EXPANSION AND MODERNIZATION OF A CEMENT GRINDING AND BAGGING PLANT TO A MAXIMUM CAPACITY OF 1.5 MILLION METRIC TONNES PER YEAR LOCATED WITHIN THE TEMA EXPORT PROCESSING ZONE (TEPZ) ENCLAVE IN THE KPONE KATAMANSO MUNICIPALITY OF THE GREATER ACCRA REGION, GHANA

FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS)

PREPARED FOR:

The Environmental Protection Agency (EPA) of Ghana on behalf of Continental Blue Investments (CBI) Ghana Limited

CBI Ghana Ltd

Prepared by:

HS+E Consulting Ghana Limited

Creating Values through Sustainability

October, 2021

Expansion and Modernisation of the Existing Cement Grinding & Bagging Plant to a capacity of 1.5 million tonnes per annum:

Final Environmental Impact Statement (EIS)

October, 2021

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LIST OF ACRONYMS

1D1F	One District, One Factory
ac	Acres
AER	Annual Environmental Report
AIDS	Acquired immunodeficiency syndrome
AoI	Area of Influence
AU	African Union
CBI	Continental Blue Investments Ghana Limited
CCMC	Chemicals Control and Management Centre
CHPS	National Community Health Planning and Services
CO_2	Carbon dioxide
COVID-19	Corona Virus
CSR	Corporate Social Responsibility
EA	Environmental Assessment
ECG	Electricity Company of Ghana
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPRP	Emergency Preparedness and Response Plan
ERT	Emergency Response Team
ESMS	Environmental and Social Management Systems
ESS	Environmental and Social Standards
FPIC	Free, Prior, and Informed Consultation and Participation
GEACaP	Ghana Environmental Assessment Capacity Development Programme
GEASP	Ghana Environmental Assessment Support Programme
GFZA	Ghana Free Zones Authority
GHA	Ghana Highway Authority
GIIP	Good International Industry Practice
GIS	Geographic Information Systems
GMet	Ghana Meteorological Agency
GNFS	Ghana National Fire Service
GoG	Government of Ghana
GPS	Global Positioning System
GSA	Ghana Standards Authority
GSGDA	Ghana Shared Growth and Development Agenda
GSS	Ghana Statistical Services
ha	Hectares
HIV	Human Immunodeficiency Virus
HR	Human Resources
HS+E	HS+E Consulting Ghana Limited
HSE	Health Safety and Environment

ICP	Informed Consultation and Participation
IFC	International Finance Corporation
ILO	International Labour Organisation
KKMA	Kpone Katamanso Municipal Assembly
km	kilometre (1,000 meters)
kV	kilovolt
kVA	kilovolt ampere
kw	kilowatts
LI	Legislative Instrument
m	meter
mamsl	meters above mean sea level
MCE	Municipal Chief Executive
MMDAs	Metropolitan, Municipal, and District Assemblies
MPIP	Multi-Purpose Industrial Pack
MSRP	Mining Strategic Reserve Plant
NCCP	National Climate Change Policy
NCEI	National Centers for Environmental Information
NCs	Non-Conformities
NDCs	Nationally Determined Contributions
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OMCs	Oil Marketing Companies
OPD	Out-Patient Department
PEMP	Provisional Environmental Management Plan
PHC	Population and Housing Census
PPEs	Personal Protective Equipment
PS	Performance Standards
SDGs	Sustainable Development Goals
SO_3	Sulphur trioxide
STDs	Sexually Transmitted Diseases
TEPZ	Tema Export Processing Zone
ToR	Terms of Reference
TSP	Total Suspended Particulate
VFD	Variable Frequency Drive
VRM	Vertical Roller Mill

NON-TECHNICAL EXECUTIVE SUMMARY

Introduction

This Final Environmental Impact Statement (EIS) entails detailed assessment of the proposed expansion and modernization of Continental Blue Investment (CBI) Ghana Limited's current 500,000 metric tonnes per year (MT/yr) cement grinding and bagging plant located in the Multi-Purpose Industrial Pack (MPIP) zone in Tema, Ghana. The Final EIS is consistent with the Environmental Assessment (EA) Regulations, 1999 (Legislative Instrument (LI) 1652) for the issuance of environmental permit to commence implementation of the proposed project. The Final EIS is also expected to meet international requirements including the International Finance Corporation (IFC) Performance Standards and the World Bank Environmental and Social Standards (ESS).

The Scope, Purpose and Objectives of the Project

The proposed scope of work involves expansion of the existing 500,000 MT/yr cement grinding and bagging plant to a new production capacity of 1,500,000 MT/yr, representing an addition of 200 percent of its current production capacity. In addition, new equipment installations will include a clay gas suspension calciner, hopper, conveyer and dust control systems.

The proposed project aims at utilising calcined clay from locally sourced kaolinitic clay (extracted from Torgorme) to augment its clinker requirements for the expansion project. The expanded production capacity due to the implementation of the proposed project will significantly contribute towards closing the cement demand-supply gap in Ghana. It will also strengthen the local economy by providing more job opportunities, generating extra revenue for the Government through the Kpone Katamanso Municipal Assembly, reducing the import portfolio of Ghana through reduced per unit import of clinker. The proposed project has the following objectives:

- Design, construct and operate an additional 1 million MT/yr cement production line to the existing 500,000 MT/yr cement production and bagging plant to enable CBI Ghana Limited meet demand-supply requirements of cement in Ghana taking into consideration industry standard sustainability and performance benchmarks;
- Add value to locally available natural resources (kaolinitic clay);
- Use less clinker per unit of production resulting in reduced per unit import volumes and associated climate change benefits (from reduced shipping/ emission from ships);
- Ensure prompt deliveries of cement products to cement distributors, companies and other consumers within Ghana and the rest of West Africa;
- Bridge the existing widening demand-supply gap for quality cement product in Ghana;

- Create employment opportunities to Ghanaians;
- Increase the market share of shareholders;
- Generate more revenue for the government through the payment of various taxes (income tax of employees, corporate tax and import levies); and
- Support national development and growth agenda of Ghana through the constant supply of cement for infrastructural developments.

Project Description

The current land take of CBI Ghana Limited's operations covers 15.7 acres (ac) or 6.14 hectares (ha) including areas for administrative offices, truck parking, landscaping and internal roads within the TEPZ, a multipurpose industrial park. The proposed expansion augments the current 500,000 MT/yr capacity cement grinding and bagging plant with an extra 1,000,000 MT/yr production capacity. The proposed project will involve the following main components:

- Existing raw material storage shed (existing)
- 1 existing and 1 new cement grinding mill (ball mill)
- Existing dosing silos and enclosed conveyer systems
- 4 existing and 1 new cement storage silos
- 1 existing and 1 new cement rotary, pellet packer and automatic truck loader
- New clay storage shed, hopper, enclosed conveyer, and clay gas suspension calciner systems
- Administrative, technical and laboratory facilities
- Standby diesel generator, transformer and associated electrical installations
- Compressor and dust control systems
- Security post and electronic weighing bridge

The primary raw materials that will be required for the cement production include clinker, limestone, gypsum, and clay. Clay and limestone will be sourced locally while gypsum and clinker will be imported.

Consideration Of Alternatives

No alternative sites were considered for the expansion and modernization of the cement plant. The non-consideration of the alternative site is informed by the already existing and functioning plant at the current location.

CBI Ghana Limited will employ the ball mill option because of its low cost and fineness of the Blaine it produces. In addition, the existing grinding mill is of a ball mill technology. This will ensure

uniformity of the cement production process, easy integration with existing production lines and easy use based on existing knowledge of the ball mill technology.

The preferred calcination technology adopted by CBI Ghana Limited is the gas suspension calcination. This technology option has a lower maintenance cost due to its static equipment and low refractories. Due to the minimum energy footprint and versatility, and lower maintenance cost, the gas suspension calcination technology is the preferred choice to be used in the new calciner selection.

Air pollution control options for the proposed project includes enclosure of the raw material storage, and grinding area, conveyer systems, installation of high-density filters and implementation of standard monitoring regimes to keep stack emissions of dust below 10 mg/Nm^3, which is below the GS 1236:2019 threshold of 50 mg/Nm^3. This will ensure that any fugitive dust is held or maintained within these operational areas, and that significant dust emissions from the production process are avoided.

Legal basis of the project

This Final EIS has been prepared in accordance with the following legislative and policy requirements. These requirements served as guidelines and the framework for the EIA process.

- Local Statutory Requirements
  - ✓ 1992 Constitution of the Republic of Ghana
  - ✓ Environmental Protection Agency (EPA) Act, 1994 (Act 490)
  - ✓ Environmental Assessment Regulations, 1999 (LI 1652)
  - ✓ Fees and Charges (Amendment) Instrument, 2019 (LI 2386)
  - ✓ Environmental Impact Assessment Guidelines for the General Construction and Services and Manufacturing Industry Sectors, 2010
  - ✓ Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)
  - ✓ Hazardous, Electronic and Other Wastes (Classification) Regulations, 2016 (LI 2250)
  - ✓ Ghana Investment Promotion Centre Act, 1994 (Act 478)
  - ✓ Factories, Offices and Shops Act, 1970 (Act 328)
  - ✓ Labour Law, 2003 (Act 651)
  - ✓ Workmen's Compensation Law, 1987 (PNDC 187)
  - ✓ Ghana Standard Authority Act, 1973 (NRCD 173)
  - ✓ Ghana National Fire Service Act, 1997 (Act 537) and Fire Precaution Premises Regulations, 2003 (LI 1724)
  - ✓ Ghana Free Zones Act, 1995 (Act, 504) and Free Zones Regulation, 1996 (LI 1618)

- ✓ Children's Act, 1998 (Act 560)
- ✓ National Building Regulations, 1996 (LI 1630)
- ✓ Local Governance Act, 2016 (Act 936)
- ✓ Land Use and Spatial Planning Act, 2016 (Act 925)
- ✓ Energy Commission Act, 1997 (Act 541) and Electrical Wiring Regulations, 2011 (LI 2008)
- ✓ Public Health Act, 2012 (Act 851)
- ✓ Persons with Disability Act, 2006 (Act 715)

- Relevant Ghanaian Policies
  - ✓ Ghana National Environmental Policy, 2014
  - ✓ Ghana Standards for Environment and Health Protection: Requirements for Effluent Discharge (GS 1212:2019)
  - ✓ Ghana Standards for Environment and Health Protection: Ambient Air Quality and Point Source /Stack Emissions (GS 1236:2019)
  - ✓ Ghana Standards for Environment and Health Protection: Ambient Noise Control (GS 1222:2018)
  - ✓ Ghana Standards for Environment and Health Protection: Motor Vehicle Emissions (GS 1219:2018)
  - ✓ Ghana Standards for Acoustics: Guide for Measurement of Outdoor A-Weighted Sound Levels (GS 1253:2018)
  - ✓ Ghana Standards for Environment and Health Protection: GSA Water Quality-Specification for Drinking Water (GS 175-1:2018)
  - ✓ National Climate Change Policy (NCCP), 2013
  - ✓ Occupational Safety and Health (OSH) Policy of Ghana, Draft, 2004
  - ✓ National Gender Policy, 2015
  - ✓ National Employment Policy, 2012
  - ✓ Land Policy of Ghana, 1999 (revised in 2002)
  - ✓ Ghana Building Code, 2018 (GS 1207)
  - ✓ National HIV and AIDS Policy, 2019
  - ✓ National Workplace HIV and AIDS Policy, 2012
  - ✓ Nationally Determined Contributions (NDCs)
  - ✓ One District, One Factory Policy, 2018
- International protocols and conventions
  - ✓ African Union Agenda 2063

- ✓ Paris Agreement, 2015
- ✓ United Nations Framework Convention on Climate Change

The impact assessment was also conducted in accordance with the IFC Performance Standards, 2012, and relevant IFC/ World Bank Group (WBG) Environmental Health and Safety (EHS) Guidelines, as required by international financial institutions. These include:

- IFC Performance Standards (PS1; PS2; PS3; PS4; and PS6);
- IFC/WBG EHS General Guidelines; and
- IFC/WBG EHS Guidelines for Cement and Lime Manufacturing.

The EIS also takes into consideration additional good international industry practices (GIIP), including:

- World Bank Environmental and Social Standards (ESS 1; ESS 2; ESS 3; ESS 4; ESS 6; ESS 9 and ESS 10);
- Equator Principles (Principle 1; Principle 2; Principle 3; Principle 4; Principle 5; Principle 6; and Principle 10); and
- Sustainable Development Goals (SDG 1: No Poverty, SDG 2: Zero Hunger, SDG 8: Decent Work and Economic Growth and SDG 9: Industry, Innovation and Infrastructure.).

EIA Methodology

A mixed methodological approach was employed in this EIA process. That is both quantitative and qualitative data was obtained from both primary and secondary sources using a variety of techniques such as desk reviews, field studies and observation as well as Geographic Information System (GIS) and other Spatial Analytical techniques. Specifically, review of literature/documents provided useful general baseline data about the project area related to the physical, biological, cultural, and socio-economic environment. Field visits were used to gather first-hand project specific information such as air quality and noise level as well as water quality assessment and interviews with some stakeholders. This enables the prediction of both the negative and positive impacts of the project, design of mitigation measures for adverse impacts, as well as to plan the monitoring of potential changes that may arise in the course of implementing the project.

Brief Biophysical Baseline Information

The project site slopes gently towards the southwest and will have implications for site drainage layout. Due to the relatively flat terrain of the site, excavation and levelling will not be extensive. The project AoI is largely underlain with Garnet, Hornblende Gneiss. According to earlier studies at the

project site, the storage area and its environs (including the new site clay storage) are underlain by the Dahomeyan rock of the Precambrian age which forms the basement complex of almost the entire country. The project site can be considered to fall within the acid gneiss region, which generally consists of foliated-biotite gneiss, quartz-feldspar gneiss and amphibolite's. There are no major faults in the Dahomeyan gneiss, as a whole. The storage area (including the new site clay storage) is underlain by about 0.5-1.1 m sandy silt. Gravel in turn overlies between 1.8-3.8 m thick sandy gravel with silt and sandy clay at certain places.

There is no stream in the immediate project area. However, the water table is fairly low resulting in ephemeral streams after heavy rains. There is a central sewerage network for the management of run-off and effluent from the enclave. The proposed project site (including the new site for clay storage) falls within the coastal savannah zone, which was made up of bare land with patches of grasses and herbaceous plants. The habitat is largely modified due to industrialisation and rapid urbanisation.

The Municipality lies in the coastal savannah zone of Ghana and therefore enjoys a dry equatorial climate. The rainfall pattern could inform the proposed expansion and modernization schedule especially for concrete works. It is recommended that the period between November and February are maximized for concrete works to ensure adequate curing. Adequate design parameters will take into account the annual variation of temperatures and its inevitable influence on the expansion and contraction of steel components. The relatively high temperature characteristic of the project area will also require health and safety considerations for construction workers especially expatriate staff, if applicable. Working conditions that reduce continuous exposure to extreme weather conditions will be adopted during the dry season. Based on the high humidity values in the project area, it is recommended that project facilities are made of materials resistant to the effects of corrosion. Dust particles from excavation and movement of vehicles/trucks during expansion and modernization of the cement grinding and bagging plant will mostly disperse towards the northeast direction, since the prevailing wind of the project area is from southwest to northeast. Dust from cement production during operation will also disperse with the same trajectory. Historical ambient air quality information from the project site indicates high levels of fine dust above the recommended thresholds likely due to the cumulative impact of multiple industries within the TEPZ.

Brief Socio-Economic Baseline Information

Kpone-Katamanso Municipal Assembly (KKMA) is the highest political authority in the Municipality and exercises deliberative, legislative and executive powers. According to the 2010

Population and Housing Census published by the Ghana Statistical Service (GSS)[1], the population of KKMA, was 109,864. The current projected population size is 138,529. The Municipality has a household population of 106,398 with a total number of 24,800 households. The immediate project area falls within the jurisdiction of the TEPZ, which is provided with security services. The entire enclave is walled off with a 10-foot perimeter wall, with a gated entrance and exit, constantly manned by trained personnel. The Municipality has both public and private educational facilities. They comprise of kindergarten, nursery, primary and junior high schools.

There are more than five (5) private and public hospitals within a 5-kilometer radius of the proposed project location. Since the Municipality is close to Tema West, most referral cases are sent to the Tema General Hospital. The TEPZ Enclave provides liquid waste treatment facilities for industries in the enclave, and waste disposal services for generated solid wastes. There are adequate road networks to transport raw materials to the site and finished products to market centres. The Municipality is connected to the national grid and so has regular electricity supply. Enclave Power is responsible for the supply of electricity to the TEPZ. The Ga-Dangmes are the dominant ethnic group in the Municipality followed by Ewes and Akans. The major festivals in the area are Homowo and Kpledzoo. Ga language is the predominately spoken language among the traditional people in the Municipality.

Stakeholder Engagement

The nature, frequency, and level of effort in stakeholder engagement varies and must be commensurate with the project's risks and adverse impacts as well as the project's development phases as required by the Environmental Assessment Regulations, 1999 (LI 1652). The proposed project is within the legally designated Tema Export Processing Zone (TEPZ) under the authority of the Ghana Free Zones Authority (GFZA), which has designated the control of utility, sanitation and spatial planning issues within the TEPZ to credible companies/ agencies. For instance, Enclave Power is responsible for power supply to all industries within the TEPZ while a designated waste management provider collects all streams of waste from the TEPZ for disposal at an approved landfill site. The critical objective of stakeholder engagement in this environmental impact assessment is to identify relevant parties and identify their potential areas concerns concerning development of the proposed project. The areas of concern of the following stakeholders were considered at relevant sections of the EIA.

[1] Ghana Statistical Service (GSS). (2014). *2010 Population and Housing Census: District Analytical Report for the Kpone-Katamanso District*. GSS: Accra

- Physical Planning Department of the Kpone Katamanso Municipal Assembly
- Ghana National Fire Service (GNFS)
- Ghana Water Company Limited (GWCL)
- Ghana Free Zones Authority (GFZA)
- Ghana Standards Authority (GSA)
- Ghana Highway Authority (GHA)
- Ministry of Trade and Industry, Head Office, Accra
- Department of Factories Inspectorate
- Ghana Ports and Harbour Authority (GPHA), Tema
- Ghana Standards Authority (GSA), Accra
- Environmental Protection Agency (EPA)
- Enclave Power
- Neighbouring land users [3F Company; Nobel Wig Production Company, Jay Kay Books and Stationery, Blue Ocean Ridge Fuel Depot; Red Sea Company Limited, Food Vendors, Vulcanizers and Squatter (Godsway Amegah, Male, NHIS No. 12560554)]
- Public

Potential Impacts and Mitigations/ Enhancements

The key environmental and social impacts associated with the various phases that will potentially transpire because of the project activities, as well as the nature of each impact on receptors, are identified in Table 0-1, below.

Table 0-1: Summary of potential impacts, significance and mitigations/ enhancements

Potential impacts and risks	Nature of Impact	Impact Magnitude	Summary of mitigations/ enhancements
Pre-Construction and Construction Phase			
Soil disturbance and potential erosion will occur from excavation activities for structural foundations, as well as movement of materials and workers	Direct adverse impact on the soil	Low (-ve)	▪ Avoid or minimise construction work during times of inclement weather ▪ Use topsoil for landscaping ▪ Erect support structures and backfill erosion prone areas ▪ Provide adequate on-site storm water drainage system
Ambient air quality impacts will arise out of dust from site clearing and movement of vehicles	Direct adverse impact on staffs, adjoining factories and community members	Low (-ve)	▪ Operate only well service equipment and vehicles ▪ Switch off all idling engines ▪ Provide dust control measures such as speed limits and tarpaulin coverings ▪ Avoid the use of over age vehicles ▪ Implement dust control measures such as water dousing ▪ Maintain vehicles and equipment regularly ▪ Provide nose masks to workers

Potential impacts and risks	Nature of Impact	Impact Magnitude	Summary of mitigations/ enhancements
			▪ Identify and control air pollution sources to permissible levels ▪ Undertake haulage activities during the day
Increase in ambient noise level and localised vibrations will arise out of movement of vehicles, fabrications and other construction activities	Direct adverse impact on workers and nearby communities	Low (-ve)	▪ Maintain/ service equipment regularly ▪ Operate only well service equipment and vehicles ▪ Avoid over age vehicles and machinery ▪ Fix mufflers on noise generating equipment ▪ Provide earmuffs to workers working in high noise areas ▪ Provide appropriate work schedules to control cumulative noise from existing operation and construction activities ▪ Switch off all idling engines ▪ Apply administrate controls to check localised vibrations
Generation and disposal of waste will come from empty cement bags and empty electric cable drums, workforce, and administrative wastes, such as paper, packaging, plastics, and food waste as well as wastewater	Direct adverse impact on land (landfill site) and indirect adverse impact on groundwater	Low (-ve)	▪ Develop inventory and schedule of likely wastes. ▪ Sensitise workers on existing waste segregation ▪ Provide properly label waste bins ▪ Specify disposal procedures for all waste streams identified ▪ Cover waste bins to prevent windblown litter ▪ Arrange with third party waste vendors to pick recyclable waste ▪ Mount “Do Not Litter” signpost ▪ Designate existing ablutions facilities for construction workers ▪ Monitor waste disposal and ensure compliance to existing waste disposal practices
Traffic impacts may originate from the haulage activities construction materials and equipment	Direct adverse impact on local traffic volumes and indirect impact on communities along the transportation corridor	Low (-ve)	▪ Employ qualified drivers ▪ Induct drivers upon engagement ▪ Prohibit overloading of trucks ▪ Assign signaller for operating vehicles with blind spots ▪ Maintain vehicles regularly ▪ Sensitise drivers on safe driving procedure ▪ Engage traffic wardens to control traffic ▪ Provide road safety signs ▪ Schedule haulage and transportation of equipment to be undertaken during off-peak traffic periods ▪ Tow faulty vehicles promptly
Occupational health and safety risks to workers mainly from risk of accidental collisions, knockdowns by moving equipment, falling object and debris; cuts, slips, falls, working at height, confined spaces, excavation and welding and unplanned events such as excessive exposure to adverse weather conditions	Direct adverse impact on workers and indirect adverse impact on productivity	Very Low (-ve)	▪ Comply with Ghana OHS policy and other GIIP ▪ Induct all newly recruited workers on safety related issues. ▪ Maintained proper lighting systems to during night to prevent accidents. ▪ Provide and enforce usage of appropriate PPEs ▪ Provide first aid boxes to manage minor injuries ▪ Ensure high risk activities are strictly supervised ▪ Issue permit to work (PTW) for all hazardous work schedules such as working at height, confined spaces, excavation works and welding ▪ Implement regular emergency drills ▪ Prohibit alcohol on the project ▪ Install and enforce usage of hand washing facilities ▪ Check temperature of workers before and close of work ▪ Label dangerous and hazardous areas at site ▪ Adhere to approved 8 daily work hours

Potential impacts and risks	Nature of Impact	Impact Magnitude	Summary of mitigations/ enhancements
Community health and safety may also come from exposure to dust and noise and knockdowns by construction vehicles	Direct adverse impact on nearby factory staff project adjoining communities	Low (-ve)	▪ Train workers on cultural sensitivities of communities ▪ Maintain dust suppression activities ▪ Encourage community reporting of incidents in a manner that is consistent with best practise ▪ Create awareness on STDs and COVID-19 protocols among construction workers ▪ Encourage voluntary STDs counselling by the construction workers
Disruption in CBI's operations due to expansion and new installations	Direct adverse impact on CBI's operations and economic returns	Very Low (-ve)	▪ Ensure proper planning and scheduling of operations and expansion works ▪ Effective communication with clients ▪ Adherence to strict timelines for the expansion work ▪ Recruit qualified and competent contractor with proven track record ▪ Make resources readily available to prevent delays in project completion timelines
Relocation of squatter	Direct impact on squatter	Very Low (-ve)	▪ Determine a new site for relocation, about 120 m north of the current squatter location. ▪ Give relocation support to the squatter to offset any associated resettlement cost. ▪ Ensure relocation and livelihood support shall be fairly determined and the squatter engaged to build consensus. ▪ Clearly document all relocation and compensation offered by CBI Ghana Limited. ▪ Clearly communicate a grievance redress processes.
Additional employment and income generation opportunities for artisans and labourers around the project area	Direct beneficial impact on nearby communities and workers as well indirect beneficial impact on dependants (Economic multiplier effect)	Medium (+ve)	▪ Adhere to local labour and international regulations ▪ Communicate the company human resource policy to all workers ▪ Commit to transparency of work processes ▪ Commit to non-discrimination and equality of all workers ▪ Commit to the health and safety of workers ▪ Recruit locally ▪ Prohibit forced labour and ensure proper documentation/ fair treatment of all migrant/ expatriate workers ▪ Induct all newly recruited workers about jobs specifications and requirements. ▪ Avoid the recruitment of children as labour ▪ Source construction materials from locally designated site ▪ Settle tax and other statutory obligations timely
Operation and Maintenance Phase			
Ambient air quality impacts will mostly emanate from grinding of raw materials, transfer, bagging, loading, movement of vehicles	Direct adverse impact on staffs, adjoining factories and community members (discrete receptors)	Low (-ve)	▪ Use simple, linear layout for materials handling operations ▪ Use enclosed belt conveyors for materials and cement transportation and emission controls at transfer points. ▪ Cover raw materials and cement with tarpaulin during transport. ▪ Store raw materials in an enclosed raw material shed. ▪ Use and maintain air abatement systems (fabric filters) to collect any dust emissions. ▪ Set negative dust collection pressure systems at all dust raise points. ▪ Install heavy strip curtain at entrance of raw material shed

Potential impacts and risks	Nature of Impact	Impact Magnitude	Summary of mitigations/ enhancements
			▪ Capture mill dust by high efficiency fabric filters and recycle within the process. ▪ Discharge concentration of waste gas and dust at each dust raise point under the control discharge index. ▪ Enclose cement loading area. ▪ Inspect and maintain air pollution abatement systems per manufacturer instructions ▪ Replace worn out fabric filters promptly. ▪ Conduct monthly ambient and fence line air quality (PM10) monitoring regime during operation. ▪ Use only fuel from accredited oil marketing companies (OMCs) with low sulphur content for the generator and vehicles. ▪ Plant and maintain trees (for instance, pine) around the parameter of the site, if practicable
Increase in ambient noise level impacts will mostly emanate from plant operations, vehicle movement and activities of workers	Direct adverse impact on workers and project adjoining communities	Low (-ve)	▪ Maintain/ service equipment regularly ▪ Operate only well service equipment and vehicles ▪ Avoid overage vehicles and machinery ▪ Fix silencers on noise generating equipment ▪ Off all idle equipment and machines ▪ Provide appropriate work schedules to control cumulative noise from existing operation and construction activities ▪ Rotate workers to reduce noise impacts on them ▪ Create awareness about noise impacts.
Generation and disposal of waste will come from spoilt packaging materials and food waste	Direct adverse impact on dumpsite/landfill site and indirect impact on soil health and groundwater quality	Low (-ve)	▪ Sensitise workers on waste segregation ▪ Provide properly labelled waste bins ▪ Continue existing arrangement with third party waste vendors to pick recyclable waste ▪ Reintroduce filter bags dust waste into the cement production cycle ▪ Mount “Do Not Litter” signpost ▪ Ensure sanitary waste is directed into the TEPZ existing waste management system ▪ Develop inventory and schedule of likely wastes ▪ Specify and monitor disposal procedures for all waste streams identified
Fire and explosion risk due to the presence of natural gas for firing the calciner	Direct adverse impact on the staff and properties as well as indirect economic cost to the company	Low (-ve)	▪ Ensure quality of gas installations ▪ Only qualified persons should be engaged to maintain gas components ▪ Implement a planned preventive maintenance schedule for gas components with proper monitoring ▪ Install gas detectors to ensure early detection of gas leaks ▪ Integrate fire hydrants and sprinkler systems into calciner design. ▪ Install fire detection systems ▪ Provide portable fire extinguishers at vantage points and ensure their regular maintenance ▪ Undertake regular fire drills and maintain an Emergency Response Team
Occupational health and safety issues may occur due to the inhalation of dust particles and cumulative hearing impairment from	Direct adverse impact on workers and indirect adverse impact on productivity	Low (-ve)	▪ Comply with Ghana OHS policy and other GIIP ▪ Provide safety trainings and induct all newly recruited workers on safety related issues ▪ Maintain an up-to-date accident and incident register and implement corrective actions to prevent recurrence of incidents ▪ Provide and enforce usage of appropriate PPEs

Potential impacts and risks	Nature of Impact	Impact Magnitude	Summary of mitigations/ enhancements
noise generating equipment.			▪ Maintain and enforce hand washing and adherence to other COVID-19 protocols ▪ Check temperature of workers before and after close of work ▪ Mark out dangerous and hazardous areas with appropriate signage ▪ Provide adequate markings to isolate human and vehicular movement on site ▪ Adhere to the approved 8 daily work hours ▪ Maintained proper lighting systems during night working hours to prevent accidents ▪ Maintain well-stocked first aid boxes to manage minor injuries ▪ Implement permit to work (PTW) systems to control high risk work/ maintenance activities. ▪ Implement regular emergency drills ▪ Prohibit alcohol use while at work
Traffic impacts may arise from the haulage activities of carting raw materials to site and finished product to distribution centres	Direct adverse impact on local traffic volumes and indirect impact on communities along the transportation corridor especially during distribution	Low (-ve)	▪ Ensure transporters recruit qualified drivers and induct drivers upon engagement ▪ Sensitise CBI Ghana Limited drivers on safe driving procedures ▪ Alcohol use and substance abuse by drivers should be prohibited ▪ Undertake off-peak hauling/ transportation
Increased resource use from expansion of production capacity	Direct adverse impact on resources (land, energy, water)	Low (-ve)	▪ Extend and install motion light sensors in the new production units. ▪ Always give preference to energy efficient machinery/ equipment ▪ Ensure water leakages are promptly repaired ▪ Consider installation of water efficient ablution facilities for the project
Additional employment for qualified persons and increased income generation for workers	Direct beneficial impact on communities, factory staff and indirect beneficial impact for small businesses (like provision shop etc)	High (+ve)	▪ Adhere to local labour and international regulations ▪ Communicate the company human resource policy to all workers ▪ Commit to transparency of work processes ▪ Commit to non-discrimination and equality of all workers ▪ Commit to safeguarding the health and safety of workers ▪ Prohibit forced labour and ensure proper documentation/ fair treatment of all migrant/ expatriate workers ▪ Recruit locally ▪ Induct all newly recruited workers about jobs specifications and requirements. ▪ Avoid the recruitment of children as labour ▪ Continue to undertake corporate social responsibilities ▪ Settle tax and other statutory obligations promptly ▪ Undertake local sourcing of supplies
Increased government revenue from increased production capacity	Direct beneficial impact on government revenue	High (+ve)	▪ Pay taxes and other statutory obligations promptly ▪ Encourage employees to pay their taxes ▪ Educate employees on importance of taxes

Potential impacts and risks	Nature of Impact	Impact Magnitude	Summary of mitigations/ enhancements
and associated taxes, levies and fees			

Provisional Environmental Management Plan

CBI Ghana Limited is committed to integrating sustainable environmental management into its activities. To achieve this, the Provisional EMP will serve as an on-site reference document during all phases of the proposed project. The Project's Provisional PEMP satisfies EPA regulatory requirements as well as other international standards specifically the IFC and World Bank. The plan will largely be implemented by selected Contractors during construction and by CBI Ghana Limited during operation and maintenance through the Health, Safety and Environment (HSE) Manager. An estimated amount of fifty-six thousand Ghana Cedis (GHC 56,000.00) per annum is required during pre-construction and construction while one hundred and forty-five thousand Ghana Cedis (GHC 145,000.00) is required per annum for implementation of environmental actions during operation and maintenance.

CBI Ghana Limited recognizes that, monitoring is of prime importance, for which reason the identified impacts will be monitored continuously. Contractors and CBI Ghana Limited's EHS Manager in collaboration with relevant stakeholders shall inspect and monitor the state and operations of the proposed project as this is vital for the implementation of the environmental permit conditions. Additionally, there will be periodic monitoring and review aimed at ensuring compliance of the various environmental improvement strategies at the various phases of the project.

The monitoring shall include, but not be limited to, indicator parameters such as evidence of noise levels, ambient and point source air quality, occupational safety, health and socio-economic issues to determine impacts on the physical, biological and socio-economic environments within the Project's Area of Influence (AoI). This has culminated in the development of a Monitoring Plan to determine whether the predictions of potential environmental impacts are accurate and whether the mitigation measures proposed for the management of their impacts are appropriate. The monitoring plans will require a cumulative annual budget of one hundred and twenty thousand Ghana Cedis only (GHC 120,000.00) for smooth implementation. This will be financed by CBI Ghana Limited as a demonstration of its commitment to sustainable implementation of the proposed expansion and modernization project.

An emergency preparedness and response plan (EPRP) has also been developed to ensure that all persons can identify, evaluate, and react to a wide spectrum of emergencies, including those arising

from injuries and illness, fire outbreak, accidental leak or spill, road accident, equipment failure, explosions, and structural collapse.

In addition, Non-Conformities (NCs) outside the scope of the Provisional EMP may be identified during monitoring of project implementation activities. These NCs may also be determined based on incident, near misses, emergency and complaint records. In such cases, the responsible party shall determine, in consultation with other parties, appropriate corrective actions to address the root cause of the NC.

Decommissioning

Early decommissioning of the proposed project is not anticipated. In the unlikely event of an early decommissioning, CBI Ghana Limited is committed to a 'Clean Closure' implying that once the plant is decommissioned and removed, there will be no remaining environmental liabilities. Consultation will be held with relevant stakeholders such as, EPA and the GFZA to determine the end use of some of the structures and equipment.

Conclusion

The EIS has provided context-specific mitigation, enhancement, management and monitoring measures for several potential adverse and beneficial impacts of the proposed project. These will be implemented in order to minimize or, if possible, eliminate these identified adverse impacts. Also, the anticipated environmental impacts from pre-construction, construction, operation, maintenance and de-commissioning can be adequately attenuated through the implementation of measures outlined in the EIS.

The immediate project area is designated for industrial activities and the proposed project aligns with the planned land use. The proposed Project will also have district, regional and national benefits in terms of additional employment opportunities, reduced climate change through reduced per unit import of clinker and its numerous multiplier benefits.

CBI Ghana Limited is of the firm conviction that this EIS has sufficiently addressed all the significant adverse impacts of the proposed project and will therefore meet the expectation of the EPA to warrant the issuance of an Environmental Permit to facilitate implementation of the proposed project without further delays.

1 INTRODUCTION

The Ghanaian economy has seen steady growth in recent years and growth projections are very positive even in the coming years particularly because of increased investor confidence in Ghana, primarily due to Ghana's stable political regime and the government infrastructural development agenda. Ghana's continuous deepening of democratic practices will continue to attract international community to invest more in the country as well as the need for infrastructural development to accelerate the expansion of the Ghanaian economy.

Continental Blue Investment Ghana (CBI) Limited was registered and incorporated under the Companies Act, 1963 (Act 179) on July 14, 2014 and issued with a Certificate to Commence Business on July 17, 2017 to specialise in the manufacturing and sales of cement. CBI Ghana Limited currently operates a 500,000 metric tonnes per year (MT/yr) cement grinding and bagging plant located in the Multi-Purpose Industrial Pack (MPIP) zone in Tema, Ghana; located 20 kilometres (km) from Ghana's capital, Accra, and 5.5 km from the port of Tema.

CBI Ghana Limited proposes to expand and modernize the existing plant within the Tema Export Processing Zone (TEPZ). The proposed expansion and modernization will lead to a combined new production capacity of 1,500,000 MT/yr, representing an addition of over 200 percent of its current production capacity. The proposed modifications will also involve the construction and installation of a Clay Gas Suspension Calciner System. This new system will be used to produce calcined clay as a supplement to the imported clinker for the production of cement. The clay will be sourced locally from Torgorme in the North Tongu District of the Volta Region.

The need for the proposed expansion is accentuated by Ghana's widening demand-supply gap for cement and cement products, catalysed by the government and private sectors large-scale infrastructural development projects. Again, Ghana's housing sector is a very important sub-sector of the economy and a critical factor in tackling poverty, social stabilization and economic growth. However, there is a widening gap in housing deficits as compared with the rapid urbanization of 56.7 percent at a time when the housing deficit is well above 5.7 million rooms in the country. To address this deficit and accommodate new households, there is the need for the annual delivery of 1,200 houses over the next twenty (20) years. This makes demand for cement particularly the 50-kilogram (kg) bags, a key component for these construction projects.

1.1 BACKGROUND OF PROJECT

CBI Ghana Limited, a company incorporated in Ghana intends to expand and modernize its current cement grinding and bagging factory located within the MPIP of the TEPZ. The proposed expansion

and modernization will add 1,000,000 MT/yr production capacity to the current maximum production capacity of 500,000 MT/yr. The expanded production capacity of the cement facility would enable the country to close the widening demand-supply gap for cement and cement products

Consistent with the Environmental Protection Agency Act, 1994 (Act 490) and Environmental Assessment Regulations, 1999 (LI 1652), CBI Ghana Limited is obliged to obtain an Environmental Permit before the commencement of the expansion project. The process to obtain an environmental authorization is defined by the Environmental Assessment Regulations.

CBI Ghana Limited in compliance with the statutory requirements or obligations have initiated the process to conduct a full Environmental Impact Assessment (EIA) through their appointed Consultant. This Final Environmental Impact Statement (EIS) is being submitted to the Agency in line with their directive contained in a letter dated July 30, 2021 following submission of a Scoping Report to the Agency.

The Final EIS is the last set of documentations required under LI 1652 to obtain an environmental permit to commence the expansion and modernization of the existing factory. This document is compiled to provide context specific attenuation measures for potential environmental and social adverse and beneficial impacts and risks. The EIS is intended to demonstrate compliance of the proposed Project to Ghanaian environmental and social safeguard requirements, the International Finance Corporation (IFC) Environmental and Social Performance Standards (PS), 2012, and the World Bank Environmental and Social Standards (ESS) and Equator Principles.

1.2 PROJECT JUSTIFICATION AND OBJECTIVES

Traditionally, cement is produced in Ghana with clinker and gypsum imported from Asia and Europe, while limestone is generally sourced locally. Importation of clinker and gypsum has direct impact on the foreign exchange and import-export ratio of Ghana with indirect impacts on the stability of the local currency and the macro economy including the forfeiture of much-needed potential job opportunities. Consistent with CBI Ghana Limited's vision of optimising the benefit of its operations to the Ghanaian economy, it intends to introduce a novel, climate friendly and sustainable cement production technology that utilises locally available clay and reduce the reliance on imported clinker. The technology requires modernisation of the existing CBI Ghana Limited's cement grinding and bagging facility.

Under the Ghana Shared Growth and Development Agenda (GSGDA), the Government of Ghana has embarked upon a programme to reduce the national housing deficit, a drive that has largely been complemented by the private sector. This has resulted in an accentuated need for quality building

materials, especially cement and other cement products. This makes the proposed expansion project aim to produce more cement for the Ghanaian market-relevant and justified by the increasing need to close the widening demand-supply gap of the cement industry which has arisen due to the massive infrastructural development and growth process of the Ghanaian economy.

Also, construction plays a vital role in the development process of the nation and cement is a major material component used in the construction sector. In recent times, Ghana has witnessed remarkable economic growth associated with a strong investment in infrastructural development and this is feasible through the constant supply of quality and affordable cement as a major material for building and construction sectors.

Therefore, CBI Ghana Limited's main aim in proposing the expansion of its existing capacity and modernisation of its facility to produce calcined clay from locally sourced kaolinitic clay to significantly contribute its quota toward meeting the cement needs of Ghana. This will also strengthen the local economy by providing more job opportunities, generate revenue for the Government of Ghana, reduce CBI Ghana Limited's per unit import of clinker and contribute towards reducing the import portfolio of Ghana. The reduced per unit clinker import will also imply fewer shipping traffic, reduced emissions from shipping lines and positive climate change impacts.

The objectives of the proposed project include but not limited to the following:

- Design, construct and operate an additional 1 million MT/yr cement production line to the existing 500, 000 MT/yr cement production and bagging plant to enable CBI Ghana Limited meet demand-supply requirements of cement in Ghana taking into consideration industry standard sustainability and performance benchmarks;
- Add value to locally available natural resources (kaolinitic clay);
- Use less clinker per unit of production resulting in reduced per unit import volumes and associated climate change benefits (from reduced shipping/ emission from ships);
- Ensure prompt deliveries of cement products to cement distributors, companies and other consumers within Ghana and the rest of West Africa;
- Bridge the existing widening demand-supply gap for quality cement product in Ghana;
- Create additional employment opportunities to Ghanaians;
- Increase market share of the shareholders;
- Generate more revenue for the government through the payment of various taxes (income tax of employees, corporate tax and import levies); and

- Support national development and growth agenda of Ghana through the constant supply of cement for infrastructural developments.

1.3 PURPOSE OF THIS REPORT AND THE EIA PROCESS

This Final EIS is the documented reporting of the Environmental Impact Assessment (EIA) process undertaken to examine the social risks and environmental impacts of the proposed project on the quality of life, the environment and lives of individuals objectively and professionally within the project's Area of Influence (AoI). It is consistent with Section 10 of the Environmental Assessment (EA) Regulations, 1999 (LI 1652) with respect to the proposed expansion and modernisation project. In addition, this Report has been developed in line with lending agency requirements to align with the IFC PSs, World Bank ESSs and other relevant institutional requirements.

The EIS allows for the determination of what environmental and social standards are applicable to the implementation of the proposed project and what potential impacts and risks related to the project are likely to result in significant effects. The EIA process establishes the current environmental and social baseline conditions of the project area, identifies stakeholders and presents the findings of stakeholder consultations, identifies all affected infrastructure (utilities, roads, etc.), identifies and assesses environmental and social risks, including health, safety and gender risks, associated with the proposed project, and develops relevant mitigation measures that are to be implemented to avoid or control adverse effects and risks of the project. In addition, this report is expected to help facilitate the decision-making processes of the EPA of Ghana regarding environmental permitting for the proposed project.

1.4 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

The procedure to obtain environmental authorisation is prescribed in the Environmental Assessment Regulation, 1999 (LI 1652). The purpose of these procedures and regulations defined in the legislation is to protect sensitive environments and the interests of affected communities, organisations and individuals. These regulations ensure that environmental and social impacts are thoroughly assessed, documented and minimised as low as reasonably possible, before the EPA of Ghana will allow the development to commence.

The methodology followed to conduct the EIA is summarised in the following technical sections. Outputs from these activities have been incorporated in various sections of this report.

1.4.1 Desk Review and Data Sources

This technical review of documents and literature consulted for the proposed project was conducted using a multi-specialist team. The desktop reviews were supplemented by analysis and processing of data using statistical and geo-processing tools.

A range of secondary data sources were used during the preparation of the EIS. Secondary data provided background information on the proposed project, which was sourced from governmental authorities. Information received from CBI Ghana Limited included project related studies; project design and technical details. Secondary data also was sourced from the Ghana Statistical Service (GSS), Ghana Meteorological Agency (GMet), Kpone Katamanso Municipal Assembly, published articles in journals, gazettes and technical reports, maps, the internet and from field observations. Environmental based spatial information was obtained from the EPA Ghana-at-a-Glance geodatabase[2], the Google Mapmaker Community[3], OpenStreetMap Foundation[4] and UNEP-WCMC database[5]. Local and international guidelines and policies related to the proposed project were also considered. This information was used to determine, describe and analyze:

- Relevant policies, laws, regulations and institutional frameworks;
- Project components, infrastructure, requirements and implementation;
- Manufacturing, clay calcination, processing extent and pollution control alternatives;
- Socio-economic baseline information;
- Geospatial analysis, generation of thematic maps and identification of receptors;
- Confirmation of field acquired biophysical baseline information;
- Identification, analysis and assessment of project related impacts;
- Identification of stakeholders; and
- Development of context specific mitigation, management and monitoring plans and programmes.

1.4.2 Site Visits and Observation

Two field visits were carried out on April 23, 2021 and July 6, 2021 to familiarise with the project environment, collect biophysical, geospatial and socio-economic information about the existing conditions in the project area. Follow up visits are carried out on September 2 and 24, 2021 to collect further data on the immediate project environment and engage adjoining land users.

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[2] World Bank & EPA of Ghana. (1999). Ghana-at-a-Glance database.
[3] The Map Maker Community Team. (2009). Google data dump for Ghana
[4] OpenStreetMap contributors. (2015). Planet dump. Retrieved from https://planet.openstreetmap.org
[5] UNEP-WCMC and IUCN (2020), *Protected Planet: Protected Areas in Ghana; The World Database on Protected Areas (WDPA)/The Global Database on Protected Areas Management Effectiveness (GD-PAME) On-line*, January, 2020, Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net

1.4.3 Geographic Information System (GIS) and other Spatial Analytical Methodologies

The study area was delineated using GIS and remote sensing techniques. This technique made use of readily available and credible environmental spatial data, field acquired geospatial information and accredited online mapping platforms. Geographic coordinates were acquired from the project site plan and overlaid with environmentally relevant geospatial data to determine environmental and social issues of concern. Ground truthing, technical review of secondary literature and aerial photography comparisons were done to complement and enhance the validity of these techniques.

1.4.4 Impact Identification and Mitigations

Impacts were identified based on careful consideration of project activities, biophysical and socio-economic receptors. Stakeholder feedback, regulatory requirements, review of relevant literature and expert knowledge were deployed to ensure a holistic identification of impacts. Quantitative and qualitative methodologies were respectively used to evaluate and determine the significance of biophysical and socio-economic impacts as detailed in Section 6.1.

Measures to reduce, avoid, or offset potential adverse environmental impacts have been outlined in Chapter 7 of this Report. These measures are based on local environmental management, Good International Industry Practices (GIIP), World Bank and IFC guidelines as detailed in Section 7.1.

1.4.5 Management and Monitoring Plans

Options for management and monitoring of adverse environmental and social impacts have been identified as part of the EIA process. Consistent with local EIS reporting requirements, these have been documented as a Provisional Environmental Management Plan (Provisional EMP) (see Chapter 8). These plans describe how CBI Ghana Limited and selected Contractors will ensure environmental and social commitments are met. They identify the necessary actions required to meet commitments and include related schedules, responsible parties, inter alia. The Provisional EMP will provide a framework for implementation of the Project's Environmental and Social Management System (ESMS).

1.4.6 Stakeholder Engagement

Stakeholder engagement has been undertaken as part of the EIA process though these stakeholders will continue throughout the project lifecycle or whenever new stakeholders are identified. Participating stakeholders have included adjoining land users, local authorities, regulatory agencies, inter alia. Further details on consultations undertaken as part of the EIA are included in Chapter 5 of this report.

2 POLICY, LEGISLATIVE AND REGULATORY REQUIREMENTS

In realistic terms, environmental management legislation in Ghana and the rest of Africa is fragmented and typically a single project such as the proposed expansion and modernisation project can be influenced by several different regulating authorities, legislation and policies. LI 1652 and other sector specific legislations are the key instruments that cover environmental management in all the sectors of project development in Ghana.

The following outlines the various key pieces of legislation and policies applicable to environmental and social matters applicable to the proposed project within the Ghanaian context.

2.1 GHANAIAN REQUIREMENTS

International standards require adherence to host country legislation and regulatory requirements when carrying out investment projects. Laws and policies of Ghana relevant to the successful implementation of all components of the proposed Project have been considered, and applicable licensing and permitting requirements have also been identified and followed.

2.1.1 Relevant Policies

2.1.1.1 Ghana National Environmental Policy, 2014

This Policy seeks to ensure sound management of the environment and sustainable use of resources to avoid irreparable damage to the environment. Hence, the preparation of this Final EIS is in line with the framework of the Ghana National Environmental Policy.

2.1.1.2 Ghana Standards for Environment and Health Protection

These Standards were formulated by the Ghana Standards Authority (GSA) in collaboration with the EPA of Ghana and other stakeholders to set acceptable thresholds and test methods for measuring the quality of some environmental parameters. These include the:

- Ghana Standards for Environment and Health Protection: Requirements for Effluent Discharge (GS 1212:2019);
- Ghana Standards for Environment and Health Protection: Ambient Air Quality and Point Source /Stack Emissions (GS 1236:2019);
- Ghana Standards for Environment and Health Protection: Ambient Noise Control (GS 1222:2018);
- Ghana Standards for Environment and Health Protection: Motor Vehicle Emissions (GS 1219:2018);
- Ghana Standards for Acoustics: Guide for Measurement of Outdoor A-Weighted Sound Levels (GS 1253:2018); and

- Ghana Standards for Environment and Health Protection: GSA Water Quality-Specification for Drinking Water (GS 175-1:2018).

Section 5.4 of GS 1222:2018 requires that an entity responsible for a construction site shall:

- Erect an acoustic barrier around the construction site; and
- Ensure that maximum noise levels near the construction site do not exceed:
    - 75 dB(A) Leq (5 mins) in an industrial area; and
    - 66 dB(A) Leq (5 mins) in other areas.

These standards provide guidance, measurement methods and requirements for the following components of the project:

- Dust emissions from the cement grinding and bagging activities as well as truck movement;
- Emissions from on-site generators and vehicles/trucks;
- Noise generation from construction and operation activities; and
- Quality of potable water for workers.

CBI will ensure compliance with the requirements of the Ghana Standards for Environment and Health Protection during construction and operation of the proposed project. No effluents are expected from the clay calcination, cement grinding and bagging process.

