hazardous chemicals must automatically provide MSDS to commercial customers upon collection (**Table 7**).

5.1.9 REQUIREMENTS FOR TRADCO (SL) LTD PROSPECTIVE MSDS

Table 7. MSDS Requirements.

Requirement	Approaches	Scope
US Occupational Safety and Health Administration(OSHA)	-Information on identity of product (Used Oil) -Its supplier, classification, hazards, safety precaution -Relevant emergency procedures	Internal and External MSDS required in the EMP
ILO Code of Practice convention No 170 and Recommendation No. 177	-Production and handling of hazardous chemicals -The storage of hazardous chemicals -The transport-consistency with National or international transport regulations -Disposal and treatment of chemical and hazardous waste products	Only internal EMP and MSDS required.
ISO/IEC Guide 51	Alert users on(Danger, Handle with care and Beware)	Safety Management Plan(SMP) is required

5.1.10 DETAIL OF CHEMICAL SAFETY DATA SHEET AS PRUDENCE FOR TRADCO (SL) LTD SUSTAINABLE OPERATION

Case 1. Chemical safety Data Sheets(CSDS) for PMS

Part-1 Product name and company identification

Product name as UN Classification: 3rd Class (PMS)

Company Name: TRADCO(SL)LTD

Company location: City: Freetown / Urban District: / Country: Sierra Leone

Company Communication Lines; +232(0)76131615

Part-2 Composition: PMS

Contains; 1500 Hydrocarbon compounds(paraffin, naphthenes and olefins)

Part-3 Hazard Identification:

(Key aspects; most significant health, physical, and environmental hazards).

	The probability of hazard happens		
	High	Moderate	Low
Risk of dermatological impairment	4		
Risk of vision loss		2	
Risk of soil toxicity	4		
Risk of water pollution	5		
Risk of air pollution		2	

Part-3.1 First-aid measures:

a. Quarterly workers' health screening check

b. Supplementary supply of liquid milk for workers at high-risk areas

c. Internal nursing support with a station health nurse

d. Routine general health check

Part-3.2 Firefighting measures:

a. Creation of bonds with specialized cementation with high grade polythene lining

b. Improve store keeping by monitoring (%RH, R-Temp ^{0}C and Lux)

c. Sort waste appropriate and store with color coding bins

d. Show signage of all flammables

e. Sandbagging and application

Part-3.3 Accidental release measures:

a. Create ventilation and pressure values to control ignition

b. Showcase WARNINGS signage for all aspects in the chemical store, generator room, and production hall

c. Effecting emergency lines and response unit

d. Design specialized drainages for release of waste

e. Making sure there are always high-grade absorbent materials

Part-5 Exposure Control and Personal Protection:

a. All staff are expected to dress accordingly with specifics to the attachment

b. TRADCO(SL)LTD. Environmental Safety Officer (ESO) must always assess atmospheric influences like Relative Humidity, Wind speed, rainfall, and temperature

c. There should be restriction zones and paintings for visitors and workers in high-risk areas

d. All haulage drivers are required to be assessed before going out to haul any used oil and the vehicles must weekly certify to prevent accidents that could lead to exposure to fumes and spills

e. As work entails key staff at the refining area needs to operate on shift bases to avoid over dosage of chemicals in the body.

Part-7 Stability and Reactivity:

a. Proximity to acid substance

b. Proximity to base substance

c. Product suitability to high-temperature

d. Product suitability to sunlight

e. Product suitability to windy climate

Part-8 Toxicology information

a. It can damage human dermal cells

b. It obstructs the normal breathing of man

c. It causes stomach upsets when ingested with a risk of toxic heavy metals accumulation

Part-9 Disposal Consideration

a. Containers, scoopers and benches and rags must be incinerated if there is no handling facility
b. Oil transfer area should have oil drained traps and phytobac to eliminate waste oil
c. Sweeps and other wood mixed oil materials should be treated with oil suppressant and phytobac

