

Date: 17th Nov 2025

To,
Member Secretary,
Meghalaya State Pollution Control Board,
Add.: Arden, Lumpyngngad, Shillong, East Khasi Hills, Meghalaya – 793014

Subject: Submission of Draft Environmental Impact Assessment (EIA) Report for Public Consultation – “Integrated Cement Plant (Clinker: 0.95 MTPA; Cement: 0.99 MTPA), CPP (15 MW), WHRS (7 MW) & DG Sets at Daistong Village, East Jaintia Hills District, Meghalaya” by M/s Shree Cement Ltd.

Respected Sir/Madam,

We hereby submit the Draft Environmental Impact Assessment (EIA) Report and Executive Summary of the proposed project titled:

“Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA; Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, RHPC & Composite Cement); Captive Power Plant (CPP): 15 MW; Waste Heat Recovery System (WHRS): 7 MW; and DG Sets of 2500 KVA (1×2500 KVA or 2×1000 KVA & 1×500 KVA / 1×1000 KVA, 2×500 KVA&2×250KVA)” at Khara Siang Lum Pyrshin, Daistong Village, East Jaintia Hills District, Meghalaya, proposed by M/s Shree Cement Ltd.

The Draft EIA has been prepared in compliance with the Terms of Reference (ToR) issued by the Ministry of Environment, Forest & Climate Change (MoEF&CC) and as per the requirements of the EIA Notification, 2006 and its subsequent amendments.

Accordingly, we request the Meghalaya State Pollution Control Board to kindly:

1. Initiate the Public Consultation process as per the prescribed procedure.
2. Issue the public hearing notice in local and national newspapers.
3. Provide guidance on any additional requirements, if applicable.

We request you to kindly accept the submission and proceed with further necessary action at your end.

We look forward to your cooperation.

Thanking you,

Sincerely

For, Shree Cement Limited


(Sunil Raosaheb Deshmukh)

DRAFT EIA REPORT

For

“Integrated Cement Plant with capacity of Clinker: 0.95 TPA Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1 X 500 KVA or 2 X 500 KVA & 2 X 500 KVA)”

At

**KHARA SIANG LUM PYRSHIN IN DAISTONG VILLAGE
DISTRICT: EAST JAINTIA HILLS,
STATE: MEGHALAYA**

For

Baseline Monitoring Period: From March 2025 to May 2025

SCHEDULE 3(B) - CEMENT PLANTS (STANDALONE GRINDING UNIT) AS PER EIA NOTIFICATION 2006 & ITS AMENDMENTS TILL DATE & CATEGORY B1 AS PER OFFICE MEMORANDUM DATED 24th DECEMBER, 2013.

PROJECT PROPONENT:



M/s. Shree Cement Ltd.

Address: Shree Cement Ltd., Bangur Nagar, Post Box No. 33, Beawar 305901, Rajasthan, India.

ENVIRONMENT CONSULTANT ENGAGED



M/s. P & M SOLUTIONS

QCI Certificate No. NABET/EIA/2326/RA 0298 (Accredited by QCI/ NABET, Approved by MoEF & CC) C - 88. Sector 65, Noida, Uttar Pradesh – 201301

Mobile No. +91 9953843815, +91 8076957101

- Certificate No. NABET/EIA/2326/RA 0298_Rev.01, at sr. no 164 list of Accredited EIA consultant in category A, valid till 07/05/2026



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National Accreditation Board for Education and Training



Certificate of Accreditation

P and M Solution, Noida

C-88, Sector-65, Noida, Uttar Pradesh- 201301

The organization is accredited to upgraded as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –

S.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including opencast/underground	1	1 (a) (i)	A
2	River Valley projects	3	1 (c)	A
3	Coal washeries	6	2 (a)	B
4	Metallurgical industries (ferrous & non-ferrous)	8	3 (a)	A
5	Cement plants	9	3 (b)	A
6	Highways	34	7 (f)	A
7	Building and construction projects	38	8 (a)	B
8	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated July 18, 2023, and Supplementary Assessment minutes dated May 17, 2024, posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/23/2846 dated August 09, 2023 and QCI/NABET/ENV/ACO/24/3300 dated July 5, 2024. The accreditation needs to be renewed before the expiry date by P and M Solution, Noida following due process of assessment.