2.1.1.3 National Climate Change Policy (NCCP), 2013

This Policy is Ghana's integrated response to climate change within the context of the nation's sustainable development priorities. It provides strategic direction and co-ordinates issues of climate change in Ghana.

The Policy aims to promote a *"climate resilient and climate compatible economy while achieving sustainable development through equitable low carbon economic growth for Ghana"*. The consideration and selection of technological options with relatively smaller environmental footprints contribute towards reducing climate change. The CO_2 emission from producing 1 ton of clinker is 970 kg while that of calcined clay is 159 kg. Therefore, the use of kaolinitic clay will result in a potential carbon dioxide (CO_2) credit of 811 kilogram (kg) per tonne of raw material used for production[6]. This is consistent with the National Climate Change Policy, which recommends a policy shift towards green development options.

2.1.1.4 Occupational Safety and Health (OSH) Policy of Ghana, Draft, 2004

The purpose of this Policy *(still in draft)* is to prevent accidents and injuries arising out of, linked with, or occurring in the course of work, by minimizing as far as reasonably practicable, the cause of

hazards in the working environment and therefore, the risk to which employees and the public may be exposed. The relevance of the Policy to the proposed project is evidenced from the engagement of skilled and unskilled workforce that will be required at various stages of the proposed project's implementation.

2.1.1.5 National Gender Policy, 2015

The overarching goal of this Policy is to mainstream gender equality concerns into the national development processes by improving the social, legal, civic, political, economic, and socio-cultural conditions of the people of Ghana particularly women, girls, children, the vulnerable and people with special needs; persons with disability and the marginalized. The implementation processes of the proposed project will be guided by the National Gender Policy which guarantees gender equality and freedom of women and men, girls and boys from discrimination on the basis of social or economic status, among others.

2.1.1.6 National Employment Policy, 2012

The National Employment Policy aims to rectify and resolve issues of employment. Its overarching goal is to achieve full employment and to enable all men and women who are available and willing to work, to attain secured and sustainable livelihood through productive and freely chosen employment and work. Key objectives of the Policy, which are relevant to this project, include the stimulation of economic growth and development, eradicating poverty and improving living standards, safeguarding the basic rights and interests of workers, as well as securing improvement in the productivity of the labour force to improve private sector competitiveness. To enhance CBI Ghana Limited's contribution to the Policy, high local content will be ensured during recruitment of construction and operation workers especially semi-skilled and unskilled labour. This will improve their livelihoods with positive multiplier effects on the local economy and neighbouring communities.

2.1.1.7 Land Policy of Ghana, 1999 (revised in 2002)

This Policy provides the policy framework guidelines and action for land administration and land use in Ghana. These guidelines are aimed at enhancing conservation and environmental quality, thus preserving options for present and future generations. Key objectives of the Land Policy, which are relevant to this Project, include: protection of the rights of landowners, ensuring payment, within a reasonable time, of fair and adequate compensation for land acquired; and promoting public awareness at all levels and community participation in sustainable land management.

The Policy is relevant to the proposed expansion of the cement grinding and bagging plant due to the additional land area (1.53 hectares/ 3.78 acres) that will be acquired for siting the enclosed clay

storage shed. Consistent with the Policy, all protocols of the GFZA will be followed by CBI Ghana Limited to acquire a lease for the additional land area.

2.1.1.8 Ghana Building Code, 2018 (GS 1207)

GS 1207 spells out requirements, recommendations, planning, management and practices that will lead to a smooth operation and construction of residential and non-residential buildings. The building code sets regulations for areas such as; safeguarding during construction, site development and land use, energy efficiency and sustainability, fire and smoke protection measures, planning, management and practices under construction and requirements for plumbing and electrical systems among other. CBI Ghana Limited will ensure compliance of the proposed project design and construction to requirements of GS 1207.

2.1.1.9 National HIV and AIDS Policy, 2019

The Policy was developed by the Ghana AIDS Commission to underpin the nation's response in working towards ending AIDS by 2030. It addresses key and emerging trends in HIV prevention, treatment, care and support. It also aligns with the Sustainable Development Goals as well as Ghana's developmental goals. Its broad objectives are to empower the population to prevent new HIV infections; ensure availability of and accessibility to prevention, treatment, care and support services; mitigate the social and economic effects of HIV on persons affected and living with HIV; and ensure the availability of adequate funding to execute the policy strategies. CBI Ghana Limited is required to be informed by and remain directly supportive of the policy objectives and strategies.

2.1.1.10 National Workplace HIV and AIDS Policy, 2012

This Policy was developed by the National Tripartite Committee and guided by the 1992 Constitution of Ghana as well as other key principles as enshrined in the International Labour Organisation (ILO) Code of Practice (2001) and Recommendation 200 (2010). It provides broad national guidelines to direct the formulation and implementation of workplace HIV and AIDS policies and programmes. The general objectives of the Policy are to provide protection from discrimination in the workplace for people living with HIV and AIDS; prevent the spread of HIV and AIDS amongst workers; and to provide care, support, and counselling for those infected and affected.

The expansion project is anticipated to lead to the influx of young people to the Free Zones Enclave in search of job opportunities. The local economy will be affected as a result of a marginal increase in demand for accommodation and other services. The involvement of persons from different backgrounds means that social and sexual relationships can increase hence the relevance of this Policy to the proposed Project. CBI Ghana Limited will be required to demonstrate their commitment to the

fight against HIV and AIDS through the formulation and implementation of a workplace HIV and AIDS policy.

2.1.1.11 Nationally Determined Contributions (NDCs)

Ghana has put forward thirty-one (31) mitigation and adaptation actions in its Nationally Determined Contributions in response to the Paris Agreement. In all, there are twenty (20) mitigation and eleven (11) adaptation actions in (7) seven priority sectors which will be implemented in a 10 - year period (2020-2030). The priority sectors are:

- sustainable land use including food security;
- climate proof infrastructure;
- equitable social development;
- sustainable mass transportation;
- sustainable energy security;
- sustainable forest management; and
- alternative urban waste.

This proposed project falls in line with the sustainable land use priority segment of Ghana's NDCs.

2.1.1.12 One District, One Factory Policy, 2018

The Government of Ghana (GoG) introduced the One District One Factory (1D1F) Policy to drive industrialisation and economic growth. Implementation of the proposed project is consistent with the aim of this Policy. It is expected that CBI Ghana Limited will bring economic growth with beneficial macro-economic multiplier effects.

2.1.2 Legal Requirements

2.1.2.1 1992 Constitution of the Republic of Ghana

Chapter six (6) of the 1992 constitution of Ghana, entitled the Directive Principles of State Policy by Article 41 makes it the Constitutional duty of the state:

- To take appropriate measures to protect and safeguard the national environment for posterity.
- To co-operate with other states and bodies to protect the wider global environment.
- To endeavour to preserve and protect places of historical interest and preserve artefacts

The Environmental Protection Agency (EPA) is mandated to deal with this constitutional duty by ensuring the performance and obligation of the citizenry in the protection of the environment. The project requirements are in line with the government objectives of ensuring adequate protection for the larger environment within Ghana.

2.1.2.2 Environmental Protection Agency (EPA) Act, 1994 (Act 490)

Act 490 gives mandate to the EPA to regulate the environment and ensure implementation of Government policies on the environment. This makes the Agency a regulatory authority over the Environmental Assessment (EA) process. After meeting all local environmental assessment requirements, the Agency will issue an environmental permit with a schedule to guide sustainable implementation of the proposed Project. In addition, the Agency will enforce the schedules accompanying the permit.

The Agency also has a division called the Chemicals Control and Management Centre (CCMC), which plays a vital role in the management of chemicals in Ghana. The CCMC's primary objective is to protect human health and the environment from the possible effects of chemicals. The CCMC issues chemical clearance permits to importers of industrial chemicals including gypsum and clinker.

2.1.2.3 Environmental Assessment Regulations, 1999 (LI 1652)

The EA process is guided by Legislative Instrument (LI 1652), the principal enactment within the EPA Act 490. The Environmental Assessment Regulations require that activities likely to have an adverse effect on the environment must be subject to an appropriate level of environmental assessment prior to the issuance of a permit and before commencement of the activity.

In order to obtain environmental authorisation, the procedures and regulations must be applied in a systematic manner and be acceptable to the EPA. The purpose of the procedures and regulations contained within LI 1652 is to protect sensitive environments and the interests of potentially affected communities, organisations and individuals. The regulations also ensure that environmental and social impacts are thoroughly assessed, documented and minimised as much as possible, before the EPA will allow the development of the proposed project to commence.

2.1.2.4 Fees and Charges (Amendment) Instrument, 2019 (LI 2386)

This Instrument provides for matters in relation to fees and charges for document processing and issuance of environmental permits and certificates. Payment of such fees and charges will be made to the EPA as specified in the schedules.

2.1.2.5 Environmental Impact Assessment Guidelines for the General Construction and Services and Manufacturing Industry Sectors, 2010

These Guidelines were published by the EPA of Ghana after the Environmental Assessment Capacity Development Programme (GEACaP) and Ghana Environmental Assessment Support Programme (GEASP) to guide implementation of LI 1652 in the general construction and services as well as manufacturing industry sectors. The Guidelines have been considered in the development of this Final

EIS especially in the identification of project related impacts and risks, attenuation, management and mitigation measures, stakeholders and regulatory requirements.

2.1.2.6 Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)

Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917) and its attendant Legislative Instrument (LI 2250) provide directions for the control, management and disposal of hazardous waste, electrical and electronic waste and for related purposes. The Act operates in two dimensions; one section deals with electrical and electronic waste whilst the other section deals with hazardous waste and other waste and seeks to domesticate the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal.

CBI Ghana Limited will ensure that all applicable aspects of this Act are complied with during all phases of the Project. Contractors and CBI Ghana Limited will also ensure that the requirements of Act 917 are taken into consideration during pre-construction, construction, operation and maintenance of the proposed project.

2.1.2.7 Hazardous, Electronic and Other Wastes (Classification) Regulations, 2016 (LI 2250)

LI 2250 clearly stipulates the classification of wastes and standard management practices to guide implementation of the Hazardous and Electronic Wastes Control and Management Act, 2016, (Act 917). CBI Ghana Limited shall ensure that management of wastes covered in LI 2250 are managed according to the requirements of the Regulation.

2.1.2.8 Ghana Investment Promotion Centre Act, 1994 (Act 478)

Act 478 requires that the effects of an enterprise on the environment be taken into consideration during the planning and implementation stages of the project. This Final EIS for the expansion and modernisation project is consistent with the requirements of Act 478 since it aims to promote sustainable implementation of the proposed project.

2.1.2.9 Factories, Offices and Shops Act, 1970 (Act 328)

Part 1 Sections 1 and 2 of the Factories, Offices and Shops Act, 1970 (Act 328) requires for the registration of factories, offices and shops with the Factories Inspectorate. The Act also requires the provision of welfare facilities as well as safety provisions during the planning and design stages for review and inputs by the relevant authorities. The relevant sections of the Act in respect of the project design, construction and implementations have been considered. The Inspectorate will inspect the new installations and issue a license to CBI Ghana Limited. Pressure vessels and lifting equipment will also be inspected by the Inspectorate for equipment integrity and early detection of potential risks.

2.1.2.10 Labour Law, 2003 (Act 651)

This act runs concurrently with the provisions of the Factories, Offices and Shops Act, 1970 (Act 328) on matters relating to industrial relations and wellbeing of workers at workplaces. The Act prescribes the working hours and determination for overtime and holiday compensations for workers.

2.1.2.11 Workmen's Compensation Law, 1987 (PNDC 187)

This Act recasts the law in relation to compensation awarded to workers for personal injuries arising out of and in the course of their employment. It governs, inter alia, the employer's liability in such cases, the distribution of compensation in the event of the worker's death (including a related schedule), degrees of partial incapacity set forth in a schedule, determination of claims, remedies against the employer and third parties, protection of compensation against attachment or assignment, payment of medical expenses and provision of medical aid, and occupational diseases (with 13 such diseases listed in an attached schedule). Statutory Instruments made under Workmen's Compensation Act 1963 (No. 174) and the 1966, 1968 and 1969 amendments are still in effect until varied or revoked in accordance with the provisions of the new law.

2.1.2.12 Ghana Standard Authority Act, 1973 (NRCD 173)

The Ghana Standards Authority (GSA) formerly Ghana Standards Board is the agency responsible for the maintenance of acceptable standards for products and services; and sound management practices in industries and public institutions. It also ensures the licensing and certification of manufactured products in conformity to current codes of good manufacturing practices and standards. All equipment and materials procured by CBI Ghana Limited for implementation of the proposed project will be checked for compliance to GSA requirements.

In addition, CBI Ghana Limited will be issued with a License with a Certification Number to enable CBI Ghana Limited use the Certification Mark of the GSA on the final product (cement bags). CBI Ghana Limited will also continue to comply with the GSA General Labelling Rules, 1992 (LI 1541). These rules stipulate those goods and products on sale shall be labelled appropriately in a manner that describes the kind of product, the production Batch Code/Numbers, Date of Manufacture, Expiry Date/Best-Before Date, Mass or Volume (whichever is applicable) and instructions for use among others. CBI Ghana Limited will be in strict compliance to these general labelling rules.

The Authority has also established the Ghana Standards for Environment and Health Protection (see Section 2.2.2) that will guide the determination of thresholds for monitoring the environmental performance of CBI Ghana Limited in areas of noise generation, emissions and dust generation. GSA

will also calibrate weighing bridges and other measuring equipment to ensure accuracy of measurements.

2.1.2.13 Ghana National Fire Service Act, 1997 (Act 537) and Fire Precaution Premises Regulations, 2003 (LI 1724)

The provision of Act 537 and LI 1724 require proponents of undertakings to obtain/secure fire certificates from the Ghana National Fire Service (GNFS) for proposed and existing undertakings. Issuance of fire certificates by GNFS requires prior installations of fire detection and fighting equipment. CBI has considered and factored these provisions into the design, construction and operation of the proposed project infrastructure.

2.1.2.14 Ghana Free Zones Act, 1995 (Act, 504) and Free Zones Regulation, 1996 (LI 1618)

Act 504 establishes and mandates the Ghana Free Zones Authority (GFZA) to be responsible for the permitting and licencing of the any development within the designated Export Processing Zones including the Tema Export Processing Zone (TEPZ), where the proposed project is located. The regulation also spells out the rights and responsibilities of developers within the TEPZ necessary for obtaining a licence or a permit to operate within the TEPZ. CBI Ghana Limited has successfully undergone the required licencing and permitting regime of the GFZA and is currently operating within the TEPZ. Further discussions are being undertaken to lease the additional land required to accommodate the new enclosed clay storage shed.

2.1.2.15 Children's Act, 1998 (Act 560)

Act 560 reforms and consolidated the laws relating to children, to provide for the rights of the child, maintenance, and adoption, regulate child labour and apprenticeship, for ancillary matters concerning children generally and to provide for related matters. The working age as stipulated by this legal statue is fifteen (15) years excluding hazardous, exploitative and night works. That is, any person below this permissible working age is prohibited and will be considered as child labour if found to be employed by CBI Ghana Limited. CBI Ghana Limited will comply with this Act and will not engage persons below 18 years.

2.1.2.16 Local Governance Act, 2016 (Act 936)

This Act established the Metropolitan, Municipal, and District Assemblies (MMDAs) as the district planning and administrative authority. The Act makes the MMDAs the highest political authority at all local government levels. CBI Ghana Limited will continue to comply with all authorisations and permitting requirements from the Kpone-Katamanso Municipal Assembly. Section 181(1) of Act 462

empowers MMDAs to "*make by-laws for the purpose of a function conferred on it by or under this Act or any other enactment."* CBI will comply with all relevant by-laws of the Municipality.

2.1.2.17 National Building Regulations, 1996 (LI 1630)

The National Building Regulations, 1996 (LI 1630) makes it mandatory for proponents of undertakings (buildings, factories inclusive) to obtain building permits from the local Assembly (Kpone-Katamanso Municipal Assembly) prior to construction activities. This legal requirement ensures that the proposed undertaking is suitable for human habitation. CBI Ghana Limited remains committed to ensuring all permitting and licensing requirements for the proposed project are met.

2.1.2.18 Land Use and Spatial Planning Act, 2016 (Act 925)

Act 925 was enacted to revise and consolidate the laws on land use and spatial planning, provide for sustainable development of land and human settlements through a decentralised planning system. It also ensures judicious use of land and enhances the attainment of Ghana's decentralisation agenda. The Act promotes health and safety in respect to human settlements and creates an enabling regime for District Assemblies to better perform their spatial planning and human settlements management functions. It also introduces land use concepts such as the development permits for various types of physical developments, change of use authentication and land use certificates. This Act requires all developments in Ghana to conform to a zoning scheme approved by a local planning authority where the land is situated.

The proposed project is located within an area zoned as an industrial enclave (MPIP). No land use conflicts are therefore expected to arise due to the expansion and modernisation project.

2.1.2.19 Energy Commission Act, 1997 (Act 541) and Electrical Wiring Regulations, 2011 (LI 2008)

LI 2008 was developed by the Energy Commission of Ghana based on its mandate from Act 541, to establish the requirements, procedures and practices to ensure enforcement of minimum standards of electrical wiring on premises as well as ensure the safety of persons, livestock and other property from hazards that arise from the presence, distribution and use of electrical energy. CBI Ghana Limited will therefore ensure that only qualified electricians duly certified carry out electrical installations within for the new and expansion components. In addition, quality electrical equipment, required electrical safety systems and periodic energy audits will be carried out.

2.1.2.20 Public Health Act, 2012 (Act 851)

This Act was enacted in 2012 to consolidate the laws relating to public health that seek to prevent disease; promote, safeguard, maintain and protect the health of humans and to provide for other associated matters. Potential risks related to the spread of COVID-19, environmental sanitation and

adequate management as well as food safety management for workers will be guided by the requirements of Act 851.

2.1.2.21 Persons with Disability Act, 2006 (Act 715)

The Persons with Disability Act, 2006 provides for persons with disability, establishes the National Council on Persons with Disability and provides for related matters such as the rights, employment, education, transportation, health care, facility access and participation of persons with disability in national activities. Consistent with Act 715, no discrimination shall be meted out to persons with disability in terms of employment and facility use rights during construction and operation of the proposed project.

2.2 INTERNATIONAL REQUIREMENTS

2.2.1 International Finance Corporation (IFC) Performance Standards

The IFC Performance Standards on Environmental and Social Sustainability (the Performance Standards), which were published in January 2012, are recognized as being the most comprehensive standards available to international finance institutions working within the private sector. The Performance Standards are directed towards project owners receiving applicable financing, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the project owner in relation to project-level activities. In addition to meeting the requirements under the Performance Standards, project owners must comply with applicable national law, including those laws implementing host country obligations under international law. The EIA process identified the Performance Standards triggered by the proposed project and are discussed in Table 2-1.

Table 2-1: IFC Performance Standards and applicability to project

Reference	Requirement	Project Specific Applicability
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts		
Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. This Performance Standard is triggered due to the environmental and social impacts associated with implementation of the proposed project.		
Objectives ▪ To identify and evaluate environmental and social risks and impacts of the project; ▪ To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, and the environment; ▪ To promote improved environmental and social performance of CBI Ghana Limited through the effective use of management systems; ▪ To ensure that grievances from adjoining land users and external communications from other stakeholders are responded to and managed appropriately; and ▪ To promote and provide means for adequate engagement with stakeholders, throughout the Project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.		

Reference	Requirement	Project Specific Applicability
General Requirements Performance Standard 1 spells out requirements for effectively managing environmental and social impacts and risks associated with a project through the proactive implementation of an Environmental and Social Management System (ESMS). An effective ESMS is a dynamic and continuous process initiated and supported by management, and involves engagement between CBI Ghana Limited, Contractors, their workers, the TEPZ and, where appropriate, other stakeholders.		
Reference	*Requirement*	*Project Specific Applicability*
1.1	Policy	An environmental and social (E&S) policy has be established by CBI Ghana Limited, which will guide achievement of sound E&S performance. The policy has been communicated to all workers of CBI Ghana Limited and will be communicated to all Contractors. The policy includes: ▪ Commitment to fulfilling local and other compliance obligations; ▪ Commitment to environmental and social protection; and ▪ Responsibility for execution of the policy.
1.2	Identification of Risks and Impacts	Environmental impacts and social risks associated with the proposed project have been identified, discussed and their significance determined. The methodology for determination of the impact significance has been reviewed by the EPA of Ghana as part of the Terms of Reference for the EIA and found to be adequate. This is detailed in Section 6.1.2.
1.3	Management Programmes	Management plans, referred to as Provisional Environmental Management Plans (Provisional EMP) by the EPA of Ghana (see Section 8), will serve as the basis for the ESMS for the proposed project.
1.4	Organisational Capacity and Competency	CBI Ghana Limited has appointed an Environment, Health and Safety (EHS) Manager, to champion implementation of the ESMS.
1.5	Emergency Preparedness and Response	Potential emergencies that could arise during implementation of the project have been identified and response procedures developed to prevent and mitigate any harm to people and/or the environment (see Section 8.7). These will be reviewed and revised when necessary to reflect changing conditions.
1.6	Monitoring and Review	Monitoring programmes including responsibilities for implementation and surveillance have been established to track effectiveness of the Project's management programmes (see Section 8.5). Local environmental reporting requirements will be included as conditions/schedules to the Environmental Permit to be issued by the EPA of Ghana.
1.7	Stakeholder Engagement	Institutional stakeholders and community groups relevant to the Project have been identified and engaged (see Section 5). CBI Ghana Limited will implement a continuous stakeholder engagement programme to ensure continued engagement during implementation of the project.
1.8	External Communication and Grievance Mechanism	External channels of communication exist through phone calls and emails. The on-site office of CBI Ghana Limited will also receive concerns from interested parties. Structures exist to receive and address grievances from external parties.
1.9	Ongoing Reporting to Affected Communities	Ongoing outreach and disclosure to the GFZA, the EPA of Ghana and other relative stakeholders have been incorporated in the impact assessment process. Outcomes of such outreach programmes will influence potential changes to the project's management programmes and ESMS throughout the project life.
Performance Standard 2: Labour and Working Conditions		
Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. Since CBI Ghana Limited and the Contractors will engage skilled and unskilled manpower, this Performance Standard is triggered.		
Objectives ▪ To promote the fair treatment, non-discrimination, and equal opportunity of workers; ▪ To establish, maintain, and improve the worker-management relationship; ▪ To promote compliance with national employment and labour laws; ▪ To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain; ▪ To promote safe and healthy working conditions, and the health of workers; and ▪ To avoid the use of forced labour.		

Reference	**Requirement**	**Project Specific Applicability**
General Requirements The requirements of this Performance Standard are consistent with requirements of the International Labour Organisation (ILO).		
Reference	*Requirement*	*Project Specific Applicability*
2.1	Working Conditions and Management of Worker Relationship	*Human Resources (HR) Policy and Management* An HR Policy exists and is being implemented by CBI Ghana Limited as part of its current operations. The Policy is commensurate with the number and category of workers. These will be required of Contractors during construction of the proposed project components. Measures to address working conditions and management of worker relationships are detailed in the Environmental Action Plans detailed in Section 8.4. *Working Conditions and Terms of Engagement* CBI Ghana Limited is committed to providing working conditions and worker entitlements that are consistent with local labour requirements. This commitment is in CBI Ghana Limited's HR Policy. *Workers Organisation* Consistent with local labour requirements, workers of CBI Ghana Limited and Contractors will maintain their right to join and be recognised as members of a worker organisation, if they meet the worker organisation's requirements. *Non-Discrimination and Equal Opportunity* CBI Ghana Limited and Contractors will implement HR procedures that ensure fairness to all workers irrespective of their gender, race, nationality, ethnic, social and indigenous origin, religion or belief, disability, age, or sexual orientation. All labour decisions will be based on sound and objective assessment of each worker. *Retrenchment* In the unlikely event of a retrenchment, CBI Ghana Limited commits to comply with all local labour requirements as well as severance entitlements of affected workers. *Grievance Mechanism* Workers of CBI Ghana Limited and Contractors are allowed to raise concerns, including anonymous concerns. Concerns raised will be addressed promptly using an amicable and transparent process that provides timely feedback to those concerned. This procedure is communicated to all workers at the time of recruitment. This will be required of all Contractors.
2.2	Protecting the Workforce	CBI Ghana Limited and Contractors through their HR Policies, will commit to the prevention of child and forced labour. Consistent with local labour laws, recruitment procedures will be established to prevent the engagement of child and forced labour.
2.3	Occupational Health and Safety	Workers will be exposed to risks during all phases of the project. Management measures detailed in the project's management actions address potential health and safety risks to workers. This will serve as a basis for context specific risk assessment and management during implementation of the project.
2.4	Workers Engaged by Third Parties	Through contract arrangements and monitoring, CBI Ghana Limited will ensure that third parties comply with local labour requirements as well as good international labour practices.
2.5	Supply Chain	CBI Ghana Limited will take steps to identify risks in the supply chain and implement relevant management strategies to address these risks.
Performance Standard 3: Resource Efficiency and Pollution Prevention		
Performance Standard 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. This Performance Standard is triggered due to the anticipated beneficial and adverse environmental impacts associated with the proposed Project.		
Objectives ▪ To avoid or minimize impacts on human health and the environment by avoiding or minimizing pollution from project activities; ▪ To promote more sustainable use of resources, including energy; and		

Reference	Requirement	Project Specific Applicability
▪ To reduce project-related Greenhouse Gas (GHG) emissions.		
General Requirements Performance Standard 3 requires a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices.		
Reference	*Requirement*	*Project Specific Applicability*
3.1	Resource Efficiency	*Greenhouse Gases* The proposed project will not involve the heating of limestone to produce clinker. All clinker needs for operation of the proposed project will be imported. The CO_2 emission from producing 1 ton of clinker is 970 kg while that of calcined clay is 159 kg. The per unit volume of clinker imported will reduce due to the use of calcined clay produced from locally sourced kaolinitic clay resulting in a CO_2 credit of approximately 811 kg per tonne of raw materials used[6]. The composition of the kaolinitic clay is detailed in Table 3-4. *Water Consumption* Significant usage of water during construction, operation and maintenance of the proposed project is not anticipated. Therefore, further assessment is not required. Water use will be monitored during implementation of the Project to determine the level of resource use efficiency. *Energy Use* The proposed project has been designed with an energy requirement of approximately 38 kWh per tonne of production, which is below the industry benchmark of 90-150 kWh per tonne of cement produced[7]. Electricity requirements for the project will be from the national grid (Enclave Power). CBI Ghana Limited will continue to monitor its energy use relative to the industry benchmark.
3.2	Pollution Prevention	*Air Emissions* Industry standard pollution control systems such as fabric filters and enclosed storage of raw materials have been integrated in the project design. An online stack emission monitoring system will also be integrated into the project design for real-time monitoring of emissions from the proposed project. Further pollution prevention measures are included in Sections 7 and 8 of this report. The cement grinding and bagging process adopted by CBI Ghana Limited ensures efficiency in resource use and maximises raw material throughput. *Waste Management* The waste generation profile of the proposed Project is not complex. Waste mitigation and management measures have been identified as part of the Provisional EMP. *Hazardous Materials Management* Hazardous materials are not a key issue; there are existing adequate systems to manage hazardous waste from implementation of the proposed project. Specific actions are detailed in the Section while Emergency Preparedness and Response Plan (see Section 8.7) recommend relevant mitigation and management measures. Incidents of spills/ pollution, if they occur, will be classified, reported and managed. *Pesticide Use and Management* The Project will not involve the use of pesticides. Therefore, further assessment and reporting is not required.
Performance Standard 4: Community Health, Safety, and Security		
Performance Standard 4 recognizes that project activities, equipment and infrastructure can increase community exposure to risks and impacts. This Performance Standard is triggered due to the potential community health and safety impacts of the Project.		
Objectives		

[6] Proposed Project Performance Guarantee Documentation (FLSmidth, 2021)
[7] International Finance Corporation (IFC). 2007. *Environmental, Health, and Safety Guidelines for Cement and Lime Manufacturing*. World Bank Group

Reference	Requirement	Project Specific Applicability
▪ To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances; and ▪ To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Community		
Reference	*Requirement*	*Project Specific Applicability*
4.1	Community Health and Safety	CBI Ghana Limited is committed to the prevention of impacts on community health, safety and security during installation and operation of the proposed Project. *Infrastructure and Equipment Design and Safety* Design of Project infrastructure has taken into consideration community health and safety. Community health and safety considerations were considered in selecting the preferred technological, and production options. *Hazardous Materials Management and Safety* Hazardous materials expected from the proposed project are limited. There are existing systems to collect and sustainably manage the limited hazardous waste streams from the proposed project. *Ecosystem Services* The proposed Project does not affect any critical ecosystems since the project site and immediate environment lies within a legally designated industrial enclave. *Community Exposure to Disease* Risks of community exposure to HIV/AIDS and COVID-19 will be controlled through the implementation of standard protocols and sensitisation of CBI Ghana Limited and Contractor workers. *Emergency Preparedness and Response* Project related potential emergencies have been identified and response measures detailed in Section 8.7. These response measures take into consideration all relevant stakeholders and resource capacities. Contractors will be required to review and implement this procedure during installation of the proposed project.
4.2	Security Personnel	Security personnel have been engaged to safeguard the project site. CBI Ghana Limited is committed to controlling potential risks of its security arrangement to those within and outside the proposed Project site. The private security firm engaged is trained, licensed and monitored by the Ministry of Interior to provide unarmed security for the current operations. Therefore, their services will be extended to cover the proposed expanded project.
Performance Standard 5: Land Acquisition and Involuntary Resettlement		
Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.		
Objectives ▪ To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs; ▪ To avoid forced eviction; and ▪ To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.		
Reference	*Requirement*	*Project Specific Applicability*
5.1	General	*Project Design* The expansion and modernisation project has been designed to be carried out within the existing CBI Ghana Limited concession. The additional adjoining space of approximately 1.53 hectares or 3.78 acres required for the enclosed clay storage shed has been designed to limit land acquisition. *Compensation and Benefits for Displaced Persons* Implementation of the Project will result in the displacement of a squatter. This individual has no legal rights to the land since the entire TEPZ is a legally

Reference	Requirement	Project Specific Applicability
		designated multipurpose industrial enclave under the management of the GFZA. This individual (squatter) has been engaged and will be given fair support to relocate about 120 m north from the current location. *Community Engagement* The GFZA, adjoining land users and local stakeholders were engaged as part of this assessment. CBI Ghana Limited will continue to engage these stakeholders throughout the project life cycle. *Grievance Mechanism* Grievance redress mechanisms exist to receive and address specific concerns from adjoining land users throughout the project lifecycle. *Livelihood Restoration Planning and Implementation* The relocation of one (1) squatter within the additional land required for the proposed project would be carried out in a planned manner. The socio-economic data, legal identity and physical measurements of the affected structure were obtained to ensure fair compensation to the squatter.
5.2	Displacement	*Physical Displacement* Implementation of the Project will result in the relocation of a squatter. CBI Ghana Limited is committed to ensuring that the relocation would be carried out in a planned, fair and legal manner. *Economic Displacement* Implementation of the Project will have no economic displacement impacts. *Private Sector Responsibilities under Government Managed Resettlement* The existing land for the proposed project has already been leased by CBI Ghana Limited. Additional land requirements will be within the control of the GFZA.
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources		
Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.		
Objectives ▪ To protect and conserve biodiversity; ▪ To maintain the benefits from ecosystem services; and ▪ To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.		
Reference	*Requirement*	*Project Specific Applicability*
6.1	General	Impacts on biodiversity are very low and are limited to loss of sparse vegetation within the additional land required for the enclosed clay storage shed.
6.2	Protection and Conservation of Biodiversity	*Modified Habitat* The project area is a modified habitat due to urbanisation, industrialisation and commercial activities. The immediate project area lies within a legally designated industrial enclave. *Natural Habitat* Natural habitats or potential natural habitats are not within the project area. *Critical Habitat* Critical habitats, or potential critical habitats, have not been identified within the project area. *Legally Protected and Internationally Recognised Areas* The proposed project will not interfere with any protected area. *Invasive Alien Species* No invasive alien species have been identified within the project area.
6.3	Management of Ecosystem Services	The construction and the operation of the proposed project is not expected to have any significant impact on the ecosystem service of the area.
6.4	Sustainable Management of Living Natural Resources	The Project will not involve the production of living natural resources.
6.5	Supply Chain	Raw material (clinker) will be imported from suppliers accredited by their national regulators and cleared through the Ports of Ghana and transported to the TEPZ via road. Limestone, basalt and granite dust will be procured from

Reference	Requirement	Project Specific Applicability
		local suppliers licensed by the EPA of Ghana. Clay will be sourced from a CBI Ghana Limited concession licensed by the EPA of Ghana. A Primary Supply Chain Management Plan will be established to guide procurement of equipment and raw materials for the construction and operation of the proposed project. Contractors will be responsible for implementation thereof during construction phase while CBI Ghana Limited will assume responsibility for its implementation during the operation and maintenance phase.
Performance Standard 7: Indigenous People		
Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded. The Project does not impact Indigenous Peoples, as such this Performance Standard is not applicable.		
Objectives: ▪ To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. ▪ To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. ▪ To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. ▪ To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle. ▪ To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present. ▪ To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.		
Reference	*Requirement*	*Project Specific Applicability*
7.1	General	The Proposed Project does not trigger this Performance Standard as the communities within the proposed Project's AoI cannot be regarded as Indigenous Peoples based on the criteria specified by the Performance Standard. Performance Standard 7 is not applicable in Ghana.
7.2	Circumstances Requiring Free, Prior, and Informed Consent	
7.3	Mitigation and Development Benefits	
7.4	Private Sector Responsibilities where Government is Responsible for Managing Indigenous Peoples Issues	
Performance Standard 8: Cultural Heritage		
Performance Standard 8 recognizes the importance of cultural heritage for current and future generations. This performance standard is not triggered since the immediate project area is a designated industrial enclave which has been screened and identified to be devoid of cultural resources. The larger project area is largely urbanised and the potential for cultural resources is very limited.		
Objectives ▪ To protect cultural heritage from the adverse impacts of project activities and support its preservation; and ▪ To promote the equitable sharing of benefits from the use of cultural heritage.		
Reference	*Requirement*	*Project Specific Applicability*
8.1	Protection of Cultural Heritage in Project Design and Execution	*Chance Find Procedures* The likelihood of encountering cultural resources is limited. No further reporting is therefore required. *Consultations*

Reference	Requirement	Project Specific Applicability
		Consultations with the GFZA have confirmed that no cultural resources exist within the TEPZ. *Removal of Replicable and Non-Replicable Cultural Heritage* No replicable or non-replicable cultural heritage or resources have been identified within the project area. Hence, the proposed project is not anticipated to negatively impact archaeological resources.
8.2	Project's Use of Cultural Heritage	Implementation of the proposed project will not involve the use of cultural heritage, including knowledge, innovations, or practices for commercial purposes.

2.2.2 IFC / World Bank Group Environmental, Health, and Safety (EHS) Guidelines

2.2.2.1 EHS General Guidelines

The Environmental, Health, and Safety (EHS) General Guidelines are technical reference documents with general and industry-specific examples of good international industry practise (GIIP). They contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

The EHS General Guidelines contain information on cross-cutting environmental, health and safety issues potentially applicable to all industry sectors. The EHS General Guidelines should be used together with the relevant industry sector guideline(s). The requirements of these guidelines will guide the development of management and monitoring strategies for various project-related impacts.

2.2.2.2 EHS Guidelines for Cement and Lime Manufacturing

The EHS Guidelines for cement and lime manufacturing provide a summary of EHS issues associated with cement and lime manufacturing that occur during the construction and operation phases of a facility, along with recommendations for their management. These guidelines include requirements relevant to the proposed project. Management and monitoring strategies as well as industry performance benchmarks are based on the requirements of these guidelines for the various project related impacts.

2.2.3 World Bank Environmental and Social Standards

The World Bank Environmental and Social Standards (ESS) set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing. The application of these standards, by focusing on the identification and management of environmental and social risks, will support Borrowers in their goal to reduce poverty and increase prosperity in a sustainable manner for the benefit of the environment and the local people. The World Bank ESS which are relevant for consideration under the proposed Project are discussed in Table 2-2.

Table 2-2: World Bank ESS and their applicability to the proposed Project

Reference	Requirement	Project Specific Applicability
Assessment and Management of Environmental and Social Risks and Impacts (ESS1)	Per ESS1, Borrowers are required to manage the risks and impacts of a project, and improve their environmental and social performance, through a risk and outcome-based approach. Borrowers are also expected to conduct environmental and social assessment of projects proposed for Bank financing to help ensure that projects are environmentally and socially sound and sustainable. In addition, Borrowers are to manage environmental and social risks and impacts of the project throughout the project life cycle in a systematic manner, proportionate to the nature and scale of the project and the potential risks and impacts. Furthermore, the borrower is required to agree with the bank to use all or part of the Borrower's national environmental and social framework to address the risks and impacts of the project, provided such use will enable the project to achieve objectives materially consistent with ESSs.	ESS1 is triggered by the Proposed Project. This EIS has been compiled after a detailed Environmental and Social Impact Assessment (ESIA). The EIS is a pre-requisite to project development in line with the Ghana Environmental Assessment Regulations, 1999 (LI 1652). A project specific Provisional EMP has been developed as part of the EIS to provide further framework for the management and monitoring of environmental aspect as well as social, health and safety risks of the proposed project.
Labour and Working Conditions (ESS2)	This requirement recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. ESS2 is meant to promote safety and health at the installation site. This requirement also seems to promote fair treatment, non-discrimination and equal opportunity of project workers.	The proposed project triggers this requirement since labour will be required during construction of the proposed project. CBI Ghana Limited will ensure that Contractors comply with this requirement.
Resource Efficiency and Pollution Prevention and Management (ESS3)	ESS3 recognizes that economic activity and urbanization often generate pollution to air, water and land and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional and global levels. Borrowers are required to address resource efficiency and pollution prevention and management throughout the project life cycle consistent with GIIP.	CBI Ghana Limited will consider ambient conditions and apply technically and financially feasible resource efficiency and pollution prevention measures in accordance with the mitigation hierarchy. Pollution control systems have been integrated in the expansion and modernisation project design. In addition, CBI Ghana Limited is required to implement technically and financially feasible measures for improving efficient usage of raw materials and other resources.
Community Health and Safety (ESS4)	ESS4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration or intensification of impacts due to project activities. ESS4 addresses the health, safety and security risks and impacts on projects-affected communities and the corresponding responsibility of borrowers to avoid or minimize such risks and impacts, with particular attention to people who because of their particular circumstances may be vulnerable.	The requirements of ESS4 is applicable to the proposed project. The community health and safety effects of the proposed project have been evaluated as part of the impact assessment. Attention will also be given to the health and safety risks posed by the potential influx of workers or people providing support services into the area as a result of the proposed project.
Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (ESS5)	ESS5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons. Project-related land acquisition, or restrictions on land use, may cause physical displacement (relocation, loss of residential land or loss of shelter), economic displacement (loss of land, assets or access to assets, leading to loss of	The preferred proposed avoids physical and economic displacement. The project site is within a designated industrial enclave. This requirement is not triggered for the proposed project.

Reference	Requirement	Project Specific Applicability
	income sources or other means of livelihood) or both. Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in displacement. Where economic resources are affected, it is desirable to value and pay compensation to affected persons in order to restore their livelihoods.	
Biodiversity Conservation & Sustainable Management of Living Natural Resources (ESS6)	ESS6 indicates the need to protect and conserve biodiversity and sustainably manage living natural resources which are fundamental to sustainable development. It also stresses the importance of maintaining core ecological functions of habitats, including forests and the biodiversity they support. Furthermore, ESS6 recognizes the need to consider the livelihood of people who are affected by projects, whose use of biodiversity or living natural resources may be affected by a project. The Standard strictly limits circumstances under which conversion or degradation of natural habitats can occur and prohibits projects which are likely to result in significant loss of critical natural habitats.	No critical or natural habitats or potential critical and natural habitats have been identified within the Project's AoI. Potential supply chain impacts will be managed through procurement of raw materials from only suppliers that meet their local environmental and social requirements.
Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities (ESS7)	ESS7 contributes to poverty reduction and sustainable development by ensuring that projects supported by the Bank enhance opportunities for Indigenous Peoples/ Sub-Saharan African Historically Underserved Traditional Local Communities to participate in, and benefit from, the development process in ways that do not threaten their unique cultural identities and well-being. ESS7 recognizes that Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities have identities and aspirations that are distinct from mainstream groups in national societies and often are disadvantaged by traditional models of development. In many cases, they do not receive equitable access to project benefits, or benefits are not devised or delivered in a form that is culturally appropriate, and they may not always be adequately consulted about the design or implementation of projects that would profoundly affect their lives or communities	The proposed Project does not trigger this requirement. Indigenous people as described by the requirement are not present in Ghana and by extension, the Project area.
Cultural Heritage (ESS8)	ESS8 recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. People identify with cultural heritage as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions. Cultural heritage, in its many manifestations, is important as a source of valuable scientific and historical information, as an economic and social asset for development, and as an integral part of people's cultural identity and practice. ESS8 sets out measures designed to protect cultural heritage throughout the project life cycle.	The likelihood of encountering cultural resources is limited. No further reporting is therefore required Consultations with the GFZA have confirmed that no cultural resources exist within the TEPZ. This ESS is not triggered.
Financial Intermediaries (ESS9)	ESS9 recognizes that strong domestic capital and financial markets and access to finance are important for economic development, growth and poverty reduction. The Bank is committed to supporting	This requirement is triggered since the proposed Project requires heavy financial commitment.

Reference	Requirement	Project Specific Applicability
	sustainable financial sector development and enhancing the role of domestic capital and financial markets.	
Stakeholder Engagement and Information Disclosure (ESS10)	ESS10 indicates the need for open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance and make a significant contribution to successful project design and implementation. Stakeholder engagement should be inclusive and conducted throughout the life cycle of the project.	This requirement is triggered and as a result relevant stakeholder consultation have been conducted by the Environmental Consultant. Consultations were an integral part of the impact assessment process and will continue throughout implementation of the proposed Project.

2.2.4 Sustainable Development Goals

The 2030 Agenda comprises the 17 Sustainable Development Goals (SDGs) which will guide policy and funding for the next 10 years, beginning with a historic pledge to end poverty. The concept of the SDGs was to produce a set of universally applicable goals that balance the three dimensions of sustainable development: environmental, social, and economic. The Proposed General Agriculture Project will directly contribute towards the attainment of the following *SDGs - SDG 1: No Poverty, SDG 2: Zero Hunger, SDG 8: Decent Work and Economic Growth and SDG 9: Industry, Innovation and Infrastructure.*

2.2.5 African Union (AU) Agenda 2063

Agenda 2063 is Africa's blueprint and masterplan for transforming the continent into the global powerhouse of the future. It serves as a strategic framework that aims to deliver on its goal of inclusive and sustainable development and is a concrete manifestation of the pan-African drive for unity, self-determination, freedom, progress and collective prosperity. As mentioned earlier, the proposed project will contribute towards Ghana's achievement of selected SDGs and, by extension, the AU Agenda 2063.

2.3 REQUIRED APPROVALS AND PERMITS

A summary of the main environmental permitting and licensing requirements relevant to the Project include:

- Registration of the proposed Project with the EPA of Ghana – Form EA 2 has been completed and submitted to the EPA, and confirmation received from the EPA (attached as Appendix A);
- Environmental Permit from the EPA of Ghana – Scoping Report and Draft EIS have been completed and submitted to the Agency (see Appendix A). This Final EIS is the last reporting requirement for issuance of a Permit by the EPA;

- Building permit from the Physical Planning Department of the Kpone Katamanso Municipal Assembly;
- Product certification and labelling rights from the Ghana Standards Authority;
- Factories inspectorate certificate from the Department of Factories Inspectorate; and
- Fire certificate from the Ghana National Fire Service.

3 PROJECT DESCRIPTION AND ALTERNATIVES

3.1 PROJECT LOCATION AND LAND TAKE

The proposed cement plant expansion and modernization will be largely undertaken on the current site, which occupies an area of 15.7 acres (ac) or 6.14 hectares (ha) including areas for administrative offices, truck parking, landscaping and internal roads. Additional 1.6 acres of land may be required at the adjoining south-western boundary of the existing site for construction of an enclosed clay storage shed. The corner coordinates for the project site are shown in Table 3-1. The project is located within the TEPZ in the Kpone Katamanso Municipality of the Greater Accra Region as shown in Figure 3-1.

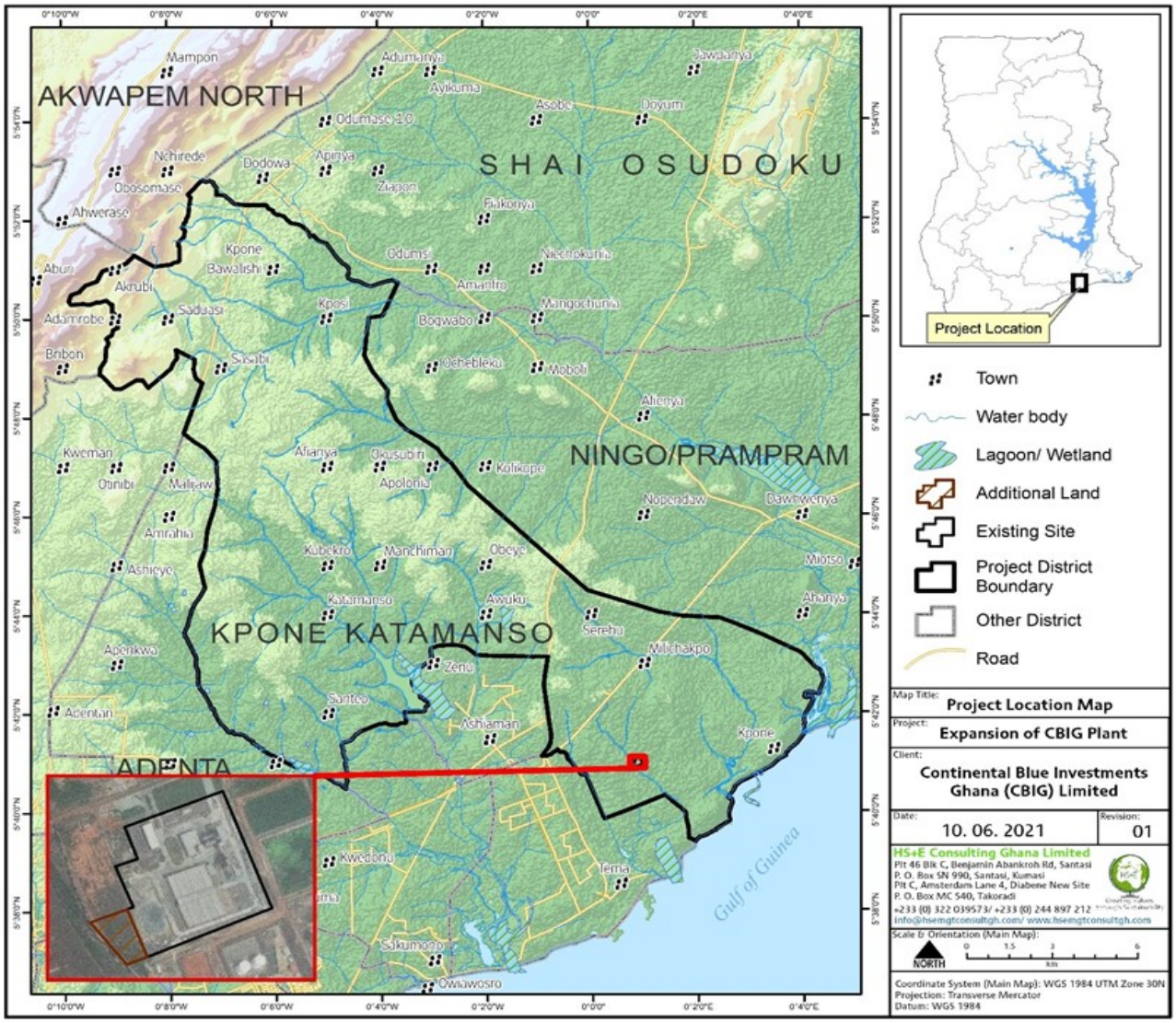


Figure 3-1: Map showing the approximate location of CBI's proposed project

Table 3-1: Corner coordinates of the project site

Cardinal position	Latitude	Longitude
North east	05° 41' 05.22079159" N	000° 00' 54.15652394" E

Cardinal position	Latitude	Longitude
South east	05° 40' 57.08309223" N	000° 00' 57.36270812" E
South west	05° 40' 57.15751077" N	000° 00' 48.31803565" E
North west	05° 40' 59.98341123" N	000° 00' 47.14579958" E
North west	05° 41' 00.50063400" N	000° 00' 48.59174863" E
North west	05° 41' 02.72448763" N	000° 00' 47.76337050" E
South west	05° 40' 53.14948674" N	000° 00' 47.89385710" E
West	05° 40' 56.07907975" N	000° 00' 45.51249297" E

3.1.1 Adjoining Land Uses

Adjoining land uses identified within the project site's immediate environment are detailed in Table 3-2. Some pictures are shown in Figure 3-2 to Figure 3-6 while Figure 3-7 shows a spatial depiction of the project environment and adjoining land uses.