Part-10 Transport Information

Date:
Time of evaluation:

Automobile type: **Lightweight with six tires** | **Heavy Weight with more than six tires** | **Very lightweight**

Vehicle Registration No:

Nature of ignition **Service Require**

Seek maintenance **Allow to operate**

Unfit

Part-11 Declaration:

I Mr/Mrs/Miss/Madam/Madam……serving in the capacity of……. solemnly declare that all information supplied truly entails TRADCO(SL)Ltd and the guide in the CSDS prepared will be followed strictly with due compliance of our laws and Best Practice.

Signature:

……

Contact: Tel/Mobile: +23276612500
Email:

Case 1. Chemical safety Data Sheets(CSDS) for AGO

Part-1 Product name and company identification

Product name as UN Classification: 2th Class (AGO)

Company Name: TRADCO(SL)LTD

Company location: City: Freetown / Urban District: / Country: Sierra Leone

Company Communication Lines; +232(0)76131615

Part-2 Composition: AGO

Contains; Hydrocarbon based(aliphatic HC)

Part-3 Hazard Identification:

(Key aspects; most significant health, physical, and environmental hazards).

	The probability of hazard happens		
	High	Moderate	Low
Risk of dermatological impairment	4		
Risk of vision loss	4		
Risk of soil toxicity	4		
Risk of water pollution	5		
Risk of air pollution		3	

Part-3.1 First-aid measures:

e. Quarterly workers' health screening check

f. Supplementary supply of liquid milk for workers at high risk area

g. Internal nursing support with a station health nurse

h. Routine general health check

Part-3.2 Firefighting measures:

f. Creation of bonds with specialized cementation with high grade polythene lining

g. Improve store keeping by monitoring (%RH, R-Temp ^{0}C and Lux)

h. Sort waste appropriate and store with color coding bins

i. Show signage of all flammables

j. Sand bagging and application

Part-3.3 Accidental release measures:

f. Create ventilation and pressure values to control ignition

g. Show case WARNINGS signage for all aspect in chemical store, generator room and production hall

h. Effecting emergency lines and response unit

i. Design specialize drainages for release of waste

j. Making sure there are always high grade absorbent materials

Part-5 Exposure Control and Personal Protection:

f. All staff are expected to dress accordingly with specifics to the attachment

g. TRADCO(SL)LTD. Environmental Safety Officer (ESO) must always assess atmospheric influences like Relative Humidity, Wind speed, rainfall, and temperature

h. There should be restriction zones and paintings for visitors and workers on high risk areas

i. All haulage drivers are requiring to be assessed before going out to haul any used oil and the vehicles must weekly certify to prevent accident that could lead to exposure of fumes and spills

j. As work entails, key staff at the refining area needs to operate on shift bases to avoid over dosage of chemicals in the body.

Part-7 Stability and Reactivity:

a. Proximity to acid substance
b. Proximity to base substance
c. Product suitability to high temperature
d. Product suitability to sunlight
e. Product suitability to windy climate

Part-8 Toxicology information

a. It can damage human dermal cells
b. It obstructs the normal breathing of man
c. It causes stomach upsets when ingested with a risk of toxic heavy metals accumulation

Part-9 Disposal Consideration

a. Containers, scoopers and benches and rags must be incinerated if there is no handling facility
b. Oil transfer area should have oil drained traps and phytobac to eliminate waste oil
c. Sweeps and other wood mixed oil materials should be treated with oil suppressant and phytobac

Part-10 Transport Information

Date:
Time of evaluation:

Automobile type: **Lightweight with six tires** | **Heavy Weight with more than six tires** | **Very lightweight**

Vehicle Registration No:

Nature of ignition **Service Require**

Seek maintenance **Allow to operate**

Unfit

Part-11 Declaration:

I Mr/Mrs/Miss/Madam/Madam……serving in the capacity of……. solemnly declare that all information supplied truly entails TRADCO(SL)Ltd and the guide in the CSDS prepared will be followed strictly with due compliance of our laws and Best Practice.