Sr. Director, NABET
Dated: July 5, 2024

Certificate No.
NABET/EIA/2326/RA 0298_Rev.01

Valid up to
May 07, 2026

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to the QCI-NABET website.



Date: 12.11.2025

This is to certify that **Shree Cement Limited** hereby **authorizes the appointed NABET-accredited EIA Consultant, M/s P & M Solutions**, to carry out all activities related to the preparation of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed project:

Project Title: Integrated Cement Plant with capacity of:

- **Clinker:** 0.95 Million TPA
- **Cement:** 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement)
- **Captive Power Plant (CPP):** 15 MW
- **Waste Heat Recovery System (WHRS):** 7 MW
- **DG Sets:** 2500 KVA (1×2500 KVA or 2×1000 KVA & 1×500 KVA or 1×1000 KVA, 2×500 KVA & 2×250 KVA)

Project Location: Khara Siang Lum Pyrshin, Daistong Village, East Jaintia Hills District, Meghalaya.

Undertaking

We hereby confirm that:

1. All information, data, and project details provided to the EIA Consultant are **true, correct, and complete** to the best of our knowledge.
2. Shree Cement Limited has **engaged M/s P & M Solutions** to prepare the EIA/EMP Report, conduct baseline studies, collect secondary data, prepare all required documents, and undertake presentations as required.
3. The consultant is authorized to interact with relevant agencies **only for the purpose of EIA preparation**, including field surveys, data verification, and compilation of the report.
4. Shree Cement Limited shall be fully responsible for the **accuracy and authenticity** of the information supplied for the preparation of the EIA/EMP.
5. This authorization is solely for the purpose of **EIA/EMP study and documentation** for the above-mentioned project.

For Shree Cement Limited

For, Shree Cement Limited


(Sunil Raosaheb Deshmukh)

Contact: 8826287364, 9555548342
GSTIN-09AATFP5994M1ZY
PAN- AATFP5994M

P & M Solution

Accredited by QCI NABET

Date: 15.11.2025

Disclosure of Consultant Undertaking

This is to certify that [Name of ACO / EIA Consultant], accredited by NABET–QCI for carrying out Environmental Impact Assessment studies, has prepared the EIA Report for the proposed project:

“Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA, CPP: 15 MW, WHRS: 7 MW and DG Sets, at Khara Siang Lum Pyrshin, Daistong Village, East Jaintia Hills, Meghalaya by Shree Cement Limited.”

In accordance with the NABET–QCI Accreditation Scheme for EIA Consultant Organizations, we hereby provide the following basic disclosure:

1. Accreditation Details:

Our organization is accredited under the NABET–QCI Scheme for the relevant sector(s) applicable to this project.

2. EIA Team Composition:

The study has been carried out by competent and NABET-approved personnel, including:

- **EIA Coordinator:** Mr. Mohan Bhagwat
- **Functional Area Experts (FAEs):** Detailed in Chapter XII

3. Declaration of Independence:

We confirm that the EIA study has been conducted with complete professional independence and without any conflict of interest.

4. Declaration of Authenticity:

All assessments, analyses, and interpretations have been carried out by qualified experts as per NABET requirements.

As required under the accreditation guidelines, the **detailed NABET Disclosure**, including accreditation numbers, validity, sectoral approvals, team roles, and declarations, is provided **in Chapter 12** of this EIA Report.

Rahul Kumar



Rahul Kumar
CMD

NABET Certificate No. & Issue Date: Certificate No. NABET/EIA/2326/RA 0298_Rev.01, at sr. no 164 list of Accredited EIA consultant in category A, valid till 07/05/2026

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Shree Cement Limited (SCL) is a public limited company incorporated under the provisions of the Companies Act, 1956 on 25th October 1979. The company operates cement and clinker manufacturing units located at Beawar, Ras, and Nawalgarh in Rajasthan; Balodabazar–Bhatapara in Chhattisgarh; Sedam in Karnataka; Guntur in Andhra Pradesh; and Ras Al Khaimah (RAK) in the United Arab Emirates (UAE).

SCL also operates twelve split grinding units located at Khushkhera, Suratgarh, and Jobner in Rajasthan; Roorkee in Uttarakhand; Aurangabad in Bihar; Bulandshahar and Etah in Uttar Pradesh; Panipat in Haryana; Hansda in Jharkhand; Cuttack in Odisha; Patas in Maharashtra; and Purulia in West Bengal.