Table 3-2: Adjoining land uses in the project area

Area	Land Use
North	The north of CBI boundary is a road reservation, a road (see Figure 3-5) and 3F Company, a shea processing company and Nobel, a wig production company. Indirect employment created by CBI Ghana Limited operations has also led to the operation of food vendors and vulcanizers at the immediate northwest and northeast side of the immediate project environment (see Figure 3-6).
South	The southern part of CBI's land is bordered by an untarred access road beyond which is the Jay Kay Books & Stationery as well as the Blue Ocean Ridge Fuel Depot. A warehouse is also located south of the project site.
East	Bordered on the east is the Central Wastewater Treatment Plant (CWTP) constructed by the GFZA for management if industrial waste within the TEPZ.
West	The west is an open land bordered by a public/storm drain (see Figure 3-4) beyond which is the Red Sea Company Limited. About 3.78 acres/ 1.53 ha may be required from the open land to serve as the site for the proposed enclosed clay storage shed (see Figure 3-2). The northwest is also occupied by Red Sea Company Limited (see Figure 3-3).

Figure 3-2: Additional land requirement for proposed project (storm drain borders to the right)

Figure 3-3: Red Sea facility at north-western side of project site

Figure 3-4: Storm/ Public drain bordering the western side of the project site

Figure 3-5: Adjoining Road north of proposed project location

Figure 3-6: Food vendors and vulcanizer north east of project site

Figure 3-7: Satellite map of the proposed project's immediate environment

3.1.2 Zoning Status of Proposed Project Area

The Tema Export Processing Zone (TEPZ), also known as the Tema Free Zone Enclave, is a legally designated, demarcated and serviced multipurpose industrial pack to promote industrial development. This is consistent with the proposed project which seeks to increase cement production capacity and modernise the existing plant infrastructure by installing a gas clay calcination and related system. No land use conflicts are therefore expected from the proposed project implementation.

3.2 PROJECT COMPONENTS

3.2.1 Existing Project Components

3.2.1.1 Enclosed Raw Material Storage Shed

An on-site primary enclosed raw material storage shed of 9,182 square meters (m^2) capacity has been erected for the storage of raw materials and other additives (clinker, limestone, gypsum and other minerals) used for manufacturing the distinct types of cement. The ratio of raw materials storage space per the clinker, limestone, and gypsum is 20,500 tonnes:12,700 tonnes:9,200 tonnes respectively. The storage of the raw materials in an enclosed shed reduces dust emissions during discharge and windy weather conditions.

The shed also prevents the introduction of moisture/water during rains thereby keeping the materials dry. The entrance to the raw material shed is fitted with heavy plastic stripped curtains to prevent dust

from escaping into the environment through the entrance. Raw materials are discharged in designated sections of the raw material shed to prevent uncontrolled mixing of raw materials. A front loader will be used to heap offloaded raw materials.

3.2.1.2 Dosing silos and enclosed conveyer systems

The clinker and other additives are transported from the enclosed raw material storage shed by a fully covered bucket conveyors linking the storage shed to four (4) sealed raw material silos (see Figure 3-8). Raw materials are dosed through dosage hoppers in programmed volumes unto covered conveyer systems for further transport to the grinding mill.

Enclosure of the raw material shed, sealing of raw material silos, use of dosage hoppers and covering of silos are meant to reduce fugitive dust emissions. Spilled raw materials are promptly cleaned and re-introduced into the cement production process.

Figure 3-8: Existing raw material silos

3.2.1.3 Cement Grinding Mill (Ball Mill)

CBI currently operates a closed-circuit ball mill grinding system (see Figure 3-9), deem amongst the best and latest technology of grinding mills present on the market owing to its performance; energy conservation; maintenance cost; environment and security.

Figure 3-9: Existing cement grinding ball mill

The ball mill has a capacity of 80 t/h and is built with a metal cylinder with a horizontal axis of 4 m diameter inside and 13 min length. To reduce energy consumption by 10 percent and noise by 19 percent, CBI, has opted for modern technology such as a "central drive". This technology limits the number of mechanical equipment, therefore improving performance. The cylinder rotates at a speed of about 17 turns per minute and will be powered by a motor output of 2,550 kilowatts (kW). The mill shell is protected from abrasion by steel liners. It is filled with steel balls having different diameters, filling it to a ratio of about 30 percent.

It is also equipped with an auxiliary motor of 55 kW, which allows the system to run slowly during maintenance operations. During rotation, the balls rise to a certain height and then fall to fragment the mineral additives. The mill has two (2) chambers separated by a grid with an air flow which serves for transporting of the cement to the outlet as well as partial dissipation of the heat produced during grinding (mechanical work). Water may be sprayed into the mill to improve heat dissipation.

At the mill's outlet, the cement produced will be transported to the storage silos by an air slide conveyor system to a central elevator, which in turn flows on an air slide conveyor above a dynamic separator guaranteeing the fineness of the product.

At the dynamic separator's outlet, the product will be classified in two categories: the large particles and rejected particles (which do not meet quality control and size criteria), which will be recycled in the mill (sent back to be grinded again). The fine particles will be chelated to reduce the levels of

chromium VI which will then be distributed through a set of air-slide conveyors to an anti-heat belt elevator towards the storage silos depending on the quality of the finished product.

Within the grinding mill building, a tank of 1000 litres will be erected to store the grinding aid. This compound will be incorporated during the grinding of raw materials to improve the performance of grinding and particular properties for cement products, such as increased strength at early stages. This liquid product is not considered flammable (flash point > 100 °C). The thermal power of this facility will be approximately 2,900 kW and the electrical power will be 4 kW. Note that the combustion gases will participate directly ill-treating the raw materials.

3.2.1.4 Cement Storage Silos

A total of four (4) cement storage silos with a capacity of approximately 1,200 tonnes each have been installed for stocking the bulk cement. The silos are inverted cone metallic types. According to production needs, the silos will each be dedicated to storing certain types of cement. All the silos are equipped with a fully fluidized system. For each silo, a blower provides air at the bottom of the silo and the other blower delivers air to the discharge chamber. The extraction of cement will be made through a flow outlet controlled by quick-closing valves and servo dosing valves.

The silos are numbered from 1-4, of which silo number 3 and 4 are capable of feeding both the bagging plant and the bulk loading station.

3.2.1.5 Cement Rotary Packer

An automatic 8 spout rotary packer with a maximum capacity of about 140 t/h for bags of 50 kg is currently in use (see Figure 3-10). The cement bags are placed on pallets, which is fully automatic. In case the weight of the cement bag is incorrect, a shredder will destroy the bags. The shredder consists of two circular saws ripping the bag and a sieve that lets through the cement. The cement collected will be recycled into the bagging system by using an endless screw. The cement bags are marked and dated using a printer and then transported along the automatic palletizing line, equipped with the following facilities:

- a ramp with rollers;
- a set of conveyors for flattening bags; and
- an automatic palletizer.

The bagged cements are then loaded onto trucks by 2 forklifts. The forklifts are operated by thermal power and the total energy capacity for the bagging line is 140 kW.

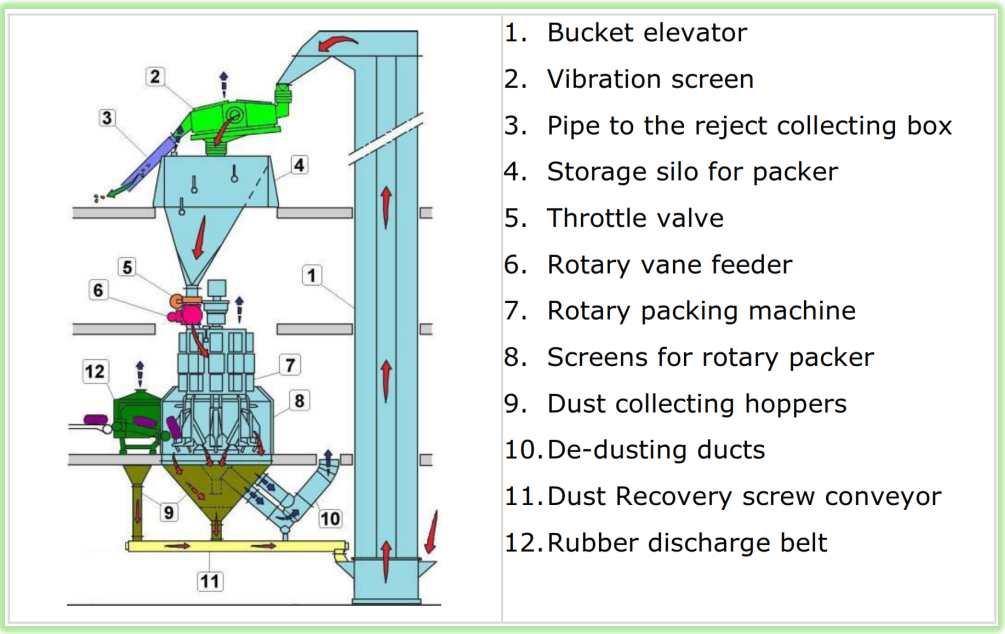


Figure 3-10: Typical packing/bagging plant

3.2.1.6 Automatic Truck Loader

The automatic truck loader (CARICAMAT) is conceived as a moving palletizer, bags are arranged in layers of 5 or 6 bags with the required pattern, and one layer are picked up with vacuum cups and discharged on the truck platform (see Figure 3-11). The take-up head is equipped with one or two bag take-up groups, which can have 5 or 6 suction pads each; according to this configuration, you can load 5, 10 or 12 bags for each deposit. The CARICAMAT allows back feeding and side feeding (right or left) layouts according to the building where it will be installed. Due to his peculiar design a vacuum plant will provide the needed vacuum to lift bags. It can be configured to have a capacity range between 2400 and 3000 bags/h.

3.2.1.7 Auxiliary Components

3.2.1.7.1 Laboratories

To monitor the cement quality to ensure compliance with Ghanaian and other international standards, CBI Ghana Limited has well-equipped control laboratories devoted to achieving its implemented "quality" procedures. The laboratories are organized as follows:

- Process laboratory: This laboratory analyses the content of the immediate product during the milling process, notably particles size, furnace and SO_3 content.
- Chemistry laboratory: This laboratory analyses to determine the various chemical composition of the cement according to the GS 1118:2016 and EN 197.
- Physics laboratory: This laboratory analyses the physical and mechanical properties of the cement such as the strengths and setting time.

These processes are conducted straight from the mill outlet. Monthly quality controls are also conducted by an external certified agency. No chemicals are used in the laboratory.

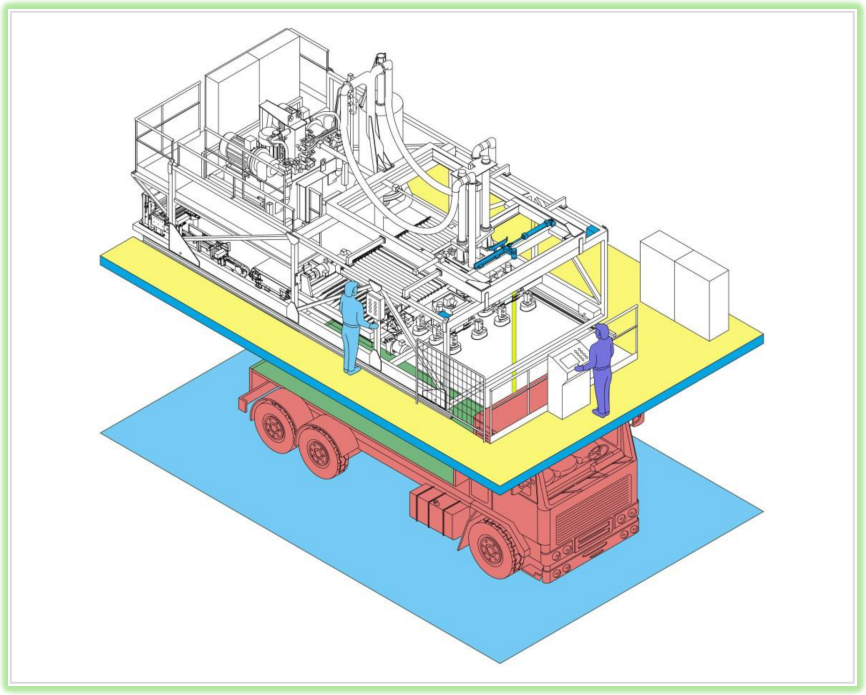


Figure 3-11: Typical automatic truck loader

3.2.1.7.2 Administrative and Technical Building

The administrative building is a one storey structure consisting of several offices, a control room, a laboratory, a rest room and a technical equipment room on the ground floor. Figure 3-12 is the administrative and technical building of CBI Ghana Limited.

Figure 3-12: CBI Ghana Limited's administrative and technical building

3.2.1.7.3 Onsite industrial diesel power plant, fuel storage tank and transformer

An onsite industrial 1,500 kVA diesel power plant and an above ground fuel storage tank with a 10,000 litres diesel capacity for the generator, forklifts, and dryer have been installed. The power plant and diesel serve as an emergency power source for the plant. The fuel storage tank area has been bunded with secondary containment, concrete floored and the tank inspected regularly. Fire extinguishers are kept in the area for emergency firefighting. Sand buckets are also kept for cleaning up spills.

A mineral oil transformer of 5,000 kVA is dedicated to the grinding mill of 6,000 V via a motorized circuit breaker and a mineral oil transformer of 2,000 kVA, located in a dedicated, isolated room next to the enclosed raw shed. This room is made of concrete and treated with a protective spray consistent with EC 1500 standards.

3.2.1.7.4 Ventilation System

The grinding mill building is design to allow for natural ventilation to aid the cooling of the mill during its operation. The offices are also equipped with air conditioning. All air conditions are energy rated as required by the Energy Commission of Ghana.

3.2.1.7.5 Spare parts for equipment

According to wear and tear, the spare parts are always ordered (sufficient quantity) at the same time as the equipment and renewed when necessary. All the equipment are of European Standards, and the technology hold for the crushers and terminals are standardized; therefore, the spare parts are similar, and a common stock is organized centrally for easy dispatching.

3.2.1.7.6 Compressor systems and dust control systems

The grinding mill building requires a treated compressed air system with two air compressors (non-flammable fluid and non-toxic). The compressor and dust control systems feed clean, dry air to the arm filters, the pneumatic mill installations, silos, the bagging plant, and the laboratory. All compressors are periodically inspected by the Factories Inspectorate.

3.2.1.7.7 Security post and electronic weighing bridge

There are currently two-guard entrances, with each having a well-fitted security post. The two gates at the premises enable easy control of inbound and outbound traffic by traffic wardens. There are a total of six installed weighing bridges, within the promises of the CBI Ghana Limited factory. These weighing bridges are used to measure and monitor the weight of both outbound finished cement products and inbound raw materials (see Figure 3-13). All weighing bridges are calibrated periodically by the Ghana Standards Authority.

Figure 3-13: An unloaded truck being weighed on the weighing bridge

3.2.2 New Project Components

3.2.2.1 Clay Storage Shed

An on-site enclosed clay storage shed of approximately 10,000 t capacity, which is equal to about 7.5 days of feed to the calcined clay line, will be developed to store kaolinitic clay extracted from Torgorme. The stockpiling and extraction will be handled by dump trucks and a front-end loader. The storage shed will be fully enclosed to control fugitive emissions.

3.2.2.2 Clay Hopper and Conveyer Systems

Clay from the storage shed will be loaded into a hopper, which will discharge the clay unto a covered belt conveyer for transport to the box feeder, a component of the clay gas calciner system.

3.2.2.3 Clay Gas Suspension Calciner System

An example of the clay gas suspension calciner system is shown in Figure 3-14. The clay calcination system will comprise of various components as described subsequently.

Figure 3-14: 3-D View of clay calcination installation

3.2.2.3.1 Box feeder seal and dosing

The box feeder is designed to handle highly sticky clay continuously.

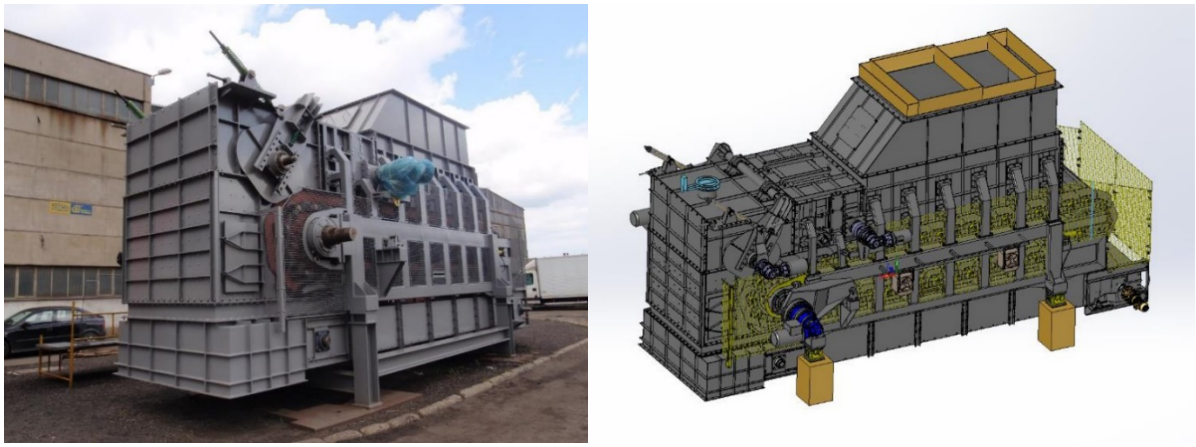


Figure 3-15: Proposed box feeder (left) for the calciner and a 3D Version (right)

3.2.2.3.2 Dryer Crusher

A dryer crusher (hammer mill type) is used for drying and deagglomeration/milling of the wet clay in one process (see Figure 3-16). The damp clay feed with the designated moisture content of 20 wt.% is dosed via a box feeder with variable speed and conveyed to the dryer crusher.

The GSC system easily handles seasonable moisture variations from 15 to 25 percent. The dryer crusher utilizes the calciner hot off-gases for drying the wet clay feed. Clay is, from nature, a fine-grained material with plastic behavior due to the particle size, geometry, and water trapped between the grains. The clay will be dried and deagglomerated to a particle size corresponding to its grain size – typically comparable with the fineness of raw meal to cement. The product will be collected in a bag filter, and the collected meal sent to an intermediate bin from where it will be fed to the preheater. A complete medium-dry clay bin makes it possible to operate the calcined clay pyro system up to ~2 hrs without feeding the drier crusher and stabilizes the pyro system ensuring a more stable flow to the preheater. In the case of the dryer, crusher feed stoppage water injection is used in the drier crusher to control outlet temperature until the process is stopped or until the intermediate dry clay meal bin is empty.

The chemical composition of the kaolinitic clay to be used for the project is detailed in Table 3-4.

Figure 3-16: Proposed dryer crusher and its labelled parts for the calciner

3.2.2.3.3 Preheater and Calciner

A 2-stage cyclone preheater is used for preheating the clay, ensuring the clay has a high temperature before entering the combustion zone in the calciner. The calciner construction is straightforward: a refractory lined cylinder with a downdraught/loop duct connected to the bottom preheater cyclone and collected by gravity. Calcined clay is then transferred by gravity feed into a cyclone cooler.

3.2.2.3.4 Cyclone cooler

Atmospheric air is pushed by a fan to the cooling cyclones and used as cooling media. The cooling air is drafted to calciner as preheated combustion air by the main filter fan.

3.2.2.3.5 Fabric filter and system fan

A fabric filter is used for dedusting and collecting clay feed dust to keep stack emissions below 10 mg/Nm^3, which is below the GS 1236:2019 threshold of 50 mg/Nm^3. The filter fan is used as the primary system fan.

3.2.2.4 Other Components

Other additional component associated with the expansion will include the following:

- One (1) cement grinding mill (ball mill – similar to existing design detailed in Section 3.2.1.3)
- One (1) 5,000 tonne steel cement storage silo

3.3 PROJECT REQUIREMENTS

3.3.1 Raw Materials

The primary raw materials that will be required for the cement production process are clinker, limestone, gypsum, and clay. Other additives such as basalt and granite dust are also used. Details regarding the quantity of raw materials required, their sources and mode of transportation are detailed in Table 3-3.

Table 3-3: Major raw material requirement for existing and proposed project

No	Name of Raw Material	Quantity (metric tonne per annum)			Source	Distance & Mode of Transportation
		Existing	Additional	Total		
1	Clinker	~350,00	~350,000	700,000	Imported from Turkey, Algeria, Spain, UAE, Saudi Arabia	Via sea on a 20,000 – 40,000 tonnes vessel. Transported from the Port of Tema to the project site via 100 tonne trucks covered with tarpaulin
2	Gypsum	~18,846	~37,692	56,538	Imported from Spain	
3	Limestone	~105,778	~211,556	317,334	Locally sourced from Otekpelu, Manya Krobo	Delivered via 100 tonne tipper trucks covered with tarpaulin
4	Clay (kaolinitic) (see Table 3-4 for chemical composition)	-	~350,000	~350,000	Locally extracted from Torgorme	
5	Granite Dust	~27,000	~54,000	~81,000	Locally sourced from Eastern Quarries, Shai Hills	
6	Basalt	~7,800	~15,600	~23,400	Locally sourced from Hannoch Supplies or Beauty Star, Kpone	

Table 3-4: Chemical composition of the kaolinitic clay to be sourced from Torgorme

Parameter	Unit	Result	Parameter	Unit	Result
SiO_2	%	59.73	As	mg/kg	<10
Al_2O_3	%	20.85	Ba	mg/kg	499
Fe_2O_3	%	7.58	Cd	mg/kg	2
CaO	%	0.28	Co	mg/kg	28
MgO	%	0.74	Cr	mg/kg	124
Mn_2O_3	%	0.04	Cu	mg/kg	34
TiO_2	%	1.24	Mn	mg/kg	274
P_2O_5	%	0.06	Ni	mg/kg	58
K_2O	%	1.26	Pb	mg/kg	19
Na_2O	%	0.47	Se	mg/kg	<5
SrO	%	0.01	TI	mg/kg	<5
SO3	%	0.08	V	mg/kg	130
LOI, 975 °C	%	7.99	Zn	mg/kg	62
Total	%	100.32	Hg	mg/kg	0.012
Chloride	%	0.014	Fluoride	%	0.03

3.3.2 Fuel

Details regarding the quantity of fuel required, the source and mode of transportation for the proposed expansion and modernisation project are given in Table 3-5. Fuel volume used will be monitored and benchmarked against industry standards.

Table 3-5: Major fuel requirement for old and new operations

No	Fuel Type	Quantity Required (m^3 per annum) Existing	Additional	Total	Source	Distance & Mode of Transportation
1	Diesel for standby generator, forklifts, and dryer	~324,000	Variable since quantity depends on rate of use of generator, forklifts and dryer.		Local oil marketing companies (OMC)	Transported via fuel tankers managed by the selected OMCs
2	Natural Gas	--	~30,000	~30,000	Connection from an existing natural gas pipeline managed by the GFZA less than 1 km south of the project site and within the TEPZ	Less than 1 km via an underground utility pipeline

3.3.3 Other Project Requirements

Other essential requirements for the project operations including water, electricity, manpower and land are given in Table 3-6.

Table 3-6: Other project requirements

No	Requirement	Existing	Additional	Total	Source/Remarks
1	Water (litres/ month)	1,281,583	~2,400,000	~3,600,000	Water supply system within the TEPZ managed by the Ghana Water Company Limited (GWCL).
2	Electricity (kWh/month)	1,569,991	~3,140,000.00	~4,710,000	Power will be sourced from the national grid with a standby generator in the event of power outage
3	Manpower	151	146	297	Unskilled/semi-skilled workforce will be sourced from the local area, and skilled workforce will be sourced from outside/local.
4	Land	15.17 acres	1.6 acres	16.23 acres	The entire project land take will be within the TEPZ, which is under the management of a competent authority (GFZA).

3.4 PROJECT ACTIVITIES

3.4.1 Pre-Construction and Construction Activities

3.4.1.1 Technical studies, project design and permitting

Consultants and other technical experts will be engaged to undertake various studies, including this EIA process, and obtain the required permits for the project. Feasibility, project technical and design considerations and other relevant studies will also be undertaken.

3.4.1.2 Acquisition of land lease for clay storage shed

Management of CBI has applied to the GFZA to lease an adjoining parcel of land. The application is necessitated by the need to construct a new enclosed storage shed for the clay that will feed the calciner.

3.4.1.3 Demolition and temporary disruption of CBI Ghana Limited operations

Portions of the existing infrastructure may be demolished or dismantled to pave way for expansion or new installations. Precisely, south-western portions of the existing fence may be demolished and reconstructed to border the additional parcel of land that will be leased for the clay storage shed. The demolished concrete waste will be used for backfilling after foundations works required for other installations.

Expansion and new installation works will require temporary shutdown of some equipment, which may disrupt CBI Ghana Limited's full-scale operations and production. Proper planning will ensure that the duration for required plant shutdowns is reduced as far as practicable. Permit control systems will ensure that risks associated with unplanned equipment start-ups are prevented.

3.4.1.4 Transportation and delivery of construction materials and equipment

Construction aggregates, prefabricated machine parts and equipment will be transported from the suppliers to the project site. The suppliers will be responsible for transportation of materials and equipment. All materials and equipment will be responsibly sourced to attenuate supply chain risks. All suppliers will be required to comply with laid down environment, health and safety protocols during delivery including compliance to road safety regulations and GFZA directives.

3.4.1.5 Civil works, fabrications and installations

The proposed project will involve civil and electrical works, fabrications and installation of relevant equipment. Work at height, welding, working in confined spaces, electrical works and excavations are typical risks associated with construction activities. Adequate permit systems, proactive risk assessment and controls, sensitisation and supervision will be implemented by the Contractors to mitigate these impacts.

3.4.1.6 Construction demobilization and management of solid waste

After construction, demobilization will be required. The demobilization will entail removing any remaining construction materials and transportation of construction equipment and machinery offsite.

Construction solid wastes will include spoils and remains of construction materials such as sand, stone, and gravel. Other types of remains may be packaging wastes consisting of cardboard boxes, wooden drums, and empty cement bags. According to their nature, packaging material will be sorted, reuse options explored. Waste that cannot be reused will be kept in skips on-site for collection by the TEPZ waste management service provider licensed by the Kpone Katamanso Municipal Assembly.

3.4.1.7 Test run and commissioning

This stage involves pre-functional test (PFT) inspections covering installed equipment, control systems, and end-of-construction checklists. The test run will evaluate the efficient and optimal functioning of the installed calciner and other expanded components. When proved to be working efficiently the expanded and modernised cement grinding and bagging plant will be commissioned for regular production.

3.4.2 Operation and Maintenance Phase

3.4.2.1 Raw material sourcing

CBI Ghana Limited imports clinker and gypsum via the Tema Port. Agreements have already been signed with suppliers, and a constant supply of clinker has been ongoing for the existing cement grinding and bagging production. The clinker is transported by sea via vessels having a capacity of 60,000 tonnes and offloaded directly on the quayside at the Tema Port (approximately 350,000 t/yr). Other additives (limestone, granite dust, basalt and clay) are sourced locally in Ghana from EPA licensed quarries (see Table 3-3).

3.4.2.2 Discharge and storage of raw materials

An eco-hopper is used in offloading imported raw materials. The eco hopper is an economic and ecological solution for efficiently transferring dry bulk materials between vessels (see Figure 3-17). The hopper is designed to suit the characteristics and flow properties of any bulk material. The hopper has integrated purpose-built dust filter units, which are incorporated into the structural configuration. The unique filter configuration is complemented by a Flex Flap system at the hopper mouth, eliminating fugitive dust release at the point of grab discharge.

The fabricated steel chassis that carries all elements of the operation is designed to allow the passage of vehicles under the hopper and beneath the loading spout while traveling parallel to the quay edge and discharge of materials from the unit into trucks. An additional filter unit has been mounted to the

high-level framework to service the loading chute. This telescopic loading chute includes powered raise and lower functions with local manual control allowing an operator positioned on a working platform above the truck to precisely control the spout's position relative to the truck body. In addition to these options, the hopper valley angles are selected according to material flow characteristics and additional hopper extensions to increase hopper volume and top shrouds to improve side wind protection. Mobility configurations include fixed feet, towable and self-propelled wheels.

Figure 3-17: Typical Eco Hopper used for discharging bulk materials at the Port

3.4.2.3 Transportation and storage of raw materials

The bulk imported or locally sourced raw materials are transported to the site by covered bulk trucks, each having a capacity of 100 tonnes. All road safety regulations are observed during transport. Trucks are well maintained and drivers well-trained. All raw materials are discharged and stored in enclosed storage sheds. Open storage of raw materials is strictly prohibited unless due to emergency reasons. CBI Ghana Limited remains committed to reducing dust emissions from its operations. Reduced per unit volume of clinker imports and the new enclosed storage shed will ensure that emergency temporary storage of raw materials are avoided.

3.4.2.4 Clay calcination

The processes of clay calcination prioritize efficiency and ultimate product quality. Material handling is based on a configuration in which the clay is held in an enclosed clay storage shed with a capacity of about 2 x 5000 ton (dry basis), which corresponds to approximately 7.5 days feed to the calciner.

Dump trucks and front-end loaders handle storage filling and extraction. The clay is dumped into a hopper and belt conveyed to the box feeder, which functions as an apron feeder with integrated rotating shovels on a shaft at the outlet to ensure stable feed of clay to the drier crusher preventing system fluctuations.

The crushing operation is carried out in an enclosed drier crusher (hammer mill type) for drying and de-agglomeration of the wet clay in one process. The wet clay feed with design moisture content of 20 wt% is dosed via a box feeder with variable speed and conveyed to the dryer crusher which utilizes the calciner hot off gases for drying of the wet clay feed. The exhausted air will pass through a cyclone and bag filters to remove the dust. Whilst the homogenized dried and deagglomerated clay typically comparable with the fineness of raw meal to cement, is collected and transferred to an intermediate bin from where it is feed to the preheater.

Preheating of the clay is done with a two-stage cyclone preheater, which ensures that the clay is at a high temperature before entering the calciner's combustion zone. The calciner is made up of nothing more than a refractory walled cylinder with a downdraught/loop duct linked to the bottom preheater cyclone and gravity collected.

The cooling of the calcined clay is done by atmospheric air. It is pushed by a fan to the cooling cyclone and used as the cooling media for rapid quenching and high heat recuperation to lower the energy consumption of the system. Prior to discharge into the atmosphere, the calciner exhaust gas will pass through a fabric filter for dedusting of the particulates. The calcined clay will be screened for *spec* as well as *off spec* and transferred to a *spec* holding steel silo of 1,000-ton capacity or 30 ton *off spec* silo. A reversible jet bag type dust collector will be provided for venting the silo and control bin.

Figure 3-18: Environmentally based process flowchart for the clay calcination

The designer and equipment supplier have guaranteed that total suspended particles (TSP) in the exhaust gas stream after the fabric filter will be less than 10 mg/Nm^3, which is less than the local regulatory (GS 1236:2019) thresholds of 20 mg/m^3. The flue gas sulphur dioxide will be undetectable, as sulphur is very low and almost undetectable in the natural gas. The carbon monoxide concentration in the exhaust gas is expected to be low as natural gas undergoes almost complete combustion in the calciner.

The calcination process is carried out following the steps outline in Figure 3-18, above.

3.4.2.5 Dosage of raw materials/ calcined clay and flow into the grinding mill

The grinding mill will be fed with clinker, gypsum, limestone and other additives by the specific raw material silos with dosing hoppers. Calcined clay will also be introduced from the calcined clay storage silos also equipped with dosage hopper. Each hopper is equipped with a weighing belt feeder

controlling the weight of all minerals entering the grinding mill. The weighing belt feeder will be enclosed to prevent the entry of rainwater and escape of fugitive dust. These dispensers allow adjusting the mill's total feed rate, retaining the pre-established proportions of each incoming mineral. All the feeders will discharge onto a reversible conveyor belt, allowing it to transport the mixed minerals to the grinding mill and checking the accurate dosage by using the weighbridge to calibrate the dosage.

3.4.2.6 Cement Grinding

The cement production process commences with the gradually heating of a mixture of clinker, limestone, gypsum, calcined clay and other additives to a temperature of between 1,600 - 1,800 ° C, and finely grounded to get “Portland" cement. The added gypsum regulates the setting (hardening) of the cement to make it easier to use during work. Other minerals (granite dust and basalt) added to the clinker and gypsum during the grinding stage enable the production of different types and qualities of cement.

Grinding involves the rotation of the mill (a cylindrical metal drum with two concentric progressively smaller cylinders arranged within it) along its horizontal axis. There are heavy steel chrome (alloy) balls rolling freely within the two smaller inner drums. As the mill rotates, the balls fall under gravity on the mixture, gradually pulverizing it till it is all ground into a fine powdery product. The first (innermost) chamber, loaded with alloy balls of between 60 mm and 90 mm diameter, is where the raw materials are loaded. The second chamber is separated by a perforated steel diaphragm that will prevent the steel-chrome balls from leaving the first chamber while allowing smaller pieces of mixed raw material to move into the second chamber. The second chamber contains more petite alloy balls of 20 to 50 mm diameters. Any particle larger than 50 µm is automatically retained and taken back for re-grinding. The entire production process will not be open to the air but will be a closed circuit, and air pollution control devices installed to trap and channel all generated dust into a cyclone where the dust will be precipitated and re-used in the cement production process.

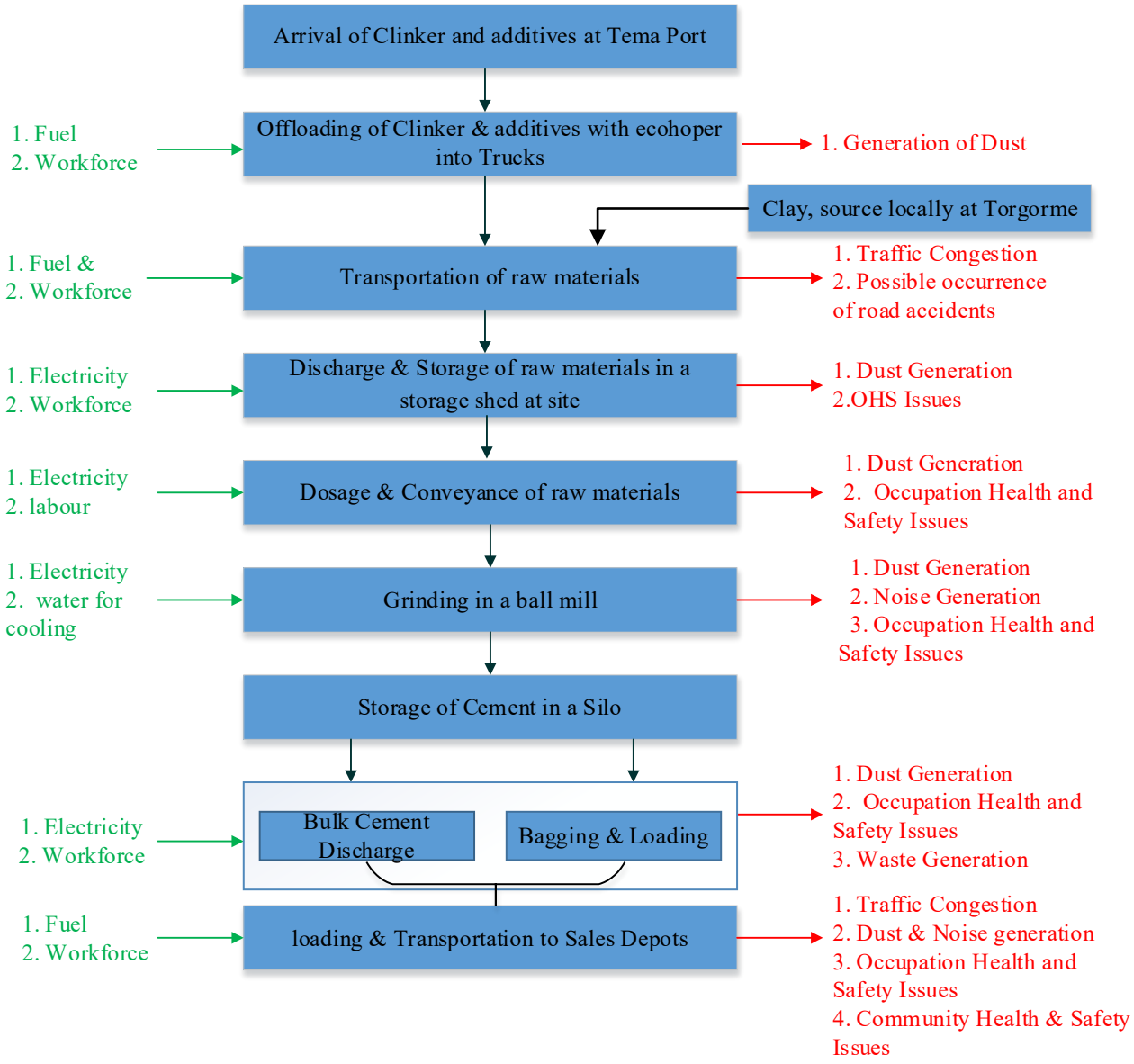


Figure 3-19: Environmentally based process flowchart for the grinding and bagging of cement

The produce cement will be tested for water demand, expansion characteristics, Blaine (fineness), sulphate content, setting time, and compressive strength. Ghana Standards Authority regulates all these testing requirements for Building and Construction Materials (GS 1118:2016), which can be traced to other international standards like the EN 197-1 Standard. CBI intends to produce the same of the current cement grades 32.5R and 42.5R cement that will meet the specifications of GS 1118:2016 for the local market.

Appendix B is a layout of the cement plant detailing both the old production unit and the new components (new facilities are marked with Turquoise). The cement production process is shown graphically in Figure 3-19, above, which also incorporates the environment flow parameters of the cement production process.

3.4.2.7 Packaging and Dispatch

The bulk cement will be transported via another covered conveyor belt to five vertical cement storage silos from the grinding mill. The stored cement in cement storage silos can be offloaded in bulk onto trucks positioned underneath. Also, the cement content in the mixed silos can be directed into a hopper (capacity 50 t) located in the bagging building and bagged directly using an automatic eight spout rotary packer which has a maximum capacity of about 140 t/ h for bags of 50 kilogram (kg). The cement bags will then be weighed for conformity. This operation is fully automatic. In case the weight of the cement bag is incorrect, a shredder will destroy the bags. This device consists of two circular saws ripping the bag and a sieve that lets through the cement. The cement collected will be recycled into the bagging system by using an endless screw. The cement bags will be marked and dated with a printer and then transported automatically using a palletizing line equipped with the following facilities:

- a ramp with rollers,
- a set of conveyors for flattening bags,
- an automatic palletizer,

The pallets will then be loaded onto the trucks by two forklifts. The forklifts are operated by thermal power, and the total energy capacity for each bagging line will be 140 kW.

Alternatively, an automatic truck loader may be used to automatically load full bags on trucks, optimizing the arrangement of the bags. The concept is very flexible and suitable to load almost any type of trucks from the top. Bags on the truck will be arranged with typical pallet pattern so that truck discharge could be manual or using forklifts if a pallet is left under the bags. When a part of the truck is full the whole machine moves to feed the next section of the platform. The truck stops in a loading bay underneath the automatic loader and the operator will have to trim the loader in the right position respect to the truck itself. Next steps of loading are fully automatic, and a single operator could handle more than one loader.

3.5 CONSIDERATION OF ALTERNATIVES

This section discusses alternative considerations to the proposed expansion project. This is consistent with Section 12(d) of Environmental Assessment Regulation, 1999 (LI 1652), which emphasizes site selection matters, including a statement of the reasons for the choice of the proposed site and whether any other alternative sites were considered. The “no-go” alternative is also considered in line with Section 12(c) of the same Regulation, which requires considering the options where the undertaking is not executed.

The potential alternatives to the proposed expansion and modernization of the cement grinding and bagging plant are discussed below concerning manufacturing technology, the extent of processing, air pollution control options, and the no-go alternative.

3.5.1 Site Alternatives

No alternative sites were considered for the expansion and modernization of the cement plant. The non-consideration of the alternative site is informed by the already existing and functioning plant at the current location.

This decision is backed by critical factors such as the availability of adequate land area, which can be acquired to add to the existing parcel, and the reasonable proximity to the Tema Port that can accommodate the proposed project. The current site in the TEPZ offers an optimal option with excellent and safe vehicular access for nationwide product distribution. In addition, the TEPZ is well served with water and electricity supply for industries within the enclave. Consultations with the utility services provider (Enclave Power) indicate that suitable and adequate electric power can be made available for the proposed expanded capacity and modernization.

3.5.2 Manufacturing Technology Alternatives

Technology for the grinding of raw materials into cement varies considerably. Two competing techniques were considered for adoption [i.e. Vertical Roller Mill (VRM) and Ball Mill]. The two considered techniques are deemed appropriate as CBI is only into the grinding and mixing of imported near-finish products such as clinker, gypsum, and limestone to form cement.

VRM is an emerging technology that began to gain ground from the past 17-years since its first installation for the grinding of cement raw materials. Significant energy saving is one of its major advantages when compared with others such as ball mill. However, the VRM is a more complex piece of equipment with a sophisticated hydraulics system that operates the rollers. Accordingly, the equipment, erection, and civil works cost of a VRM technology is around 20 – 25% greater than a ball mill system of the same capacity.[8] Also, VRM has a lower wear rate on maintenance requirements but higher parts replacement costs when benchmarked against a ball mill. On Blaine quality, there is a general perceived belief among cement manufacturers that VRM has less fineness when compared to the long-trusted ball mill technology. This technology is not CBI Ghana Limited's favored option mainly because of its associated higher cost and fineness of Blaine it produces.

[8] World Cement, 26TH February, 2013. Cement grinding: VRM or ball mill?

The ball mill epoch-making relationship with the cement industry dates back about 80 years. Design as a two-compartment mill, it operates in a closed circuit with a high-efficiency separator. Thus, the ball mill has operational simplicity, relatively low cost of equipment installations and maintenance as its most remarkable qualities when juxtaposed with the VRM. Likewise, the quality of Blaine of ball mill ground cement is much finer than that of the VRM. This makes the ball mill still the most preferred technology for new cement grinding installations, although the vertical roller mill now has emerged as a viable alternative to the ball mill system. CBI Ghana Limited will employ the ball mill option because of its relatively associated low cost and fineness of the Blaine it produces. Another reason for the choice of ball mill over VRM is that the current 500,000 MT/yr production capacity uses ball mill technology. Therefore, the ball mill choice for the additional mill will ensure uniformity of process, easy orientation, and transfer of knowledge to new staff, amongst others.

3.5.3 Clay Calcination Technology Alternatives

The option of clay calcination technology as a new feature of the expansion has been considered as calcined clay would be used as a supplement to the imported clinker. Two types of technology were considered for clay calcination: suspension calcination technology and traditional rotary kiln technology.

Suspension calcination technology combines the flexibility to use the least expensive and most readily available fuels with sustainable cement production's environmental and economic benefits. This system has the possibility of higher substitution rates by alternative fuel covering either liquid, solid and gaseous. Most notably, even when electricity will be used, the overall electrical consumption of the suspension calciner technology is lower than in a rotary kiln due to different requirements in grinding energy and the absence of the kiln motor drive, although it requires larger exhaust energy.

Again, the suspension calciner technology has low thermal inertia due to the limited amount of refractory lining in the equipment, allowing for a faster start-up and production. Its overall thermal energy consumption is lower than in a rotary kiln system due to fewer hot surfaces exposed to ambient and better heat recovery.

The suspension calciner technology has a lower maintenance cost due to its static equipment and low refractories. For minimum energy footprint and versatility, lower maintenance cost, and ease of fit to the mill of both new and existing plants makes the suspension calcination technology the preferred choice to be used in the new calciner selection.

On the other hand, the traditional rotary kiln technology has its significant advantage as having both drying and calcination in a single unit as well as a comparable range of fuels, with multi-fuel firing

possible. However, its energy efficiency does not measure up to the suspension clay calcination technology. Also, the rotary kiln system has a relatively higher maintenance cost due to the high amount of refractories. For that reason, rotary kiln technology is least favoured.

3.5.4 Extent of Processing

The nature and characteristics of the final product also influence the design of the cement plant. Provision has been made for various additives to be added during the production process to yield distinct types and grades of cement (32.5R and 42.5R), as may be necessary. While the cement plant will produce bagged cement, bulk consumers such as construction firms and block makers will require cement in bulk, unpacked form, which can be supplied in jumbo sacks or directly into concrete batching trucks.

3.5.5 Air Pollution Control Options

Various techniques exist for controlling air pollution from the manufacturing of cement. Gypsum is naturally hygroscopic and thus does not emit dust, so only the clinker will require dust emission control. The proponent has the option of choosing from electrostatic precipitators, baghouse filters, and vapour mists, plus enclosed conveyors, mill, material transfer points, and storage areas.

In the proposed expansion, the new clay storage shed as well as the grinding area will be enclosed, and high-density filters installed and monitored to keep dust stack emissions below 10 mg/Nm^3, which is below the GS 1236:2019 threshold of 50 mg/Nm^3. This will ensure that any fugitive dust is held or maintained within these operational areas, and that dust emissions from the production process are avoided. It cannot be overemphasized that any loss of raw material or end product to dust emission is not only a negative environmental impact but also a direct loss to the enterprise - both are situations that will be engineered out of possibility.

3.5.6 "No Project" Scenario

The substantial national housing deficit of over one million five hundred units implies that individuals and real estate companies will continue to build residential accommodation houses. Ghana's policy thrust on the housing sector has been to reduce the housing deficit as identified by the most recent Population and Housing Census (PHC) 2010.

The government has also embarked on accelerated programmes to expand the road sector. These policy directions have engendered significant responses from the private sector, both local and international. Real estate developers have bought into the vision and are investing more in housing. Donor partners are also supporting the policy with low-interest loans to real estate developers towards making housing affordable. This is expected to boost the building construction sector and, as a result,

the demand for building materials, including cement. The accelerated development of the road sector implies that moulding of culverts and drains will increase and thus increase the demand for cement.

Major ongoing constructions and several affordable housing projects and the continually increasing investments in the real estate sector have increased the national demand for cement. By the simple economic principles governing demand and supply, the inordinately high demand for cement has escalated the product's escalated prices, coupled with shortages, both artificial and real.

A “no-project” scenario will perpetuate and exacerbate the pertaining situation, which has recently merited public outcry in the national media. This will adversely affect national development.

4 ENVIRONMENTAL AND SOCIAL BASELINE INFORMATION

The baseline description of the project site and the area of influence (AoI) is examined according to the framework in Figure 4-1. The biophysical environment made up of the vegetation, climate, drainage, topography and geology are examined. Aspects of the social environment such as administrative, demographic and economic as well as public health and safety information are also examined.

Although the project concept is such that it has the potential to have an influence at the national and to some extent at the international level *(for instance in terms of procurement, etc.),* majority of impacts; both positive and negative; will be experienced by the more immediate environment, communities in close proximity to the project site and the project municipality, Kpone Katamanso Municipal Assembly (KKMA). Baseline data collection therefore focused on providing information to support the assessment of such impacts.

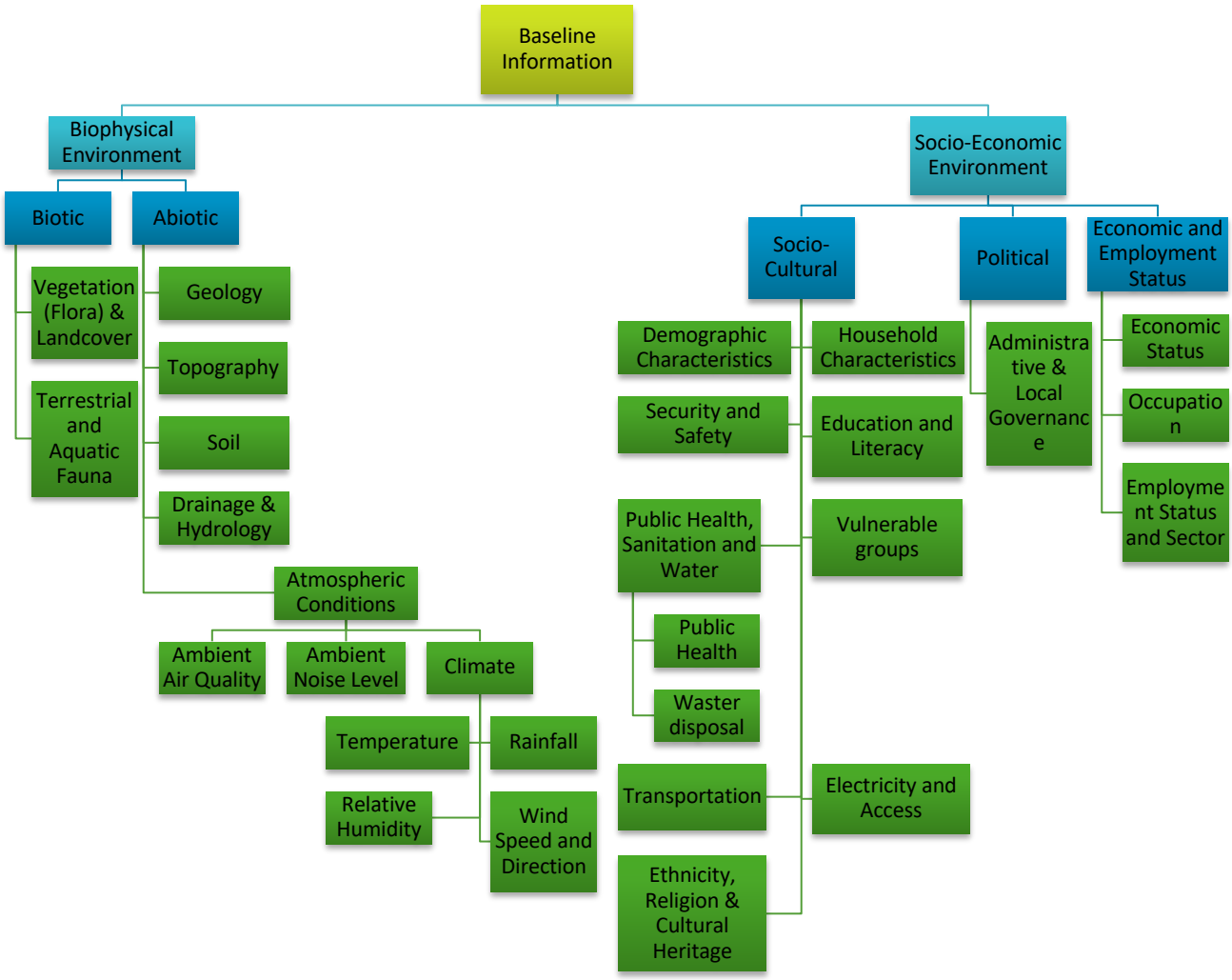


Figure 4-1: Framework for examining baseline information

4.1 AREA OF INFLUENCE

The scope of description of the biophysical characteristics for the proposed expansion and modernisation is guided by an area of influence (AoI) developed from a fixed corridor technique[9]. This technique was chosen since it is simple, relatively easy to understand and measure and also offers easy data accessibility. The AoI includes:

- the physical project footprint;
- a 1-kilometre perimeter buffer around the project site, serving as the primary AoI; and
- a 12-kilometre buffer around the perimeter of the project site serving as the secondary AoI.