Signature:

……

Contact: Tel/Mobile: +23276612500
Email:

5.2.1 ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR TRADCO (SL) LTD

5.2.2 OVERVIEW

This section describes the environmental management requirements for the operation of the TRADCO (SL) LTD factory storage tanks and hauling PMS and AGO; located in one of Freetown's fuel industrial sites. This EMP is an environmental management framework to comply with the requirements of the Environmental Quality standards related to the EPASL Act 2022 concerning the prevention, reduction, and mitigation of ecological impacts that possibly can result from the operation of the TRADCO (SL) LTD and its operational systems on storage tanks. A detailed EMP report is required to be prepared and submitted for approval by the EPASL. The EMP for TRADCO (SL) LTD should be aligned with the EMP for the overall project.

5.2.2.1 OBJECTIVES OF THE EMP

The EMP ensures that sound environmental practices are adopted at all stages of the project and that the proposed mitigating measures contained in this report are adopted in the day-to-day operation of some related companies used as baseline referenced to aligned TRADCO (SL) LTD project accordingly, its captures work on-site during construction and the plant operation. The objectives of the EMP are:

1. To comply with the requirement by EPASL and any relevant laws, regulations, and guidelines about the project activities;
2. To be a part of the HSE Management Plan for TRADCO (SL) LTD Project;
3. To check and balance the project activities so that they will not result in environmental pollution in areas surrounding the project site;
4. To be an early trigger to remediate the environmental nonconformance; and
5. To establish an environmental monitoring and audit program that will be used as a guide to track the environmental performance of the project implementation.

5.2.2.2 THE EMP SHOULD CONTAIN RECOMMENDATIONS OF THE FOLLOWING

1. Environmental Monitoring which includes the parameters, location and frequency of the monitoring to be implemented based on the existing baseline study and the potential impact identified;
2. Environmental Audit requirements

3. Environmental Training requirements
4. Environmental Incident Closure Procedures

5.2.2.3 THE HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT SYSTEM

TRADCO (SL) LTD Project should implements an HSE Management System (HSEMS) for all its business activities and the HSEMS subscribes to the state auditory. The HSEMS is defined as a structured set of controls for managing HSE-related matters in the business to ensure and demonstrate that HSE objectives are met and serves also as a tool for maintaining sustainable business activities. The Health, Safety, and Environment (HSE) Policy of TRADCO (SL) LTD requires showing its corporate policy and strategic objective on HSEMS also ensures the following:

1. Organization including responsibilities, resources, training, competency, standards, and document management;
2. Risk Management including the Hazards and Effects Management Process (HEMP) and Environmental Aspect Impact (EAI), which identifies and assesses hazards and effects and develops the measures to control the release of hazards and for recovery in the event of the release of the hazard;
3. Planning & Procedure including asset integrity, work instructions, management of change contingency and emergency response planning; Implementation & Monitoring including monitoring activities, record, non-compliance and corrective action, incident report, and follow-up; and
4. Auditing & Management Review.

5.2.2.4 ANTICIPATED ENVIRONMENTAL MANAGEMENT BUDGET FOR MITIGATION BY TRADCO(SL)LTD OPERATION

Table 8. Budget on Environmental Management Plan of Action

		Anticipated impacts	Impact Rating			Implementing sessions and responsible body and or personnel				
			CP	OP	DP	Year 1	Year2	Year 3	Total Cost.($)	
1	TRADCO(SL)LTD Project Impact rating assessment on constructional phase(CP), Operational Phase(OP) and Decommissioning Phase(DP)	Stockpiles of industrial waste				$1000	$500	$400	$2900	TRADCO (SL) LTD-ESO,EPA &MCC
2		Human-generated waste				$500	$800	$800	$2100	TRADCO (SL) LTD -ESO
3		Noise				$250	$250	$250	$750	TRADCO (SL) LTD -ESO & EPA
4		Landscape removal				$3000	$500	$500	$4000	Ministry of Lands, EPA & Council
5										
6		Sanitary waste				$300	$600	$600	$1500	TRADCO(SL)LTD -ESO & MCC