At present, the installed cement production capacity of the SCL Group is 62.8 million tonnes per annum (MTPA). The company has a total power generation capacity of 1084.94 MW, comprising 503.0 MW thermal power, 242.50 MW waste heat recovery system (WHRs), 283.14 MW solar power, and 56.3 MW wind power.

1.1.1 Identification of the Project

The Proposed Integrated Cement Plant with production capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, [LC3](#), RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

1.2 Site Selection for the project.

The proposed project site is located in East Jaintia Hills district, Meghalaya. The Nurpuh Wildlife Sanctuary lies at an approximate distance of 28.13 km in the south-southwest (SSW) direction from the site, indicating no direct impact on any notified eco-sensitive area.

There are no Archaeological Sites or Wetland Reserves within a 10 km radius of the project location. The international border with Bangladesh is situated at approximately 37 km from the site.

The nearest human settlement is Village Daistong, located about 0.82 km in the east-southeast (ESE) direction.

Overall, the selected site does not fall within any environmentally or archaeologically sensitive zone and is suitable for the proposed development from a locational sensitivity perspective.

1.3 Brief Description of the Project.

For the brief description of the project the below mentioned table may be referred.

Table – 1.1: Brief Description of Nature, Size and Location of the Project

S. No.	Particulars	Details	
1.	Type of Project	Greenfield Project	
2.	Name of Unit	Integrated Cement Plant (A Unit of Shree Cement Limited)	
3.	Size & Configuration of Project	✓ Clinker: 0.95 million TPA ✓ Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) ✓ CPP: 15 MW ✓ WHRS: 7 MW ✓ DG Sets: 2500 KVA (1 x 2500 KVA or 2 x 1000 KVA & 1 x 500 KVA or 1 x 1000 KVA, 2 x 500 KVA & 2 x 250 KVA) ✓ Project Site Area: 25.08 ha (61.95 Acres)	
4.	Location		
	Villages	Daistong	
	Elaka	Elaka – Nongkhlieh Dolloiship	
	District	East Jaintia Hills	
	State	Meghalaya	
5.	Geographical extents of project site	Latitude	Longitude
		25°21'01.823" N to 25°20'59.918" N	92°33' 27.501" E to 92°33'27.104" E
	Toposheet No.	Core & Buffer Zone: 83C/11 & 83C/7	
6.	Project Details		
	Capital Cost of the project	Rs. 1264 Crores	

S. No.	Particulars	Details	
	Cost for Environmental Protection measures	• Capital Cost: Rs. 23.5 Crores • Recurring Cost: Rs. 0.30 Crores/annum	
7.	Project Basic Requirement		
	Area	Total Plant Area	25.08 ha (61.95 Acres)
		Greenbelt Development & Plantation	Approx. 8.27 ha (20.44 Acre) (~33% of total plant area)
	Water Requirement (KLD)	600 KLD (Including Fresh Water Requirement: 515 KLD & Recycled Water from STP & RO Rejects: 85 KLD). <i>Source: Water requirement will be fulfilled by the ground water and nearby surface water bodies with prior statutory permission from the concerned State government.</i>	
	Power Requirement (MW)	Total Power Requirement: 18 MW ❖ Energy consumption per ton of Clinker: 48.2 Kwh ❖ Energy consumption per ton for Cement Grinding: • OPC, PPC, RHPC, LC3 & SRC Cement: 25 to 30 Kwh, • PSC Cement: 28 to 51 Kwh, • Composite Cement: 28 to 36 Kwh Thermal Energy consumption of Clinker: 670 Kcal/Kg • Source: Proposed Captive Power Plant, WHRS and State Grid Power Supply & DG sets (for back up)	
8.	Manpower Requirement		
	Implementation (Construction) Phase	Permanent: 100 Nos.	
		Contractual: 500 Nos.	
	Operation Phase	Permanent: 150 Nos.	
Contractual: 300 Nos.			
9.	Project Site Vicinity Details		