Description of the biophysical environment is therefore concentrated within but not limited to the physical project footprint, 1-kilometre and the 12-kilometre buffer. This AoI was created from the perimeter of the proposed site (including the new site to be acquired for clay storage) since the impacts on the receiving biophysical media are likely to be highest in this area.

4.2 ENVIRONMENTAL BASELINE INFORMATION

4.2.1 Topography

The topography of KKMA is generally flat and forms part of the coastal plains, ranging from mean sea level in the south to about 35 meters above mean sea level (mamsl) in the north. Similarly, the project is site and AoI is relatively flat. A shown in Figure 4-2, the southern portion of the AoI is typically below 30 mamsl due to its proximity to the coast while the northern portion of the AoI peaks at 63 mamsl due to its proximity to the Akuapim-Togo Range.

The project site also portrays a flat terrain (see Figure 4-3). A south-west to north-east elevation profile of the site indicates that the site has an average slope of 2.1 percent ranging from 19 mamsl to 25 mamsl. The project site slopes gently towards the southwest and will have implications for site drainage layout. Due to the relatively flat terrain of the site, excavation and levelling will not be extensive.

[9] Morgan G. (2013). *Defining a project's area of influence (AoI)*. The World Bank Group: Washington, DC

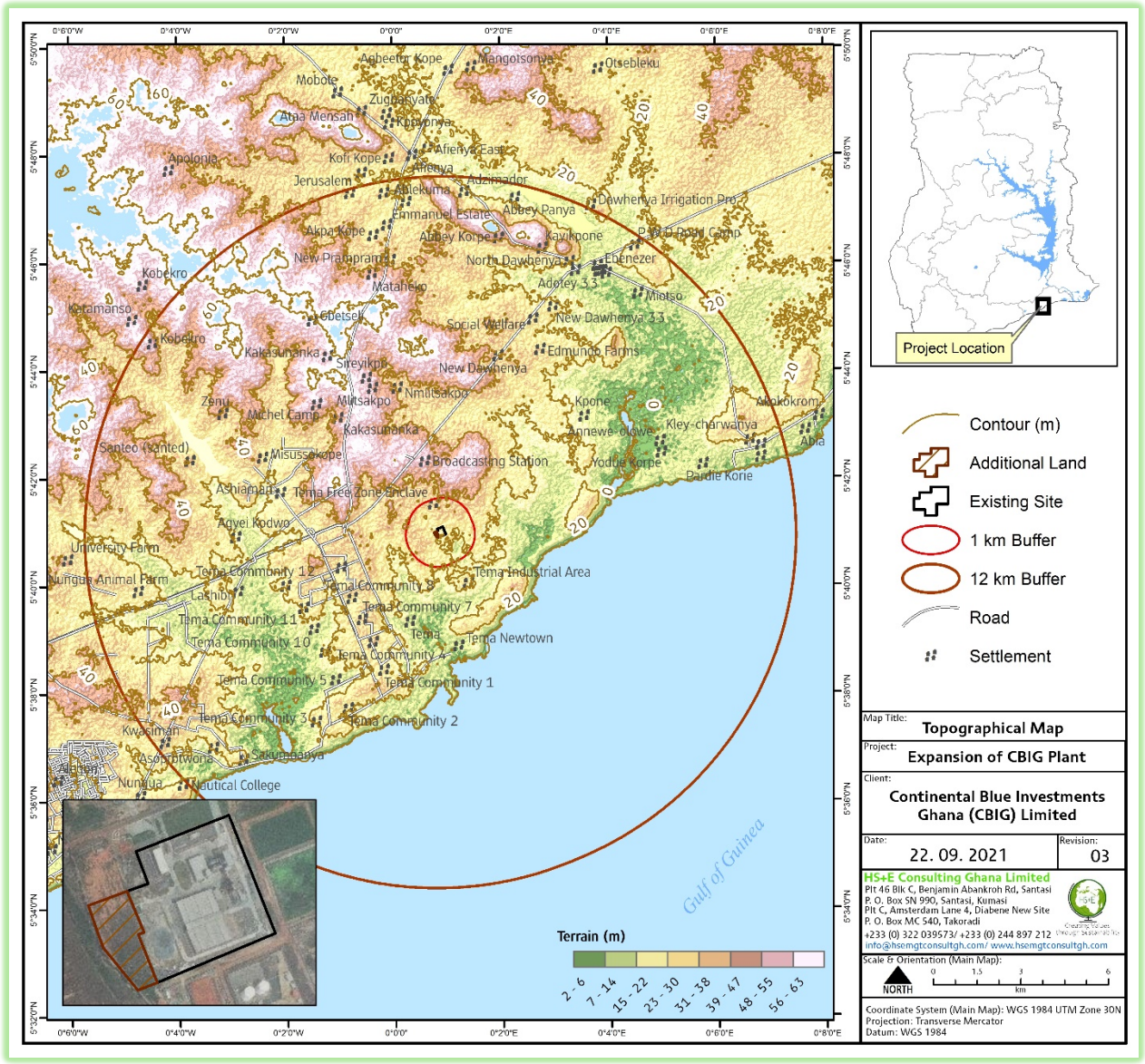


Figure 4-2: Topographical map of the project area

Figure 4-3: Elevation profile of Proposed cement grinding and bagging plant

4.2.2 Geology

The Precambrian rocks of the Dahomeyan formation underlie the Municipality. These are metamorphic rocks mainly consisting of granite, gneiss and schist which have been derived from sedimentary layers. By extension, the project AoI is largely underlain with Garnet, Hornblende Gneiss (see Figure 4-4). These are distinctive mineral metamorphic rocks with some specimens of gneiss containing minerals such as biotite, cordierite, sillimanite, kyanite, staurolite, andalusite, and garnet.

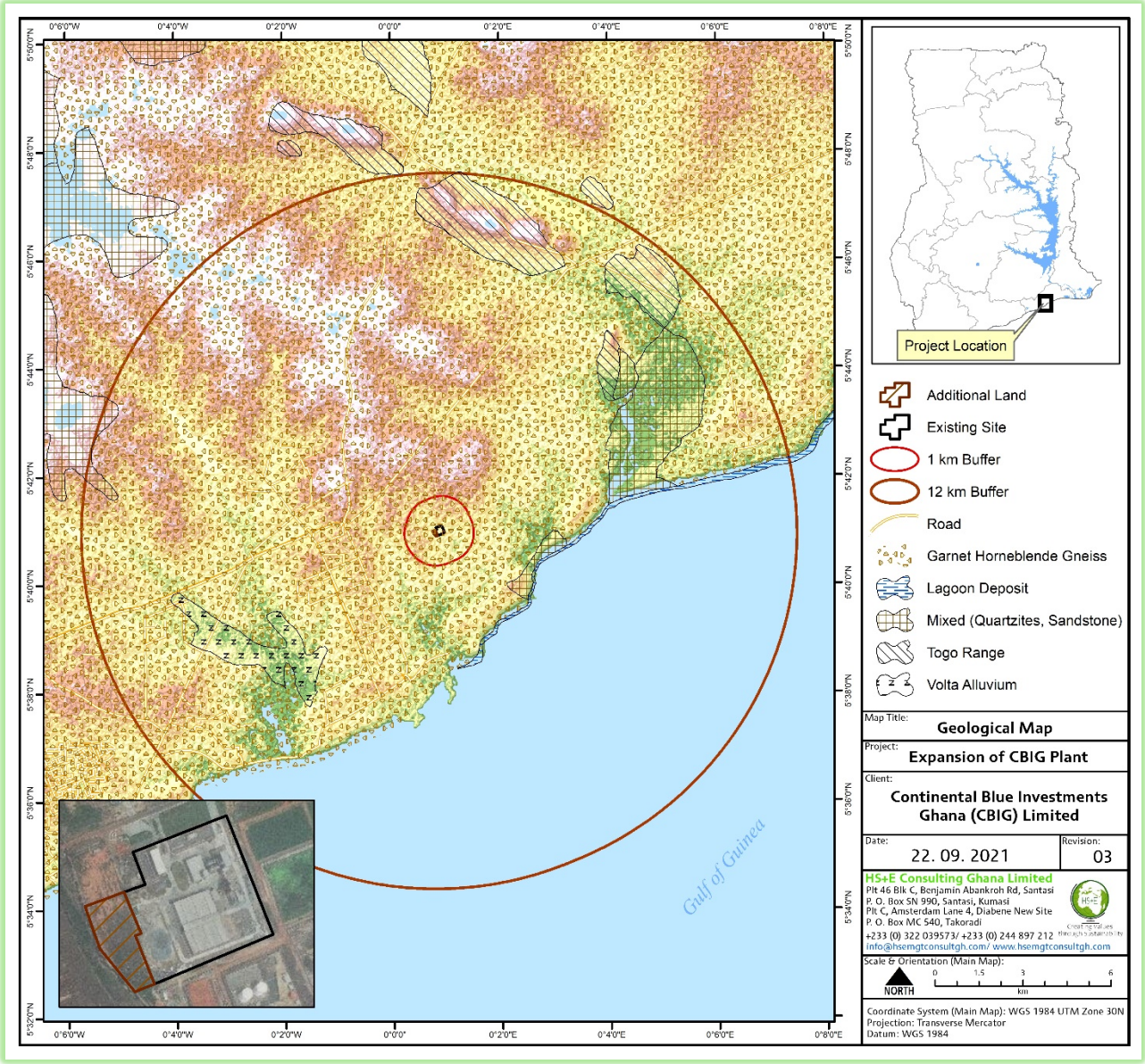


Figure 4-4: Geological map of the project area

According to earlier studies at the project site, the storage area and its environs (including the new site clay storage) are underlain by the Dahomeyan rock of the Precambrian age which forms the basement complex of almost the entire country. The project site can be considered to fall within the

acid gneiss region, which generally consists of foliated-biotite gneiss, quartz-feldspar gneiss and amphibolite's. There are no major faults in the Dahomeyan gneiss, as a whole. These rocks decompose to slightly permeable calcareous clay and sandy gravels. These factors coupled with other geological factors render the rocks fully competent with high bearing capacities. The additional components required for clay calcination and expanded operations are therefore not expected to stress the underlying geology.

4.2.3 Soil

The soil types in the Municipality are sandy, clayey, humus soils and suitable for farming activities. Some portions of the land in the Municipality are very rocky. As shown in Figure 4-5, Simpa-agawtaw soils dominate the project area and are the soils at the project site.

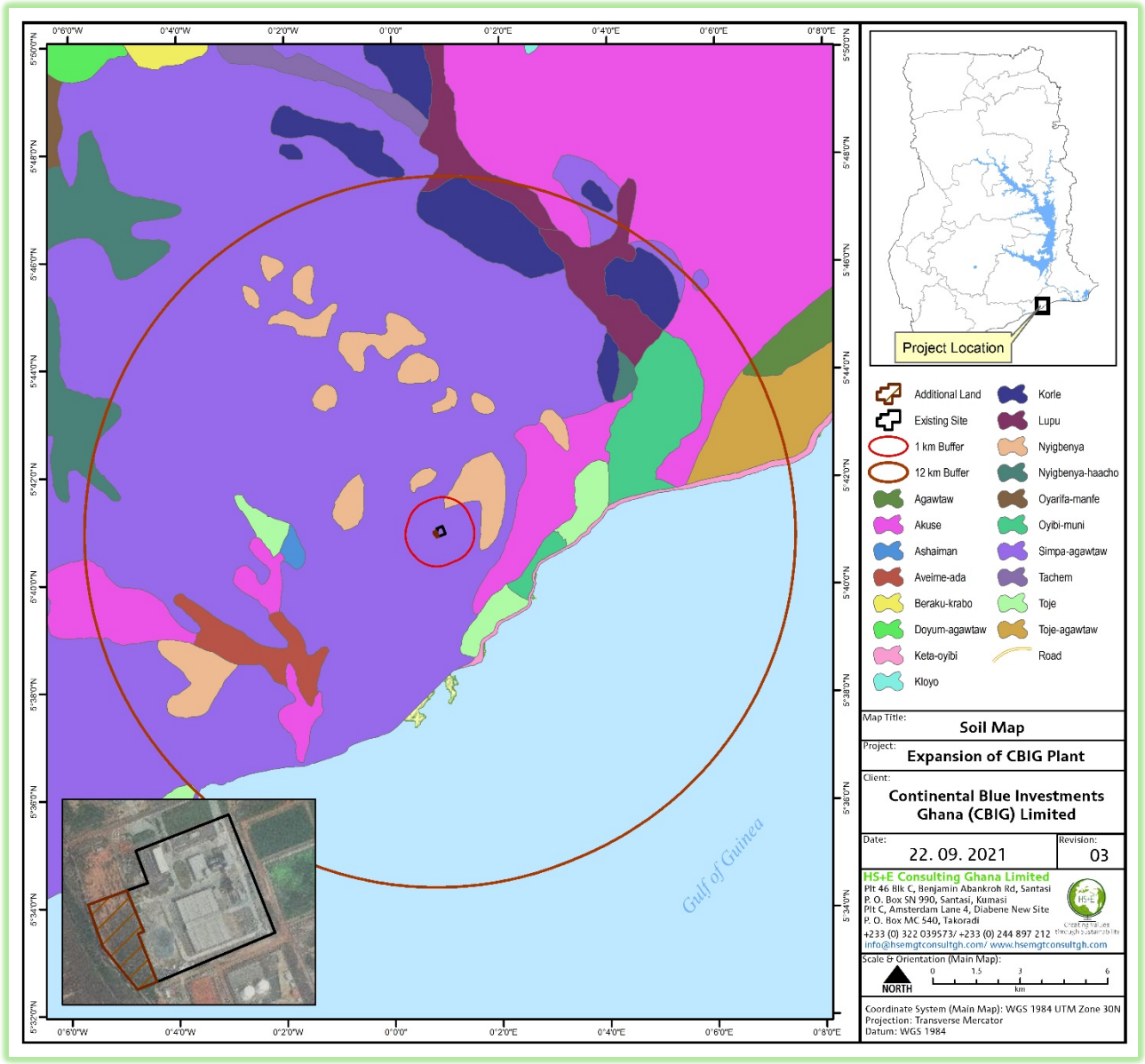


Figure 4-5: Soil map of the project area

The topography of this soil unit is very gently undulating and slopes in most areas are less than 3 percent. Well defined stream courses are few and valleys are broad and wide. The major soils are Simpa and Agawtaw series. They are developed over Dahomeyan acid schists and gneisses. The major upland soil is Simpa series which consists of pale-coloured sand overlying gravelly sandy loam to sandy clay. The major lowland soil is Agawtaw series and consists of grey, brown compact sodic hard pan sometimes calcareous clays. The topsoil consists of loose to medium reddish brown sandy silt. It is about 0.5m thick and consists predominantly of silt and some sand and gravel and exhibits moderate plasticity. The storage area (including the new site clay storage) is underlain by about 0.5-1.1 m sandy silt. Gravel in turn overlies between 1.8-3.8 m thick sandy gravel with silt and sandy clay at certain places.

Other soil types in the project area include Akuse, Keta-Oyibi, Nyigbenya, Oyibi-Muni and Toje soils.

4.2.4 Drainage and Hydrology

The Municipality falls within the Volta Basin and is well drained by surface water bodies including Gyorwulu, Gbagbla-Ankormu, Ayrokorgyor, among others. These water bodies generally have a dendritic pattern and are mostly at their mature stage. Most of these water bodies have been polluted by anthropogenic activities closely related to rapid urbanisation and poor sanitation. Groundwater in the project area generally has high salt content due to marine influence.

There is no stream in the immediate project area (see Figure 4-6). However, the water table is fairly low, varying between 3 and 4 m resulting in ephemeral streams after heavy rains. But these quickly dry up due to the soil structure. The GFZA provides liquid waste treatment facilities for industries in the TEPZ, as well as waste disposal services for generated solid wastes. Therefore, there is a central sewerage network for the management of run-off and effluent from the TEPZ. Grey and black water from ablution facilities will therefore be connected to the central sewerage system and is not expected to have any significant impact on groundwater or any immediate surface water.

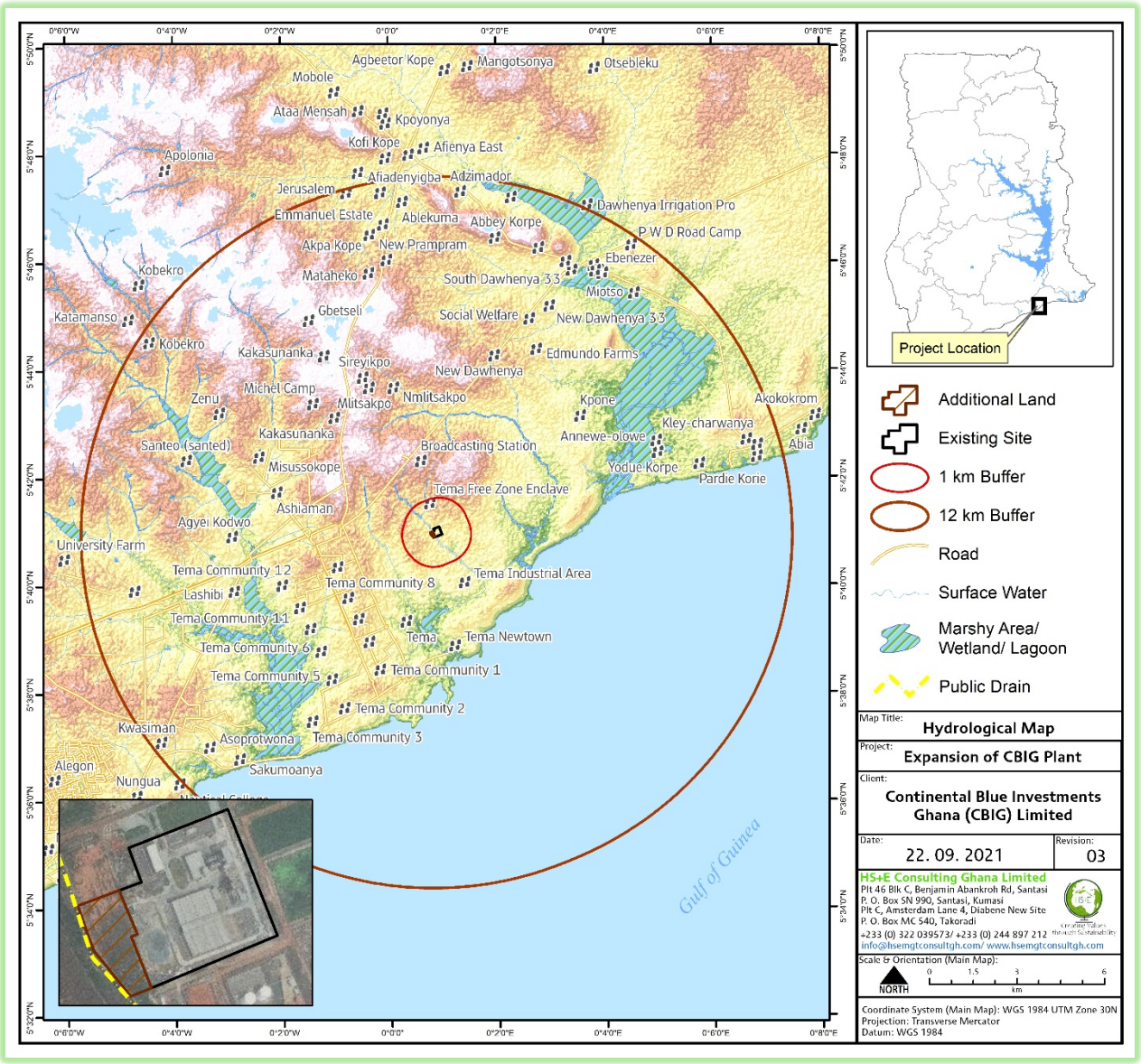


Figure 4-6: Hydrological map of the project area

4.2.5 Vegetation Type, Flora and Fauna

Vegetation of the eastern part of Accra, extending to Tema, forms part of the Accra Plains and has been affected over the years by climatic, edaphic and anthropogenic factors. The proposed project site (including the new site for clay storage) falls within the coastal savannah zone (see Figure 4-7), which comprised of bare land with patches of grasses and herbaceous plants.

Presently, the major form of vegetation in the immediate project area and the new site for clay storage is *Gramineae* (grasses), and sparsely distributed brush. The vegetation consists mainly of coastal scrub and grassland. The existing footprint of CBI operations have already been cleared with the exception of lawns purposely grown as ornamentals. Earlier surveys in the immediate project area identified the following grass and herb species as common in the area (see Table 4-1).

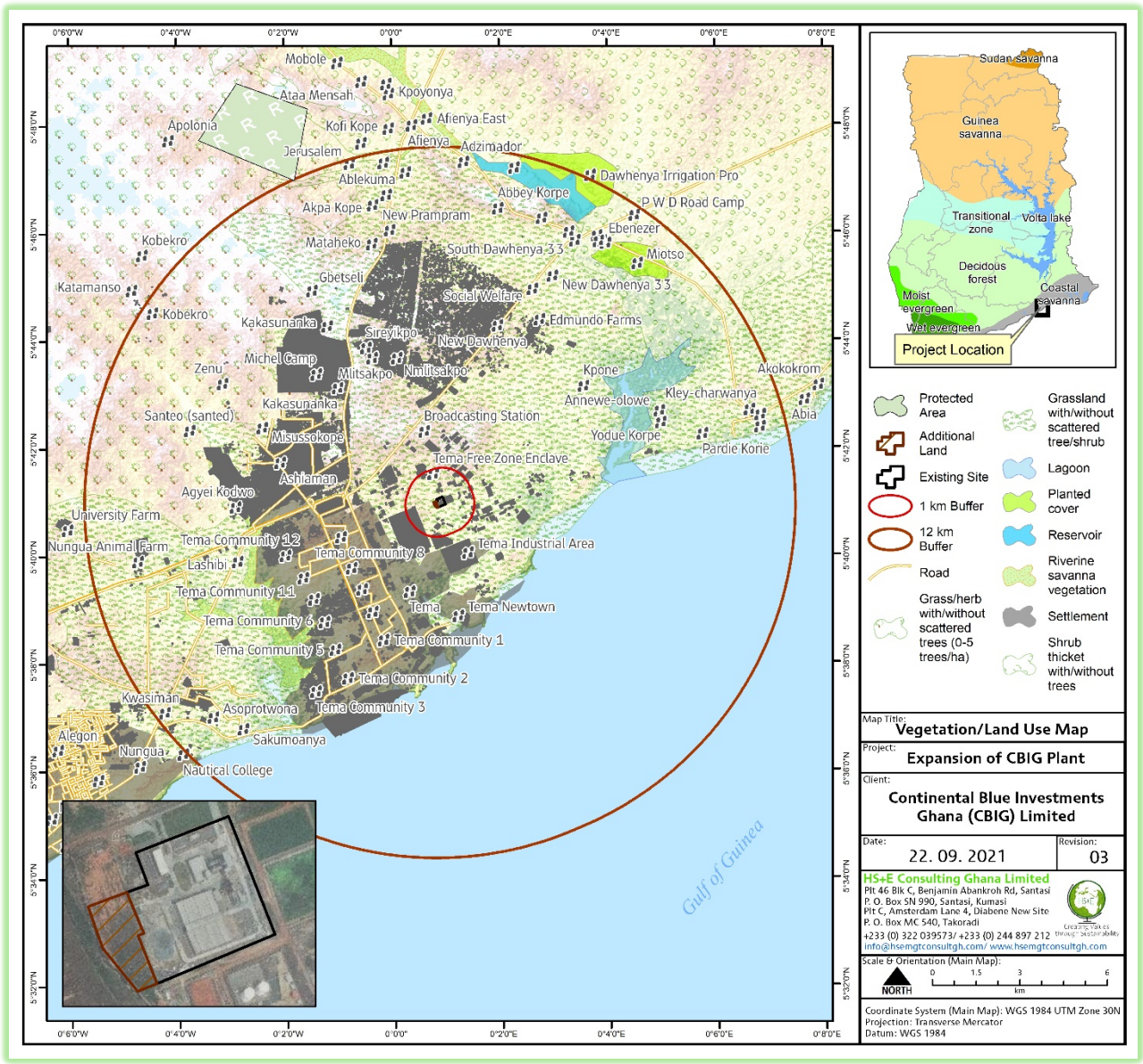


Figure 4-7: Vegetation and land use map of the project area

Table 4-1: Some grasses and herbs common in the project area

Common name	Scientific Name
Water leaf	*Talinum triangulares*
Rat tail grass	*Sporobolus pyramidalis*
Guinea grass	*Panicum maximum*
Devil's bean	*Crotalaria retusa*
Rush nut/ Earth almond	*Cyperus esculentus*
Sensitive plant	*Mimosa pudica*

Since the immediate project area has been screened for ecological sensitivity and earmarked for industrial developments, no endangered or threatened plant species, either locally or internationally, are likely to be found in the area. Fauna spotted on the immediate project area included reptiles (Agama lizards), rodents and birds. A few animal species are known to occur in the project area. An

earlier faunal survey conducted through interviews, direct observation and identification of animal spoors identified the following fauna species in the immediate project area (see Table 4-2).

Table 4-2: Some fauna species common in the project area

Type	Common name	Scientific Name
Mammals	Striped Grass Rat	*Lemniscomys striatus*
	Cane rate	*Thrypnomys swinderianus*
Birds	Gray-headed sparrow	*Passer griseus*
	Cattle egret	*Bubulcus ibis*
	Pied Crow	*Corvus Albus*
Reptiles	Rainbow lizard	*Agama agama*
	Orange-flanked skink	*Mabuya perotetti*
	Black and white cobra	*Naja melanoleuca*

4.2.6 Ecosystem Services

The Millennium Ecosystem Assessment (MA) (2003) and the Common International Classification of Ecosystem Services (CICES) both categorized ecosystem services into four namely: provisioning services, support services, regulatory services, and cultural services. The provisioning services, regulatory services, support services and cultural services are present in the project area but limited primarily due to rapid urbanization and industrialization of the area. Some ecosystems services identified during the assessment through interviews, field observations, and review of secondary data are compiled in Table 4-3**.**

Table 4-3: Ecosystem services in the project area

Category	Local benefits
Provisioning services	▪ Food provision (crops, fruits, vegetables and livestock) ▪ Water ▪ Grasses as fodder for goats and sheep ▪ Herbs and medicinal plants
Regulating services	▪ Pollination ▪ Groundwater purification ▪ Trapping of dust particles
Cultural services	▪ Beautification of open area with lawns and ornamental plants ▪ The premises is well planned and laid out to add aesthetic value
Supporting services	▪ Support soil formation ▪ Soil fertility maintenance (addition of organic matter)

4.3 ATMOSPHERIC CONDITIONS

4.3.1 Climate

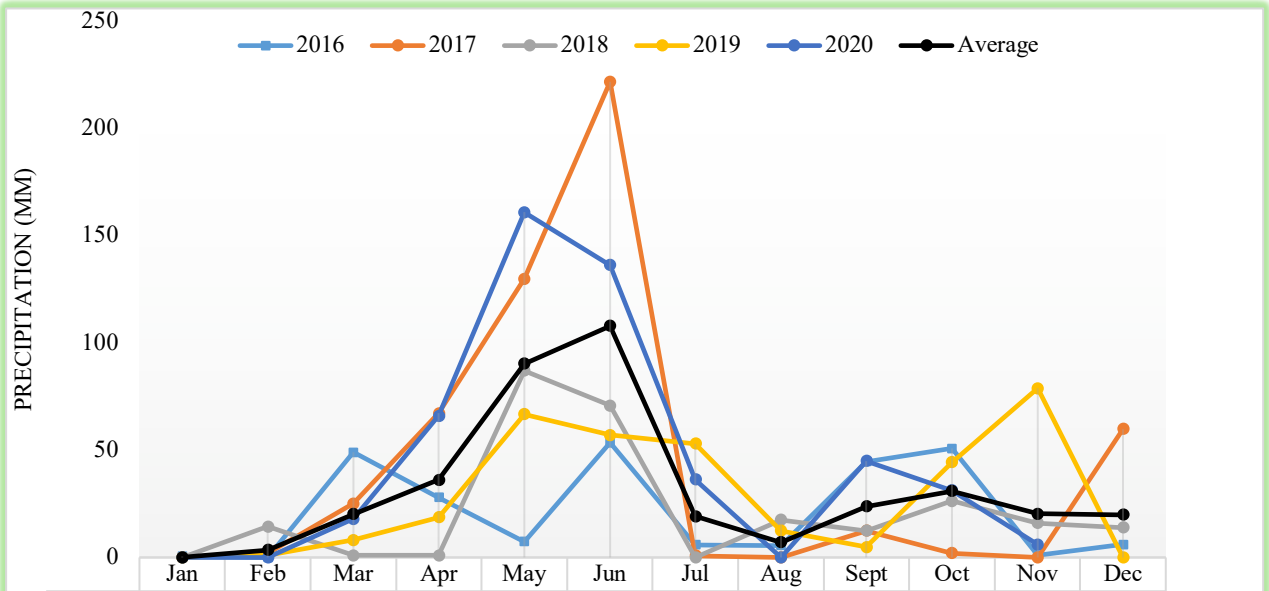
The Municipality lies in the coastal savannah zone of Ghana and therefore enjoys a dry equatorial climate. To understand the climatic characteristics of the project area, five years (2016 – 2020) of monthly meteorological data, recorded at the Tema Meteorological Station [654730 (DGAT)] of the

Ghana Meteorological Agency (GMet), were obtained directly from GMet and the National Centers for Environmental Information (NCEI). This station, which is located less than 4 km south of the Project site, is the closest reliable climatic data source. The information provided was used to characterise the precipitation, temperature, relative humidity, wind direction and speed in the project area.

4.3.1.1 Precipitation (Rainfall)

KMMA lies in one of the driest parts of the country. Mean annual rainfall historically ranges between 730 millimetres (mm) to 790 mm. The rainy season is usually from April to July (major rainy season) and from September to November (minor rainy season). The highest amount of rain is experienced from May to July, when the monsoons are predominant and are accompanied by squalls.

As shown in Figure 4-8, the major rains begin in April and end in July. The rains become intermittent in the last few months of the year. The highest rainfall is recorded in the month of May and June making them the wettest months of the year. The driest month is January, recording no rainfall throughout the period under consideration. The rainfall pattern could inform the proposed expansion and modernisation schedule especially for concrete works. It is recommended that the period between November and February are maximised for concrete works to ensure adequate curing.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2016	0,51	0	49,03	27,94	7,36	53,59	5,84	5,58	44,7	50,8	1,01	6,1
2017	0	2,03	25,15	67,31	130,05	222,01	0,76	0	12,45	2,03	0	59,94
2018	0	14,48	1,02	1,02	87,11	70,81	0	17,52	12,45	26,4	16,01	13,97
2019	0	1,02	8,13	18,79	66,8	57,14	53,09	12,44	4,82	44,44	78,99	0
2020	0	0	18,03	66,04	161,04	136,4	36,31	0	44,96	31,24	6	
Average	0,10	3,51	20,27	36,22	90,47	107,99	19,20	7,11	23,88	30,98	20,40	20,00

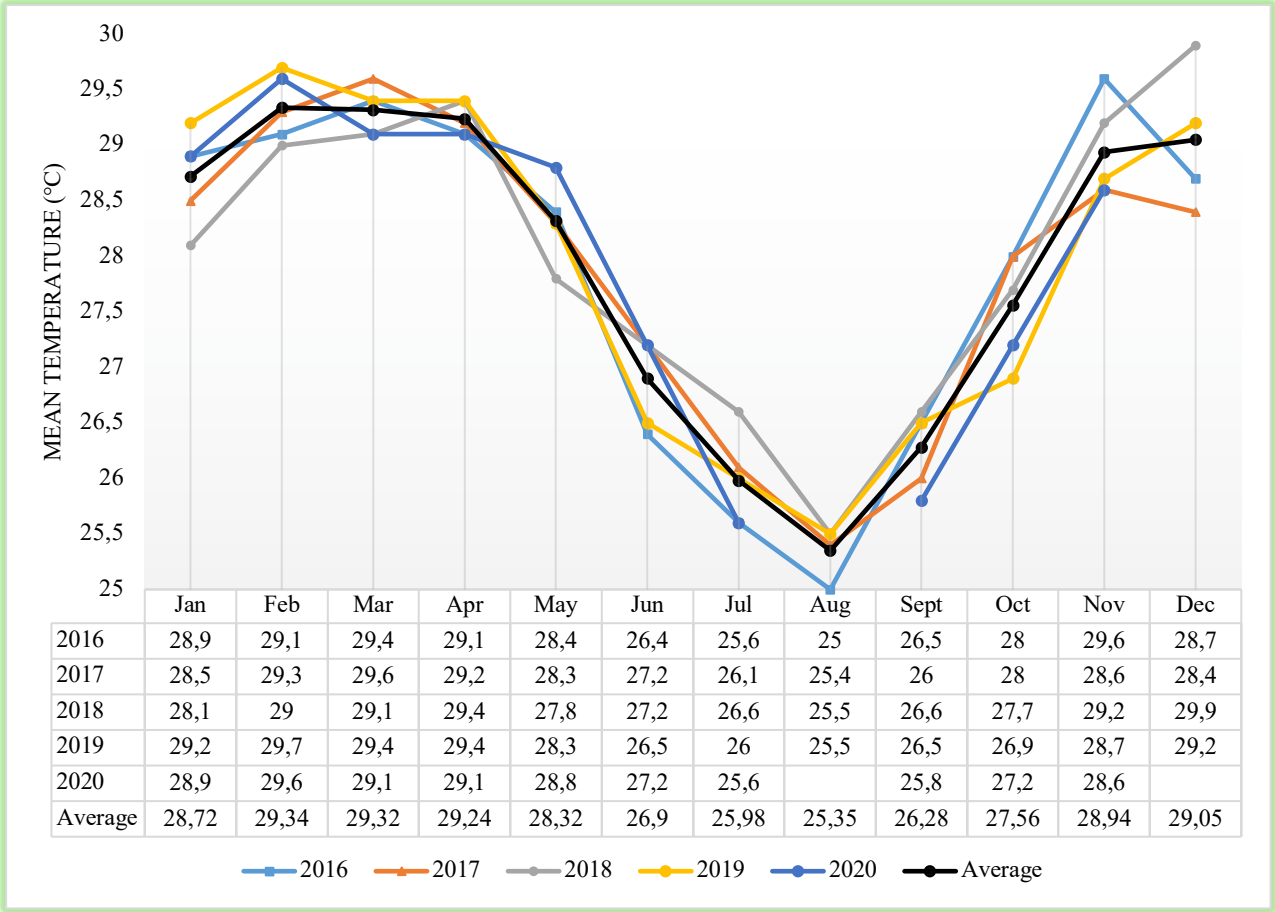
Figure 4-8: Amount of Precipitation in the project area

4.3.1.2 Average Temperature

Temperatures in the Municipality are high all year round with significant daily and seasonal variations. The annual average temperatures range from 25 degree Celsius (°C) in the major rainy season while in the minor season, temperatures range from 27 °C to 30°C.

The highest temperature in the project area is always recorded between February and March, with daytime temperatures reaching up to 32 °C. This period precedes the onset of the minor rains, which has a mean monthly temperature of about 29 °C. The period between July and August is relatively cool, with mean temperatures of about 25.5 °C. At some coastal locations in the Metropolis, minimum temperatures could be as low as 15°C. Figure 4-9 gives the monthly mean temperatures between 2016 and 2020 in the project area.

Adequate design parameters will take into account the annual variation of temperatures and its inevitable influence on the expansion and contraction of steel components. The relatively high temperature characteristic of the project area will also require health and safety considerations for construction workers especially expatriate staff, if applicable.

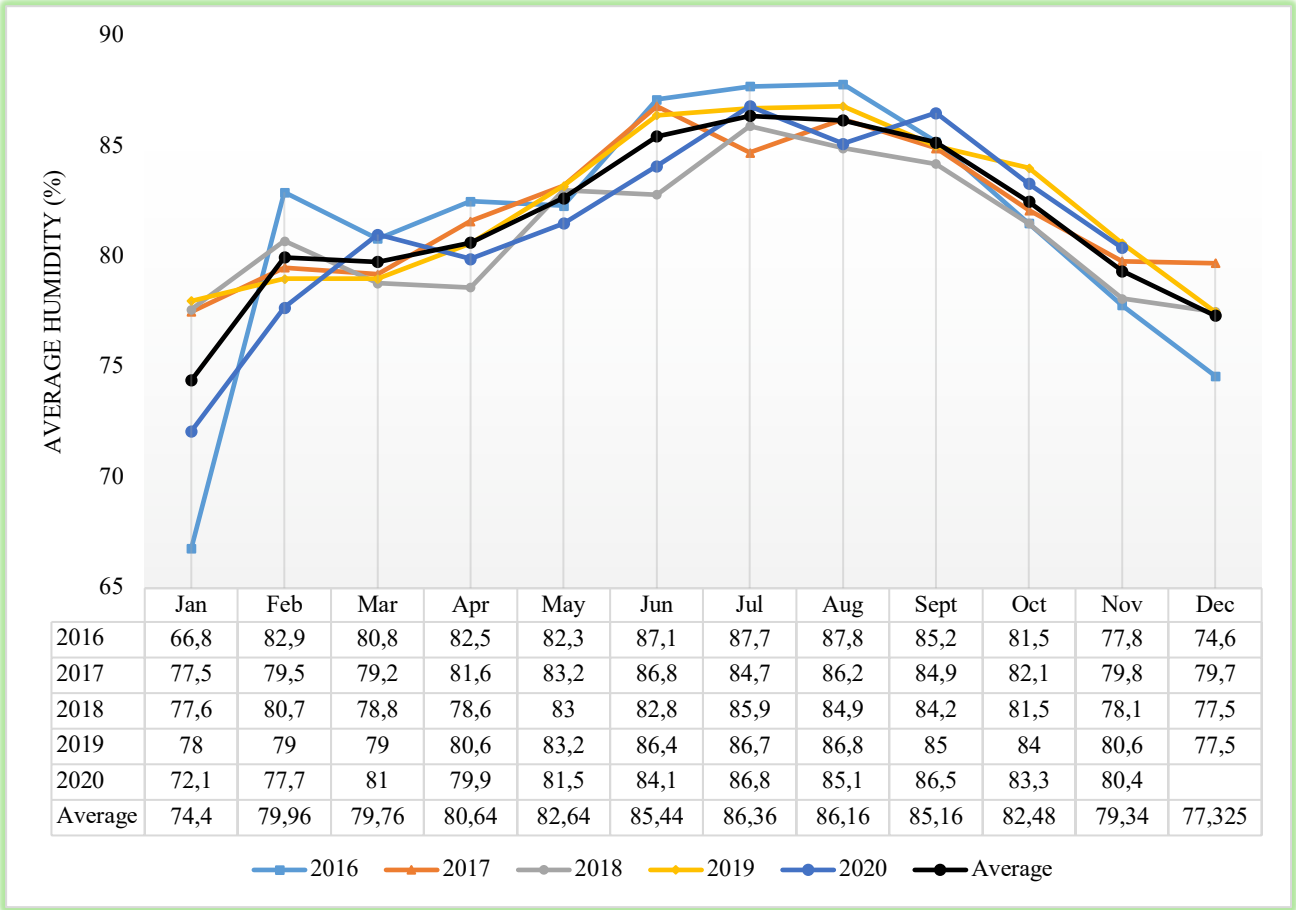


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2016	28,9	29,1	29,4	29,1	28,4	26,4	25,6	25	26,5	28	29,6	28,7
2017	28,5	29,3	29,6	29,2	28,3	27,2	26,1	25,4	26	28	28,6	28,4
2018	28,1	29	29,1	29,4	27,8	27,2	26,6	25,5	26,6	27,7	29,2	29,9
2019	29,2	29,7	29,4	29,4	28,3	26,5	26	25,5	26,5	26,9	28,7	29,2
2020	28,9	29,6	29,1	29,1	28,8	27,2	25,6		25,8	27,2	28,6	
Average	28,72	29,34	29,32	29,24	28,32	26,9	25,98	25,35	26,28	27,56	28,94	29,05

Figure 4-9: Average Temperature (°C) within the project area

4.3.1.3 Relative humidity

Relative humidity refers to the ratio of actual vapour pressure of water in the air to that in air saturated with water vapour; often expressed as a percentage. The project area records high relative humidity figures from the beginning to the end of the year, as shown in Figure 4-10. Relative humidity is at its peak in the months of June and July. Low relative humidity occurs in the month of January and is coupled with the Harmattan Winds resulting in relatively higher daytime temperatures. Working conditions that reduce continuous exposure to extreme weather conditions will be adopted within this period. High humidity values will have implications on the rate of oxidation reduction reactions to the proposed project facilities. It is therefore recommended that project facilities are made of materials resistant to the effects of corrosion.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2016	66,8	82,9	80,8	82,5	82,3	87,1	87,7	87,8	85,2	81,5	77,8	74,6
2017	77,5	79,5	79,2	81,6	83,2	86,8	84,7	86,2	84,9	82,1	79,8	79,7
2018	77,6	80,7	78,8	78,6	83	82,8	85,9	84,9	84,2	81,5	78,1	77,5
2019	78	79	79	80,6	83,2	86,4	86,7	86,8	85	84	80,6	77,5
2020	72,1	77,7	81	79,9	81,5	84,1	86,8	85,1	86,5	83,3	80,4	
Average	74,4	79,96	79,76	80,64	82,64	85,44	86,36	86,16	85,16	82,48	79,34	77,325

Figure 4-10: Relative humidity (percent) of the project area

4.3.1.4 Wind Speed and Direction

Wind speed and direction is of particular significance because of their possible effect on weather conditions. The predominant wind direction for the entire area is north-westerly throughout the year. The monthly average wind velocity is between 3 and 4 knots.

Wind speed, or wind flow velocity, is a fundamental atmospheric phenomenon which is caused by air moving from a high-pressure zone to a low-pressure zone. Wind velocity values recorded shows that the average monthly wind speed in the project area is 2.81 metre per second (m/s). Wind direction in the project area in depicted in Figure 4-11**.** Calm winds are experienced 2.07 percent of the time while the overall resultant wind vector of 239 degrees is experienced 80 percent of the time. South westerly winds are the dominant wind in the project area. This is followed by westerly winds and north westerly winds.

Wind direction is known to influence dispersion of dust particles (particulate). This means that dust particles and other pollutants from the proposed project activities will mostly disperse towards the north east direction, since the prevailing wind of the project area is from south west to north east. Dust from cement production during operation will also disperse with the same trajectory. Further investigations into the project's air dispersion characteristics are detailed in Section 6.6.

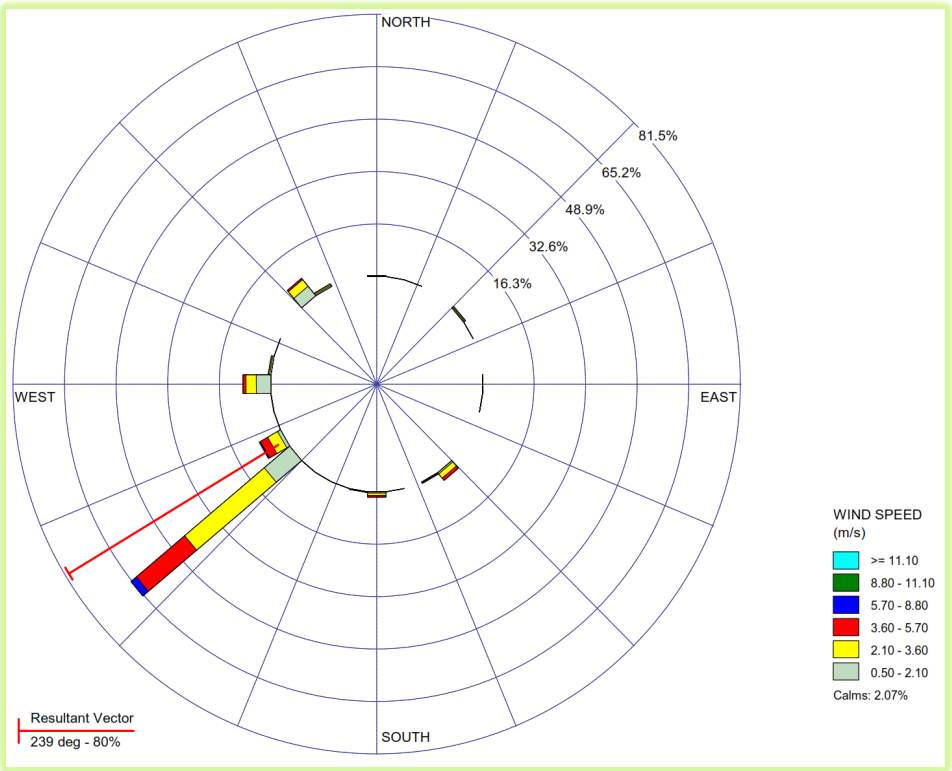


Figure 4-11: Wind rose of wind speed (m/s) and direction in the project area

4.3.2 Ambient Air Quality and Noise Levels

Tema has been built as an industrial city and houses major industries in Ghana. Operational activities of industries generate atmospheric pollutants like oxides of carbon, sulphur and nitrogen, as well as short chain hydrocarbons, lead, antimony and particulates, emanating from point sources such as factory boilers, diesel generators and the Tema Oil Refinery. Moving haulage trucks and other

vehicles, port machinery and ships at anchorage or within the port are also major sources of pollution and noise generation.

The TEPZ Enclave is also home to a number of major industries, including Barry Callebaut, Cargill, Commodity Processing Industry and Niche Processing Industry (all cocoa processing companies), Red Sea Housing, and Wilmar Africa Limited (an edible oil processing factory). Within the immediate proximity of the project site are the Tema Oil Refinery, Nobel Wig Production Company, 3F Company, the Mining Strategic Reserve Plant (MSRP), a thermal power plant, and tank farms belonging to Fuel Trade, Chase Petroleum, Puma and Blue Ocean Ridge Energy. Further south are Sentuo Steel Mills, VALCO (an aluminium smelting company that currently operates at reduced capacity) and Aluworks, an aluminium processing company. These companies generate atmospheric pollutants of various compositions and different discharge dynamics.

The main components of air quality expected to be affected by the proposed expansion and modernisation project are particulate matter of aerodynamic diameter less than 10 microns (PM_{10}), $PM_{2.5}$, Total Suspended Particles (TSP), nitrogen oxides (NO_2), sulphur oxides (SO_2) and carbon monoxide (CO). During construction, particulates are expected from civil works and movement of trucks while gaseous emissions are expected from the exhaust of trucks/ concrete mixing machines and from welding activities. Raw material transport, storage, transfer and cement bagging, loading and transport will generate particulates during operation. Gaseous emissions are expected from the calciner, on-site diesel generator as well as raw material and finished product trucks.

Figure 4-12: Spatial location of historical monitoring locations

Historical and current on-site noise level and air quality information from the project site have been provided in Table 4-4 and Table 4-5 respectively. The monitoring values are 24-hour averages recorded during operation of the existing CBI Ghana Limited cement grinding and bagging facility. The ambient air quality and noise level monitoring were conducted by the Environmental Quality/ Laboratory Services Unit of the EPA in accordance with the Ghana Standards for Environment and Health Protection (GS 1236:2019 & GS 1253:2018). The spatial location of the monitoring locations are shown in Figure 4-12, above.