7		Radiation				$500	$1000	$1000	$2500	TRADCO(SL)LTD –ESO & Radiation
10		Fumes				$300	$400	$400	$1100	TRADCO(SL)LTD –ESO & Factory Inspectorates
12		Oil Spill				$500	$2000	$2000	$4500	TRADCO(SL)LTD –ESO, EPA-SL
13		Chemical leaching				$600	$600	$600	$1800	TRADCO(SL)LTD –ESO, Production Head & EPA-SL
14		Vehicle				$1000	$1000	$1000	$3000	TRADCO(SL)LTD –ESO & Factory Inspectorates and Freetown Fire Force(FFF)
			Total Cost anticipated			$	$	$	$ 26,250	

5.2.2.5 PLANNING FOR MITIGATION OF HIGH RISK IMPACTS

Table 9. Indicates Output indicator and critically important assumptions

Output indicator	Responsible personnel and activities	Timeline and cost sourcing	Critically important assumptions
Emission: dust greenhouse gases, volatile compounds from hydrocarbon waste oil fumes, and smoke if released on burning.	Environmental Technician(ET) • Design and construct smoke diversion and dilution systems • Routing air quality monitoring • Road maintenance to minimize dust emission	Timeline; pre-operation and operation phases Cost: Invest appreciable amounts from the budget line from to address all critical risks.	Available financing; trained and qualified staff; quality assurance
Industrial waste (woods, metals, sediments, etc..,) from land preparation and processing.	Site supervisor, ET • Identify use options and optimize use efficiency • Liaise with the community to identify use options and confidence	Construction phase; minimal consideration in operation phase (road maintenance) Cost: No cost involved. Give freely to users or sell to interested customers	There is a demand for hazardous management technology opportunities for Sierra Leone's waste oil recycling process.
The ecosystem is kept intact, biodiversity is protected	ET: • Activities limited to soil top cover removal and engagement by strict monitoring and reporting • Liaise with community and Experts on issues	Ongoing Cost: Included in the budget for activities of the ET	Positive attitude towards conservation of repairing, aquatic and terrestrial biodiversity; upstream and downstream users also abide by requirement.

	relating to environmental changes		
Minimal problems from any construction activities of TRADCO(SL)LTD	Site supervisor: • Construction of drainages • Pavement of roads leading to the site, routine sprinkling to minimize dust • Planting of economic trees for the benefit of the community • Promote community labour enrollment	Timeline: Ongoing Cost: Site supervisor and ET to come up with a realistic budget for the implementation	Available financing or delimitation approaches should be followed (caution tapping, pen-full fencing, cones, and other signage.)
Health and Safety program is robust	Health and Safety Officer(HSO): • Develop and utilize a conceptual design for wastewater collection, treatment and disposal • Create continuous flow between source, reservoir and	Timeline: Ongoing Cost: See budge line for health and Safety implementation	Available financing; trained and qualified staff

sink of solid waste

- Protect groundwater from intrusive flow of dirt waters
- HSE team should be doing biannual monitoring on near-by streams and drainages for incidence of oil spills.