S. No.	Particulars	Details
	Nearest Village	Village Daistong (~1.43 km in ESE direction)
	Nearest Major Town City	Mutong (~5.51 km in ESE direction)
	Nearest National /State Highway	NH- 6 (~18.93 km in SW direction)
	Nearest Railway Station	Ditokcherra Railway station (~36.90 km in SE direction)
	Nearest Airport	Silchar Airport (~63.35 km in SE direction) Guwahati Airport (~128.21 km in NW direction)
	Nearby Water Bodies	River (Wah Chyrmit) about 4.48 NW Direction. Pal Lam Kankalang River about 8.50 NE Direction
	National Park, Wildlife Sanctuary, Tiger/ Elephant Reserve, Eco-Sensitive Zone etc.	No National Park, Wildlife Sanctuary, Tiger/ Elephant Reserve, exist within 10 km radius study area.
	Reserved/ Protected Forest within 10 km radius	No Reserved/ Protected Forest within 10 km Study area. Except, Saipung Reserved Forest (~6.35 in SE direction)
	CPA/SPA/OPA within study area	There is no CPA/SPA within 10 km radius study area.
	Archaeological site	None within 10 km radius
	Seismic Zone	Zone - V as per IS: 1893 (Part-I): 2002

1.4 Major Requirements for the Proposed Project

1.4.1 Raw Material Requirement:

Major raw material required for Clinker & Cement production is Limestone, Iron Ore, Bauxite, Gypsum (Mineral, Synthetic, Chemical & Imported), Fly ash and Slag. Details regarding quantity of raw materials required their source along with distance and mode of transportation are given in Table 11.2 (a & b):

Table No. 1.2

S. No.	Name of Raw Material	Basis	Quantity (Million TPA)	Source	Mode of Transport.
1.	Limestone	1.5 T/T of Clinker	1.43	Captive Mine	~ 0.1 km; Combination of Two or three modes.
2.	Iron Ore (Laterite)	0.015 T/ T of Clinker	0.014	Nearby Area	~60 km; Combination of Two or three modes.
3.	Bauxite	0.044 T/ T of Clinker	0.042	Nearby Area	Combination of Two or three modes.
4.	Gypsum	0.07 T / T of Cement	0.06	Bhutan Imported	~60 km; Combination of Two or three modes.
5.	Fly ash	0.35 T/T of Cement	0.34	Nearby Area	Combination of Two or three modes.
6.	Slag	0.55 T/T of Cement	0.54	Nearby Area	Combination of Two or three modes.
7.	Dolochar	-	0.095	Nearby Spong Iron Plant	~60 km; Combination of Two or three modes.
8.	Petcock as feed Stock	-	0.095	--	~60 km; Combination of Two or three modes.
9.	Biomass	-	0.56	Nearby Agriculture Field	~60 km; Combination of Two or three modes.

Table No 1.2 (b)

Requirement (in Million TPA) for Cement (OPC/PPC/Composite Cement/PSC/RHPC/LC3/SRC) Production						
S. No.	Raw Material	OPC / RHPC/ SRC	PPC	PSC	LC3	Composite Cement

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

Executive Summary

1.	Clinker	0.92	0.57	0.38	0.50	0.38
2.	Gypsum	0.07	0.07	0.07	0.07	0.07
3.	Fly ash	0.00	0.35	0.00	-	0.35
4.	Slag	0.00	0.00	0.00	-	-
5.	Calcined Clay	-	-	-	0.33	-
6.	Limestone	-	-	-	0.10	-
	Total Capacity (MTPA)**	0.99	0.99	0.99	0.99	0.99

Note:

**Clinker will also be sent to the sister grinding units, market sale and will also be received from outside (Other SCL Plants), if Clinkerization plant is not in operation or in case of shortfall of Clinker.*

*** Cement production will be 0.99 million TPA only either from various options as OPC/RHPC/SRC/LC3/PPC /PSC/Composite Cement.*

1.4.2 Fuel Requirement

Fuel / Feed stock Requirement

Details regarding quantity of Fuel/Feed Stock required, their source along with distance and mode of transportation for proposed Integrated Cement Plant is given in Table – 1.3

Table – 1.3 Fuel Requirement for Proposed Integrated Cement plant

S. No.	Name of Feed Stock	Quantity (Million TPA)	Source	Calorific Value (Kcal/kg)	Ash (in %)	Sulphur (in %)	Distance & Mode of Transportation
For Cement Plant							
1.	Indian & Imported Coal	0.36	<i>Indigenous Coal:</i> Nearby Coal Mines	4200-4800	30-35	0.4-0.5	Local Area ~20 to 200 km by Road
			<i>Imported Coal:</i> USA, South Africa, Australia and	5000-5800	6-10	0.5-0.6	Calcutta Port / Calcutta or Paradeep