Table 4-4: Historical ambient noise levels within the project site

Monitoring Location	First Half of 2020	Second Half of 2020	First Half of 2021		
			Jan	Feb	Mar
North-Western End (security post end) (5°41'2.56"N, 0° 0'48.02"E)	67.2 dB(A)	65.5 dB(A)	64.3	70.0	66.2
South-Eastern End of factory (5°40'57.15"N, 0° 0'57.07"E)	59.05 dB(A)	63.55 dB(A)	59.8	60.5	56.6
North - Eastern end of the factory (5°41'4.65"N, 0° 0'53.92"E)	64.1 dB(A)	63.15 dB(A)	60.7	65.3	63.7
South - Western end of the factory (5°40'54.01"N, 0° 0'49.35"E)	65.4 dB(A)	66.2 dB(A)	-	-	-
GS 1222:2018[10]	*70 dB(A)*	*70 dB(A)*	*70 dB(A)*		

All historic and current ambient noise levels recorded for the existing CBI Ghana Limited operations were within permissible limits for heavy industrial areas (see Table 4-4).

Some historical and current ambient air quality parameters reviewed exceeded regulatory limits (see Table 4-5). All gaseous pollutant levels were within regulatory thresholds. The exceedances were mostly related to particulates (TSP, PM_{10} and $PM_{2.5}$). Though this cannot be attributed solely to the operations of CBI Ghana Limited since the TEPZ have many industries that also generate fine dust from their operations, CBI Ghana Limited remains committed to ensuring that $PM_{2.5}$ emissions from its operations are maintained within regulatory limits. CBI Ghana Limited will also integrate an online stack monitoring system into the proposed project design to facilitate real-time monitoring of emissions from its operations.

[10] Permissible Noise level for heavy industrial areas (day & night)

Table 4-5: Historical ambient air quality data within the project site

Location	North-Western End (5°41'2.56"N, 0°0'48.02"E)					South-Eastern End (5°40'57.15"N, 0°0'57.07"E)					Clinker and limestone grinding area				
Month and Year	NO_2 (µg/m^3)	SO_2 (µg/m^3)	$PM_{2.5}$ (µg/m^3)	PM_{10} (µg/m^3)	TSP (µg/m^3)	NO_2 (µg/m^3)	SO_2 (µg/m^3)	$PM_{2.5}$ (µg/m^3)	PM_{10} (µg/m^3)	TSP (µg/m^3)	NO_2 (µg/m^3)	SO_2 (µg/m^3)	$PM_{2.5}$ (µg/m^3)	PM_{10} (µg/m^3)	TSP (µg/m^3)
January, 2020	3.85	32.4	39.78	70	-	2.4	30.1	38.43	69.2	-	-	-	-	-	-
February, 2020	1.94	28.91	36.3	68.89	-	2.3	26.87	35	68.6	-	-	-	-	-	-
March, 2020	2.91	29.39	37.76	68.3	-	1.14	20.67	36.29	61.41	-	-	-	-	-	-
April, 2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May, 2020	2.97	25.36	38	69.1	-	2.4	21.7	35.2	66.7	-	-	-	-	-	-
June, 2020	3.32	21.06	39.83	69.9	-	5.5	20.7	34.8	67.4	-	-	-	-	-	-
July, 2020	3.7	21.9	40.1	68.6	-	4.2	22.6	36.1	69	-	-	-	-	-	-
August, 2020	4.41	23.02	33.7	67.5	-	3.9	24.1	34.9	66.8	-	-	-	-	-	-
September, 2020	3.41	24.11	36.91	69.6	-	5	26.13	39.1	68.2	-	-	-	-	-	-
October, 2020	2.99	27.5	37.4	68.89	-	5.5	24.5	35.8	67.7	-	-	-	-	-	-
November, 2020	5.76	29.37	41.67	69.44	-	3.84	18.69	39.83	70	-	-	-	-	-	-
December, 2020	6.1	23.7	35	70	-	6.9	16.15	36.8	69.92	-	-	-	-	-	-
January, 2021	37.34	4.33	36.01	69.5	102	20.66	2.14	34.9	68.2	137.4	17.50	1.90	34.9	69.3	138.1
February, 2021	30.22	2.93	34.9	68.2	137.4	21.05	2.32	35.0	67.7	102.5	18.76	2.02	34.4	70.0	108.7
March, 2021	33.52	3.51	36.32	70.54	125	27.87	2.67	37.52	71.27	129.27	19.62	1.95	38.34	73.56	133.03
May, 2021	-	-	28	56	97	-	-	83	125	167	-	-	56	83	167
GS 1236:2019[11]	*150*	*50*	*35*	*70*	*150*	*150*	*50*	*35*	*70*	*150*	*150*	*50*	*35*	*70*	*150*

[11] Maximum Limits for Ambient Air Quality (24 hours) – Results highlighted red denote exceedances

4.4 SOCIO-ECONOMIC AND CULTURAL BASELINE INFORMATION

In contemporary times, developmental projects are focused on improving the quality of life and livelihood of individuals in the beneficiary communities. Analysis of prevailing socio-economic conditions in the project area is therefore crucial as it serves as a benchmark for forecasting the social, economic, community health and safety risks associated with a specific project.

The potential socio-economic impacts resulting from the proposed project will primarily be experienced at the municipality level. Regional impacts are expected in relation to improved industrial outlook and wider socio-economic multipliers as well as fulfilment of the Government of Ghana's industrialisation drive and the Sustainable Development Goals 1, 2, 8 and 9. A jurisdictional or neighbourhood approach[9] has therefore been adopted in defining the project's sphere of influence for the socio-economic baseline analysis. This approach has been chosen due to information scarcity at the community level. The socio-economic characteristics examined in the following sections will thus be in relation to the Kpone-Katamanso Municipality.

4.4.1 Administrative and Local Governance

Kpone-Katamanso Municipal Assembly (KKMA) is the highest political authority in the Municipality and exercises deliberative, legislative and executive powers. In total, the Assembly has a membership of 29. The membership is made up of 18 elected, 9 appointed, 1 Member of Parliament, and 1 Municipal Chief Executive (MCE). The MCE is the political head of the Municipality whilst the Municipal Coordinating Director is the administrative head. The Municipality has four (4) area councils namely; Kpone (Afieye, Laloi and Dingla), Kamsbeg (Bethelhem, Gbetsile, Kakasunanka, Sebrepor and Nmlitsakpo), Zekas (Zenu, Katamanso, Appolonia and Saasabi), and Onsbac (Oyibi, Nanoman, Saduase and Bawaleshie).

The Municipality has recognised traditional authorities that help in the developmental process of the Municipality. In Kpone, the head of the traditional institution is the paramount chief who rules with the help of the council of elders. These chiefs help to settle disputes and plan development projects. The traditional council plays key roles in mobilising the people for communal activities and are often the first point of call for the preparation and organisation of social events. The Katamanso area has over 22 chiefs who represent the various communities. Apart from the Katamanso chief, all the other chiefs are responsible to the Tema Mantse (the paramount chief of Tema).

4.4.2 Demographic characteristics

According to the 2010 Population and Housing Census published by the Ghana Statistical Service (GSS)[12], the population of KKMA, was 109,864 representing 2.7 percent of the region's total population. Males constituted 48.7 percent and females represented 51.3 percent. About 90.4 percent of the population live in urban localities. The Municipality has a sex ratio of 88.9. The population of the Municipality is youthful (under 15 years) (34.5%) depicting a broad base population pyramid which tapers off with a small number of elderly persons 60 years and above (3.4%) (see Figure 4-12). The total age dependency ratio for the Municipality is 58.1, the dependency ratio in the rural localities is higher (58.7) than that of the dependency ratio in the urban areas (58.0). The annual growth rate of the Municipality is 2.6 percent. The current projected population size is 138,529 with 68,507 (49%) males and 70,022 (51%) females.

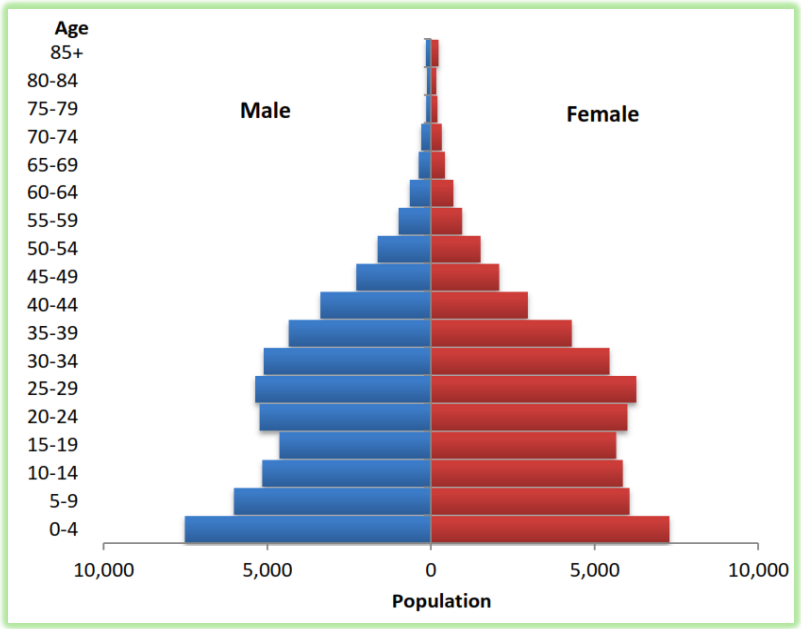


Figure 4-13: Population structure within KKMA[12]

4.4.3 Household Characteristics

The Municipality has a household population of 106,398 with a total number of 24,800 households. The average household size in the Municipality is 4.0 persons per household. Children constitute the largest proportion of the household members accounting for 38.4 percent. Spouses form about 12.6 percent while other relatives constitute 9.2 percent. Nuclear families (head, spouse(s), children) constitute 30.4 percent of the total number of households in the Municipality and this is followed by extended households (head, spouse(s), children and other relatives) (21.3%).

[12] Ghana Statistical Service (GSS). (2014). *2010 Population and Housing Census: District Analytical Report for the Kpone-Katamanso District*. GSS: Accra

4.4.4 Security and Safety

The immediate project area falls within the jurisdiction of the TEPZ Enclave, which is provided with security services. The entire enclave is walled off with a 10-foot perimeter wall, with a gated entrance and exit, constantly manned by trained personnel.

4.4.5 Education and Literacy

Of the population 11 years and above, 90.7 percent are literate, and 9.3 percent are nonliterate. The proportion of literate males is higher (94.7 %) than that of females (87.0%). About five out of ten people (49.3%) indicated they could speak and write in English and at least one (1) Ghanaian language. Of the population aged 3 years and above (100,670) in the Municipality, 8.7 percent has never attended school, 36.6 percent are currently attending, and 54.7 percent have attended in the past.

The Municipality has both public and private educational facilities. They comprise of kindergarten, nursery, primary and junior high schools. Both trained and untrained teachers are employed in these schools. According to the KKMA[13], there are 661 educational facilities across the length and breadth of the Municipality of which 99 are public basic schools and 562 private basic schools (see Table 4-3). The Municipality has 1 government senior high school and 3 private senior high school as well as 1 private university at Oyibi.

Table 4-6: Private and public schools in the Municipality[13]

Level	Number of schools		
	Public	Private	Total
Kindergarten	25	216	**241**
Primary	38	134	**172**
Junior High School	35	208	**243**
Senior High School	1	3	**4**
Tertiary	-	1	**1**
Total	**99**	**562**	**661**

Generally, private schools have higher enrolments and Teacher-Pupil Ratios (PTR) relative to public schools. Enrollments are generally higher in private schools except at the junior high school level.

Table 4-7: Teacher-Pupil Ratio (PTR) in the Municipality[13]

Level	Public			Private		
	Enrollment	Teachers	PTR	Enrolment	Teachers	PTR
Kindergarten	2364	72	33:1	11725	661	18:1
Primary	16039	346	46:1	32043	1612	20:1

[13] Kpone Katamanso Municipal Assembly. (2021). *Composite Budget for 2020 – 2024. Programme based Budget Estimates for 2021.* Ministry of Local Government and Rural Development: Accra

Level	Public			Private		
	Enrollment	Teachers	PTR	Enrolment	Teachers	PTR
Junior High School	11626	366	32:1	10682	997	11:1
Senior High School	752	51	15:1	256	34	8:1
Total	**30781**	**835**	**37:1**	**54706**	**3304**	**17:1**

4.4.6 Public Health, Water and Sanitation

4.4.6.1 Public Health

The Municipality has both private and public health facilities. There are a number of primary health facilities in the Municipality. Since the Municipality is close to Tema West, most referral cases are sent to the Tema General Hospital. The public health facilities in the Municipality have no resident doctors serving the people. However, they offer outpatient, antenatal and prenatal care services.

According to KKMA, there are 9 public health facilities, 20 private and 1 quasi-government facility. The public health facilities include 6 health centres and 1 Community-based Health Planning and Services (CHPS) compound at Seduase, Oyibi. There are 55 demarcated CHPS Zones and 41 functional CHPS Zones in the area. Also in existence are pharmaceutical shops and herbal centres that complement these facilities.

The infant mortality rates for 2018 and 2019 from both private and public health facilities were 2.2 and 0.85 per 1000 live births respectively. With respect to the top ten diseases in the Municipality, Malaria was the first on the chart as the most reported disease at the OPD since 2017 followed by Upper Respiratory Infection, Anaemia and other sanitation and environmental diseases.

4.4.6.2 Waste disposal

Most households (32.0%) dump their solid waste in a public dump. Another 29.2 percent have their solid waste collected. For liquid waste disposal, throwing waste onto the street (29.3%) and onto the compound (37.5%) are the two most common methods used by households in the Municipality.

The GFZA provides liquid waste treatment facilities for industries in the TEPZ, as well as waste disposal services for generated solid wastes.

4.4.7 Transportation

Haulage trucks bringing in raw material from the Tema Port to the project site will use the Harbour Road through to the Harbour Roundabout and the connection to Akosombo Road to the Motorway Interchange before using the Tema-Aflao Road to the entrance of the TEPZ enclave. Clay from Torgorme will use the Akosombo-Accra Road to the Motorway Roundabout before using the Tema-Aflao Road to the entrance of the TEPZ Enclave.

The road network within the TEPZ Enclave opens out onto the main Tema-Aflao Road. This is a two-lane dual carriage way, with a turning loop for users on the Tema-Aflao section who wish to turn around to Tema. The loop runs in front of the entrance of the TEPZ Enclave. Haulage trucks arriving at or leaving the enclave must necessarily use this road, which is quite a busy road. Because of the nearby BOST tank farm, bulk road tankers ply the road. However, traffic on the road is regulated by the location of traffic lights at the intersection with the Steel Works Road, ensuring that the traffic moves at a controlled pace.

Within the enclave, vehicular traffic is not much of a challenge. However, there is considerable vehicular traffic on the Akasanoma Road around the Motorway interchange and the Tema-Aflao Road, especially around the peak traffic hours, i.e., between 07:30 and 09:00 hours, and between 16:00 and 19:30 hours, when most commuters to Tema are arriving for daily business and departing to their homes respectively. This situation usually arises because of a build-up of vehicular traffic on the Motorway interchange that spills over onto the Aflao-Tema section of the road. The proposed project, at the construction and operation phases, could add to the traffic situation.

4.4.8 Electricity and Access

The Municipality is connected to the national grid and so has regular electricity supply. Located in the Municipality is the Asogli Thermal Plant which produces power and feeds same into the national grid for redistribution. The community also uses charcoal, kerosene, liquified petroleum gas and firewood as their source of energy for cooking and its related activities. Fisherfolks in the area also use pre-mixed fuel for their fishing operations.

4.4.9 Economic and Employment Status

4.4.9.1 Economic status

About 75.1 percent of the population aged 15 years and older are economically active while 24.9 per cent are economically not active. Of the economically active population, 91.6 percent are employed while 8.4 percent are unemployed. For those who are economically not active, a larger percentage of them are students (53.3%) and 23.7 percent perform household duties. Again, about 51.9 percent of the unemployed are seeking work for the first time and available for work.

4.4.9.2 Occupation

Of the employed population, about 31.2 percent are engaged as service and sales workers, 23.2 percent in craft and related trade and 12.0 percent in elementary occupations. About 15.9 percent are engaged as managers, professionals, and technicians.

In the Municipality, 8.3 percent of households are engaged in agriculture. In the rural localities, 10.6 percent of households are agricultural households while in the urban localities, 8.1 percent of households are into agriculture. Most households in the Municipality (62.5%) are involved in crop farming with chicken as the dominant animal reared in the Municipality.

4.4.9.3 Employment status and sector

Of the employed population 15 years and older 46.0 percent are self-employed without employees, while 2.9 percent are contributing family workers. About 7.2 percent are self-employed with employees and 36.9 percent are employees. The private informal sector is the largest employer in the Municipality, employing 70.5 percent of the population followed by the public sector with 7.4 percent.

4.4.10 Vulnerable Groups

Vulnerable groups are defined to include women and children, persons with disability, orphans and children orphaned by HIV/AIDS, trafficked children, child labourers and the aged because of cultural, social and economic factors[14]. According to the KKMA Health Directorate and the human immunodeficiency virus (HIV) Focal Person, the ratio of HIV prevalence was 3.8 and 3.9 per 1000, for the years 2018 and 2019, respectively.

About 1.8 percent of the Municipality's total population has one form of disability or the other. The proportion of the male population with disability is the same (1.8%) as that of females (1.8%). The types of disability in the Municipality include sight, physical, hearing, speech, intellect, and emotion. Persons with sight disability recorded the highest of 31.2 percent followed by physical (30.1%), and emotional disability (25.1%). Of the population disabled, 55.4 percent are employed and 39.8 percent economically not active. About 17 percent of the population with disability have never attended school.

4.4.11 Religion, Ethnicity and Cultural Heritage

The Ga-Dangmes are the dominant ethnic group in the Municipality followed by Ewes and Akans. The major festivals in the area are Homowo and Kpledzoo. The festivals provide an occasion for the gathering together of Ga-Dangmes from every part of the country to dine and welcome new members of the family while remembering the dead. It is also an occasion whereby people come together to develop their communities and settle family disputes. The Ga language is the predominately spoken language among the traditional people in the Municipality.

[14] District Planning Coordinating Council. (2018). *Annual Progress Report, 2017*. Upper Denkyira West District Assembly; Diaso

5 STAKEHOLDER CONSULTATION

The engagement of stakeholders creates the basis for strong, constructive, and responsive relationships essential for the successful implementation of the proposed plant expansion and modernization. Stakeholder engagement is an ongoing process that involves, in varying degrees, stakeholder analysis and planning, consultations, disclosure and dissemination of information, public participation, and reporting to affected stakeholders.

The nature, frequency, and level of effort in stakeholder engagement varies and must be commensurate with the project's risks and adverse impacts as well as the project's development phases as required by the Environmental Assessment Regulations, 1999 (LI 1652). The proposed project is within the legally designated Tema Export Processing Zone (TEPZ) under the authority of the Ghana Free Zones Authority (GFZA), which has designated the control of utility, sanitation and spatial planning issues within the TEPZ to credible companies/ agencies. For instance, Enclave Power is responsible for power supply to all industries within the TEPZ while a designated waste management provider collects all streams of waste from the TEPZ for disposal at an approved landfill site. The critical objective of stakeholder engagement in this environmental impact assessment is to identify relevant parties and identify their potential areas concerns concerning development of the proposed project.

5.1 STAKEHOLDERS IDENTIFIED

The interest of the various stakeholders, engagement approach and potential areas of concern are as follows and have been considered in relevant sections of the EIA including local and international compliance screening, impact identification, mitigations, management and monitoring regimes. Expert knowledge, technical review of relevant literature and snowballing were the techniques used in ensuring a holistic identification of all relevant stakeholder. Stakeholders identified during the EIA and their purpose are listed in Table 5-1 below.

5.2 CONSULTATIONS UNDERTAKEN

Institutional and community consultations have been undertaken as part of the environmental impact assessment (see Table 5-2, below). All consultation activities were in strict consideration of the existing COVID-19 protocols stipulated by the Imposition of Restrictions Act, 2020 (Act 1012). Phone calls and publication of scoping notice in the project area and national newspaper were therefore the key stakeholder engagement methods adopted.

Table 5-1: Stakeholder identification

Category	Stakeholder Group	Identified Stakeholders	Interest/Relation to the Project
Government	National Government Stakeholders, including regulatory authorities	▪ Ghana National Fire Service (GNFS) ▪ Environmental Protection Agency ▪ Ghana Water Company Limited ▪ Ghana Highways Authority ▪ Ghana Standards Authority (GSA) ▪ Ghana Free Zones Authority ▪ Enclave Power ▪ Ministry of Trade and Industry ▪ Department of Factories Inspectorate ▪ Ghana Ports and Harbour Authority	▪ Approvals for and assistance in Project activities within each of the authorities' remit (environmental, water use, energy, investment support, product quality, labelling, etc.) ▪ Issues of occupational health and safety ▪ Project interaction with public infrastructure/ government entity assets
	Local/ District Government Stakeholders	▪ Physical Planning and Finance Departments of the Kpone Katamanso Municipal Assembly ▪ Department of Environmental Health of the Kpone Katamanso Municipal Assembly	▪ Approvals for and assistance in Project activities within each of the authorities' remit (business registration and operating permits, etc.) ▪ Support with providing various baseline information on the area of project implementation (regional level) ▪ Potential assistance in interaction with other authorities and local population/organizations
	Government Bodies working on Community Development Activities	▪ Ghana Statistical Service (GSS)	▪ Support with providing various baseline information on the area of Project implementation (regional level) ▪ Potential assistance in interaction with other authorities and local population/organizations
Community	Adjoining land users	▪ 3F Company ▪ Blue Ocean Ridge Fuel Depot ▪ Red Sea Company Limited ▪ Jay Kay Books & Stationery ▪ Nobel Wig Production Company	▪ Potential perceivable impacts of the project (dust, noise, glare, visual, water- and land use-related, load on communal infrastructure) ▪ Potential opportunities (employment, community development)
		▪ Food vendors	▪ Potential perceivable impacts of the project (dust, noise) ▪ Potential perceivable benefits of the project (indirect employment, improved market)
		▪ Squatter (Godsway Amegah, Male, NHIS No. 12560554)	▪ Create awareness of proposed project and new land take ▪ Land use rights and relocation
Public	All stakeholders	▪ Public ▪ All interested parties	▪ Potential perceivable impacts of the project (dust, noise, glare, visual, water- and land use-related, load on communal infrastructure) ▪ Potential opportunities (employment, community development)

Table 5-2: Summary of consultations undertaken

Stakeholders	Engagement Methods	Location	Purpose	Summary Feedback
Physical Planning and Finance Departments of the of Kpone Katamanso Municipal Assembly	▪ Phone	▪ Office of the Physical Planning Officer, Kpone Katamanso	▪ Inform the Department about the proposed project ▪ Solicit views and concerns of the Department about the project	▪ Confirmed CBI operations have been registered and operating permit issued to them. ▪ Urged CBI to comply with Municipal bye laws
Ghana National Fire Service	▪ Phone	▪ Kpone Katamanso	▪ Inform the Service about the proposed project ▪ Request technical inputs (emergency) for consideration in expansion project design ▪ Understand project compliance/permitting requirements	▪ Confirmed CBI existing operations are compliant with fire and safety regulations ▪ Expressed readiness to monitor and inspect fire safety measure of the new units to be added ▪ Willing to suggest areas of improvement when necessary.
Ghana Water Company Limited (GCWL)	▪ Phone	▪ Kpone Katamanso	▪ Inform GWCL about the proposed project ▪ Obtain information on additional water use arrangement ▪ Solicit views and concerns of GWCL about the project	▪ Assures the company of regular supply of water as it pays its bill promptly ▪ Suggested CBI to consider rainwater harvesting to complement the GWCL water and reduce the water bill. ▪ Notify the Agency of significant changes in the water needs of the project. ▪ Ensure compliance with all relevant laws.
Environmental Protection Agency	▪ Completed Form EA2 ▪ Submitted Scoping Report, July 2021 ▪ Submitted Revised Scoping Report, September 2021 ▪ Submitted Draft EIS, September 2021	▪ Head Office, Accra	▪ Notify the Agency about the proposed project ▪ Request formal categorisation of project impact assessment and provide further technical directives consistent with LI 1652 ▪ Scoping Report submitted for technical review and decision making regarding the proposed project ▪ Received processing fee invoice ▪ Revised Scoping Report and Draft EIS submitted for final decision making	▪ Project classified as EIA mandatory project. ▪ Scoping Report reviewed and found to be satisfactory - Commence actual EIA based on terms of reference in Scoping Report and technical comments from the EPA. ▪ Technical comments from the EPA on the Scoping Report were addressed as part of the Draft EIS ▪ Draft EIS and Revised Scoping Report (September, 2021) submitted to the Agency. Reviewed and found to be satisfactory. Technical comments received are being addressed as part of this Final EIS.

Stakeholders	Engagement Methods	Location	Purpose	Summary Feedback
			regarding permitting of the proposed project ▪ Permit fee invoice received	▪ Processing and permit fee paid (receipts attached as *Appendix A*). ▪ Refer to letters of correspondence in Appendix A for details.
Ghana Free Zones Authority (GFZA)	▪ Face-to-face meetings ▪ Official letters	▪ Accra	▪ Inform GFZA about the proposed expansion ▪ Status of the additional land acquisition request ▪ Notify the Authority about the proposed expansion	▪ Expressed willingness to complete the additional land acquisition application ▪ Confirmed CBI has demonstrated strong compliance to the GFZA rules and responsibilities.
Ghana Highway Authority (GHA)	▪ Phone interaction	▪ On phone	▪ Technical advisory regarding the management of project's traffic impacts ▪ Inform GHA about the proposed expansion ▪ Technical advisory regarding the management of project's traffic impacts ▪ Obtain information about the traffic situation along the Free Zones area and other adjoining roads	▪ Avoid, as far as practicable, transportation of construction materials, equipment, raw materials and finished products during peak traffic periods ▪ Pay required road tolls
Ministry of Trade and Industry, Head Office, Accra	▪ Phone interactions	▪ On phone	▪ Information on the import license of cement raw materials into Ghana ▪ Regulations controlling the marketing of cement products in Ghana ▪ Facilitating the development of the private sector	▪ Import permit issues pending and will be resolved when production is to start. ▪ Expressed readiness for public-private sector dialogue with project investors, which is part of the Ministry's 10-point agenda.
Department of Factories Inspectorate, Accra	▪ Phone interactions	▪ On phone	▪ Notify the Inspectorate about the proposed project ▪ Inspection of laydown for safety and welfare of workers during project execution	▪ The Inspectorate is aware of the proposed project but has not visited the project site due to logistical challenges. ▪ Relevant equipment such as compressors, conveyers, and front loaders are required to be inspected and certified by the Inspectorate before use and thereafter, periodically.

Stakeholders	Engagement Methods	Location	Purpose	Summary Feedback
				▪ Ensure compliance to all COVID-19 protocols on-site during construction and operations ▪ Obtain relevant permits from the Inspectorate ▪ Consider extending support to the Inspectorate due to its limited logistical capacity
Ghana Ports and Harbour Authority (GPHA), Tema	▪ Phone interaction	▪ On phone	▪ Confirm the Authority's knowledge of the proposed project ▪ Consult on importation and offloading of raw material requirements within the Port	▪ Authority is aware of the proposed project since CBI will be importing some machinery for the project. ▪ Port can support sealed bulk cargo ships and dislodge raw materials. ▪ Dust mitigation measures should be deployed to reduce adverse impacts E.g. Using an Eco Hopper for dislodging of raw materials. ▪ Dislodging of raw materials during windy conditions should be avoided. ▪ CBI and raw material transporters should comply with Port entry and exit requirements. ▪ Trucks should be well maintained to prevent breakdowns within the Port environment since this may have a significant impact on traffic flow. ▪ Pay required Port User Fees promptly.
Ghana Standards Authority, Accra	▪ Phone interaction	▪ On phone	▪ Issues of product specification (GS 1118:2016)	▪ Ensure certification of cement products especially cement produced with clay ▪ Ensure proper labeling of the cement ▪ Gave assurance to monitor and ensure compliance with the required standards for cement products
Enclave Power	▪ Face to face	▪ TEPZ	▪ Availability and reliability of adequate electricity for the expanded operations.	▪ Indicated that suitable and adequate electric power can be made available for the proposed expanded capacity and modernization. ▪ Undertake energy audit of the facility on an annual basis ▪ Bills should be paid promptly to avoid illegal connections.

Stakeholders	Engagement Methods	Location	Purpose	Summary Feedback
				▪ Only qualified and well-trained technicians should install electrical components ▪ Quality electrical equipment that meets IEC and Energy Commission standards should be used
Neighbouring land users (3F Company; Nobel Wig Production Company; Blue Ocean Ridge Fuel Depot; Jay Kay Books & Stationery; Red Sea Company Limited)	▪ Scoping Notice (see Appendix C for sample) ▪ One-on-One discussion with caretaker (Red Sea Company Limited) (September, 2021)	▪ Project area, TEPZ	▪ Notify adjoining land users of proposed expansion and modernisation project ▪ Provide channels for making complaints or making concerns known ▪ Solicit for concerns, if any	▪ Appreciate good relation CBI ▪ No other concern has been received since posting of the scoping notice in the project area ▪ CBI Ghana Limited remains committed to sustainable implementation of the proposed project
Food vendors and vulcanizers	▪ Scoping Notice (see Appendix C for sample) ▪ Random interviews (September, 2021)	▪ Project area, TEPZ	▪ Notify food vendors of the proposed expansion and modernisation project ▪ Sensitize on the need for hygiene and food vendor certification from the local assembly as well as safety measures by vulcanisers ▪ Solicit for concerns, if any ▪ Communicate grievance redress channels	▪ Expressed enthusiasm of the additional market for their services due to additional direct and indirect employments ▪ Food vendors should continue to exercise good hygiene and obtain required certifications from the Kpone Katamanso Municipal Assembly ▪ Vulcanizers should continue to ensure safety of their operations ▪ Ensure waste generated from operations are adequately disposed
Squatter (Godsway Amegah, Male, NHIS No. 12560554)	▪ Scoping Notice (see Appendix C for sample) ▪ One-on-One discussion (September, 2021) (see Figure 5-2)	▪ Project area, TEPZ	▪ Notify squatter of proposed project ▪ Investigate land use rights/ eligibilities ▪ Identify alternative location for relocation of wooden structure ▪ Solicit concerns	▪ Lives in a 2.79 x 3.72 m wooden structure (see Figure 5-1) but has no legal entitlement to the land ▪ Alternative location identified by squatter for relocation about 120m north of current squatter location. ▪ Relocation support to be considered by CBI Ghana Limited ▪ No other concerns were raised
General Public	▪ Publication of scoping notice in the most circulated newspaper in Ghana (see Appendix E)	▪ Daily Graphic (September 1, 2021, Page 40)	▪ Solicit views and concerns from the general public about the project ▪ Providing the general public with the medium or channel to follow in	▪ No feedback was received from the general public concerning the project ▪ CBI Ghana Limited remains committed to sustainable implementation of the proposed project

Stakeholders	Engagement Methods	Location	Purpose	Summary Feedback
			responding to issues related to the project	

Figure 5-1: Wooden structure for squatter within new land take area[15]

Figure 5-2: One on one discussion with squatter and Red Sea Company Limited caretaker[15]

[15] Consultant's Fieldwork (September, 2021)

6 IMPACT IDENTIFICATION AND SIGNIFICANCE

The following sections describe potentially significant adverse and beneficial environmental and social issues. It captures the analysis and significance of identified pertinent issues associated with the Project, which may either impact positively or negatively, directly, or indirectly on the biotic and abiotic environment, and socio-economic resources.

Although the proposed project concession has been selected to minimise social risks and environmental impacts, there will, nonetheless, be some impacts due to the activities during pre-construction, construction, operations and maintenance. It is likely that many of these impacts can be adequately addressed through the implementation of appropriate mitigation and management measures.

6.1 IMPACT ASSESSMENT METHODOLOGY

An impact is any change to a resource or receptor brought about by the presence of a project component or by the execution of a project related activity.

6.1.1 Impact Identification

Potential impacts were identified through site verification visits of the proposed Project's AoI, team discussions, reviews of project designs, project related literature and guidelines (local, IFC and World Bank), issues and concerns raised by stakeholders during the consultation process, and available information about the environmental effects of similar developments.

6.1.2 Criteria for Determining Impact Significance

6.1.2.1 Physical and Biological Environmental Impacts

The significance of identified environmental impacts was determined using the Conesa-Fernandez-Vitora[16] quantitative method summarised in Table 6-1.

Table 6-1: Environmental Impact Significance Ranking System

Sign		**Degree of Perturbation (DP)**	
Beneficial Impacts	+	Low	1
Negative Impacts	-	Medium	2
		High	4
		Very high	8
		Total	12
Extension/ Extent (E)		**Duration (D)**	
Spot	1	Brief	1
Partial	2	Temporary	2
Extensive	4	Permanent	4

[16] Fernández-Vítora, V. C., Ripoll, V. C., Ripoll, L. A. C., Garro, V. R., & Bolea, M. T. E. (1997). *Guía metodológica para la evaluación del impacto ambiental.* Madrid: Mundi-Prensa.

Total	8		
Critical	12		
Risk of Occurrence (RO)		**Reversibility (RV)**	
Irregular or discontinued	1	Short term	1
Periodical	2	Middle term	2
Continuous	4	Long term	4
IMPACT SIGNIFICANCE (IS)= +/- (DP + RO + E + D + RV)			
The significance of the impact varies between 5 and 36. Scores between 29 and 36 are considered very high; high between 23 and 28; medium between 17 and 22; low between 11 and 16; and very low between 5 and 10.			
Impact Significance	***Score***	***Colour Codes***	
Very High Impact	*(29 – 36)*		
High Impact	*(23 – 28)*		
Medium Impact	*(17 – 22)*		
Low Impact	*(11 – 16)*		
Very Low Impact	*(5 – 10)*		

This methodology assesses the cumulative and residual impacts of various Project implementation activities on environmental and social receptors within the Project's AoI. The approach incorporates significance determination of identified impacts using the outcome of applied methodologies such as site verifications, GIS, assessments, compliance obligations as well as expert judgment. These provided inputs to the determination of impact significance and magnitude. The resultant magnitude will aid the determination of the overall significance of the physical or biological environmental impact. Elements that constitute the matrix are explained as follows:

- *Sign (+ / -):* Impact sign refers to the beneficial (+) or prejudicial (-) character of the different Project actions on environmental elements.
- *Degree of Perturbation (DP):* Refers to the degree of disturbance the action causes over a particular environmental factor in the specific field of occurrence. It ranges between 1 and 12; where 12 correspond to a total destruction situation and 1 is a minimal effect.
- *Risk of Occurrence (RO):* Refers to the frequency of the effect, whether cyclical or recurrent, unpredictable or temporally constant. It ranges between 1 and 4. Continuous effects are assigned a value of 4; periodical 2; and 1 for discontinuous occurrences.
- *Extension/Extent (E):* Refers to the theoretical area of influence of the impact related to the Project's overall area (percentage of impacted area). It ranges between 1 and 12. If the action produces a spot effect, the impact is considered localized (1). On the contrary, a generalized influence over the Project is considered 8. Meanwhile, intermediate situations correspond to partial effects (2) and extensive effects (4). Critical areas are ranked 12.
- *Duration (D):* Refers to the period the effect remains and after which the affected environmental factor would return to the initial condition either by natural or corrective measures. If the effects

last less than a year, it is considered that the action produces a short-term effect (1); between 1-5 years is considered medium term while between 5 and 10 years is considered a long-term/permanent effect.

- *Reversibility (RV):* Refers to the possibility of reconstitution of the affected element, that is, the possibility to return to the initial condition prior to the actions, by natural means, once the former stops acting over the affected media. A short term is assigned a value of 1; mid-term is 2; and irreversible effects are assigned a value of 4.

6.1.2.2 Socio-Economic Impacts and Risks

The key element of impact assessment is to determine the significance of impacts on resources/receptors. The significance of social impacts was assessed based on a qualitative criteria approach, combining a prediction of the magnitude of an impact with an assessment of the sensitivity/vulnerability/importance of the impacted resource/receptor. Accordingly, the magnitude of social impacts, which essentially describes the degree of change that the impact is likely to impart upon the resource/receptor, was based on the extent to which a human receptor gains or loses access to, or control over, socio-economic resources[17] resulting in a positive or negative effect on his or her wellbeing[18]. The term 'magnitude' in this respect covers all dimensions of the predicted impact to the natural or human environment including:

- The nature of the change (what resource and receptor is affected, and how);
- The spatial extent of the area impacted, or proportion of the municipal population affected;
- Temporal extent (i.e. duration, frequency, reversibility); and
- Where relevant, the probability of the impact occurring.

The assessment of impact magnitude needs to consider each of the factors detailed in Table 6-2. It is important to acknowledge that the scale of magnitude (from low to high) is in practice continuous and may not fit into a neat categorisation, and evaluation along the spectrum of professional judgement and experience. Each impact is evaluated on a case-by-case basis and the rationale explicitly described in the analysis of each impact. The magnitude designations are: negligible, small, moderate, major.

Table 6-2: Magnitude criteria for social impacts

Parameter	Description
Nature	**Resources:** The term resources is used to describe features of the environment such as water resources, habitats, species, landscapes, etc. which are valued by society for their

[17] Socio-economic resources in this context refers to natural, physical, social and financial capital (stock of resources)
[18] A concept combining an individual's health, prosperity, their quality of life and their satisfaction.

Parameter	Description
	intrinsic worth and/or their social or economic contribution. For a socio-economic assessment, resources can be business or municipality assets, amenities, and opportunities. These include existing and potential resources within the areas of influence such as local business customers, employment and training opportunities, agricultural, residential, and commercial land values etc. **Receptors:** The term receptor is used to refer to people and communities who may be affected by the proposed Project.
Extent	**On-site** – impacts that are limited to the Project site only. **Local** – impacts that affect an area in a radius of 2 - 3 km around the development area. **Regional** – impacts that affect regionally important resources or are experienced at a regional scale as determined by administrative boundaries. **National** – impacts that affect nationally important resources or affect an area that is nationally important/ or have macro-economic consequences. **Transboundary/International** – impacts that affect internationally important resources or have transboundary consequences.
Duration	**Temporary** – impacts are predicted to be of short duration and are intermittent/ occasional. **Short-term** – impacts that are predicted to last only for the duration of the installation period. **Long-term** – impacts that will continue for the life of the Project but cease when the Project stops operating. **Permanent** – impacts that cause a permanent change in the affected receptor and resource that endures beyond the Project lifetime.
Probability	The likelihood that an impact will occur: **Unlikely** - The impact is unlikely to occur. **Likely** - The impact is likely to occur under most conditions. **Definite** – The impact will occur.

In evaluating the sensitivity of resources and receptors for cultural and socio-economic impacts, the degree of sensitivity of a receptor is considered as *"a stakeholder's (or groups of stakeholders') resilience or capacity to cope with sudden changes or economic shock"*. The sensitivity of a resource is based on its quality and value/importance, for example: its local, regional, national or international designation; its importance to the local or wider municipality; or its economic value. Stakeholders may be more sensitive for a variety of reasons, including the following factors:

- age, gender, race or religion;
- land rights and ownership patterns;
- income/employment/unemployment;
- livelihood (current and extent of livelihood alternatives);
- services, e.g. health, amenities (quality and access);
- access to, and use of, natural resources including water;
- food security and reliance some ecosystem services;
- education/skills;
- health or disability;

- support networks; and
- exclusion or marginalisation (e.g. degree of access to resources, services and formalised rights).

The groups that have been identified as being vulnerable, drawing on the above criteria, include the following:

- those living below the poverty line;
- the unemployed;
- those with low education levels or are unskilled;
- female-headed households;
- the elderly; and
- those who do not own the land that they use or live on.

As described above, magnitude and sensitivity are looked at in combination to evaluate whether an impact is significant, and if so, its degree of significance. For social impact assessments the perceptions of stakeholders of particular issues, expressed as opinions around certain issues, are particularly important and consequently the concept of perception is explicitly brought into the evaluation of significance after an impact is evaluated. The identification of an impact of significant stakeholder concern may raise the significance rating, for example, from moderate to major. The change in significance rating prompts the formulation of more rigorous and appropriate mitigation measures, which focus on the source of the impact, and addresses stakeholder concerns. Sensitivity importance designations are: very low, low, medium, and high.

Once magnitude of impact and sensitivity have been characterized, the significance can be assigned for each impact using a matrix (see Table 6-3), showing sensitivity and magnitude of impacts.

Table 6-3: Impact significance matrix

		Sensitivity of Resource / Receptor			
		Very Low	Low	Medium	High
Magnitude of Impact	Negligible	Very Low	Very Low	Very Low	Low
	Small	Very Low	Very Low	Low	Medium
	Moderate	Very Low	Low	Medium	High
	Major	Low	Medium	High	Very High

In both assessment methodologies assigned significance is described as follows:

- *Very Low:* a resource/receptor will essentially not be affected in any way by a particular activity, or the predicted effect is deemed to be 'imperceptible' or indistinguishable from natural

background variations. This impact would not have a direct influence on the decision to develop in the area.

- *Low:* a resource/receptor will experience a noticeable effect, but the impact magnitude is small (with or without mitigation) and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. This impact would not have a direct influence on the decision to develop in the area.
- *Medium:* An impact of moderate significance has an impact magnitude that is within applicable standards, but falls somewhere in the range between a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. This impact could influence the decision to develop in the area unless it is effectively mitigated.
- *High:* An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly sensitive/vulnerable/important resource/receptors. This impact must have an influence on the decision process to develop in the area.
- *Very High:* Potential fatal flaw in the proposed Project. This impact must have an influence on the decision process to develop in the area.

6.2 IMPACT IDENTIFICATION

A synthesis of the key environmental and social impacts, for the pre-construction and construction (i.e. planning and construction), operation and maintenance phases of the proposed 1,500,000 MT/yr cement grinding and bagging facility is presented in this section. The determination of these impacts is contingent on the local context and the setting of the project, stakeholder feedback, expert knowledge, industry guidelines as well as other variables such as the nature of project activities. The key environmental and social impacts associated with the various stages that will potentially transpire as a result of the additional activities and the nature of each impact on receptors are identified in Table 6-4.

Table 6-4: Potential Project-Related Impacts on Environmental and Social Receptors

Phase	Potential Impacts and Risks	Nature of Impacts on receptors
Expansion/ Construction	Soil disturbance and potential erosion	Direct adverse impact on the soil
	Air quality impacts	Direct adverse impact on workers and adjoining factories within the Free Zone Enclave
	Noise level impacts	Direct adverse impact on workers and adjoining factories within the Free Zone Enclave
	Increased traffic	Direct impact on local traffic volumes especially on the Tema Motorway and other factories within the TEPZ
	Generation and disposal of waste	Direct adverse impact on land (dumpsite) and indirect negative impact on groundwater

Phase	Potential Impacts and Risks	Nature of Impacts on receptors
	Occupational health and safety risks to workers	Direct adverse impact on workers and indirect impact on dependants including women and children
	Community health and safety	Direct adverse impact on communities along construction material transportation routes, nearby factory and other workers within the TEPZ
	Additional employment and income generation	Direct beneficial impact on workers and indirect beneficial impact on their dependants
	Generation and disposal of waste	Direct adverse impact on land (dumpsite) and indirect adverse impact on groundwater
	Disruptions in normal CBI operations due to expansion	Direct adverse impact on working environment and CBI's economic returns
	Relocation of squatter	Direct impact on affected squatter within additional land required for the proposed project
Operation and Maintenance	Air quality impacts	Direct adverse impact on workers and adjoining factories
	Increase in ambient noise level	Direct adverse impact on workers and adjoining factories
	Generation and disposal of waste	Direct adverse impact on land (dumpsite) and indirect negative impact on groundwater
	Fire and explosion risks from gas use	Direct adverse impact on the workers and the cement plant
	Increase resource use	Direct adverse impact on the resources
	Health and safety risks to workers	Direct adverse impact on workers and indirect impact on dependants including women and children
	Increased traffic volumes	Direct impact on local traffic volumes and indirect impact on communities along the transportation corridor
	Additional employment creation and income generation	Direct beneficial impact on workers and indirect beneficial impact on dependants
	Increased government revenue	Direct impact on government revenue mobilization

6.3 IMPACT SIGNIFICANCE

The significance of the proposed project's impacts and risks is evaluated using quantitative and qualitative methods. Biophysical environmental impact significance is based on the quantitative method detailed in Section 6.1.2.1, above and presented in, Table 6-5 below. The significance of socio-economic, health and safety risks are assessed based on the qualitative methodology detailed in Section 6.1.2.2, above and presented in
Table 6-6, below.

Table 6-5: Quantitative assessment of biophysical impacts

ACTIVITY	IMPACT	RECEPTOR	SIGN	PRE-MITIGATION QUANTITATIVE ASSESSMENT								POST-MITIGATION QUANTITATIVE ASSESSMENT							
				E	RO	RV	D	DP	Total	Impact Magnitude (IM)	Impact Significant? (IS)	E	RO	RV	D	DP	Total	Impact Magnitude (IM)	Impact Significant ? (IS)
PRE-CONSTRUCTION AND CONSTRUCTION PHASE																			
• Leasing and preparation of additional ~1.6-acre land • Removal/ demolishing of part of some facilities • Temporary shutdown of some existing production activities • Transportation of construction materials and equipment • Civil works, fabrication and installation of equipment • Commissioning and testing	Soil disturbance and potential erosion	Land/Water	-	4	2	4	4	4	18	Medium	Yes	2	2	2	4	4	14	Low	No
	Ambient Air quality impact	Air and Land	-	4	4	4	4	4	20	Medium	Yes	2	2	4	4	4	16	Low	No
	Increase in ambient noise level	Humans and Land	-	4	4	4	4	4	20	Medium	Yes	2	2	4	4	4	16	Low	No
	Generation and waste disposal	Land and Water	-	4	4	2	4	2	16	Low	No	2	2	2	2	2	12	Low	No
OPERATION AND MAINTENANCE PHASE																			
• Transportation of raw materials	Ambient air quality impact	Air	-	4	4	4	4	4	20	Medium	Yes	2	2	4	4	2	14	Low	No

ACTIVITY	IMPACT	RECEPTOR	SIGN	PRE-MITIGATION QUANTITATIVE ASSESSMENT								POST-MITIGATION QUANTITATIVE ASSESSMENT							
				E	RO	RV	D	DP	Total	Impact Magnitude (IM)	Impact Significant? (IS)	E	RO	RV	D	DP	Total	Impact Magnitude (IM)	Impact Significant ? (IS)
• Raw material offloading and storage • Clay calcination using natural gas	Increase in ambient noise level	Humans and Land	-	4	4	4	4	4	20	Medium	Yes	2	2	4	4	2	14	Low	No
• Movement of raw materials into the mill • Milling/ griding • Cement storage, bagging and loading • Truck movement/ transportation of finished product	Generation and disposal of waste	Land	-	4	4	2	4	2	16	Low	Yes	2	2	2	4	2	12	Low	No
	Fire and explosion risk	Cement Plant and Humans	-	4	4	4	4	4	20	Medium	Yes	4	4	2	4	2	16	Low	No
• Fuelling of generator/ vehicles • Equipment or machinery maintenance/ servicing • Administrative activities	Increase resource use	Land, water, and Electricity	-	4	4	4	4	4	20	Medium	Yes	2	2	4	4	4	16	Low	No

Table 6-6: Qualitative assessment of socio-economic impacts

ACTIVITY	IMPACT/ NATURE	SIGN	PRE-ENHANCEMENT ASSESSMENT				POST- ENHANCEMENT ASSESSMENT			
			Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?	Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?
PRE-CONSTRUCTION AND CONSTRUCTION PHASE										
• Leasing and preparation of additional ~1.6-acre land	Increased traffic volumes	-	Moderate	Medium	Medium	Yes	Small	Medium	Low	No

ACTIVITY	IMPACT/ NATURE	SIGN	PRE-ENHANCEMENT ASSESSMENT				POST- ENHANCEMENT ASSESSMENT			
			Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?	Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?
• Removal/ demolishing of part of some facilities • Temporary shutdown of some existing production activities • Transportation of construction materials and equipment • Civil works, fabrication and installation of equipment • Commissioning and testing	Occupational health and safety issues	-	Moderate	Low	Low	No	Small	Low	Very Low	No
	Community health and safety issues	-	Small	Medium	Low	No	Small	Medium	Low	No
	Disruptions in normal CBI operations due to expansion	-	Small	Medium	Low	No	Negligible	Medium	Very Low	No
	Relocation of squatter	-	Moderate	Low	Low	No	Negligible	Low	Very Low	No
	Additional employment and income generation	+	Small	Medium	Low	No	Moderate	Medium	Medium	Yes
OPERATION AND MAINTENANCE PHASE										
• Transportation of raw materials • Raw material offloading and storage • Clay calcination using natural gas • Movement of raw materials into the mill • Milling/ griding • Cement storage, bagging and loading • Truck movement/ transportation of finished product • Fuelling of generator/ vehicles • Equipment or machinery maintenance/ servicing • Administrative activities	Increase traffic volumes	-	Moderate	Medium	Medium	Yes	Small	Medium	Low	No
	Occupational health and safety risks to workers	-	Moderate	Medium	Medium	No	Moderate	Low	Low	No
	Additional employment and income generation	+	Moderate	Medium	Medium	Yes	Major	Medium	High	Yes
	Increase government revenue	+	Moderate	Medium	Medium	Yes	Major	Medium	High	Yes

6.4 IMPACT DISCUSSION

The following sections describe potentially significant adverse and beneficial environmental and social issues. Although the proposed expansion will be within an already operating cement plant, there will still be some impacts, which will be discussed in cumulative terms (i.e. taking into account the existing operations and the proposed project impacts). Many of these impacts can likely be adequately addressed through the implementation of appropriate mitigation and management measures.