5.2.2.6 ANTICIPATED ENVIRONMENTAL QUALITY MANAGEMENT COST

Table 10. Proposed cost for Environmental Quality Management action

	Influential factors for Impact	Responsible personal	Monitoring Implementation Scope			Anticipated Cost in SLL/2024 to2027		
			Mth	Qtr	Yr	Yr1(2024)	Yr2(2025)	Yr3(2026-2027)
Oil spill	Monitoring of hazards on handling, processing & loading	ESO, Production manager, Consultant & EPASL					**25to 30,000**	**25to 30000**
Building design	Dampness, pointers and settlements gradients & daylight factors	ESO, Ministry of housing and construction & EPA				**5 to 8000**	**5 to 10000**	**5 to 10000**
Staging Operation	Environmental nuisance and traffic	ESO, Personnel Manager, EPA, MoLSW				**30 to 35000**	**30 to 300000**	**30 to 300000**
Waste Management	Poor disposal accessibility to facility, access to waste communal storage centers	ESO, EPA & Local Govt				**6 to 10000**	**6 to 10000**	**6 to 10000**
Drainage and erosion management	Drainage discontinuity by clogs (papers, plastics, tins etc.,) and runoff	ESO, Site Engineer and MoW				**4 to 8000**	**4 to 6000**	**4 to 6000**

Health, Hygiene and Safety Issues	Insufficient water supply at toilets, internal drainage discontinuity and lack of hygiene background	ESO, EPA, MoH & MoLSW				**10 to 30000**	**10 to 30000**	**10 to 30000**
Security	Accident (fire, flooding, criminal) and theft issues	ESO, SLSB, MoH & EPA				**10 to 20000**	**10 to 20000**	**10 to 20000**
Fire Management	The use flammables and explosives materials including electrical sparks	ESO, FFF and EPASL				**10 to 30000**	**10 to 30000**	**10 to 30000**
			Total Anticipated cost					

***Disclaimer**: All budget cost in the EMQC matrix serves as anticipated costs and will be retain with TRADCO(SL)LTD management, but compel in them to meet their expected target every month/quarter / year with all aspect requires effective communication with the EPA and other auditors.*

*Where: **M**: denote Millions in Sierra Leone Currency **MoH**: Ministry of Health **MoW**: Ministry of Works **MoLSW**: Ministry of Labor Social Welfare and **SLSB**: Sierra Leone Standards Bureau*

5.3.1 TRADCO GRIEVANCE REDRESS POLICY AND ANTICIPATED DESIGN

Table 11. Summary of Grievance Redress approach

Design of TRADCO grievance document:	Concept guide	Requirement
1. Introduction:	**The Grievance Redress Policy (GRP) acts as an enforcer with selective guidelines on the pros and cons of the company suitability and rejection components that entitle to comply with; by its entire staff including contractors. It enshrines with both international and national guidelines on policies and implementation of different functionalities within TRADCO and Kissy Dockyard Community;** www.worldbank.org/responsibleinvestment	**TRADCO shall produce the GRP once their EIA license issued as addendum**
2. Policy briefing and purpose	TRADCO grievance procedure policy; otherwise GRP should explain how employees can voice their complaints in a constructive way. Supervisors and senior management should know everything that annoys employees or hinders their work, so they can resolve it as quickly as possible. Employees should be able to follow a fair grievance procedure to be heard and avoid conflicts.	TRADCO shall use its contract policy and national labour laws of SL to develop an independent policy once EIA License is received
3. Scope	This policy refers to everyone in the company regardless of position or status.	TRADCO most making sure the GRP applicable for all staff
4. Policy Element	Employees can file grievances for any of the following reasons: ● Workplace harassment ● Health and safety ● Supervisor behavior ● Adverse changes in employment conditions	TRADCO should consider the following areas as found very intricate areas with possible grievance threats
5. Objective	The purpose of this particular policy is to set forth a benchmark and procedures to be followed in receiving, handling and responding to any grievance in the workplace against employer from the employee or community people in respect of any unfair treatment, recruitment process, dismissal or termination of contract.	TRADCO must making sure the GRP seeks to include Transparency, Accountable and