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

Executive Summary

S. No.	Name of Feed Stock	Quantity (Million TPA)	Source	Calorific Value (Kcal/kg)	Ash (in %)	Sulphur (in %)	Distance & Mode of Transportation
			Indonesia through Calcutta Port / Calcutta or Paradeep or Vizag etc.				or Vizag – ~650 km by Road.
2.	Petcoke as feed stock	0.24	Petcoke USA / Saudi Arabia / Turkey / Canada through Calcutta Port / Calcutta or Paradeep or Vizag etc.	7800 - 8300	0.5-2	6-9	Calcutta Port / Calcutta or Paradeep or Vizag – ~650 km by Road.
3.	Dolochar	0.24	Nearby Sponge Iron Plant	2500- 2700	68.1 8	0.32	~100 to 300 km by Road
4.	Biomass	0.30	Nearby Agriculture Fields	2300- 2500	5- 29	0.15 - 0.22	~100 km by Road
For Captive Power Plant							
1	100% Indian Coal	0.225	Indigenous Coal: Nearby Coal Mines	4200- 4800	30- 35	0.4-0.5	Local Area ~20 to 200 km by Road
2	100% Imported Coal	0.12	USA, South Africa, Australia and Indonesia through Calcutta Port / Calcutta or Paradeep or Vizag Port etc.	5000- 5800	6-10	0.5-0.6	Calcutta Port / Calcutta or Paradeep or Vizag ~650 km by Road

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

Executive Summary

S. No.	Name of Feed Stock	Quantity (Million TPA)	Source	Calorific Value (Kcal/kg)	Ash (in %)	Sulphur (in %)	Distance & Mode of Transportation
3	Biomass	0.26	Nearby Agriculture fields	2300-2500	5- 29	0.15 - 0.22	~100 km by Road

1.4.3 Other Basic Requirements:

Total water requirement for proposed project will be 600 KLD; which will be sourced from Water from Dihang River/ Ground water/ Mine Pit water based on the availability.

Table – 1.4: Water Requirement

S. No.	Descriptions / Particulars	Total Water Requirement (KLD)		Remarks
		Fresh Water (KLD)	Recycled Water (RO Reject/ Domestic waste) (KLD)	
A.	Cement Plant Process Requirements			
	Cement Mill Spray	120		70 KLD Cooling water blow down & RO Reject Water will be used in Mill Spray, Stackers & Recamier.
	Cooling Water	60		
	Stackers & Reclaimer	10		
	Raw Mill Section	10		
	Coal Mill	5		
B.	WHRs	40	15	
C.	CPP	160	50	
D.	Drinking & Domestic requirement for Plant	25	05	Sewage water will be treated in STP & 15 KLD treated STP water

E.	Plantation & Greenbelt Requirement	85	15	will be used for greenbelt & plantation development
Grand Total (A + B + C + D + E)		515	85	515 KLD Raw Water +85 KLD Recycled water (from STP Treated, Blowdown & RO Reject)

Note: Total Water Requirement 600 KLD {including Fresh requirement 515 KLD & Recycled water from STP & RO rejects 85 KLD}.

Power Requirement for the plant will be 18 MW; which will be sourced from proposed Captive Thermal Power Plant (15 MW) & Waste Heat Recovery System (7 MW), State Grid and DG Sets (for emergency backup).

1.5 Process Description:

The manufacturing of cement will be based on dry process technology and essentially consist of the following unit operation steps:

- Crushing of limestone at the mine site.
- Pre-blending of crushed limestone by Stacker & Reclaimer.
- Grinding-cum-Drying of Raw Materials and Coal/ Petcoke/ Dolochar/ Biomass in VRM
- Homogenization of raw meal in a blending silo.
- Clinkerization of the raw meal in a rotary kiln with preheater, calciner and Cooler.
- Grinding, storage and packing of cement
- Transportation of Clinker & Cement through Road Networks