6.4.1 Pre-Construction and Construction Phase

6.4.1.1 Potential Physical Environmental Impacts

6.4.1.1.1 Soil disturbance and potential erosion

The potential effect on soil from excavation activities for structural foundations, as well as movement of materials and workers during the construction phase, may include:

- Potential local alteration of soil properties;
- Potential soil contamination from improper disposal of construction waste; and
- Limited clearing of the sparse vegetative cover on the additional ~1.6-acre land may expose the soil to erosion.
- Excavation for the laying of gas pipes will negatively impact the soil structure and properties, thereby making the soil prone to agents of erosion.

The additional physical footprint for the proposed expansion and modernisation project is limited to the additional site to be acquired for installation of the clay storage shed. All other component of the project will be within the existing CBI Ghana Limited's boundary. This area has already been disturbed by existing operational activities. The resultant impact is therefore expected to be low.

6.4.1.1.2 Ambient air quality impacts

The construction activities for the expansion will result in dust generation, mainly from digging and excavating for structural foundations. Also, demolishing of some existing structures notably the fence wall to facilitate the construction of the clay storage shed will generate dust. Construction aggregate can also dust generators, as the loose material is easily erodible especially during high winds. Fugitive dust generation can also result from materials handling activities and offloading at the project site. In addition, machinery and equipment that will deliver materials to the proposed project site or be used in the construction would emit exhaust fumes (CO_2, NO_x, and PM) that would compromise air quality. However, the levels of dust generated are dependent on the time of year, the intensity of the activities and the prevailing winds at the time of the construction. The impact of dust also depends on the wind direction and the relative locations of dust sources and receptors.

The cumulative impact of the existing cement production and new installations are likely to marginally decrease the ambient air quality which is expected to be intermittent and of short duration. Therefore, the overall post-mitigation impact is expected to be of low significance.

6.4.1.1.3 Increase in noise level and localised vibration

The cumulative noise sources during the construction will comprise of noise from CBI Ghana Limited's existing operations as well as construction activities. The noise generation from construction activities will arise from vehicles/ trucks transporting prefabricated metal components, namely the cement mill, box feeder, and hoppers as well as construction aggregates. Other sources of noise will include excavation activities, civil works, welding, mobile concrete mixers, and general activity of workers. This will cumulatively increase the ambient noise levels at the project site.

6.4.1.1.4 Generation and disposal of waste

Most construction activities have the potential to generate a wide range of waste. Specifically, waste from the expansion and modernisation project will comprise of the following:

- Empty electric cable drums;
- Pre-fabricated metal and roofing sheet scrap from construction of metal lattice and other structures;
- Smaller volumes of the workforce and administrative wastes, such as paper, packaging, plastics, and food waste will be generated throughout the construction phase;
- Demolishing waste from removal of some facilities (e.g. fence wall) due to the expansion works or installation of new equipment;
- Wastewater will be generated from site works, including contaminated water from washing equipment and tools as well as potentially contaminated stormwater runoff. The labor force will generate sewage at the laydown area, as well as construction site areas.

6.4.1.2 Potential Socio-Economic Impacts

6.4.1.2.1 Increased traffic volumes

The Akosombo Road that links the Tema Harbour and the Motorway Roundabout are among the busiest roads in Tema. The haulage of sand, gravel, and construction equipment for the proposed expansion and modernisation will likely increase traffic in the operational area due to trucks moving in and out of the site. The road linking to the project site is a busy road that is used by both commercial and private vehicles. As such, the haulage trucks will add to the already existing traffic. Hence, the resultant impact of the expansion and modernisation project will likely heighten the traffic situation on the roads serving the project area.

6.4.1.2.2 Occupational health and safety risks to workers

The expansion and modernisation of the proposed project will require the engagement of contractors and recruitment of construction staff. The construction may pose danger to people, equipment and even vehicles. Risks such as collisions, falls, slips, cuts, knockdown and excessive exposure to adverse events weather conditions are most likely. Also, workers are not insulated from occupational health hazards as it could occur on-site. For instance, working at height and confined space could put workers at risks and exposed to hazards. Moreover, excessive noise from construction machinery, inhalation of dust/particulate matter and pathogen could also compromise the health of workers in the medium to long term. Conversely, most of these occupational health and safety impacts are avoidable with minimal efforts from both staff and contractors. Hence, the impact significance is anticipated to be low.

6.4.1.2.3 Community health and safety risks

The expansion construction activities will likely create nuisances for communities along construction material transportation routes, nearby companies, workers of adjoining factories and other workers within the immediate project site such as food vendors. These persons will be exposed to dust and noise (especially during the dry season). Short-term dust is primarily a nuisance factor but may cause acute health issues (e.g. eye irritation, breathing problems) if acceptable standards are exceeded. The issue of unarmed security (private security firm licensed by the Ministry of Interior) intimidating or harassing locals may not arise as the factory is sited within an industrial park. The construction phase of the expansion and modernisation project is short, which will reduce community interaction with the proposed project or project area. Therefore, the resultant impact significance is predicted to be low.

6.4.1.2.4 Disruptions in normal CBI operations due to expansion

Construction activities for the proposed expansion will disrupt CBI Ghana Limited's usual operations and, in some cases, halt their operational activities to pave way for the expansion works. This will affect production outputs. The projected project's development will almost certainly have unintended consequences for CBI Ghana Limited's earnings, as production levels may be inconsistent. Also, employees may lose production hours and associated remuneration. However, these will be temporary, as it will only last for the proposed project construction period. As a result, the overall impact is expected to be minimal.

6.4.1.2.5 Relocation of squatter

Leasing of the additional land (1.53 ha) for the proposed project will result in the relocation of a squatter. The squatter has no legal right or entitlement to the land since the additional land falls within the TEPZ, a legally designated industrial enclave managed by the GFZA. The wooden structure occupied by the squatter measuring approximately 2.79 x 3.72 m will be relocated about 120 m north

of the current location to pave way for the proposed project. No significant economic or livelihood activities are carried out by the squatter within the wooden structure since it only serves as a place of shelter. Few chickens are reared by the squatter by the extensive animal rearing method for subsistence. Due to the proximity of the new location, the social risks posed to the squatter is expected to be negligible.

6.4.1.2.6 Construction employment and income generation

Construction activities are likely to have a positive impact on the local economy through employment and income generation. This will indirectly boost the local economy in areas of housing rental, food retail and patronising services of artisans within and around Tema. Other downstream employment opportunities would arise for product transporters, distributors and retailers. This is an addition to the employment opportunities that already exist in the company amidst the construction phase is transient, it will augment the staff strength and make the aggregated impact significance not only positive but high.

6.4.2 Operations and Maintenance (O&M) Phase

6.4.2.1 Potential Physical Environmental Impacts

6.4.2.1.1 Ambient Air Quality Impacts

Offloading of raw materials, storage, transfer, grinding, bagging, storage and packing/ loading generate particulate matter (dust). Combustion gases from the drying unit and generators (when in use) will also generate emissions. Due to the similarity of machinery, the proposed expanded production units will potentially add to existing emissions and increase the dust within the project site. Notably, the calciner, when added, will be a completely new potential dust generating source. This will potentially impact the ambient air quality and the resultant impact significance is anticipated to be high.

6.4.2.1.2 Increase in noise level

Major noise generating sources will comprise the old and new cement grinding mill, cement packers, and conveyor belts. Noise will also emanate from the dryer crushing of clay during the calcination process. The periodic operation of the standby generator will generate background noise. Other sources will include noise from vehicles transporting raw materials for the expanded operations. Given conditions like exposure limit and time, noise may have both physiological and psychological effects on human health. However, increase ambient noise concern will not be a major concern as the major noise generating sources are designed to be far apart from each other. The resultant impact is expected to be moderate.

6.4.2.1.3 Generation and disposal of waste

The proposed new production unit will potentially add to the waste generated at the site. The current estimated monthly solid waste generated out of CBI Ghana Limited's operations is about 8.5 tonnes and liquid waste generation about 10 cubic meters. The new bagging unit may also accidentally damage some packaging materials which could be a potential source of waste. In addition, the employment of extra workers to operate the new production units will increase the overall workforce, and subsequently, a marginal increase in the waste generated. Additional staff to augment the current staff will potentially increase domestic and administrative waste. Solid and liquid waste emanates primarily from structures like the canteen, and ablution facilities. The cumulative quantity of waste that will arise from the operation of the expanded project is expected to be moderate.

6.4.2.1.4 Fire and explosion risk

Natural gas is one of the inflammable materials that will be used to power the calciner. When natural gas is exposed to a source of ignition, it may explode or result in fires. Other trigger sources of fire are overloaded sockets, old and malfunctioning equipment, and faulty wiring. Human errors also contribute to the dangers associated with workplace fire outbreaks. Human errors and actions such as smoking, improper use of machinery. Fires generally have the potential for adverse effects on air quality and could pose risks to human health and safety as well as the infrastructure. This impact is considered negative, long-term, and of medium significance.

6.4.2.1.5 Increased resource use

At the operation phase, resources such as energy, water, natural gas, clay, and clinker may be required to support the expanded cement production. Large amount of energy may be consumed especially during the grinding and clay calcination process. Other activities that will require energy consumption include the conveyer and lighting systems. Additional raw materials will be required for the expanded production capacity. This will increase absolute volume of clinker and gypsum imports, clay transport from the extraction site at Torgorme, as well as local procurement of limestone, basil and granite dust. Water is also required for dust suppression within the facility and sanitary facilities. Cumulatively, the impacts emanating from resources use (energy, water, natural gas, raw materials) at the operational is anticipated to be high.

6.4.2.2 Potential Socio-Economic Impacts

6.4.2.2.1 Additional employment and income generation

The employment and income generation of the current operations is anticipated to be very high and beneficial. CBI Ghana Limited's current operations provide direct employment opportunities. Other downstream employment opportunities will include distributors, haulers, and retailers of the product

(see Figure 6-1 and Figure 6-2). The larger influence of the additional employment opportunities will reflect positively in the livelihoods of the beneficiary employees and their dependents. The proposed expansion would create opportunities for retailing, services and other economic opportunities to local people and the local labour market profile will alter. This will boost CBI's positive outlook on employment opportunities relative to other cement producers in the country.

Figure 6-1: A typical retail outlet of CBI

Figure 6-2: Truck drivers north of the project site

6.4.2.2.2 Occupational health and safety risks to workers

Personnel working in the factory stand the health risk of inhalation of dust particles. By its fine particulate nature, cement is easily borne by air and could compromise the air quality in the working area. The risk of accidental slips and falls are also likely. Workers could continually be exposed to noise generated by equipment which can result in hearing impairment. Occupational health hazards may also be promoted by lack of procedures that mitigate negligence at work, fatigue due to understaffing and long working hours, employing wrong people on a particular job, low morale, etc. However, the likelihood of such incidents will be reduced, considering the occupational safety procedures and contingency plans outlined in the Provisional EMP as well as the positive occupational health and safety performance track record of CBI Ghana Limited.

6.4.2.2.3 Increased traffic volumes

CBI Ghana Limited finished product (bulk and bagged cement) are carted away from the cement plant by haulage trucks that exit the TEPZ onto the Tema - Aflao road. Similarly, the imported and locally sourced raw materials are also carted on the road to the cement plant by trucks. Such haulage activities affect the already busy traffic situation in the project area. The local traffic situation is expected to slightly increase due to the proposed expanded production capacity. This will be caused by the higher volumes of finished products that will be transported from the facility and the increased demand for raw materials to feed the expanded production capacity. For instance, the haulage of clay as raw material for the calciner from Torgorme in the Volta Region using trucks will generate additional traffic volumes.

6.4.2.2.4 Marginal increase in Government revenue

The project will enhance the full swing production of the cement plant which in turn will increase the revenue collection to the government at both local level (Municipal Authority) and national level. The project and its operations will be subjected to statutory fees and charges with eventual marginal increase in revenue. The project will also create economic activities in the project area through its supply chain activities, downstream economic opportunities and this will result in increment to overall government revenue. Increase in the absolute volume of clinker import will also generate revenue to the Ghana Ports and Harbours Authority (GPHA). This impact is considered positive, cumulative, long-term and of moderate significance.

6.5 POTENTIAL CUMULATIVE IMPACTS

In consonance with the IFC guidelines, CBI Ghana Limited is expected to make an Assessment of Cumulative Impacts (ACI) to establish existing impacts that the proposed expansion and modernisation

project will add on to. The assessment of cumulative impacts considers the combination of multiple impacts that may result when the project is considered alongside other existing or proposed projects in the same geographic area or similar development timetable. The assessment of cumulative impacts identifies where particular resources or receptors would experience significant adverse or beneficial impacts because of a combination of projects (inter-project cumulative impacts).

The TEPZ enclave is already an industrial area with low air quality and high noise level; the area is also exposed to high resource use and noted for high traffic volumes. Moreover, CBI Ghana Limited's per unit consumption of clinker will likely reduce. Initially, their existing operations (500, 000 metric tonnes) use only imported clinker for production. However, the proposed expansion and modernisation project (thus 1.5 million metric tonnes) will use double the quantity of clinker used in the 500,000 metric tonnes production, thus a combination of clay and clinker for the cement production. However, the expansion and modernisation project will potentially add up to the employment levels and marginally increase revenue generation for the project area especially to the Kpone Katamanso Municipal Assembly and government.

In summary, the following beneficial and adverse cumulative impacts are therefore anticipated:

- Increase in traffic especially, along the main material transport corridors (adverse).
- Marginal increase in resource use (adverse).
- Increase in noise level during construction and operations (adverse).
- Steady decrease in air quality in the project area (adverse).
- Decrease in the per unit volume of clinker use (beneficial).
- Marginal increase in employment opportunities during the pre-construction and operations phase (beneficial).
- Improvement in the industrial and economic outlook of the TEPZ with marginal increase in revenue generation (beneficial).

6.6 AIR DISPERSION MODELLING

This section is an air dispersion modelling for likely air pollutants from the proposed project. The dispersion model is largely based on principles of the United Stated (US) Environmental Protection Agency (EPA) modelling guidelines. However, modelling results are benchmarked against the Ghana Standards for Environment and Health Protection – Requirements for Ambient Air Quality and Point Source/Stack Emissions (GS 1236:2019) to determine possible violations and guide formulation of mitigation strategies. Additionally, the cumulative air quality impact of all sources within the project area (including the proposed cement grinding and bagging facility) will be determined. It also describes

the air dispersion modelling analysis for $PM_{2.5}$, TSP, SO_2, PM_{10}, CO and NO_2 from the proposed project and the consequent comparison with GS 1236:2019. A determination will also be made on whether the proposed project's air emissions will create a significant air quality impact.

6.6.1 Potential Pollution Sources

The air discharges from the cement grinding and bagging facility will occur from several point and area sources. The point sources are vents designed specifically for the release of air streams after processing through air pollution control systems which will be incorporated in the facility laydown. The air pollution abatement systems proposed include:

- Chamber pulse bag dust collector;
- Single machine dust collector; and
- Bag filter with pulse plenum.

The discharges from these point sources will consist mainly of particulates (PM_{10}, $PM_{2.5}$ and TSP). Nitrogen oxides (NOx), carbon monoxides (CO) and sulphur dioxide (SO_2) will be emitted from combustion sources, such as the calciner, diesel generator and vehicles.

The area sources include the raw material and clay storage shed, the cement loading area as well as movement of trucks within the project site. The main emission from these area sources is fugitive particulates. Emissions released from the cement grinding and bagging facility during operation phase will be dispersed in the atmosphere and finally reach the ground at a specified distance from the sources.

6.6.2 Potential air emissions

The primary air pollutant to ambient air quality from the proposed cement manufacturing facility will be particulates (TSP, $PM_{2.5}$ and PM_{10}). Other air pollutants will include CO, NO_2 and SO_2 realised from fuel combustion in the calciner, diesel generator as well as movement of trucks.

6.6.2.1 Particulate Pollution and Countermeasures

It is expected that particulate emissions (TSP, $PM_{2.5}$ and PM_{10}) will contribute the most to air pollution from the proposed cement grinding and bagging facility. Consequently, a major effort in reducing air pollution loads from the proposed project will be focussed on particulates. The sources of particulate pollution and the countermeasures are listed in Table 6-7.

Table 6-7: Particulate pollution sources and countermeasures

Pollution Source	Countermeasures
Raw Material (Clay, Clinker, Gypsum,	▪ Use of a simple, linear layout for materials handling operations to reduce the need for multiple transfer points

Basalt, Granite Dust and limestone) storage and transport	▪ Use of enclosed belt conveyors for materials transportation and emission controls at transfer points ▪ Covering of raw materials and cement with tarpaulin during transport ▪ Storage of raw materials in an enclosed raw material shed ▪ Use and appropriate maintenance of air abatement systems (fabric filters) to collect any dust emissions ▪ Setting negative dust collection pressure systems at all dust raise points. ▪ Dousing of entrance of enclosed raw material shed with water to reduce fugitive emissions
Calcining, Grinding, crushing, milling and blending	▪ Integration of cyclones into project design ▪ Adoption of closed-circuit mill ▪ Capturing mill dust by high efficiency fabric filters and recycling within the process ▪ Ensure the discharge concentration of waste gas and dust at each dust raise point under the control discharge index. ▪ Set negative pressure dust collecting system at all dust raise points
Packaging and Loading	▪ Using enclosed conveyor belts for transporting cement ▪ Enclosing cement bagging area ▪ Ensure labourers use adequate nose masks and eye protection

In order to effectively control particulates at each dust emission point, air pollution abatement systems will be incorporated in the design of the facility. The generation of particulates during material transfer points will be minimized and highly efficient filters will purify exhaust streams containing dusts, while the dust collected by the filters will be recycled into the relevant unit of operation. Effectively, all particulate gas streams after treatment will be reduced to acceptable dust concentration levels.

6.6.2.2 Oxides of Sulphur Pollution and Countermeasures

Burning of fuel and natural gas by the calciner, generator and trucks within the facility will also produce SO_2. The amount of sulphur to be produced is purely a function of the sulphur content in the fuel/ natural gas. During the combustion process, essentially all the sulphur in the fuel is oxidized to SO_2. The oxidation of SO_2 gives sulphur trioxide (SO_3), which reacts with water to give sulphuric acid (H_2SO_4), a contributor to acid precipitation. Sulphuric acid reacts with basic substances to give sulphates, which are fine particulates that contribute to PM_{10} and visibility reduction. Sulphur oxide emissions also contribute to corrosion of the engine parts. Therefore, opting for fuel or natural gas with very low sulphur content will significantly reduce sulphur emissions.

6.6.2.3 Oxides of Nitrogen Pollution and Countermeasures

NOx will also be emitted from the calciner, diesel generator as well as trucks to be used at the facility. Nitrogen oxide formation occurs by two fundamentally different mechanisms. The predominant mechanism with internal combustion systems is thermal NOx, which arises from the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most thermal NOx is formed in the high-temperature region of the flame from dissociated

molecular nitrogen in the combustion air. Some NOx, called prompt NOx, is formed in the early part of the flame from reaction of nitrogen intermediary species, and hydrocarbon radicals in the flame. The second mechanism, fuel NOx, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Gasoline, and most distillate oils have no chemically bound fuel N_2 and essentially all NOx formed is thermal based.

The most common NOx control technique for diesel engines focuses on modifying the combustion process. Formation of nitrogen oxides will be controlled by using Low-NOx Burning generators / calcination systems with a reduction efficiency of 40-50 percent. Transporters will also be encouraged to use trucks with Low-NOx Burning engines or trucks fitted with Selective Catalytic Reduction (SCR) systems known to have a reduction efficiency of 60 – 90 percent.

6.6.2.4 Carbon Monoxide Pollution and Countermeasures

Carbon monoxide is a colourless, odourless, relatively inert gas formed as an intermediate combustion product that appears in the exhaust when the reaction of CO to CO_2 cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon (fuel) molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short. The oxidation rate of CO is limited by reaction kinetics and consequently, can be accelerated only to a certain extent by improvements in air and fuel mixing during the combustion process. This will also be controlled by using highly efficient calciners/ generators or trucks as well as ensuring regular servicing.

6.6.3 Air Dispersion Modelling Methodology

6.6.3.1 Modelling Approach

The approach selected for modelling the atmospheric dispersion of pollutants from the proposed facility is based on the latest United States (US) EPA steady-state plume model, AERMOD model (v 21112 released April 22, 2021). This model is the next generation air dispersion model based on planetary boundary layer theory. It is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.

AERMOD utilizes a similar input and output structure to ISCST3 and shares many of the same features, as well as offering additional features. AERMOD fully incorporates the PRIME building downwash algorithms, advanced depositional parameters, local terrain effects, and advanced meteorological turbulence calculations.

6.6.3.2 Model Inputs

The model requires information on:

- Emission sources;
- Land Use Considerations;
- Topography;
- Conversion ratios for NOx to NO_2;
- Building downwash effects;
- Receptor locations;
- Background air quality concentrations; and
- Meteorological conditions.

6.6.3.2.1 Source Emissions

Source emissions were estimated *(see Table 6-8)* based on the USEPA method "AP-42 Compilation of Air Pollutant Emission Factors", where the emission rate is expressed by the formulae below.

$$E = A \times EF \times (1 - \frac{ER}{100})$$

Where: E = emission rate (in g/s)

A = activity rate (volume of cement to be produced per hour);

EF = emission factor (tabulated using the EPA method AP-42); and

ER = overall emission reduction efficiency (%)

An Emission Factor (EF) is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant. Such factors allow for the estimation of emissions from various sources of air pollution. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed representative of long-term averages for all facilities in the source category.

Depending on the degree of accuracy, required emission factors are often quoted with associated Emission Factor Rating (EFR) code. An A or B rating indicates a greater degree of certainty than a D or E rating. These ratings notwithstanding, the main criterion affecting the uncertainty of an emission factor remains the degree of similarity between the equipment/process selected in applying the factor, and the target equipment/process from which the factor was derived.

EFs were used to estimate point source emissions either by referencing to literature, if they existed and found to be applicable to the target equipment/ process under study or calculated from empirical equation given in AP 42 Section 11.6, Section 11.25 as well as equipment manufacturer data.

The emission rates were based on full capacity operation of 1.5 million tonnes per year or 171.23 tonnes per hour. Though the diesel generator will be used only when there are power cuts, a 100 percent operation load was assumed for this modelling. A 100 percent operation load was also assumed for the clay gas calciner system.

6.6.3.2.2 Conversion Ratios for NOx/ NO_2

In determining the impact of Nitrogen dioxide from combustion sources (diesel generator and calciner), it is important to note that of the nitrogen oxides emitted, nitric oxide is the most significant form (typically more than 90%). Conversion of nitric oxide takes place in ambient air and the conversion rate is dependent on a number of factors such as ambient ozone concentration, presence of daylight and the presence of organic compounds; including Volatile Organic compounds (VOCs); and radicals.

The Ambient Ratio Method (ARM) was used to estimate NO_2 emission from the calculated NOx emission rates. A NOx – NO_2 conversion factor of 0.800 was therefore used for the modelling.

Table 6-8: Estimated emission rates

Description	Release Height	Release Diameter	Release Velocity	Release Temperature	Emission Rates					
					PM10	PM2.5	TSP	CO	SO2	NOx
Unit	[m]	[m]	[m/s]	[K]						[g/s]
Raw material unloading	16	0.5	1.1	Ambient	0.000222657	0.0001091	0.000506039	-	-	-
Raw material shed	16	0.5	7.2	Ambient	0.041640625	0.02040391	0.094637784	-	-	-
Raw material transfer	16	0.5	1.1	Ambient	0.000222657	0.0001091	0.000506039	-	-	-
Dryer Crusher & Calciner	16	0.5	1.0	373.15	0.000084541	0.00002779	0.000 0.000389	0.00423561	0.00007189	0.0003281
Raw material silos (4 No.)	24	0.5	7.2	Ambient	0.041640625	0.02040391	0.094637784	-	-	-
Grinding mill feed belt	5	0.5	0.9	Ambient	0.0178125	0.00872813	0.040482955	-	-	-
Grinding mill weight hopper	5	0.5	0.9	Ambient	0.029765625	0.01458516	0.067649148	-	-	-
Raw material grinding	11	0.5	2.6	373.15	0.09203125	0.04509531	0.209161932	-	-	-
Grinding mill air separator	5	0.5	0.9	296.15	0.03078125	0.01508281	0.069957386	-	-	-
Cement silos (5 No.)	24	0.5	7.2	303.15	0.041640625	0.02040391	0.094637784	-	-	-
Cement load out	0.5	0.5	1.1	Ambient	0.000326572	0.00016002	0.000742209	-	-	-
Diesel generator	4	0.2032	22.778	427.45	0.00743111	0.00364124	0.016888886	0.00902542	0.0069244	0.0335
Truck movement	0.5	0.2	22.778	400	0.009660443	0.00473362	0.021955552	0.01173305	0.00900172	0.04355

6.6.3.2.3 Building Downwash Effects

Buildings located close to point sources may significantly affect the dispersion of the pollutants from the source. If the point source is low, the air pollutants released may be trapped in the wake zone of nearby obstructions (structures or terrain features) and may be brought down to ground level in the immediate vicinity of the release point (down-wash). To determine the effect of building downwash, the layout of the proposed facilities was modelled using the Building Profile Input Program (BPIPPRM)[19]. The USEPA BPIP was designed to incorporate the concepts and procedures expressed in the GEP technical support document[20], the Building Downwash guidance[21], and other related documents into a program that correctly calculates building heights and projected building widths. BPIPPRM inputs were limited to proposed structures of the project since no building was identified within the "region of influence" for which entrainment could be likely.

6.6.3.2.4 Land Use Considerations

The classification of the land use near the proposed cement grinding and bagging plant is needed because dispersion rates differ between urban and rural areas. In general, urban areas cause greater rates of dispersion because of increased turbulent and buoyancy-induced mixing. This is due to the combination of greater surface roughness caused by more buildings and structures and greater amounts of heat released from concrete and similar surfaces.

The USEPA guidance provides two procedures to determine whether the character of an area is predominantly urban or rural. One procedure is based on land-use type, and the other is based on population density. Both procedures require an evaluation of characteristics within a 3-km radius from the subject source, but the land-use methodology is considered more accurate. According to the land-use type methodology, a 3 km radius circle was circumscribed about the centre of the meteorological station. Then using the Auer land use types[22], a significant section of the 3 km radius area around the meteorological station was open water hence, the rural option was selected. Figure 6-3 shows the land use within the modelling domain.

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[19] United States Environmental Protection Agency (US EPA). 1995a. *User's Guide to the Building Profile Input Program*. EPA-454/R-93-038, U.S. EPA, Research Triangle Park, NC

[20] United States Environmental Protection Agency. 1985. *Guideline for Determination of Good Engineering Practice Stack Height*, EPA-450/4-80-023r, June, 1985

[21] Thé, J.L., Lee, R., and Brode, R.W. *Worldwide Data Quality Effects on PBL Short Range Regulatory Air Dispersion Models*

[22] Auer, A.H., 1978. *Correlation of Land Use and Cover with Meteorological Anomalies*. Journal of Applied Meteorology, 17:636-643

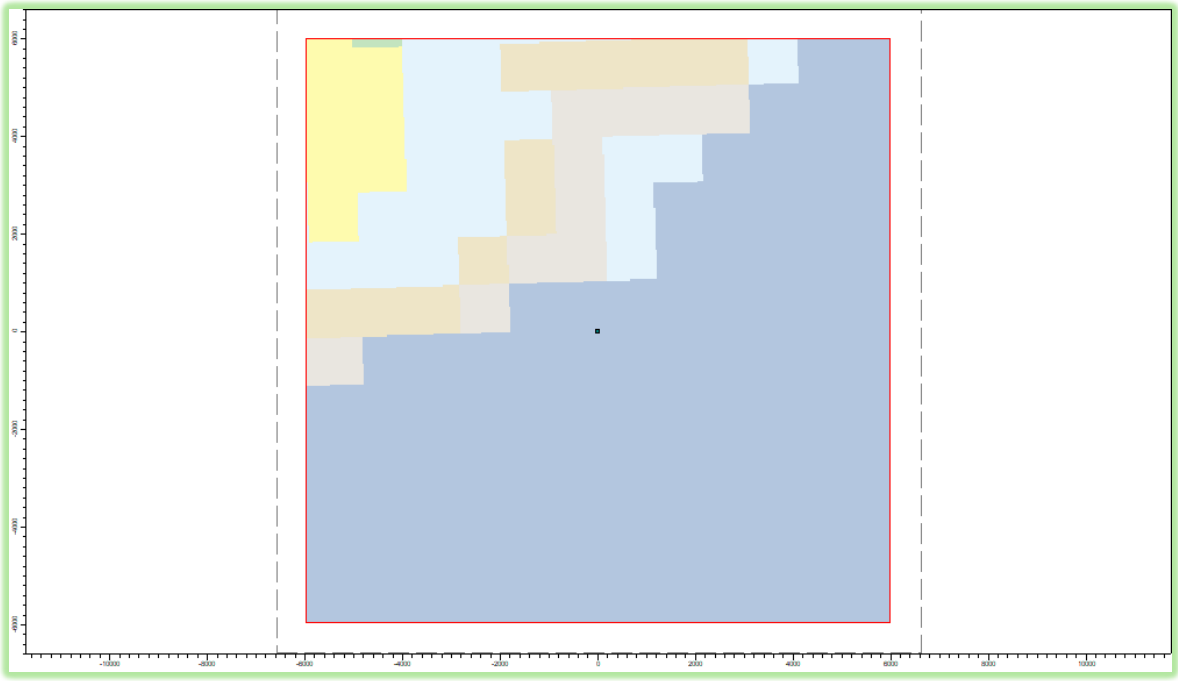

Figure 6-3: Land use depiction of the modelling domain

6.6.3.2.5 Topography

The topography in the modelling domain is defined as either simple terrain (terrain lying below the stack top elevation) or complex terrain (terrain above the top of the stack). Measurements of the terrain in the area surrounding the proposed facility were made using terrain data obtained from the United States Geological Service (USGS) Digital Elevation dataset.

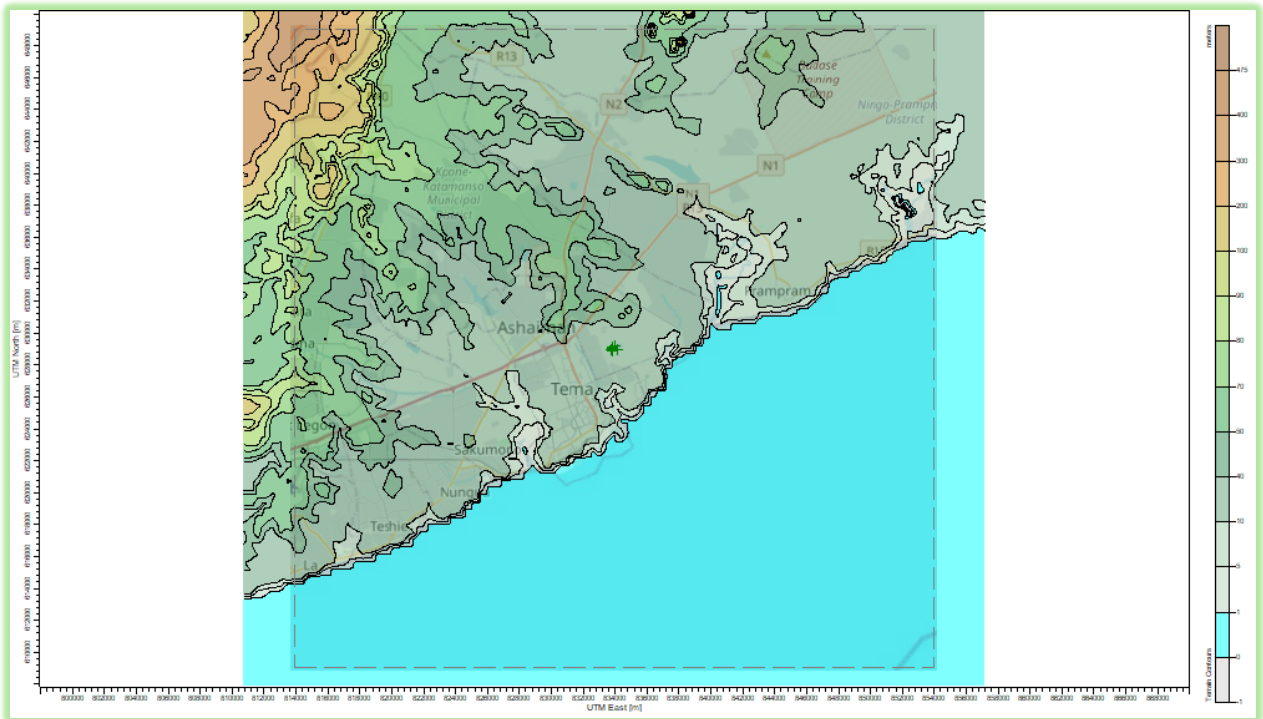

Figure 6-4: Terrain of project area

The topography is largely below 100 m with exception of the north-western portions of the modelling domain, which rise above 400 m (see Figure 6-4).. The entire southwestern, southern and south-eastern portions of the modelling domain are open water (the Gulf of Guinea). Therefore, since terrain elevations extend above the facility's highest top stack elevation, complex terrain algorithms were included as part of the dispersion modelling analysis.

6.6.3.2.6 Meteorological data

Single-point meteorological observations were used to create one "surface" data file and one "upper-air" data file in a format needed by AERMOD. The meteorological information was a twenty - year average (2000 – 2020) from the Tema Meteorological Station (DGAT 65473) as detailed in Section 4.3.1.4, above. The meteorological observations were assumed to be located at the centre of the modelling domain and persist for the duration of the modelling.

6.6.3.2.7 Receptor network

The selection and location of the receptor network are important in determining the maximum impact from a source and the area where there is significant air quality impact. Impacts were assessed at locations beyond the fence line. Consequently, the receptor locations were selected as a nested grid that is defined by discrete Cartesian receptors, square in shape, and with origin at the centre of the proposed cement manufacturing facility. An intermediate plant boundary grid was also included with spacing of 5 m along the fence line. Discrete receptors were also defined for all communities within a 20 km radius of the proposed facility.

A total of 17,152 receptors were considered and are graphically depicted in Figure 6-5. The entire receptor network locations include the following:

- A 500-meter spaced grid between 10 km and 20 km from the centre of the proposed facility;
- A 250-meter spaced grid between 5 km and 10 km from centre of the proposed facility;
- A 200-meter spaced grid between 2 km and 5 km from centre of the proposed facility;
- A 50-meter spaced fence-line grid 2000 m away from the facility fence line;
- A 5-meter spaced intermediate fence-line grid; and
- A total of 44 special receptors that include all communities within a 12 km radius of the proposed facility.

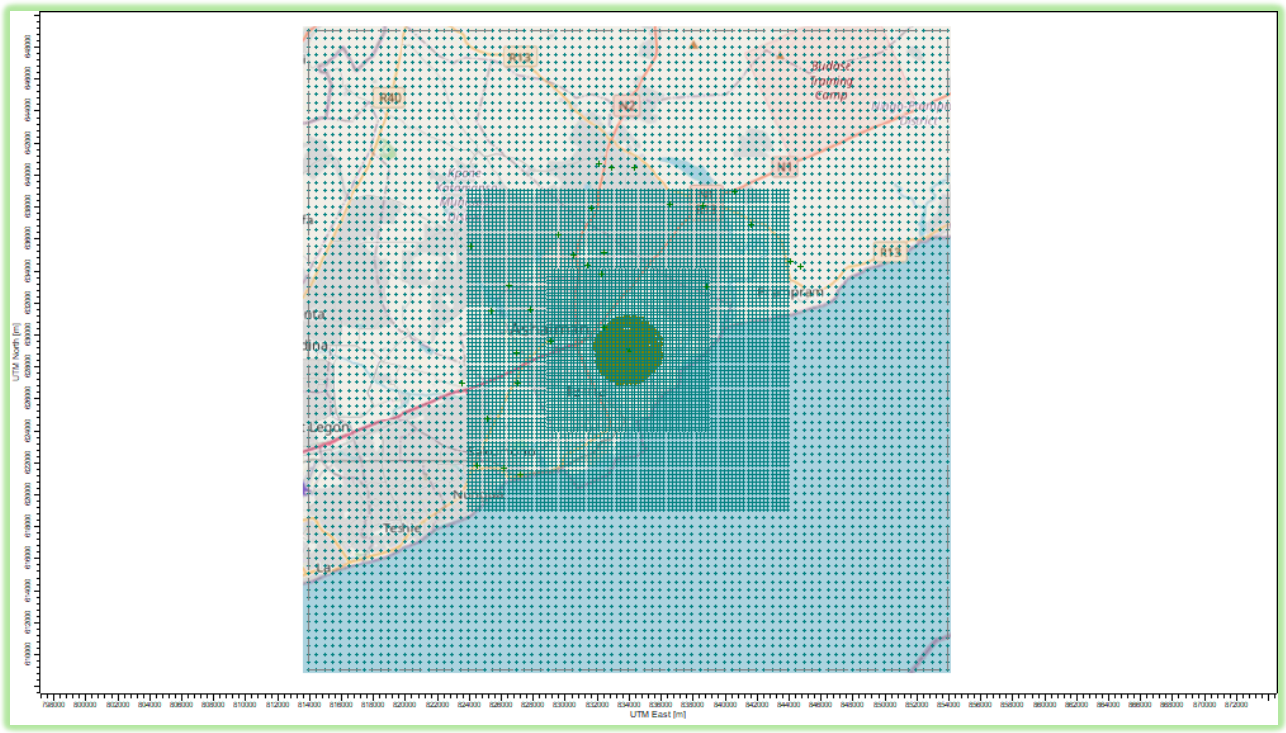

Figure 6-5: Receptor Grid for modelling

6.6.3.2.8 Background Concentrations

Background concentrations represent the concentration of a given pollutant when the contribution from anthropogenic sources (in this case, the proposed cement grinding and bagging plant) is removed. Background levels are important because, often times, air quality regulations require considering of background concentrations when evaluating compliance with ambient air quality standards. The higher the background level in a certain area, the lower modeled concentrations must be to meet standards. Historical ambient air quality data measured at the project site served as background concentrations data for the dispersion modelling as detailed in Section 4.3.2, above.

6.6.4 Model Results

With the various sources identified, a model domain of 20 km centred in the middle of the proposed cement grinding and bagging facility and the necessary input files created, model predictions were made for the pollutants SO_2, NOx, PM_{10} and CO for averaging periods for which there are Ghanaian ambient air quality standards (see Table 6-9). Due to the scale of the proposed project, the modelling results will be compared to the industrial thresholds for the various pollutant sources to establish compliance of pollutants from the proposed project.

Table 6-9: GS 1236:2019 Air quality thresholds

Pollutant	Averaging Time	Maximum Limits (µg/m^3)	
		Ambient Air Pollutants	Fenceline Air Pollutants
Sulphur Dioxide (SO_2)	1 hour	520	-

Pollutant	Averaging Time	Maximum Limits (µg/m³) Ambient Air Pollutants	Fenceline Air Pollutants
	24 hours	50	150
Nitrogen Oxides (measured as NO_2)	1 hour	250	-
	24 hours	150	150
PM_{10}	24 hours	70	70
	1 year	70	70
Carbon Monoxide	15 minutes	-	100
	30 minutes	-	60
	1 hour	-	30
	8 hours	-	10
$PM_{2.5}$	24 hours	35	35
Total Suspended Particles (TSP)	24 hours	150	150
	1 year	80	100

6.6.4.1 Proposed project cumulative air quality impacts

Table 6-10 summarizes the maximum predicted concentrations for the proposed cement facility sources and their comparison with GS 1236:2019. The results revealed that the maximum predicted ground level concentrations from all the proposed sources of the cement facility did not exceed the regulated thresholds. Additionally, the maximum predicted ground level concentrations from all the proposed cement facility sources plus the background concentrations were all less than the thresholds set by GS 1236:2019.

All maximum ground concentration fallouts are on the fenceline. Consistent with GS 1236;2019, fenceline thresholds served as benchmarks for determining the air quality impact of the proposed facility operations at 100 percent plant and calciner capacity and generator load. All concentrations modelled for all averaging periods fall within permissible limits.

The dispersion fallout distance for all modelled pollutants are within the modelling domain (20 km). Consistent with the primary wind vector prevailing in the project area, all dispersion fallout distances are in the north-eastern direction. Fallout ground concentration at all communities within a 12 km radius of the proposed site are all within permissible limits.

Table 6-10: Model Results for proposed facility

Pollutant	Averaging Period	GS 1236:2019 Threshold (µg/m³)		Dispersion fall-out			
		Ambient	Fenceline	Maximum Concentration [Ground Level] (µg/m³)	Fenceline UTM E (m)	Fenceline UTM N (m)	Dispersion fallout distance from fence line (m)
PM_{10}	24 hours	70	70	43.37412	833879.57	628883.71	5334.12
	1 year	70	70	33.86814	833879.57	628883.71	2269.00
NO_2	1 hour	250	-	26.89206	834145.63	629045.07	> 20000

Pollutant	Averaging Period	GS 1236:2019 Threshold (µg/m^3)		Dispersion fall-out			
		Ambient	Fenceline	Maximum Concentration [Ground Level] (µg/m^3)	Fenceline		Dispersion fallout distance from fence line (m)
					UTM E (m)	UTM N (m)	
	24 hours	150	150	11.81595	834145.63	629045.07	> 20000
SO_2	1 hour	520	-	6.8026	834145.63	629045.07	769.24
	24 hours	50	150	3.68639	834145.63	629045.07	169.38
CO	1 hour	-	30	6.70819	834145.63	629045.07	11057.59
	8 hours	-	10	4.37027	834145.63	629045.07	11057.59
$PM_{2.5}$	24 hours	35	35	17.696	833879.57	628883.71	397.56
TSP	24 hours	150	150	44.44427	833879.57	628883.71	4678.93
	1 year	80	100	40.73341	833879.57	628883.71	1874.78

6.6.5 Conclusion

The following conclusions may be made as a result of the conduct of the air dispersion modelling analyses for the proposed project:

The emission rates for PM_{10}, $PM_{2.5}$, TSP, CO, NO_2 and SO_2 that will be emitted from the proposed cement grinding and bagging facility are in compliance with ambient and fenceline air quality standards. It may be inferred that these emission standards would not be exceeded based on the superior suite of air pollution control technology (air-box pulse-jet bag filter and pulse-jet dust collector) to be incorporated in the design of the proposed cement grinding and bagging facility.

The model predictions for the proposed cement grinding and bagging facility revealed compliance with the PM_{10}, $PM_{2.5}$, TSP, CO, NO_2 and SO_2 ambient air quality standards and guideline concentration for the requisite averaging periods. The incremental impact of these air pollutants were also less than the established values that would have created a significant air quality impact.

The proposed cement grinding and bagging facility sources demonstrated compliance with the ambient air quality standards and the guideline concentration, as well as the significant impact incremental values. Attenuation and monitoring strategies have been proposed to ensure that the proposed project's related air quality impacts are maintained within regulatory limits and potential threshold violations detected.

7 MITIGATION AND ENHANCEMENT MEASURES

Based on the assessment of potential impacts, this section contains proposed mitigation and enhancement measures to avoid or minimize adverse impacts and maximise beneficial impacts. The mitigation and enhancement measures show the proposed commitments to address and manage the potential impacts associated with the proposed project. Selected Contractors will implement pre-construction and construction phase mitigation and enhancement measures that will be incorporated into the contract documents of contractors, sub-contractors and Project design specifications in close collaboration with the CBI Ghana Limited. CBI Ghana Limited spearheaded by the Health, Safety and Environment (HSE) Manager will implement O&M phase mitigation and enhancement measures drawing from its own internal quality, environmental, health and safety management systems. The activities of these Contractors will be supervised by CBI Ghana Limited and relevant state agencies.

7.1 APPROACH TO IMPACT AVOIDANCE AND MITIGATION

Measures to reduce, avoid, or offset potential adverse environmental impacts outlined in this EIS are based on local environmental management, Good International Industry Practices (GIIP), World Bank and IFC guidelines. The mitigation sequence/ hierarchy is as shown in Figure 7-1.

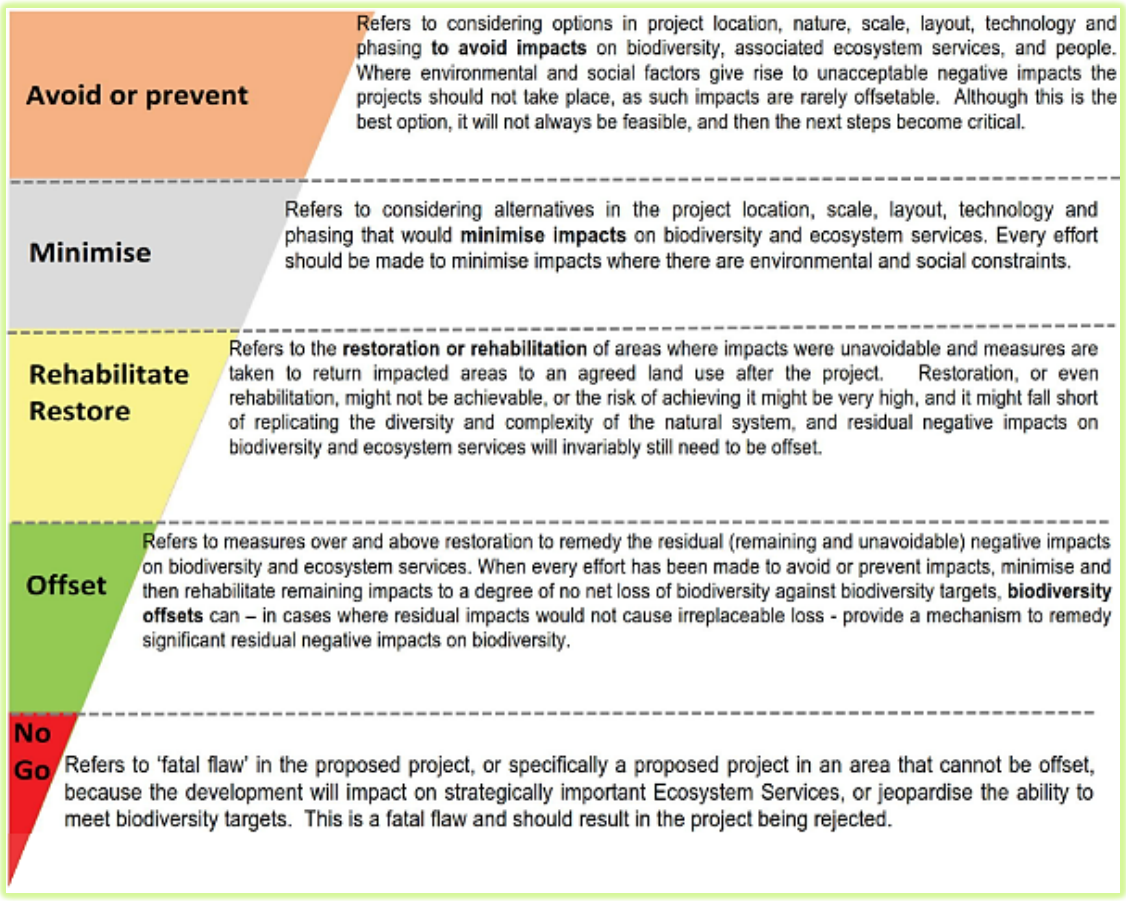

Figure 7-1: Sequence for preference of mitigation measures

7.2 PRE-CONSTRUCTION AND CONSTRUCTION

7.2.1 Potential Physical Environmental Impacts

7.2.1.1 Soil disturbance and potential erosion

Construction activities that will require exposure of the soil will be minimised during times of inclement weather; whilst maximum work would be done during favourable weather conditions. Topsoil from foundation trenches and other excavations will be stockpiled and used for landscaping. Backfilling and support structures will be adequately done in locations where the soil can easily be washed away.

7.2.1.2 Ambient air quality impacts

The contractor will employ water dowsing as a dust suppression mechanism at the section of the existing plant with active construction activities. Haulage trucks carrying sand and gravel will be covered with tarpaulin or equipped with closed buckets to prevent the escape of particulate matter. Also, construction will be scheduled to avoid the excavation, handling, and transport of erodible materials under high wind conditions. Stockpiles sand for construction works will be wetted and/or sheltered from the wind to prevent the dispersion of particulate matter. To ensure efficient fuel consumption and minimize emissions, all construction machinery must be maintained to be in good condition. Additionally, appropriate construction specific Personal Protective Equipment such as respirator/filtering facepieces will be provided to workers as well as their uses enforced to minimise the impacts of decrease in ambient air quality. The contractor would undertake routine inspections and document findings to enable regular review for possible improvements in attenuation measures.

7.2.1.3 Increased Ambient Noise Levels and Localised Vibrations

Mobilization of the construction equipment and additional prefabricated metallic components of the new installations will be restricted to daytime hours (8 am to 6 pm), to reduce noise nuisance. The contractor will ensure the provision of acoustic dampeners in foundations and insulators in the interiors. Other, noise levels impact that emanates from the active use of equipment such as concrete mixers, on site generator(s) and trucks will be attenuated through a well-structured preventive maintenance programme in line with manufacturer's specifications, and properly functioning mufflers fitted to minimize noise pollution. Additionally, appropriate construction specific Personal Protective Equipment such as earmuffs will be provided to workers onsite and the contractor will enforce the use of these PPEs to minimise the impacts of noise pollution. The contractor will undertake periodic inspections and document findings to enable periodic review for possible improvements in the implementation of attenuation measures. Vibration effects will be reduced by administrative controls such as awareness creation programmes and rotation of workers.