		non-bias resolutions
6. Procedures	Employees are encouraged to talk to each other to resolve their problems. When this isn't possible, employees should know how to file a grievance:	TRADCO should provide lessons with all staff on GRP knowledge
7. How to Raise Grievance	An employee can raise his/her grievances through the following modes: Phone Call: Call at contact number to register the complaint. Email: The employee may write to the organization or company via the organization's official Email address. Letter: Employee may also raise the grievance by writing formally to the organization. Complain: Through the Ministry of Labor: An employee can also complain of grievance through the Ministry of Labor. Through the Office of the OMBUDSMAN:	TRADCO shall have emergency lines that operates effectively every working day
8. Acknowledgement of Grievance	As in reference with Sierra Leone Labor Act and guidelines, an acknowledgement shall be sent to the complainant within three (3) working days of the receipt of the grievance. Acknowledgement shall contain; I. Date of receipt of complaint/grievance, II. Unique Grievance Number, III. Expected date for resolution of grievance, IV. Name, Designation and Contact details of Officer, V. Grievance escalation matrix with contact details and address (includes organizational levels, and Ombudsman) and VI. Manner and mode of tracking resolution of grievance/complaint with the Unique Grievance Number. Otherwise; in case the complaint received does not pertain to the intermediary, the complaint shall be transferred to the concerned intermediary within three (3) working days.	TRADCO should use the GoSL and ILO policies as binders under the companies Acts
9. Redresser of Grievance	I. The complaint letter / email should contain the: Application number and other relevant reference number,	TRADCO should making sure the

	II. Complainant's name, III. address and contact details, IV. copies of supporting documents, with timing, de-escalation and credits	office of the GRP works in line with the company Human Resources(HR) section and the Health and Safety Head
10. Resolution of Grievance	The employee /complainant shall be intimated on resolution of grievance/complaint. The intimation of resolution shall contain the: I. Date of receipt of complaint/grievance, II. unique Grievance Number, III. Name IV. Designation and Contact details of Officer signing the communication, procedure of representing the matter to the employer (contact details and address) and further right to approach OMBUDSMAN and International Standards Approach;	TRADCO should help all its staff to go by the GRP establish
11. Escalation of Grievance	Any employee whose grievance has not been resolved within 30 days from the date of receipt of the grievance by the intermediary, or who is not satisfied with the resolution provided can escalate the grievance with the National Pension System Trust.	A full knowledge on the contract and GRP should be compulsory for all staff to understand the GRP
12. Maintenance of Record and Reporting	The Grievance Redresser Officer (GRO) shall preserve records about the grievance/complaint received resolution and closure of the grievance. The General Management platform of TRADCO shall be updated within a maximum period of one (1) working day after sending intimation of resolution to the subscriber. The GRO shall submit the required reports as per the guidelines of the Authority/TRADCO Trust.	TRADCO GRP officer shall sign a confidentiality consent note on company and staff information through legal backing with labour law and the TRADCO legal team

13. **Closure of Grievance**	Every grievance shall be disposed of within thirty (30) days of receipt; a final reply shall be sent to the complainant, containing details of the resolution or rejection of the complaint, with reasons as recorded in writing.	TRADCO must support all resolutions generated during any grievance approaches and redress

CHAPTER SIX

6.0 TRADCO(SL)LTD PROPOSED COMMUNITY ACTIVITIES AND EXPENSE BUDGET PLAN

The previous screening assessment study reveals the need of stakeholders, youths, and neighborhood concerns on key aspects as categorized into three key concerns and expectations; General safety Management, waste management, sanitation and hygiene, education and youth engagement. Technical and vocational skills support was also triggered since the community hosted physically challenged groups through the provision of scholarships.