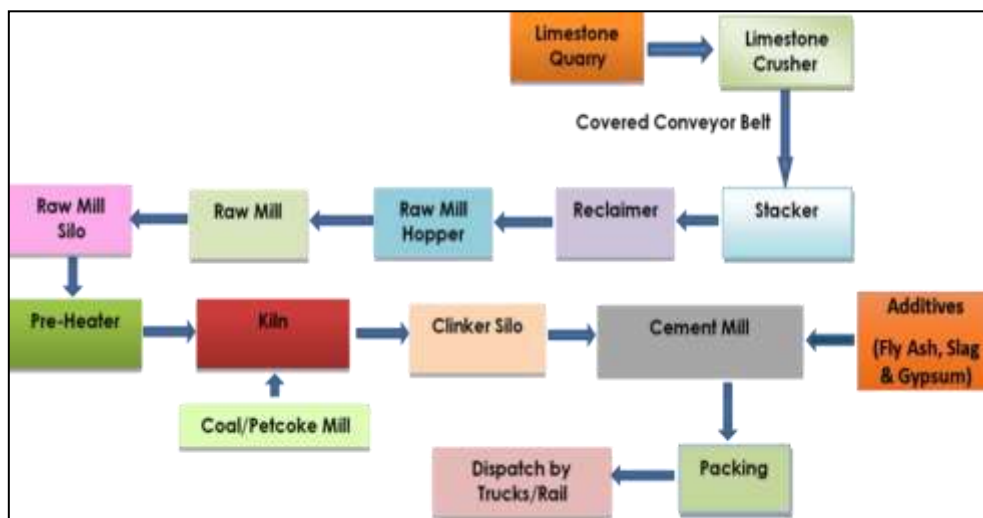


Figure 1.1

Technology Description of Cement Plant

- ✓ **Limestone Crushing:** ROM limestone is processed through a wobbler and crusher to achieve <90 mm size, then sent for stacking and pre-blending.
- ✓ **Pre-Blending:** Crushed limestone is homogenized using stacker and reclaimer systems.
- ✓ **Raw Material & Fuel Grinding (VRM):** Limestone with corrective materials is ground and dried in VRM using preheater hot air. Coal/petcoke is crushed in a roll crusher and ground in a ball mill/VRM. Alternative fuels such as hazardous waste, dolochar, and biomass may be used.
- ✓ **Raw Meal Homogenization:** Ground material is stored and blended in continuous blending silos.
- ✓ **Clinkerization:** Preheater and calciner ensure efficient heat transfer and partial calcination. Final clinker formation occurs in the kiln's burning zone.
- ✓ **Clinker Cooling:** Hot clinker (~1000°C) is cooled in a grate cooler and transported to storage silos.
- ✓ **Cement Grinding & Packing:** Clinker is ground in the cement mill using hot air from HAG (coal/dolochar/biomass). Final cement is stored in silos and packed via electronic rotary packers.
- ✓ **Transport:** Cement and clinker are dispatched mainly by road via NH-6.
- ✓ **NOx Reduction (SCR):** Low-NOx burners, calciner modifications, controlled reducing atmosphere, and combustion optimization minimize NOx generation through in-system reactions.
- ✓ **Alternative Fuel Co-Processing:** Hazardous/non-hazardous waste is co-processed at ~1400°C, reducing coal dependency and eliminating residues. AFR system includes ground and feed hoppers, hoists/elevators, conveyors, double-flap valves, and safety shut gates.

1.6 Description of Environment.

The Baseline was conducted during summer season (March to May 2025).

1.6.1 Air Environment

Baseline ambient air quality was monitored at eight locations within the 10 km study area during March 2025 to May 2025. PM₁₀ concentrations ranged from 32.48–63.21 µg/m³ (98th percentile: 60.31–62.81 µg/m³), while PM_{2.5} levels ranged from 14.65–34.56 µg/m³ (98th percentile: 30.38–34.42 µg/m³). Gaseous pollutants were low, with SO₂ between 2.29–4.92 µg/m³ and NO₂ between 3.11–5.98 µg/m³, all well below NAAQS limits. All other monitored air quality parameters (including CO, O₃, NH₃, Pb, Ni, As, and Benzene) were also well within National Ambient Air Quality Standards (NAAQS), confirming overall compliance.

Variations in particulate matter were influenced by rural traffic, domestic fuel burning, and scattered mining activity. Overall, the region maintained good air quality throughout the baseline period.