7.2.1.4 Generation and Disposal of Waste

The contractor will continue with the implementation and sensitisation of workers on its existing waste segregation programme focusing on the key principles of waste management (reduction, re-use and recycling of materials) for efficient collection and disposal. For instance, construction and demolished debris will be reused for backfilling excavated foundations for the calciner and new silos. Also, potential wastes such like wooden pallets and cable drums will be repurposed into furniture for the administrative area and workers' common/ changing rooms. Designated waste bins would be allocated for the construction workers. Workers would as well be enlightened to dispose of waste in the appropriate designated waste bins. Liquid wastes from the canteen, kitchen and rest rooms will be ducted into the central wastewater treatment facility provided by the GFZA. Existing ablutions facilities will be designated for use by construction workers. Adequate informational signs such as *"Do Not Litter"* as shown in Figure 7-2 will be displayed at vantage points to further sensitise construction workers.

Figure 7-2: Sample of informational sign to promote a good waste management culture

7.2.2 Potential Socio-Economic Impacts

7.2.2.1 Increase Traffic Volumes

The contractor will engage haulers with demonstrated capacity to comply with Ghana Highway Authority regulations to transport the needed equipment and materials to the project site. All hired drivers will have the appropriate driving licenses and be inducted upon engagement. Drivers will be sensitized through daily briefings on adherence to road regulations, made fully aware of the site location and the bespoke operating procedures for the site in advance, including providing the most appropriate route plan. The briefing will also cover site-specific safety/operational requirements for

accessing the site and when on the site itself. It will as well include warning drivers of the potential presence of pedestrians and cyclists along the road.

Traffic wardens will be engaged and deployed at the entrance to control/direct the arrival and departure of vehicles using appropriate radio/telephone communications at the site. Haulage of heavy equipment will be scheduled to fall outside the AM peak traffic hour (07:00-09:00) on the highway whenever possible, and where necessary, an escort will be provided. The Management of CBI Ghana Limited will implement a monitoring scheme that includes a review of driver logbooks to track arrivals and departures at the site and schedule future trips.

7.2.2.2 Occupational Health and Safety Risk to Workers

The contractor will act in line with Ghana's Occupational Safety and Health (OSH) Draft Policy (2004) and other Good International Industry Practice (GIIP). Activity-specific job safety analysis guided by GIIP will be undertaken to identify specific occupational health and safety hazards associated with the activity and appropriately mitigated. Sufficient orientational training for all construction workers. Along with the training, appropriate Personal Protective Equipment (PPE) such as hard hats, safety shoes, eye protection, earmuffs, and N95 dust masks will be provided, and their use will be enforced for workers' safety. Handwashing facilities and sanitisers will be placed at vantage points of the site for use by workers in line with the COVID-19 protocols. The temperature of construction workers will be checked each day before admittance into the construction site using an "Infra-Red Thermometer Gun". CBI Ghana Limited will label areas deemed dangerous. The approved eight working hours per day will be observed to avoid accidents due to fatigue. Regular monitoring and site-specific risk assessment will be conducted per each new construction activity to be undertaken, and a safety procedure developed and implemented to avoid or reduce risk.

7.2.2.3 Community Health and Safety Risks

The contractor will provide fencing around the construction site and erection of appropriate site signage as warnings to unauthorised person from uncontrolled access. Expatriate construction workers will be sensitised to properly respect the boundaries of companies within the TPEZ. Dust and noise suppression by water dousing and the use of mufflers will be use by the contractor to reduce dust and noise pollution respectively.

The contractor will ensure that construction material suppliers comply with road safety regulations including speed limits and road signs. Drivers will be well-trained and trucks well maintained.

The contractor will sensitize construction workers on sexually transmitted diseases (STDs) notably HIV/AIDs and the usage of appropriate protections such as condoms. Construction workers will be

encouraged to undergo voluntary counselling and testing. CBI Ghana Limited will support the Ghana Health Service during any community level HIV/AIDS awareness programme in the project area to sensitize community members on the dangers of STDs.

All construction workers will be required to observe all COVID-19 protocols within and outside the construction site. Any workers showing symptoms of COVID-19 will be required to isolate and seek prompt medical attention.

7.2.2.4 Disruptions in normal CBI's operations due to expansion

The contractor will plan ahead to minimize the impact of any disruptions to routine operations. For example, the company will forecast the amount of cement needed to meet client requests or expectations during the time they may not be in operations, and this will serve as a buffer. Additionally, the existing production unit's operating hours will be shifted to weekends throughout the construction period. This will supplement the buffer and ensure a steady supply of cement to its customers. The contractor, on the other hand, will implement a proper communication plan to guarantee that real-time information about any anticipated operational issues is sent to both suppliers and clients. Clients will be given precise information about when the procedure will most likely be put on hold, when it will resume, and the alternative strategy for meeting their goals. For the proposed project's completion, the contractor would adhere to rigorous deadlines. By doing so, the organization will be able to hire contractors who have a track record of meeting deadlines. The contractor would also make resources available to help the project be completed on schedule.

7.2.2.5 Relocation of Squatter

A new site for relocation, about 120 m north of the current squatter location, has been identified for relocation of the squatter. Relocation support shall be given to the squatter to offset any associated resettlement cost. The support shall be fairly determined and the squatter engaged to build consensus. All relocation and compensation offered by CBI Ghana Limited shall be documented and a grievance redress process duly communicated.

7.2.2.6 Additional Employment and Income Generation

The contractor will continue to give preference to the recruitment of local labour (especially marginalized groups such as women and youth), particularly when only semi-skilled or unskilled labourers are required. Labour needs will be communicated via job posters at vantage points to economically active population within the Kpone Katamanso Municipality. Local sourcing of available construction materials such as sand and chippings will be practiced by the contractor. For

the enhancement of revenue generation, CBI Ghana Limited and the contractor will fulfil its tax and other statutory obligations to the respective government authorities in a timely manner.

Also, the contractor will proactively implement its human rights strategy to prevent and address discrimination in its work environment. The strategy will enable the contractor to fully take responsibility in dealing effectively, quickly, and fairly with situations involving claims of harassment or discrimination. At a minimum, the contractor will adhere to international requirements, including IFC Performance Standard 2. This will be achieved through the under bulleted.

- Ensure fair treatment of all workers.
- Avoid employment of minors (persons less than 18 years of age) or child labour.
- Observe a strict 'Non-Discrimination and Equal Opportunity Policy' during recruitment; and
- Avoid engaging in forced labour practices.

7.3 OPERATIONS AND MAINTENANCE (O&M) PHASE

7.3.1 Potential Physical Environmental Impacts

7.3.1.1 Decrease in Ambient Air Quality

The following pollution control measures will be implemented to reduce air quality impacts from the project taking into consideration results of air dispersion modelling:

- All transfer points and storage silos will be provided with dust collection and extraction systems for effective control of fugitive emissions.
- Use of enclosed belt conveyors for materials transportation and emission controls at transfer points.
- Covering of raw materials and cement with tarpaulin during transport.
- Storage of raw materials in an enclosed raw material shed. Avoid storage of raw materials outside.
- Use and appropriate maintenance of air abatement systems (fabric filters) to collect any dust emissions.
- Capturing mill dust by high efficiency fabric filters and recycling within the process.
- Air pollution abatement systems will be regularly inspected and maintained per manufacturer instructions to ensure optimum efficiency. Worn out fabric filters should be promptly replaced.
- Ensure the discharge concentration of waste gas and dust at each dust raise point under the control discharge index.
- Set negative pressure dust collecting system at all dust raise points.
- Using enclosed conveyor belts for transporting cement.
- Ensure workers use adequate nose masks and eye protection.

- Consider planting of ornamental trees/plants around the parameter of the site for the twin-rational of onsite beautification as well as a barrier in combating air-pollution.
- Conduct monthly ambient and fence line air quality monitoring during operation to ensure early detection of actual air quality non-compliances and take the necessary corrective actions.
- Integrate stack monitoring facilities into the proposed project design to determine actual emissions from the proposed project.
- Only fuel from accredited oil marketing companies (OMCs) with low sulphur content should be used for the generator and vehicles.

7.3.1.2 Increase in Ambient Noise Levels

Regular maintenance will be carried out on all equipment and machinery in accordance with manufacturer specifications to reduce their noise levels and boost efficiency. Workers at the site will use ear mufflers to avert hearing problems they may develop with prolonged exposure to noise levels above the allowable limit. Workers will be encouraged to switched off idling machinery or vehicles to minimize noise. Unnecessary tooting of vehicles carting raw materials to site and finish product will be prohibited. Management of CBI Ghana Limited will implement a planned preventive maintenance programme for vehicles and trucks to reduce noise levels. Vibration effects will be reduced by administrative controls such as awareness creation programmes and rotation of workers. CBI Ghana Limited will undertake continuous monitoring and document findings to enable periodic review for possible improvement in the attenuation measures

7.3.1.3 Generation and Disposal of waste

CBI Ghana Limited will continue to implement a waste segregation programme focusing on the principles of reduction, re-use and recycling (3Rs) for efficient collection and disposal. Waste from filter bags will be reintroduce into the cement production cycle. Cement bags will be reassembled and supplied tailoring shops for reuse in training apprentice. However, damaged cement bags, paper, plastic container/bottles will be given to private vendors to recycle. Properly labelled waste bins will be provided to encourage waste segregation. All employees will be sensitised and encouraged to segregate waste generated and dispose same into their respective bins. Food waste and other biodegradables will be transformed into compost through an aerated static pile composting technique (covered) and used as manure for maintenance of lawns and other ornamental plants. Information signs will be displayed at vantage points within the factory. Worker will use the existing on-site ablution facilities. A licensed service provider will be engaged to dislodge the septic system when it is full to capacity.

7.3.1.4 Fire and Explosion Risk

Cement plants are thought to be less vulnerable to significant fire and explosion losses. However, there have been cases of costly fire losses at cement plants. Management of CBI Ghana Limited will engage qualified and certified technicians to design and implement the lightening and gas systems. CBI Ghana Limited will install fire hydrants and a fire sprinkler at the plant premises (see figure 72). The hydrants will provide adequate source of water to help fire officials in the event of a fire outbreak at the premises of the cement plant. Moreover, the installation of fire sprinklers will deliver sufficient pressure and disperse water to protect the building from fire emergencies. In addition, CBI Ghana Limited will install an automated fire detection system in all offices and cable trenches. This will help detect smoke and fire at an early stage which pave way for evacuation and necessary cautionary measures to be adopted and helps speeds up the control of fire outbreaks. Likewise, CBI Ghana Limited would ensure that all areas of the plant are equipped with the required type and number of portable fire extinguishers. This will provide the necessary options for controlling small fire emergencies. Lastly, CBI Ghana Limited will frequently ensure effective training on some safety measures in mitigating or stopping fires. All employees of the cement plant will be provided with the basic knowledge in fire drills to equip employees with the technical know-how in responding to fire emergencies. Behavioural change measures targeting the intake of alcohol and smoking before or during working hours will be adequately communicated to limit negligence.

Figure 7-3: Typical fire hydrant and fire sprinkler to be installed

7.3.1.5 Increase Resource Use

CBI Ghana Limited will use energy-efficient machinery and equipment at the operational phase to ensure the conservation of electrical power and reduce the carbon footprint of the plant. The addition of the Clay Gas Suspension System for clay calcination will be powered by natural gas which will reduce electricity consumption and contributes to CBI Ghana Limited commitment to lowering of its CO_2 emissions. Regular payments will be made to supplier of the natural gas to guarantee the constant supply and optimum operation of the calciner as its considered clean fuel with positive environmental

footprint particularly its non-emittance of CO_2. The new structures will be fitted with motion sensors that will potentially boost the eco-efficiency footprint of CBI Ghana Limited.

CBI Ghana Limited will ensure reduce consumption of water and reuse of water at the project site which will increase water use efficiency and conversation. This will include, but not exclusively, the collection of washing and cooling water, supervising or monitoring water consumption, and reusing treated wastewater (once wastewater treatment plant is operational) as part of its water saving measures. Also, the expansion of the project will integrate rainwater harvesting system especially during the raining season for domestic and operational use. The use of lower showerheads and sensor taps at the domestic level will help reduce and conserve water.

7.3.2 Potential Socio-Economic Impacts

7.3.2.1 Additional Employment and Income generation

CBI Ghana Limited will prefer recruiting local labour (especially marginalized groups such as women and youth), particularly when only semi-skilled or unskilled labourers are required. Every completed recruitment process will be followed by job orientation and capacity building detailing specific rules and standards requirements expected of the company's employees. All such engagements are then activated with a structured contract developed to meet local and international labour requirements.

Also, CBI Ghana Limited will proactively implement its human resource policy to prevent and address discrimination in its work environment. The strategy will enable CBI Ghana Limited to fully take responsibility in dealing effectively, quickly, and fairly with situations involving claims of harassment or discrimination. At a minimum, CBI Ghana Limited will adhere to international requirements, including IFC Performance Standard 2 and the Contractor such as:

- Ensuring fair treatment of all workers;
- Avoiding employment of minors (persons less than 18 years of age) or child labour;
- Ensuring standard treatment and management of migrant workers consistent with local requirements;
- Observing a strict 'Non-Discrimination and Equal Opportunity Policy' during recruitment; and
- Avoiding the engagement of forced labour.

7.3.2.2 Occupational health and safety risks to workers

CBI Ghana Limited will act in line with Ghana's Occupational Safety and Health (OSH) Draft Policy (2004) and other Good International Industry Practice (GIIP). All workers will be periodically examined for health status. The parameters which are monitored as per occupational health check-up are blood, urine, sputum, stool, ECG, X-Ray (Tuberculosis & Silicosis), eye test, audiometry and

lung function test (PFT), etc. Additionally, sufficient training, appropriate Personal Protective Equipment (PPE) such as hard hats, safety shoes, eye protection, earmuffs, and N95 dust masks will be provided, and their use is enforced for workers' safety. The approved eight working hours per day will be observed to avoid accidents due to fatigue.

CBI Ghana Limited management will provide first aid equipment on-site to administer for all minor injuries while major cases will be referred to the nearby health center. Additionally, handwashing facilities will be placed at vantage points of the site for use by workers in line with the COVID-19 protocols. The temperature of workers will be checked each day before admittance into the construction site using an "Infra-Red Thermometer Gun".

Management of CBI Ghana Limited will institute and apply appropriate sanction regimes for workers who flaunt mandatory safety protocols without prior permission. An OHS register will be maintained, and workers tasked to report all occupation health and safety related incidents for documentation and review purposes. Daily monitoring of the implementation of all OHS measures will be done to enable the fashioning of timely corrective actions, when necessary. Lastly, CBI Ghana Limited will carry out occupational health survey for the all the workers including the contract and sub-contract workers to inform the design and implantation of future mitigations.

7.3.2.3 Increase Traffic Volumes

During operations, CBI Ghana Limited will ensure that, finished cements are transported during off peak hours by haulage trucks fitter with approve reflectors. The approve load limits of haulage trucks would be followed to reduce breakdowns and possible accidents. Haulage trucks and associated equipment's will be serviced in line with manufacturer's schedule and specifications. Only suitably valid driving licence holders will be recruited and inducted prior to the performance of their assign duties. Drivers will be sensitized during weekly toolbox meetings on adherence to road regulations or signage and defensive driving procedures. The briefing will also cover site-specific safety/operational requirements for accessing the site and when on the site itself. It will as well include warning drivers of the potential presence of pedestrians and cyclists along the road.

Refresher driving test and licence renewals will be made mandatory at the approve interval in conformity with the Driver and Vehicle Licensing Authority (DVLA) and Road Safety Commission regulations. CBI Ghana Limited will ensure arrangements are made for prompt towing of broken-down trucks from the road. Traffic wardens will be engaged and deployed at the entrance to control/direct the arrival and departure of vehicles using appropriate radio/telephone communications

at the site. The Management of CBI Ghana Limited will implement a monitoring scheme that includes a review of driver logbooks to track arrivals and departures at the site and schedule future trips.

7.3.2.4 Increased Government Revenue

For the enhancement of government revenue generation, CBI Ghana Limited will fulfil its tax and other statutory obligations to the respective government authorities in a timely manner. Additionally, employees of CBI Ghana limited will be encouraged to honour their tax obligations, thus potentially increasing government revenue. CBI Ghana Limited will also educate its employees on the importance and role taxes play in the development of the country.

8 PROVISIONAL ENVIRONMENTAL MANAGEMENT PLAN

The Provisional Environmental Management Plan (Provisional EMP) is prepared per the EPA of Ghana's directives for conducting impact assessments. Therefore, this Provisional EMP provides general mitigation and management measures for the pre-construction, construction, operation, and maintenance phases of the proposed expansion project. Its purpose is to reduce the risk of adverse impacts of the project on sensitive environmental resources. The Provisional EMP also focuses on achieving best practices, through an approach that establishes environmental objectives, procedures, action plans and evaluation, and sets up a process that integrates environmental responsibility in all aspects of the expansion project activities.

CBI Ghana Limited will assign environmental management responsibilities to all managers involved in construction, operation and maintenance of the project. The overall responsibility for environmental management rests on the Environment, Health and Safety (HSE) Manager. The HSE Manager will provide monthly environmental performance report detailing performance against the objective in this Provisional EMP to Management of CBI Ghana Limited and any such reports as may be required for external assessment. Figure 8-1 is the organisational structure for CBI Ghana Limited to facilitate the implementation of this Provisional EMP.

8.1 OBJECTIVES OF THE PROVISIONAL EMP

The PEMP has the following objectives:

- To outline mitigation measures and environmental specifications which are required to be implemented for all phases of the proposed project to minimize the extent of all environmental impact;
- To outline functions and responsibilities of responsible persons (see Table 8-1 for implementation structure);
- To set out procedures on how internal communication will be planned, managed and documented with respect to all environmental matters;
- To state standards and guidelines, which are required to be achieved in terms of environmental legislation; and
- To prevent long term or permanent environmental degradation.

8.2 ENVIRONMENTAL AND SOCIAL REQUIREMENTS

8.2.1 Legal and Regulatory Requirements

Refer to Chapter 2.0 of this Report for details of the key legislation and policies applicable to the proposed project.

8.2.2 Environmental, Social, Occupational Health and Safety (E&S) Policy

CBI Ghana Limited is committed to ensure sustainability and promote social acceptance in its areas of operations. In addition, CBI Ghana Limited demonstrates its commitment towards safeguarding workers' safety and prevention of ill-health by establishing and implementing an OHS policy as shown in Appendix D.

8.3 IMPLEMENTATION STRUCTURE AND RESPONSIBILITIES

The HSE Manager will develop an Environmental and Social Management System (ESMS) detailing the objectives, organizational structure, responsibilities, resources, mitigation and control measures prior to project implementation. The ESMS will also include monitoring and auditing plans, review systems, provisions for implementing corrective actions for deviations from this Provisional EMP as well as training systems for the pre-construction, construction, operation and maintenance phases. The ESMS will serve as the basis for preparing project design and other contractual documents.

The HSE Manager will ensure effective implementation of ESMS on a day-to-day basis with the support of other Managers. The organisational structure of CBI Ghana Limited is shown in Figure 8-1. The duties of the HSE Manager will include but not limited to the following:

- Prior to construction, the HSE Manager shall develop an Environmental and Social Management System (ESMS) detailing the objectives, organizational structure, responsibilities, resources, mitigation and control measures prior to Project implementation.
- Monitor the compliance of the proposed project with environmental legislation and recommendations from EPA.
- Responsible for compiling where necessary, a monitoring checklist.
- Organize training and awareness creation for workers;
- Prepare and supervise environmental monitoring and compliance activities and provide recommendations that improve the site's environmental sustainability and efficient operations; and
- Ensure adequate provision and use of PPEs among workers and monitor their operations according to acceptable standards.

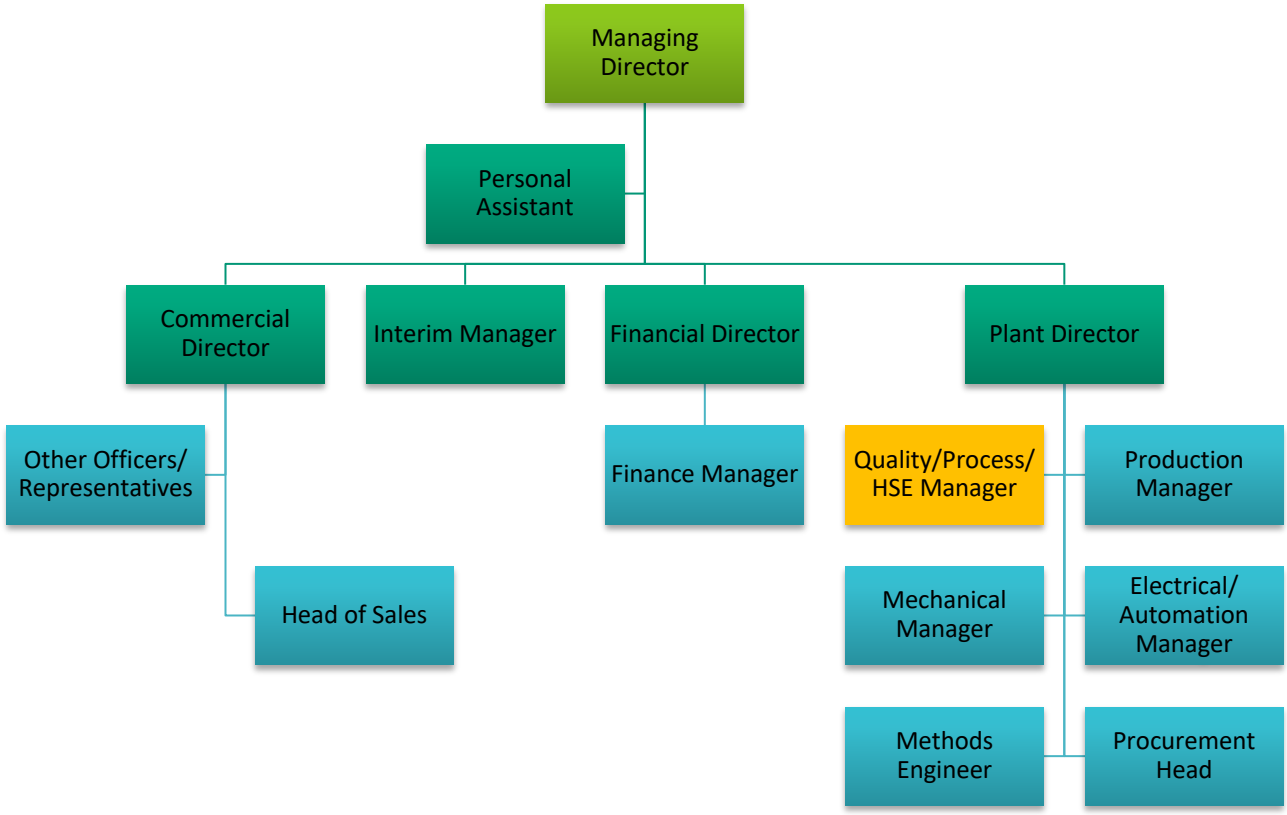

Figure 8-1: Organizational structure for CBI Ghana Limited

During construction, the HSE Manager will be responsible for:

- Ensuring that environmental, health, safety and social performance indicators are integrated in the contract with contractors based on this Provisional EMP;
- Meeting on site with the Contractors prior to the commencement of construction activities to confirm the construction procedure and designated activity zones;
- Regular monitoring of contractor activities on-site; and
- Conducting an environmental inspection on completion of the construction period.

During operation and Maintenance, the HSE Manager will be responsible for:

- Prepare and timely submit Annual Environmental Reports (AER) and Environmental Management Plans (EMP) to the EPA of Ghana;
- Ensuring necessary environmental monitoring takes place and maintain records; and
- Overseeing the implementation of the mitigation measures for the operation phase. Manage and report on-site environmental performance;
- Compile environmental, health and safety policies and procedures;
- Renew environmental permits and applicable certificates;
- Advise Management on environmental, health and safety issues;

- Conduct environmental, health and safety training and awareness for workers; and
- Liaise with interested and affected parties on environmental, health and safety issues of common concerns.

8.4 ENVIRONMENTAL AND SOCIAL ACTION PLANS

CBI Ghana Limited is committed to integrating sustainable environmental management into its preconstruction, construction, operation, and maintenance activities. To achieve this, this Provisional EMP will serve as an on-site reference document during all phases of the proposed project.

Table 8-1 and Table 8-2 contain environmental action plans to guide the ESMS implementation during the preconstruction, construction, operation, and maintenance phases of the project.

An estimated amount of fifty-six thousand Ghana Cedis (GHC 56,000.00) per annum is required during pre-construction and construction while one hundred and forty-five thousand Ghana Cedis (GHC 145,000.00) is required per annum for implementation of the environmental action plan during operation and maintenance.

Table 8-1: Pre-construction and construction phase environmental and social action plan

Impact	Identified mitigation actions	Actual action	Objective	Target	Budget (GHC)	Time Frame	Responsibility
Soil disturbance and potential erosion	▪ Control erosion of topsoil	▪ Avoid or minimise construction work during times of inclement weather ▪ Use topsoil for landscaping ▪ Erect support structure and backfill erosion prone areas ▪ Incorporate adequate storm water drains in project design	▪ Protect the soil	▪ No visible evidence of soil erosion	Part of Contractor responsibility	Before and during construction	Contractor
Ambient air quality impacts	▪ Reduce air pollution	▪ Operate only well service equipment and vehicles ▪ Switch-off all idle engines/ truck ▪ Provide dust control measures such as speed limits and tarpaulin coverings ▪ Avoid the use of overage vehicles ▪ Implement dust control measures ▪ Maintain vehicles and equipment regularly ▪ Provide nose masks to workers in dusty areas ▪ Identify and control air pollution sources to permissible levels ▪ Undertake haulage activities during the day	▪ Reduce the impacts and risks of air pollution	▪ Comply with GS 1222:2018	25,000.00	During construction	Contractor
Increase in ambient noise levels and localised vibration	▪ Reduce noise pollution and vibration	▪ Maintain/ service equipment regularly ▪ Operate only well service equipment and vehicles ▪ Avoid overage vehicles and machinery ▪ Fix mufflers on noise generating equipment ▪ Provide earmuffs to workers in noisy area ▪ Schedule construction activities to control cumulative noise from existing operation and construction activities ▪ Switch off all idling engines	▪ Reduce the impact and risk of noise pollution and vibrations	▪ Comply with GS 1222:2018	20,000.00	During construction	Contractor

Impact	Identified mitigation actions	Actual action	Objective	Target	Budget (GHC)	Time Frame	Responsibility
		▪ Apply administrate controls to check localised vibrations					
Generation and disposal of waste	▪ Control waste generation and disposal	▪ Develop inventory and schedule of likely wastes and specify disposal procedures for all waste streams identified ▪ Sensitise workers on the existing waste segregation practices of CBI Ghana Limited ▪ Provide additional properly label waste bins, if required ▪ Continue existing arrangement with third party waste vendors to pick recyclable waste ▪ Mount "Do Not Litter" signpost ▪ Designate existing ablution facilities to construction workers in collaboration with CBI Ghana Limited ▪ Monitor waste disposal	▪ Protect the environment	▪ No visible evidence of waste pollution	Part of existing waste management practice	During construction	Contractor
Increased traffic	▪ Avoid road traffic accidents	▪ Employ qualified drivers ▪ Induct drivers upon engagement ▪ Prohibit overloading of trucks ▪ Maintain vehicles regularly ▪ Sensitise drivers on safe driving procedure ▪ Engage traffic wardens to control traffic ▪ Provide road safety signs ▪ Undertake off-peak hauling ▪ Tow faulty vehicles promptly ▪ Develop and implement a traffic management plan prior to commencement of construction activities.	▪ Protect construction workers and the general public	▪ Zero traffic related accidents/Incidents	Part of Contractor responsibility	During construction	Contractor

Impact	Identified mitigation actions	Actual action	Objective	Target	Budget (GHC)	Time Frame	Responsibility
Occupational health and safety risks to workers	▪ Avoid OSH related incidents	▪ Comply with Ghana OHS policy and other GIIP ▪ Induct all newly recruited workers on safety related issues. ▪ Maintained proper lighting systems. ▪ Provide and enforce usage of appropriate PPEs ▪ Provide first aid boxes to manage minor injuries ▪ Issue permit to work (PTW) for all hazardous work schedules ▪ Implement regular emergency drills ▪ Prohibit alcohol use on the project ▪ Install and enforce use of hand washing facilities ▪ Check temperature of workers before and close of work ▪ Label dangerous and hazardous areas at site ▪ Adhere to approved 8 daily work hours ▪ Isolate vehicular and human traffic	▪ Protect workers against OSH related accident	▪ Zero OSH incidents	10,000.00	During construction	Contractor
Community health and safety risks	▪ Avoid community Health and Safety ricks and incidents	▪ Ensure construction material suppliers comply with road safety regulations. ▪ Train workers on cultural sensitivities of communities ▪ Implement dust suppression activities ▪ Encourage community reporting of incidents in a manner that is consistent with best practise ▪ Create awareness on STDs and COVID-19 protocols among construction workers ▪ Encourage voluntary STDs counselling by the workers	▪ Protect community members	▪ Zero incidents of community Health and Safety ricks	Part of Contractor responsibility	During construction	Contractor

Impact	Identified mitigation actions	Actual action	Objective	Target	Budget (GHC)	Time Frame	Responsibility
Disruptions in normal CBI's operation due to expansion and new installations	Reduce the impact of construction on CBI operations	▪ Ensure proper planning ▪ Effective communication with clients ▪ Adherence to strict timelines for the expansion work ▪ Recruit qualified and competent contractor with proven track record ▪ Make resources readily available	▪ Ensure continuity of the operations	▪ To meet client's expectation	Part of Contractor and plant director responsibility	During main construction work	Contractor and Plant Director
Relocation of squatter	Provide relocation and livelihood support	▪ Determine a new site for relocation, about 120 m north of the current squatter location. ▪ Give relocation support to the squatter to offset any associated resettlement cost. ▪ Ensure relocation and livelihood support shall be fairly determined and the squatter engaged to build consensus. ▪ Clearly document all relocation and compensation offered by CBI Ghana Limited. ▪ Clearly communicate a grievance redress processes.	▪ Reduce impact of relocation on squatter	▪ Zero cost of relocation to squatter	1,000.00	Prior construction activities	HSE Manager and Plant Director
Construction employment and income generation	▪ Enhance employment and income generation impact	▪ Adhere to local labour and international regulations ▪ Communicate contractor human resource policy to all construction workers ▪ Commit to transparency of work processes ▪ Commit to non-discrimination and equality of all workers ▪ Ensure proper documentation and fair treatment of migrant workers/ expatriate staff ▪ Commit to the health and safety of workers ▪ Prioritise local recruitment	▪ Encourage local employment	▪ 50% of constructional workers being community members	Part of Procurement head and Contractor responsibility	Twice a year during construction	Procurement head and Contractor

Impact	Identified mitigation actions	Actual action	Objective	Target	Budget (GHC)	Time Frame	Responsibility
		▪ Induct all newly recruited workers about jobs specifications and requirements. ▪ Avoid the recruitment of children as labour ▪ Source construction materials from local suppliers with the required permits ▪ Settle tax and other statutory obligations promptly					
Total					**56,000.00**		

Table 8-2: Operations and maintenance phase environmental and social action plans

Impact	Identified mitigation actions	Actual action	Objective	Target	Annual Budget (GHC)	Time Frame	Responsibility
Ambient air quality impacts	▪ Reduce air pollution	▪ Use simple, linear layout for materials handling operations ▪ Use enclosed belt conveyors for materials and cement transportation and emission controls at transfer points. ▪ Cover raw materials and cement with tarpaulin during transport. ▪ Store raw materials in an enclosed raw material shed. Avoid open storage of raw materials. ▪ Set negative dust collection pressure systems at all dust raise points. ▪ Capture mill dust by high efficiency fabric filters and recycle within the process. ▪ Inspect and maintain air pollution abatement systems per manufacturer instructions ▪ Replace worn out fabric filters promptly.	▪ Reduce the impacts and risks of air pollution	▪ Comply with GS 1236, 2019; and GS 1219, 2018	80,000.00	Monthly	HSE Manager, Factory/ Maintenance Manager, and Production Manager

Impact	Identified mitigation actions	Actual action	Objective	Target	Annual Budget (GHC)	Time Frame	Responsibility
		▪ Discharge concentration of waste gas and dust at each dust raise point under the control discharge index. ▪ Plant and maintain trees (for instance pine) around the parameter of the site, where practicable ▪ Conduct monthly ambient and fence line air quality (PM10) monitoring during operation. ▪ Integrate stack monitoring facilities into the proposed project design to determine actual emissions from the proposed project ▪ Use only fuel from accredited oil marketing companies (OMCs) with low sulphur content for the generator and vehicles.					
Increase in ambient noise levels	▪ Reduce noise generation	▪ Maintain/ service equipment regularly ▪ Operate only well service equipment and vehicles ▪ Avoid overage vehicles and machinery ▪ Fix silencers on noise generating equipment ▪ Switch off all idle equipment and machines ▪ Rotate workers to reduce noise impacts on them ▪ Create awareness about noise impacts ▪ Prohibit un-necessary tooting	▪ Reduce the impact and risk of noise pollution and vibrations	▪ Comply with GS 1222:2018	20,000.00	Quarterly	HSE Manager
Generation and disposal of waste	▪ Reduce, reuse, recycle ▪ Sensitization	▪ Sensitise workers on waste segregation and the use of the labelled bind provided ▪ Continue to engage third party waste vendors to pick recyclable waste ▪ Reintroduce filter bags dust waste into the cement production cycle ▪ Mount “Do Not Litter” signpost ▪ Maintain septic system	▪ Protect the environment	▪ No visible evidence of waste pollution	5,000.00	Annual	HSE Manager

Impact	Identified mitigation actions	Actual action	Objective	Target	Annual Budget (GHC)	Time Frame	Responsibility
		▪ Develop inventory and schedule of waste streams and specify disposal procedures for all waste streams identified ▪ Monitor waste disposal methods and volumes ▪ Collect waste in designated bins for collection and disposal by the GFZA assigned waste service provider					
Fire and explosion risks	▪ Avoid potential of fire explosion	▪ Ensure quality of gas installations ▪ Contract only qualified/certified electrical technicians for wiring of the plant and installation of gas components ▪ Avoid overloading electrical sockets ▪ Install fire hydrants and a fire sprinkler at the plant premises. ▪ Install an automatic fire and gas leak detection system ▪ Provide portable fire extinguishers ▪ Undertake regular fire drills and establish an Emergency Response Team	▪ Protect workers and the cement plant	▪ Zero fire and explosion incidents	10,000.00		HSE Manager
Increased resource use	▪ Control resource use	▪ Use of energy-efficient machinery and equipment ▪ Operate only well maintained/serviced machinery ▪ Avoid overage vehicles and machinery ▪ Extend and install light with motion sensors in new structures ▪ Inspect and monitor calciner for optimum performance ▪ Install sensor taps in ablution facilities, if practicable ▪ Train employees on resource efficiency and wastage minimization.	▪ Encourage efficient resource utilization and minimization of wastage	▪ At least 50% resource use efficiency	5,000.00	Annual	HSE Manager

Impact	Identified mitigation actions	Actual action	Objective	Target	Annual Budget (GHC)	Time Frame	Responsibility
		▪ Post signages to prompt workers to conserve resources					
Additional employment and income generation	▪ Enhance employment and income generation impact	▪ Adhere to local labour and international regulations ▪ Communicate the company human resource policy to all workers ▪ Commit to transparency of work processes ▪ Commit to non-discrimination and equality of all workers ▪ Commit to the health and safety of workers ▪ Prioritise local recruitment of labour ▪ Ensure proper documentation and fair treatment of migrant workers/ expatriate staff ▪ Induct all newly recruited workers about jobs specifications and requirements. ▪ Avoid the recruitment of children as labour ▪ Source construction materials from local suppliers with the required permits ▪ Settle tax and other statutory obligations promptly ▪ Continue to undertake corporate social responsibility programmes ▪ Continue to settle tax and other statutory obligations promptly	▪ Encourage local employment ▪ Improve local livelihoods	▪ At least 50% of workers being community members	Part of Senior Human Resource Officer responsibility	Twice a year	Senior Human Resource Officer
Occupational health and safety risks to workers	▪ Avoid OSH related incidents/Accidents	▪ Comply with Ghana OHS policy and other GIIP ▪ Maintain an up-to-date accident and incident register and implement corrective actions, as required ▪ Provide and enforce the use of appropriate PPEs	▪ Protect workers against OHS ricks	▪ Zero incidents/accidents of OHS ricks	20,000.00	Quarterly	HSE Manager

Impact	Identified mitigation actions	Actual action	Objective	Target	Annual Budget (GHC)	Time Frame	Responsibility
		▪ Maintain and enforce use of hand washing facilities and the adherence to the COVID-19 protocols ▪ Check temperature of workers before and close of work ▪ Mark out/ cordon off dangerous and hazardous areas with appropriate signages ▪ Adhere to the approved 8 daily work hours ▪ Induct all newly recruited workers on safety related issues. ▪ Maintained proper lighting systems. ▪ Provide and enforce the use of appropriate PPEs ▪ Maintain first aid boxes to manage minor injuries ▪ Implement regular emergency drills ▪ Prohibit alcohol use during operation ▪ Ensure proper health and safety controls are implemented for maintenance activities					
Increased local traffic	▪ Avoid traffic related incidents	▪ Ensure transporters recruit qualified drivers and induct drivers upon engagement ▪ Sensitise CBI Ghana Limited drivers on safe driving procedures ▪ Undertake off-peak hauling ▪ Implement traffic management plan in collaboration with relevant stakeholders	▪ Protect workers and general public	▪ No traffic related incidents	5,000.00	Annual	HSE Manager, Factory/ Maintenance Manager, and Production Manager
Increased government revenue	▪ Enhance government revenue generation	▪ Pay taxes and other statutory obligations promptly ▪ Encourage employees to pay their taxes ▪ Educate employees on importance of taxes	▪ Support revenue mobilization	▪ Contribute to government revenue generation	Part revenue collection agencies duties	Annually	Finance Manager
Total					**170,000.00**		

8.5 ENVIRONMENTAL AND SOCIAL MONITORING PLANS

This section outlines the environmental and social monitoring and reporting programme to be implemented to ensure that the potential impacts identified from the proposed project are effectively controlled. The relevance of this programme is to help predict unforeseen impacts and propose mitigation actions to address their occurrences.

8.5.1 Objectives of the Monitoring Plan

The main objectives of the monitoring plan include the following:

- Ensure regulatory requirements are met;
- Verify that predicted impacts are accurate and mitigation measures taken are effective;
- Provide early warning of potential environmental impacts and social risks;
- Identify any unforeseen impacts so that appropriate mitigation measures can be taken at the earliest stage.
- Inform future operations and contribute to continuous improvement in the management of environmental and social issues related to the project; and
- Eliminate or reduce environmental and social related costs.

8.5.2 Monitoring Approach

This environmental and social monitoring program involving inspections, compliance and receptor monitoring is designed to ensure that the proposed project is in conformity with environmental laws and regulations as well as project mitigations.

8.5.2.1 Inspection

Inspections of relevant environmental and social aspects (including air quality, water quality, health and safety, noise levels, traffic impacts, waste management and employment) will be planned and carried out on regular basis by the HSE Manager to ensure that mitigation measures and commitments are properly maintained and that specific management procedures are being followed.

The HSE Manager and all Managers shall form an Environmental, Health and Safety (EHS) Team to support in-house inspections and discuss outcomes of such inspections.

8.5.2.2 Impact Detection Monitoring

Impact detection monitoring involves the assessment of the performance of environmental, social, health and safety mitigation measures as well as the detection of further impacts which could arise from the rice cultivation project implementation. The HSE Manager shall ensure that impacts and their mitigation measures are implemented and that potential negative impacts are minimized.

Impact detection monitoring will serve as the threshold where any monitoring component exceeding the stipulated limit for their respective parameters as per those presented in monitoring results for water quality will be taken as an indication of ineffectiveness or defectiveness of mitigation measures for those particular aspects. The social and health monitoring indicators shall be ensured including the community/TEPZ perception about the project impacts, health and safety performance and emergency situations. Any adverse findings resulting from these monitoring programs may be used to enforce proper implementation, monitoring and alternative measures.

8.5.2.3 Compliance Monitoring

Mitigation measures can only take effect if they are properly implemented. The level of implementation may vary in accordance to the commitment made by the project proponents to comply with the mitigating measures. Procedures and requirements for the compliance monitoring will comprise the availability of project performance data which will be sourced from the following:

- Environmental monitoring data such as water and occupational health issues of the same project in the Municipality;
- Recommendations on inspections and field verifications conducted by project team set up by the HSE Manager for periodic inspections;
- Self-monitoring, self-recordkeeping, and self-reporting by project owners and workers; and
- Community/public complaints which will establish a mechanism for citizens to submit complaints to the government concerning activities that are causing environmental harm or socio-economic imbalance.

8.5.3 Monitoring Report

Based on the data collected, Monitoring Reports and Environmental Management Plans (EMPs) will be compiled by the HSE Manager as required by the EPA of Ghana. This report will include methodologies and protocols followed for data collection, analysis, quality control measures and indication of uncertainties.

8.5.4 Monitoring Plans

The monitoring of all biophysical and socio-economic parameters is essential. However, to avoid burdening the system and prevent it from becoming a constraint in the project implementation, the elements listed in Table 8-3 and Table 8-4 will be monitored for the pre-construction, construction as well as operation and maintenance phases respectively. The monitoring plans will require a cumulative annual budget of one hundred and twenty thousand Ghana Cedis only (GHC 120,000.00)

for smooth implementation. This will be financed by CBI Ghana Limited as a demonstration of its commitment to sustainable implementation of the proposed project.

Table 8-3: Environmental monitoring plan for pre-construction and construction phase

No	What to monitor (parameter)	When to monitor (frequency)	How to monitor (methods)	Who monitors	Annual Budget (GHC)
1	Particulate matter (TSP, PM_{10}, $PM_{2.5}$) SO_2, NO_X, CO_2, CO	Monthly	▪ Ambient Air Quality Monitoring ▪ Observation	Contractor	10,000.00
2	Noise Levels	Quarterly	▪ Ambient Noise Level ▪ Complaints	Contractor	10,000.00
3	Eroded Area	After heavy rains	▪ Site inspection	Contractor	Part of Contractor responsibility
4	Volumes of waste generated, reused, recycled and disposed.	Monthly	▪ Waste inventory	Contractor	Part of Contractor responsibility
5	Traffic Accidents and Incidents Community complaints, Traffic Fines	Quarterly	▪ Review of incidents and accident reports Inspections	Contractor	Part of Contractor responsibility
6	OHS Accident and Incidents, PPEs, Safety signs, periodic medical checks, Safety trainings done, Vehicles and equipment maintenance schedules	Monthly	▪ Review of accident and incident records ▪ Inspection ▪ Face to face interviews	Contractor	Part of Contractor responsibility
7	Community Complaints	Monthly	▪ Record keeping	Contractor	Part of Contractor responsibility
8	Disruptions on CBI's Operations	Monthly	▪ Production inventory	Production Manager	Part of Production Manager's responsibility
9	Employment levels, categories and infractions	Quarterly	▪ Review of employment records	Senior Human Resource Officer	Part of Senior Human Resource Officer responsibility
Total					**20,000.00**

Table 8-4: Environmental monitoring plan for operations and maintenance phase

No	What to monitor (parameter)	When to monitor (frequency)	How to monitor (methods)	Who monitors	Annual Budget (GHC)
1	Volumes of waste generated, reused, recycled and disposed	Monthly	▪ Review of waste inventory ▪ Record keeping	HSE Manager	Part of HSE Manager responsibility
2	Particulate matter (TSP, PM_{10}, $PM_{2.5}$) and emissions (SO_2, NO_X, CO_2, CO)	Monthly	▪ Stack and ambient air quality monitoring ▪ Observation	HSE Manager	50,000.00
3	Noise Levels	Monthly	▪ Ambient noise level monitoring ▪ Complaints	HSE Manager	50,000.00
4	General water use and sources	Monthly	▪ Record keeping	HSE Manager	Part of HSE Manager responsibility

No	What to monitor (parameter)	When to monitor (frequency)	How to monitor (methods)	Who monitors	Annual Budget (GHC)
5	Electricity use	Monthly	▪ Record keeping	Electrical / Automation Manager and HSE Manager	Part of Electrical/Automation responsibility and HSE Manager
6	Fuel consumption	Monthly	▪ Record keeping	HSE Manager / Production Manager	Part of HSE Manager / Production Manager responsibility
7	Leakages or spillages from fuel storage tank and generator	Monthly	▪ Physical inspection	HSE Manager / Production Manager	Part of HSE Manager / Production Manager responsibility
8	Raw material use	Monthly	▪ Record keeping	Production Manager and HSE Manager	Part of Production Manager and HSE Manager responsibility
9	Production rates	Monthly	▪ Record keeping	Production Manager	Part of Production Manager responsibility
10	Traffic Accidents and Incidents Community complaints Traffic Fines	Quarterly	▪ Review of incidents and accidents reports ▪ Inspection ▪ Observation	HSE Manager	Part of HSE Manager responsibility
11	OHS Accident and Incidents, PPEs, Safety signs, Hand washing facilities, periodic medical checks, Safety trainings done, Vehicles and equipment maintenance schedules	Monthly	▪ Review of OHS incidents and accident records ▪ PPEs and washing facilities inventory ▪ Physical Inspection ▪ Face to face interviews	HSE Manager	Part of HSE Manager responsibility
12	Employment levels, categories, and infractions	Quarterly	▪ Review of employment records	Senior Human Resource Officer	Part of Senior Human Resource Officer responsibility
13	Permit statuses (Fire Permit, GSA Certificate, Environmental Permit, Factories Inspectorate and Statutory Reporting)	Every six months	▪ Permit monitoring	HSE Manager / Senior Human Resource Officer	Part of HSE Manager / Senior Human Resource Officer responsibility
14	Community Complaints	Monthly	▪ Record keeping	HSE Manager	Part of HSE Manager responsibility
Total					**100,000.00**

8.6 NON-CONFORMANCE AND CORRECTIVE ACTION

Non-conformities (NCs) outside the scope of this Provisional EMP may be identified during monitoring of the proposed project implementation activities. Such NCs may also be determined based on incident, near misses, and emergency and complaint records. In such cases, the HSE Manager shall determine, in consultation with other parties, the appropriate corrective actions to address the root cause(s) of the NC.

8.7 EMERGENCY PREPAREDNESS AND RESPONSE PLANS

This section provides responsibilities and procedures for response to major emergencies. Primarily, these procedures are to ensure that personnel are capable of coping with any emergency. Work related risks are inevitable conditions or situations that are associated with a project. It is necessary to identify them especially those that pose a serious risk and put practical measures in place to prevent their occurrences. Emergencies and disasters can occur any time without warning. Proactive measures such as training of employees, procurement of emergency equipment and ensuring effective communication regarding where to go, and how to ensure safety during an emergency are needed. Therefore, it becomes a "need" that, every worker should wilfully avail themselves and be acquainted with the immediate actions they must take in an emergency so that they can act promptly, calmly, and efficiently.

CBI Ghana Limited is committed to the safety and wellbeing of the public, its employees and contractor. As a result, the emergency response plan has been developed to enable emergency personnel to rapidly identify, evaluate and react to a wide spectrum of emergencies including those that arise from injuries and illness, fire outbreak, electrocution, accidental leaks or spills, road accidents, and equipment failures.

8.7.1 Objectives

The emergency response plan covers likely emergencies associated with the pre-construction, construction and operation and maintenance phases of the Proposed Project. The objectives of the plan are to ensure:

- The safety of the general public, all contractors and employees during emergencies;
- Timely stabilization of emergency situations; and
- Assets belonging to the public, contractors, employees and CBI Ghana Limited are adequately protected.

8.7.2 Responsibilities

Table 8-5 summarises the responsibilities of all parties in ensuring a smooth implementation of the Emergency Preparedness and Response Plan (EPRP).

Table 8-5: Emergency preparedness and response plan roles and responsibilities

Designation	Responsibilities
Management of CBI Ghana Limited	▪ Provide adequate resources needed to implement the EPRP during operation. ▪ Employ a qualified Health, Safety and Environmental Manager to oversee implementation of the EPRP during operation. ▪ Perform oversight responsibility of ensuring contractors implement the ERP during construction.

Designation	Responsibilities
HSE Manager	▪ Review and update this plan, at least annually ▪ Receive suggestions, comments or questions from all stakeholders regarding the EPRP ▪ Establish communication with nearest emergency services ✓ Ghana National Fire Service, ✓ National Disaster Management Organisation, ✓ National Ambulance Service, ✓ Ghana Police Service ✓ Health institutions ✓ Appoint Emergency Response Team (ERT) ▪ Undertake regular training (at least annually) for employees including ERT on topics such as: o Raising alarm and warning others o Emergency shutdown of the plant or equipment o First aid o Calling for external help (through the ERT) o Response protocols for electrocution and fires ▪ Keep up-to-date records including incidents, complaints, monitoring results, non-conformance reports and corrective action instructions (with assistance from the ERT). ▪ Investigate all incidents or accidents and make appropriate recommendations to prevent re-occurrence of such incidents. ▪ Ensure the display of appropriate emergency and warning signs at vantage points. ▪ Ensure proper functioning of emergency siren. ▪ Perform emergency drills (at least biannually). ▪ Regularly inspect the cement grinding and bagging plant during the operation phase.
Emergency Response Team *(ERT)*	▪ Serve as principal contact persons to the emergency services. ▪ Assist in collecting information about incidents and accidents. ▪ Assist during environmental, health and safety incident investigations. ▪ Assist the HSE Manager in other tasks assigned.
All employees and public	▪ Report all incidents/ accidents to the HSE Manager, with adequate information ▪ Follow all laid down emergency protocols

8.7.3 Emergency Programmes

8.7.3.1 Induction and Training

- CBI Ghana Limited will provide all workers with induction on emergency arrangement and given specific instructions regarding basic personal health and safety.
- First aid training will be provided to designated employees, preferably members of the ERT.
- Fire prevention and firefighting training will be conducted periodically for all workers.