6.1.1 CDAP STAKEHOLDERS ENGAGEMENT IN WELLINGTON INDUSTRIAL ESTATE

Table 1. Matrix on stakeholders' opinion and request for TRADCO(SL)LTD action on development

Opinion:	**Request:**
1. Total commitment to Community Development funds 2. Community indigenes were keen to access opportunities including(employment) 3. The community indigenes expect to be part of TRADCO environmental mitigation and management as a means of opportunity sharing	1. Water facility increase as key in the community 2. Infrastructure of community (public toilets) 3. Welcoming educational; support programs

6.1.2 TRADCO(SL)LTD COMMUNITY DEVELOPMENT ACTIVITY PLAN MATRIXES FOR 2024/2027

Table 2. Summary of TRADCO Community Development Plan

		Year one(1)/2024/2025				Year two(2 &3)/2025-/2027					
	TRADCO- CDAP	**Qtr1 (SLL)**	**Qtr2 (SLL)**	**Qtr3 (SLL)**	**Qtr4 (SLL)**	**Qtr1 (SLL)**	**Qtr2 (SLL)**	**Qtr3 (SLL)**	**Qtr4 (SLL)**	**Grand Total Cost(SLL)**	**Responsible Monitors**
1	Support Educational programs such as: (Scholarships for 5 female and 5 male pupils in the community government-supported schools)	**20000**	--	--	--	**40000**	--	--	--	**60000**	**TRADCO(SL)LTD, CLC &EPA-SL**
2	Supporting Health Centre with First aid equipment for burns and sanitation-As part of welfare alleviation	**10000**	--	--	--	**10000**	--	--	---	**20000**	**TRADCO(SL)LTD, CLC &EPA-SL**
3	Social and economic promotion like general waste management within TRADCO operating community		**15000**		**15000**		**15000**		**15000**	**60000**	**TRADCO(SL)LTD, CLC&EPA-SL**
	Total CDAP Cost per Qtr	**30000**	**15000**		**15000**	**60000**	**15000**		**15000**	**140000**	**TRADCO(SL)LTD, CLC &EPA-SL**

Spent cost	**XXX**	**XXX**	**XXX**	**XXX**	**XXX**	**XXX**	**XXX**	**XXX**	**XXX**	**TRADCO(SL)LTD,CLC &EPA-SL**
Retention amount	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	

Photo A

Photo B

Fig. 1. From left to right, NET-SL team of experts collecting baseline information for the development of ESMP (photo A) and the pre-focus group engagement team (photo B).

FOCUS GROUP DISCUSSION

Community name…… **Date:** / /2024

Constituency: Ward:

Dear Respondent;

On behalf of TRADCO(SL)Ltd, the Njala Environmental Technicians (NET) Sierra Leone; is conducting this survey to gather feedback on a fuel products containment and marketing company in your community. Your response is important as we strive to ensure that this facility has a positive impact and meets the needs of the residents within the concession area. Essentially we are craving your support through your participation in obtaining information that can help the development of TRADCO(SL) environmental impact assessment studies. Your comments, recommendations, and reviews will be included as significant contributions to the TRADCO(SL)Ltd ESHIA report.

NETSL will assure you of the confidentiality of critical information sharing through your varied consents in time, the information that will be obtained will be used only for the development of TRADCO(SL)Ltd Environmental Impact Assessment Report (EIAR).

SECTION A: DEMOGRAPHY

Population:

1. How can you describe the type of population of the Kissy Dockyard Community?

Sparsely Populated	
Moderately Populated	
Densely Populated	

2. On a scale of 1 – 3, please rank the most dominant age class of the population within the TRADCO(SL)Ltd community.

Children	
Youth	
Aged/Old	

3. What is the sex ratio of the TRADCO(SL)Ltd community?

More men than women	
More women than men	
Equal men and women	

4. In the order of their population sizes, name the sectional or zonal division of the TRADCO(SL)Ltd Community.

1		4		7	
2		5		8	
3		6		9	

Mobility:

1. On a scale of 1 – 4, please rank the mode of transportation used within the TRADCO(SL)Ltd community

Vehicle	
Tricycle	
Auto cycle	
Bicycle	
By Foot	

2. How can you describe the road network within the TRADCO(SL)Ltd community?

Poor	
Moderate	
Good	

Useful Skills:

1. What are the useful skills of people within the Kissy Dockyard Community? *Examples: welding, construction, carpentry, fitting, farming, etc.*

2. What is/are the mode used to acquire these skills?

Formal Training	
Informal	
Innovational	

Hazard awareness:

1. Are there any means of communicating hazards within the TRADCO(SL)Ltd Community?

Yes ☐ No ☐

2. If yes, what means of communication is used for hazard awareness within the community? *Examples: Radio, Television, Town crier etc.*

3. Have there been reports of hazards in the Kissy Dockyard community before?

Yes ☐ No ☐

Vulnerable groups:

1. Please indicate the presence of the following vulnerable groups in the Kissy Dockyard community.

Blind		Amputee	
Deaf		Mental Disorder	
Dumb		Others, specify:	

2. Is there an existing measure to care/cater to the vulnerable groups within the community?

Yes ☐ No ☐

Health level:

1. What are the health facilities available in the community?

Government Hospital		Drug stores	
Private Hospital			
Clinic			

2. What are the most prevailing diseases reported within the Kissy Dock yard community?

Malaria		Hepatitis	
Typhoid		Tuberculosis	
HIV/AIDS		Measles	
Malnutrition		Cholera	

3. What is the rate if infant mortality in the community?

Low ☐ Moderate ☐ High ☐

4. What is the rate if maternal mortality in the community?

Low ☐ Moderate ☐ High ☐

Education level:

1. Indicate in percentage (%) score the level of education within the community

Nursery School		Poly Technic	
Primary School		University	
Junior Secondary School		Technical Vocational	
Secondary School		OPS:	

2. What system of education is used by schools in the community?

Co-education ☐ Same Sex ☐ Both ☐

3. List the challenges of education within the community

SECTION B: CULTURE

Tradition

1. Please indicate the cultural society practice within the community.

Poro society	
Bondo society	
Lantern festival	
Wende	
Hunting	
Orgeh society	
Others please indicates( )	

Ethnicity

1. What is the ethnicity in the Kissy Dockyard community? Rank in percentage

Tribes	%	Tribes	%	Tribes	%
Temne		Mende		Fullah	
Limba		Kono		Koranko	
Mandingo		Susu		Creole	
Loko		Sherbro		Yalunka	

Social values

1. What are the social values/norms applicable in the community?

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2. List the most occurring social values within the Community.

Religion

1. Which religion is the most dominant? In percentage ranking

More Christians	
More Muslims	
Equal	
Others	

Access to food

1. Please indicate by percentage the affordability of meals per day within the community.

80 - 100%		20 -39%	
60 - 79%		0 – 19%	
40 – 59%			

Power structure

1. What is the leadership pattern and indicate the other of leadership?

President		Chiefs	
Honorable		Speaker	

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Councilors		Headmen	

SECTION C

Trade

1. Please indicate the type of trade residents of the community are engaged in by percentage

Luma	
Regular Community Market	
Trade by barter	
And others(Please indicates	

Agriculture

1. What type of agriculture is being practiced within the community?

Subsistence farming	
Commercial farming	
Nomadic	
Poultry	
Fish farming	
Mixed farming	

2. Please list the types of crops grown within the Kissy community

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SECTION D: INFRASTRUCTURE

Communication network

1. What communication network is available within the community

Orange	
Africell	
Ocell	
Orange and Africell	
Africell and Ocell	
Ocell and orange	
Orange, Africell and Ocell	

Transportation network

1. What system is goods and services being distributed

Road ☐ Rail ☐ Sea ☐

Essential services

1. What are the essential services available in the community?

Education	
Health	
Electricity	
water	
manufacturing	

Community assets

1. What are the assets in the community? *Example: Town hall, Market, community Farm, etc.*

Government structure

1. What is the government structure in the community?

Thank you for your service and patience:

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