8.7.3.2 Inspection and Testing

A routine inspection and testing programme will be implemented for all emergency related equipment and protective devices. The programme will encompass equipment such as firefighting equipment and first aid supplies. Organisational capacity will be developed to deal appropriately with all potential emergencies through:

- Annual emergency fire and medical drills;

- Fire marshal training; and
- First aid training.

8.7.4 Emergency Response Procedures

Clear renderings of the emergency response decision tree/ procedure (see Figure 8-2 and Figure 8-12) has been developed for the following potential emergency conditions:

- Confined space emergency
- Injuries and sudden illnesses
- Road accident
- Fire outbreak
- Electrocution
- Fuel/oil leak or spill
- Equipment/Machine Failure
- Fall from height
- Failure of pollution control systems
- Gas leaks
- Large product spill from explosion/ silo collapse/machine failure

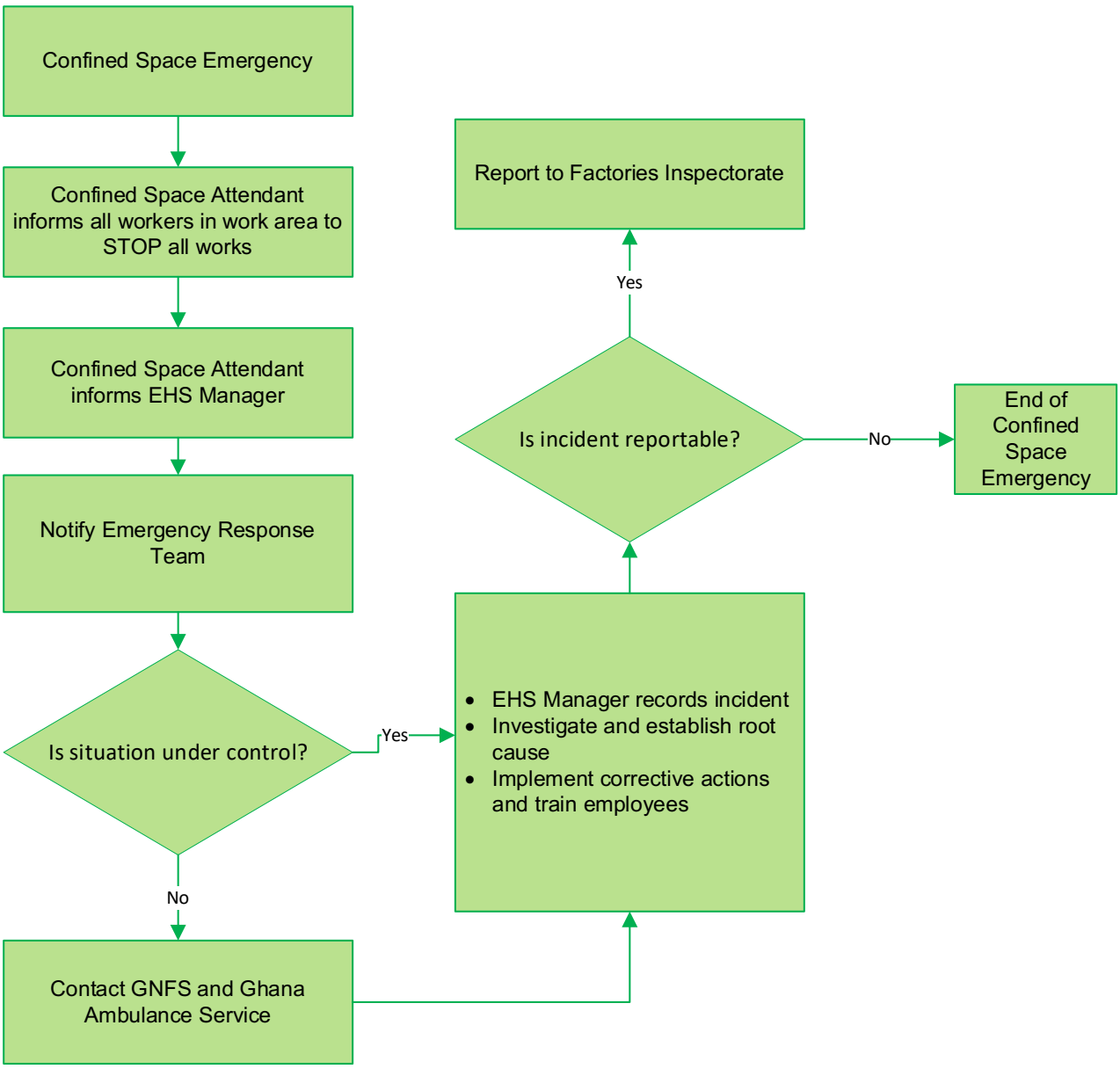

Figure 8-2: Emergency Response Decision Tree for Confined Space

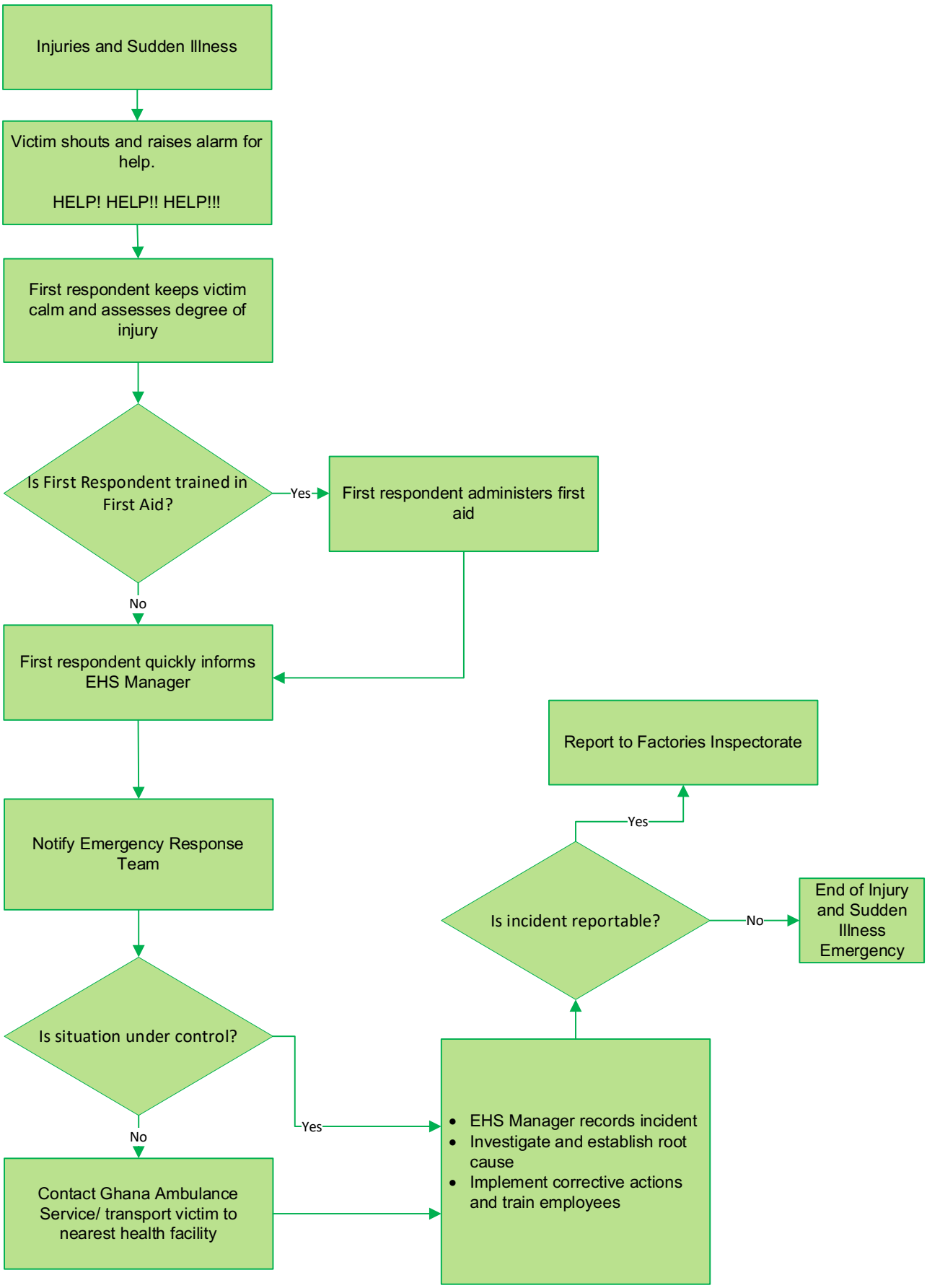

Figure 8-3: Emergency Response Decision Tree for Injuries and Sudden Illness

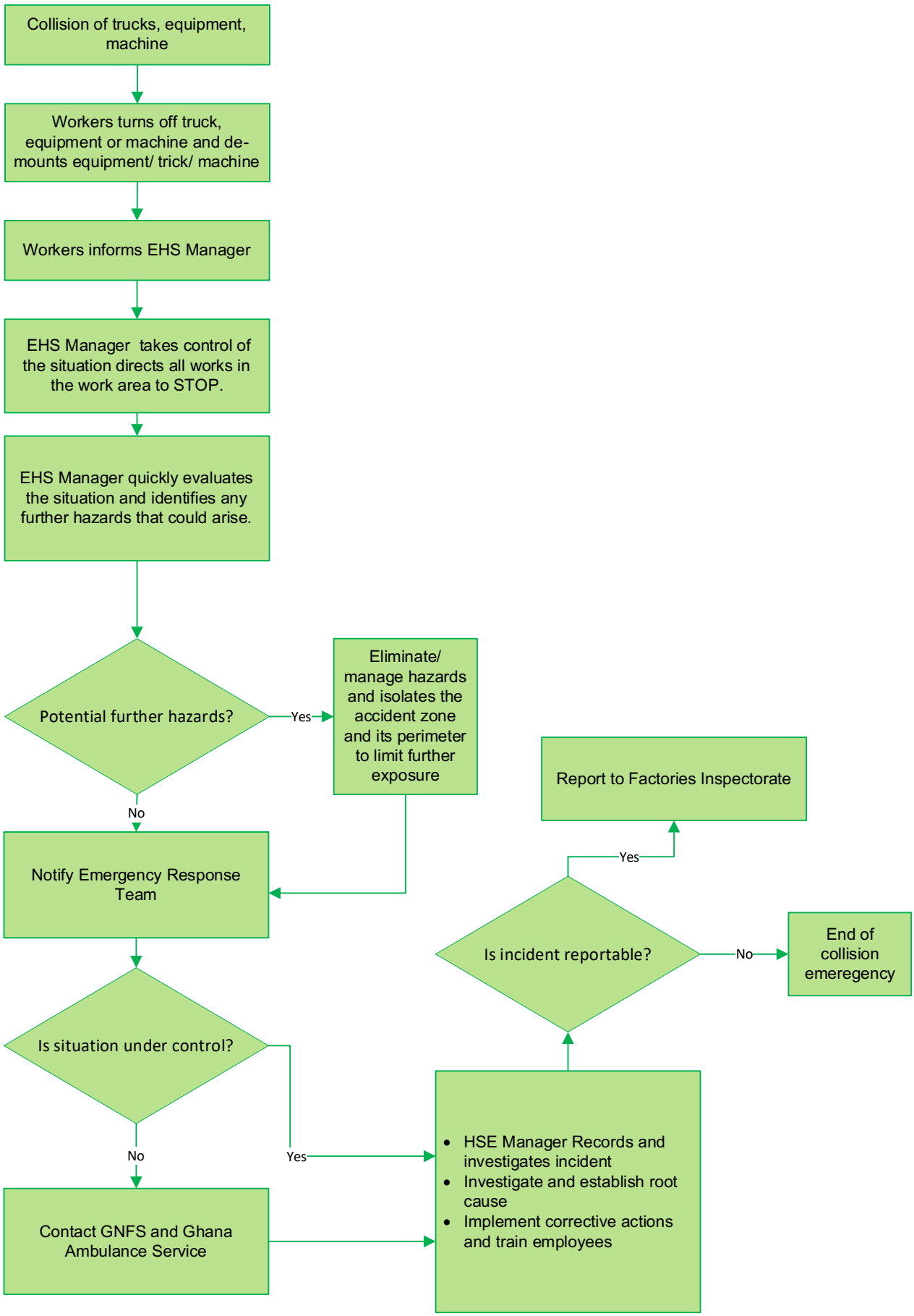

Figure 8-4: Emergency Response Decision Tree for Road Accident

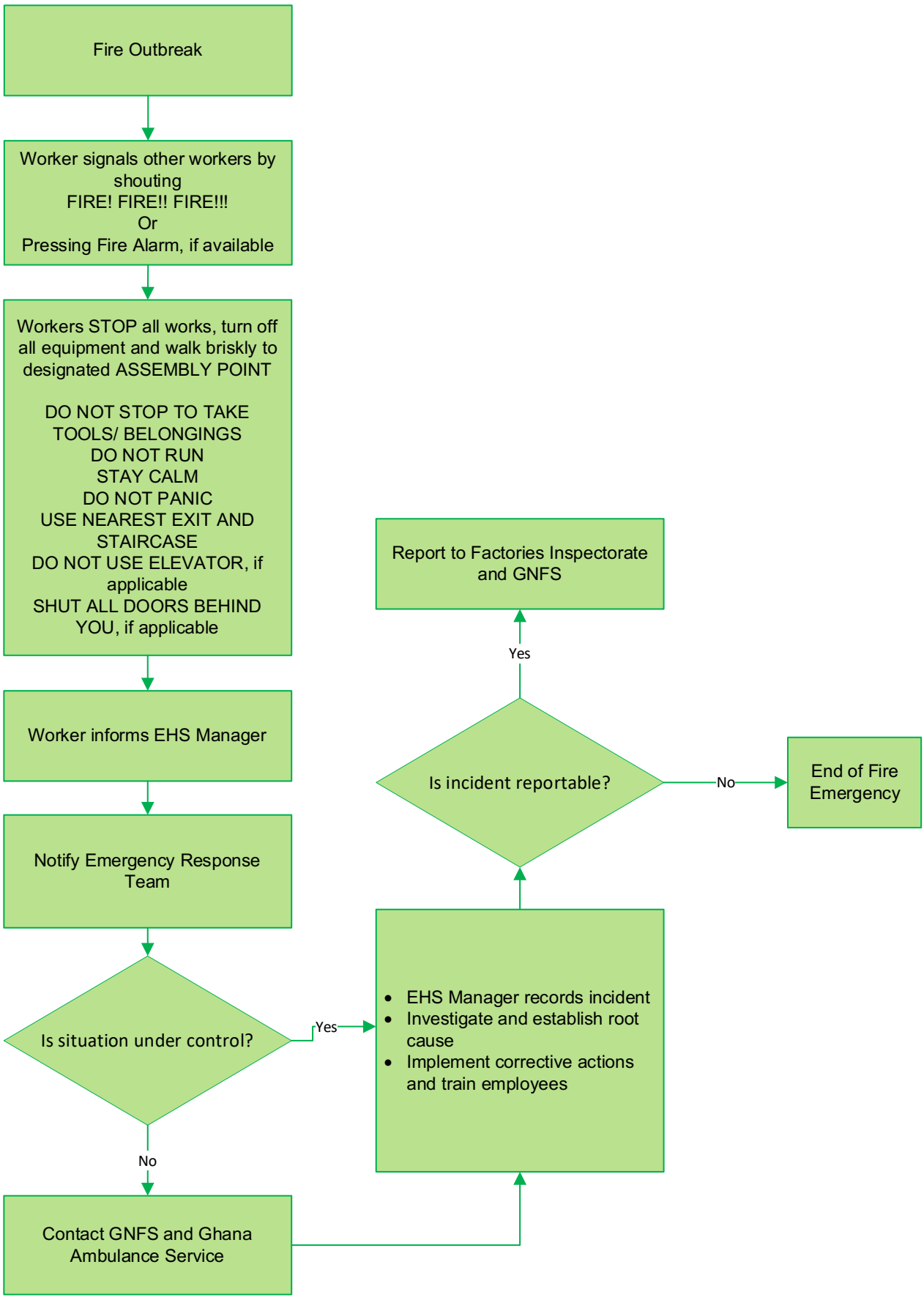

Figure 8-5: Emergency Response Decision Tree for Fire Outbreak

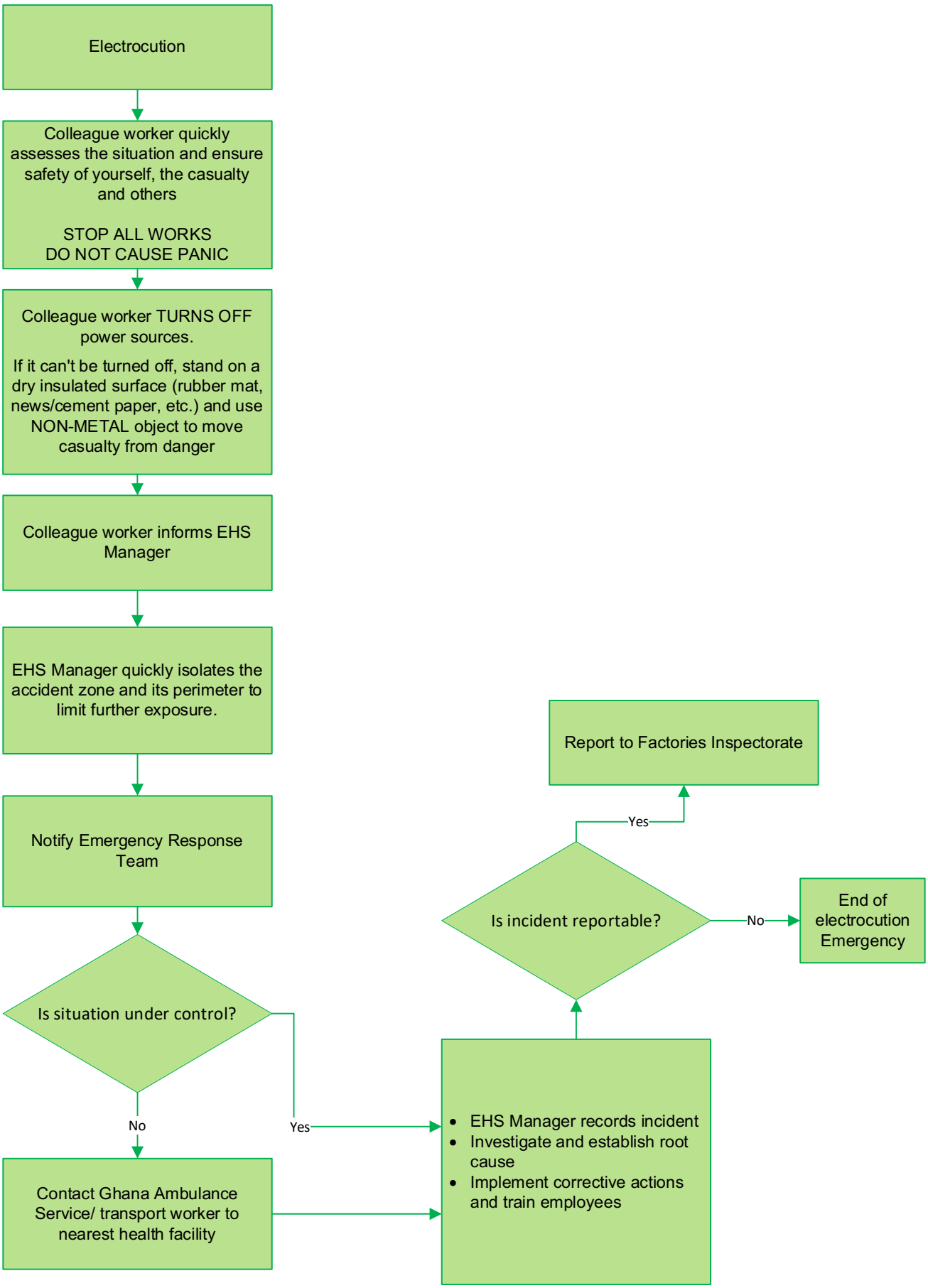

Figure 8-6: Emergency Response Decision Tree for Electrocution

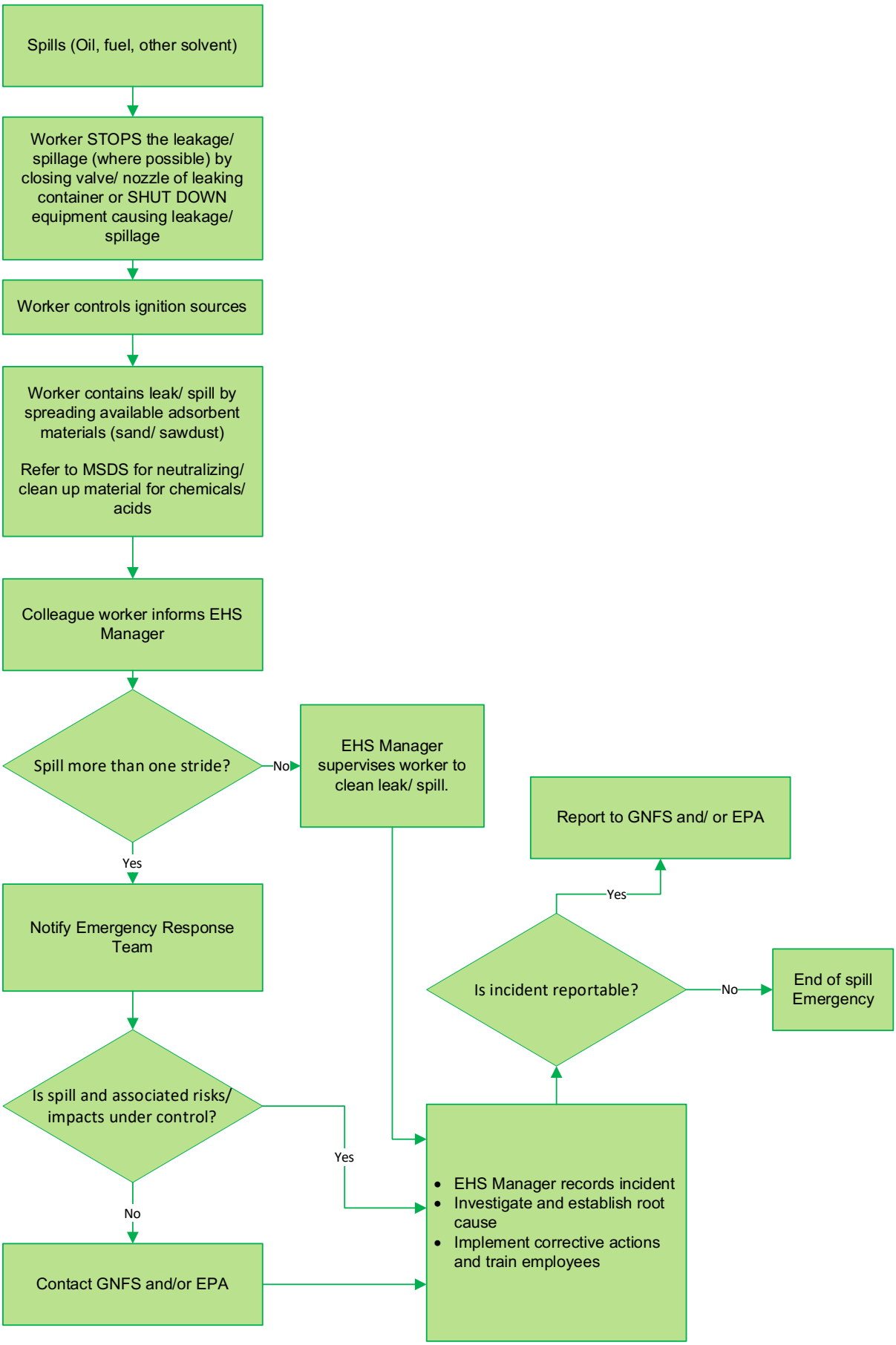

Figure 8-7: Emergency Response Decision Tree for Oil/ Fuel Spills

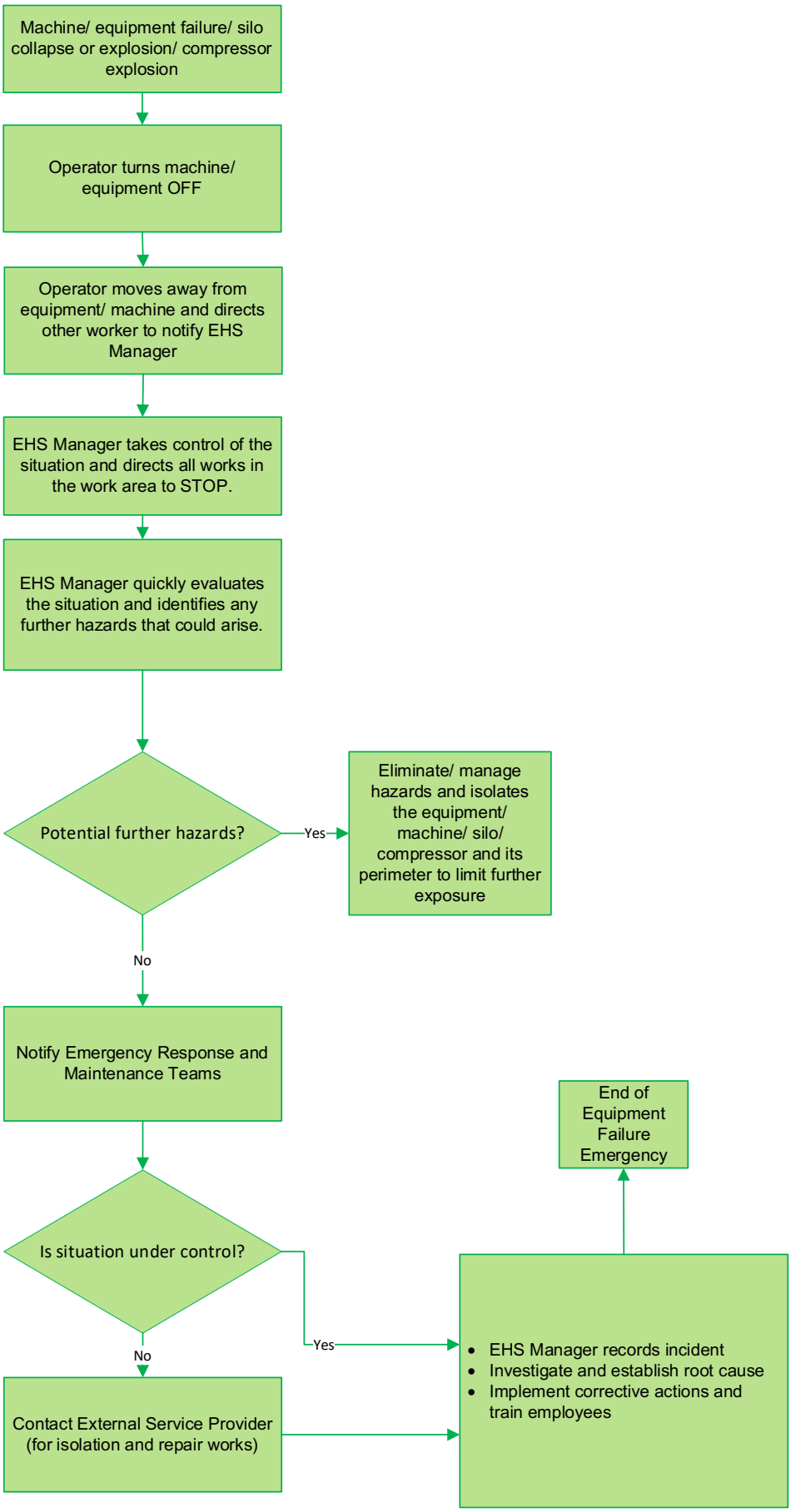

Figure 8-8: Emergency Response Decision Tree for Equipment Failure

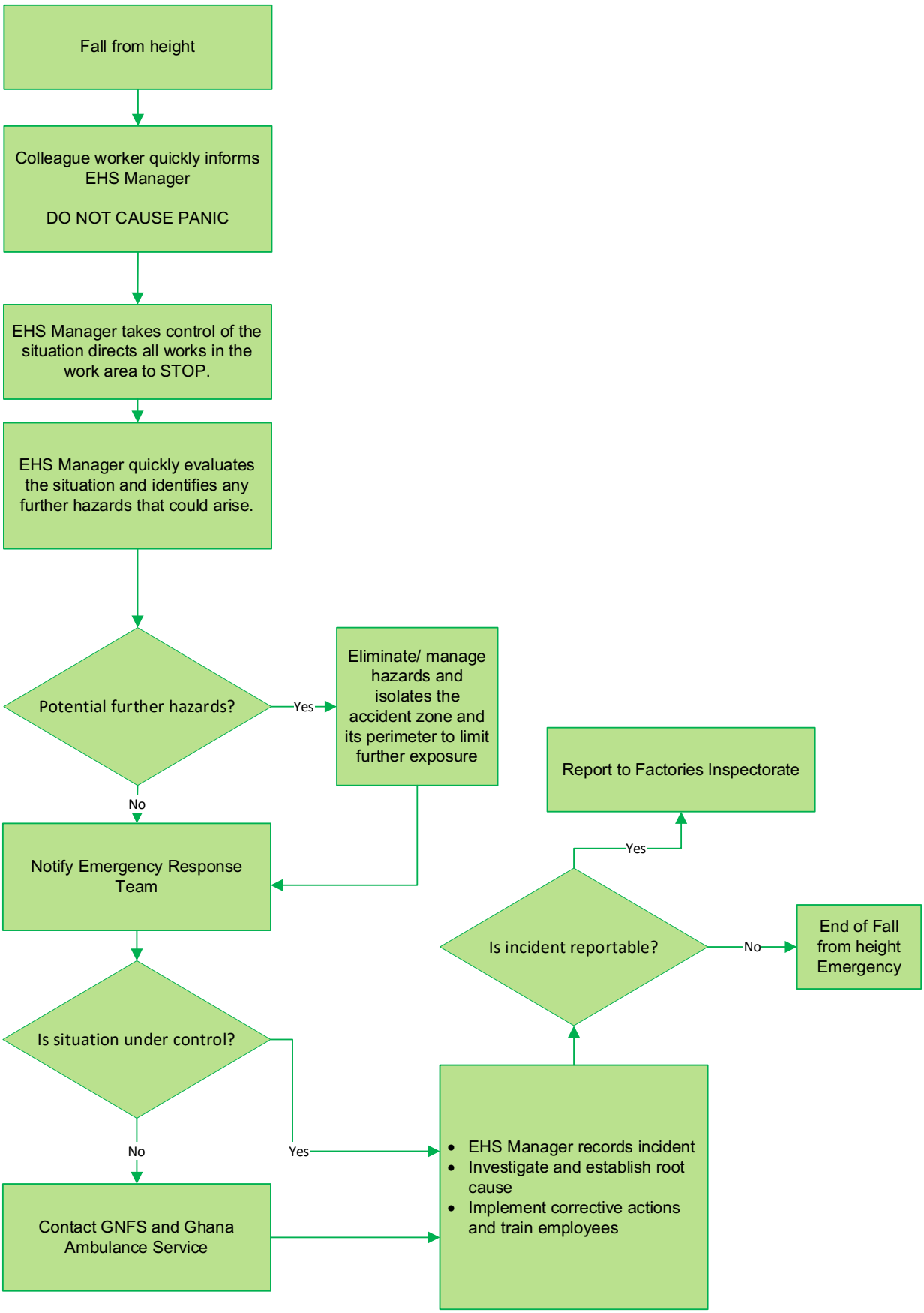

Figure 8-9: Emergency Response Decision Tree for fall from height emergency

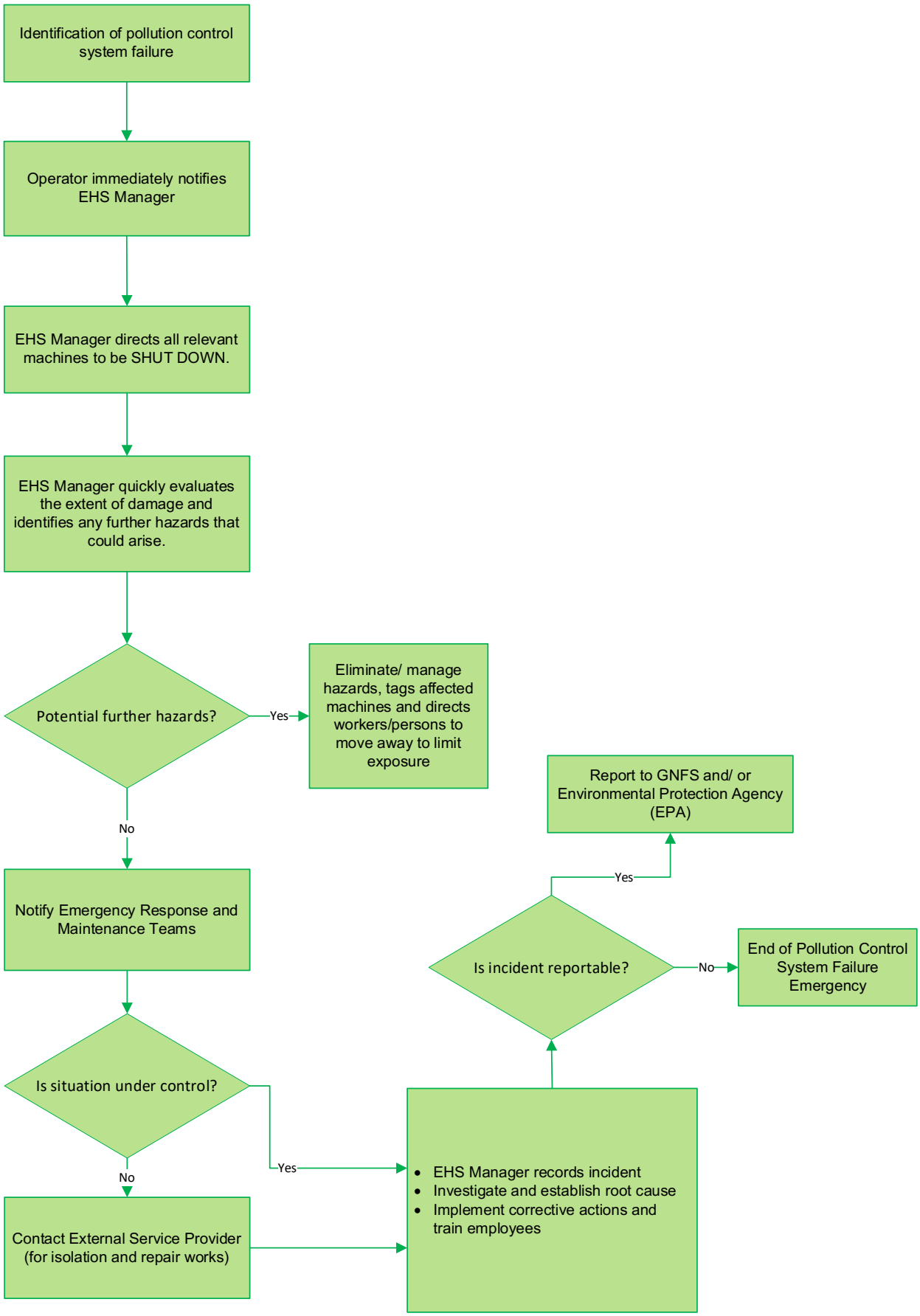

Figure 8-10: Emergency Response Decision Tree for failure of pollution control systems

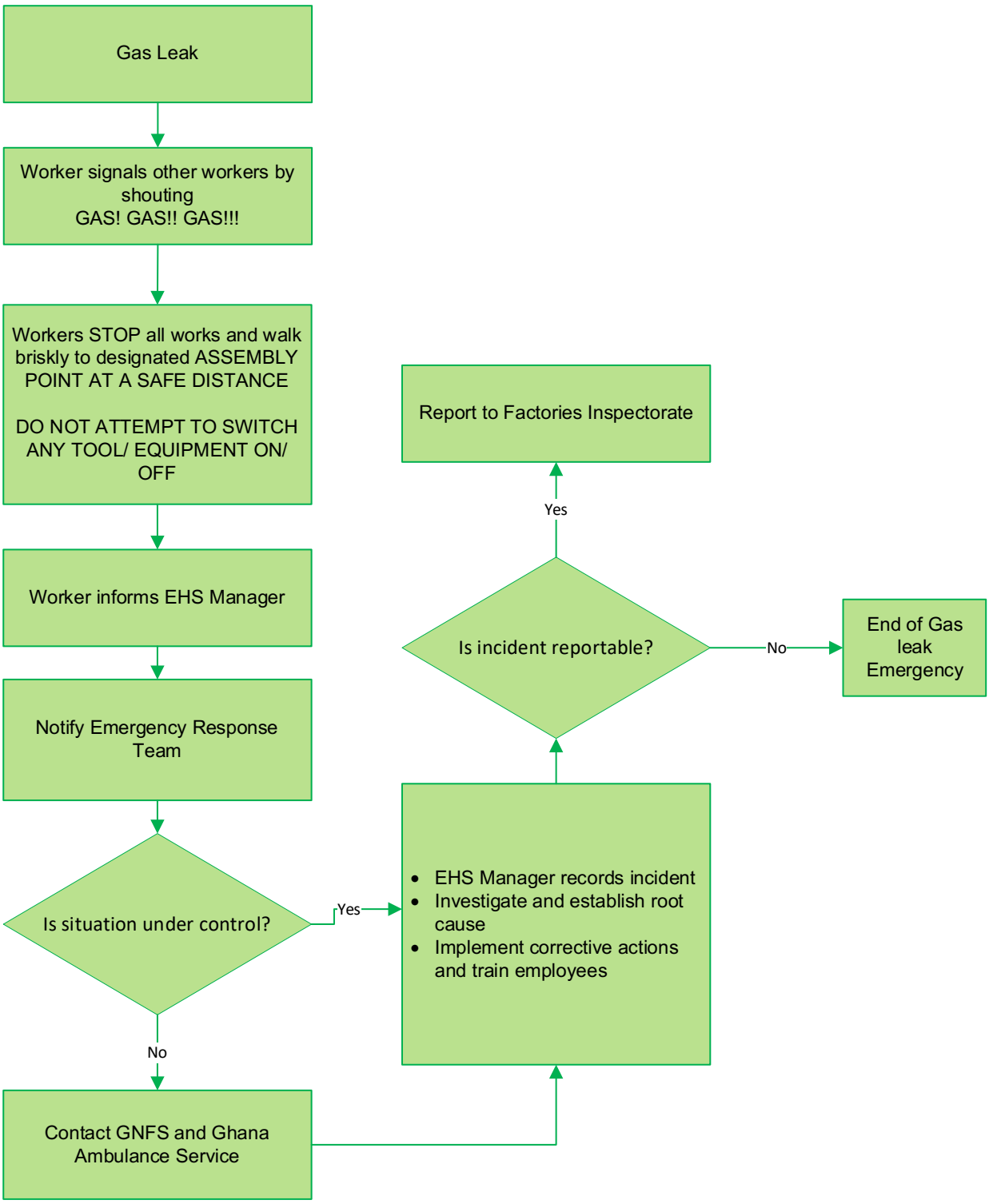

Figure 8-11: Emergency Response Decision Tree for gas leaks

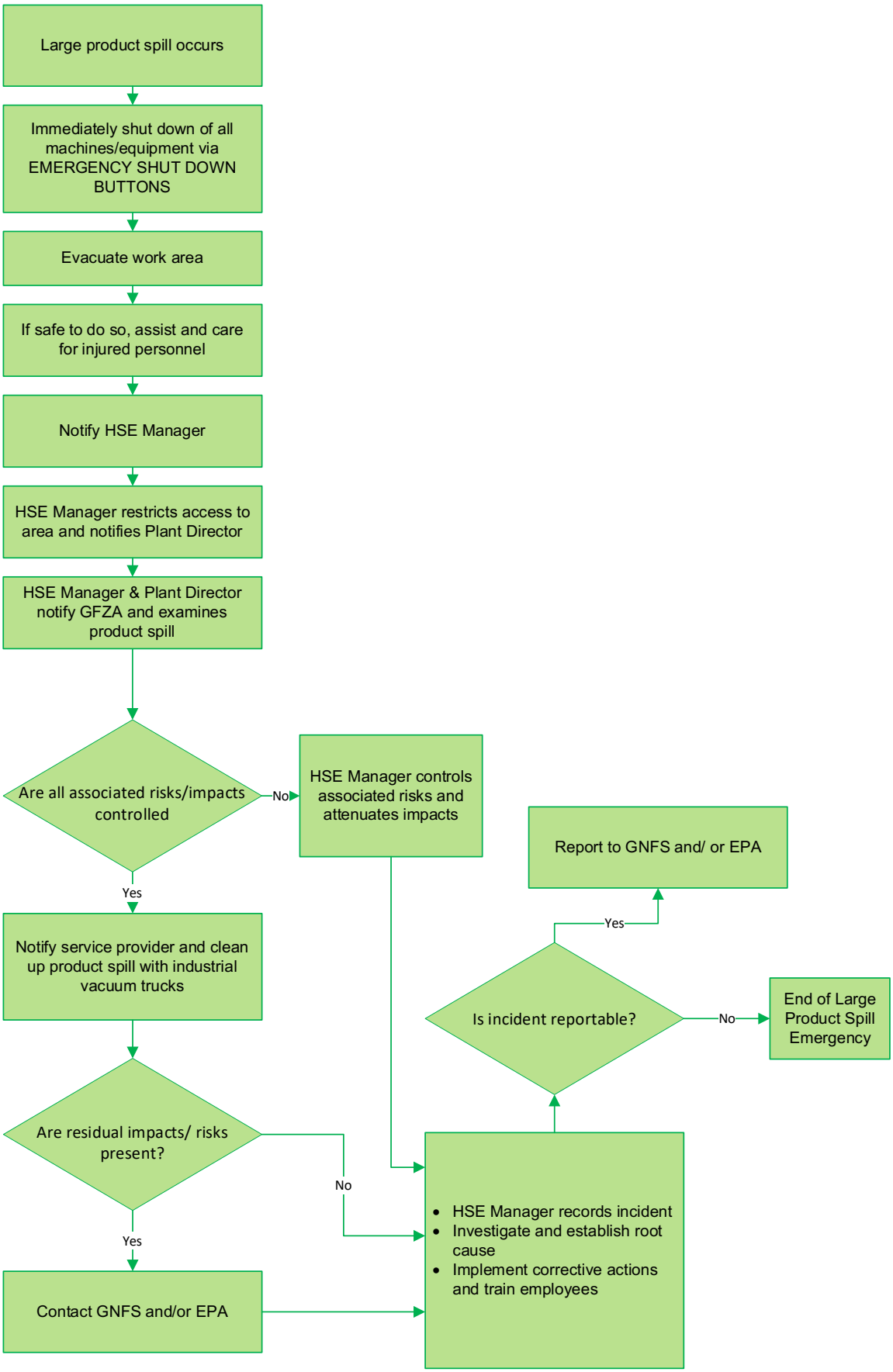

Figure 8-12: Emergency Response Decision Tree for large product spills from explosions/silo collapse/equipment failure

8.7.5 Reporting and Accident Investigation Procedures

Reporting will be done according to the following procedures, presented graphically in Figure 8-13:

- Workers report all incidents/ accidents to the HSE Manager/ERT.
- ERT in collaboration with HSE Manager investigate reported incidence/accident and submit findings to Management of CBI Ghana Limited.
- Management of CBI Ghana Limited will execute remedial actions as early as possible per the recommendations made.

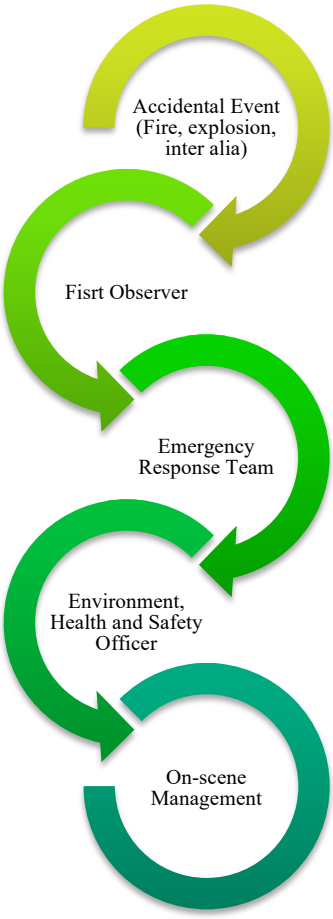

Figure 8-13: Emergency response reporting format

8.8 DE-COMMISSIONING PLAN

The production life of most private investments such as CBI Ghana Limited largely depends on their long-term economic viability and competing technology overall. Other factors such as deterioration of infrastructure may influence the useful life span of the project as well. At the end of the production life of CBI Ghana Limited, the project will be abandoned and/or decommission to restore the site to safe condition and minimises the potential residual environmental impact and permits the reinstatement of other activities.

Though not envisage of possible early decommissioning of the proposed project, should any decommissioning be due, environmental and social elements will take centre stage of the process. The plan will follow the steps outline in the EPA regulation for decommission and reclamation of projects.

8.8.1 Decommissioning Process

CBI Ghana Limited is committed to a 'Clean Closure' during the decommissioning/closure. CBI Ghana Limited is committed to the adoption of environmentally sustainable de-commissioning strategies that will meet local and international requirements in the best possible interest of all stakeholders. That is, once the plant is decommissioned and removed there will be no remaining environmental liabilities.

The removal stages of all structures are set out in a logical sequence under:

8.8.1.1 Production Decommissioning

The following sequence of activities will be followed

- The first step would be to cease all raw material procurement activities.
- Utilize all raw material already stockpiled for the production of cement as advanced notice of closure is assumed.
- Sale of all finished products (cement) in storage.
- Removal and demobilisation of all equipment, sheds and storage silos.
- Decommission of all auxiliary components.
- Removal of all pavements and concrete from concreted areas.

8.8.1.2 Waste Disposal or Recovery

The associated waste arising out of the process of decommissioning, will be segregated and all reusable or recyclable waste put into alternative use. For example, the empty buildings after the removal of all machines may be handed over to the GFZA. Components of the cement mill and crushers, once removed, will be sold or moved to a new production area. Any remaining waste will be disposed through waste companies designated by the GFZA. Disturbed land areas will be allowed to fallow.

9 CONCLUSION

This Final EIS is prepared in accordance with the requirements of the EPA of Ghana and other applicable international requirements, inter alia, the IFC Performance Standards, World Bank Environmental and Social Standards and Equator Principles. The environmental assessment, based on interactions between the proposed expansion and modernization of CBI Ghana Limited's 500,000 MT/yr cement production capacity plant to a 1,500,000 MT/yr capacity and the recipient environment, has been well documented in this EIS.

The proposed expansion and modernization will take place at CBI Ghana Limited current plant site at TEPZ in the Kpone Katamanso Municipality of the Greater Accra Region of Ghana. The project will contribute to the following

- Reduce the price of cement as a major component of the building industry and go to lend support to the Government of Ghana policy direction to increase the number of affordable housing units and thus reduce the national housing deficit as identified by the PHC 2010.
- Create a sizeable number of employment opportunities, both at the construction and operational stages and offer means of livelihood to cascading number of family members and individuals.
- Generate socio-economic benefits through the corporate social responsibility programmes to neighbouring communities and the Municipality.

The adverse impacts associated with the activities of the proposed project are not significant and can be managed within reasonable and acceptable limits by applying the recommended mitigation measures and management strategies. In addition to the identified mitigation measures, there are a number of other commitments to be followed:

- Modern technology that incorporates environmentally friendly methods will be used in the production of cement to support the construction industry in Ghana;
- Define and undertake monitoring (as required) for environmental impacts, social risks and associated parameters;
- Undertake regular audits on the environmental performance of the proposed project operational elements; and
- Continually engage stakeholders to ensure that social bottlenecks are avoided.

A Provisional EMP (see Chapter 8) has also been prepared to manage residual impacts, ensure compliance with local regulatory requirements and incorporate environmental controls throughout the proposed project life cycle.

From the foregone, the proposed project adopts practical, sustainable, and industry standard technology that fulfil the requirements of national and international environmental protection. CBI Ghana Limited believes that this Final EIS has sufficiently addressed all the significant adverse impacts of the proposed project and will therefore meet the expectation of the EPA to warrant the issuance of an Environmental Permit to facilitate implementation of the proposed project without further delays.

10 APPENDICES

Appendix A: Letters of correspondence from EPA and evidence of processing & permit fee payment

Appendix B: Proposed project layout (new facilities marked with turquoise)

Appendix C: Scoping notice posted in the project area

Appendix D: CBI Ghana Limited's Occupational Health and Safety Policy

Appendix E: Extract of Scoping Notice published in the national newspaper