1.6.2 Water Environment

Groundwater Quality

Groundwater samples collected during March–May 2025 from Saipung PHC, St. Joseph’s Church (Khahnar), Tangnub Presbyterian Church (Lumpdeng), and Shnongrim playground showed slightly acidic pH (5.32–5.90). Other parameters were within IS 10500:

- Chlorides: 34.2–38.2 mg/L
- Sulphate: 18.2–25.2 mg/L
- Nitrate: 8.1–9.8 mg/L
- Calcium: 42.5–48.2 mg/L
- Magnesium: 8.4–9.2 mg/L
- Iron: <0.05 mg/L

Groundwater is suitable for livestock use but often unsuitable for direct human consumption due to acidity. The proposed project is designed as a zero-discharge system, ensuring no impact on local water bodies. SCL will support the community by implementing desalination-based potable water supply measures under the EMP/SEDP.

1.6.3 Surface Water Quality

Surface water sampled during the baseline period showed:

- pH: 5.4–5.8
- DO: 6.8–7.6 mg/L
- BOD: 4.2–4.8 mg/L
- Chlorides: 18.12–20.30 mg/L
- Sulphates: 24.40–24.70 mg/L
- Total Coliform: 44–46 MPN/100 ml

Most parameters comply with CPCB Category A standards, indicating suitability as a drinking water source after treatment.

1.6.4 Noise Environment

Noise monitoring conducted in March–May 2025 across five stations recorded day-time levels between 48.50–52.90 dB(A) and night-time levels between 38.10–42.60 dB(A). All values comply with CPCB standards for residential and silence zones.

Background noise stems from local traffic, community activities, and natural surroundings, reflecting a calm acoustic environment.

1.6.5 Soil Environment

Soil sampling during the baseline period revealed consistent texture—sandy-loam to loamy-clay—with good nutrient content:

- pH: 7.11–7.40
- Organic Carbon: 0.86–1.20%
- Phosphorus: 54.32–66.01 kg/ha
- Potassium: 162.9–215.58 kg/ha
- Magnesium: 472.33–809.51 mg/kg
- Calcium: 3508.9–3952.7 mg/kg

Soils are nutrient-rich and suitable for vegetation. Slight alkalinity is natural to the region. SCL will implement soil conservation and greenbelt measures as part of the EMP.

1.6.6 Ecology & Biodiversity (EB)

Ecological surveys conducted during March–May 2025 show that the study area comprises agricultural land, scrub, grasslands, and forest patches. No protected areas or eco-sensitive zones exist within 10 km. Species recorded are common and non-threatened.

Ecological Impact & Mitigation

Potential biodiversity impacts from the integrated cement and thermal power project include habitat disturbance, dust deposition, and noise. Mitigation includes:

- Wildlife Conservation Plan (WLCP)
- 33% native-species greenbelt
- Advanced pollution control systems (ESP, Bag Filters, FGD, Low-NOx)
- Noise barriers and wildlife-safe infrastructure
- Fly ash management, soil protection, and ZLD
- Continuous ecological monitoring and annual reporting

1.6.7 Socio-Economic Environment

Socio-economic surveys undertaken during March–May 2025 indicate rural livelihoods supported by agriculture, small-scale trade, and labor work. The area has basic infrastructure such as schools, health centers, and road networks.

The project is expected to generate local employment, enhance skills, support community development, and improve infrastructure through CSR/SEDP initiatives.

1.7 Anticipated Environmental impacts and Mitigation Measured

1.7.1 CONSTRUCTION PHASE IMPACTS & MITIGATION

Table1.5 : Land Use & Physical Environment – Construction Phase

Aspect	Impact During Construction	Significance	Mitigation Measures
Topography	Minor disturbance due to site clearance and levelling	Low	Maintain natural contours; restrict excavation
Land Use	Temporary loss of agricultural activity within project site	Medium	Reuse topsoil; restore green areas post-construction
Soil	Soil disturbance, compaction, erosion	Low–Medium	Controlled excavation; soil reuse; temporary bunds

Aspect	Impact During Construction	Significance	Mitigation Measures
Hydrology	No direct impact (no water body within site boundary)	Insignificant	Protect southwest waterbody zone; maintain buffer
Dust (PM)	Significant temporary dust from earthwork, vehicle movement	Medium	Water sprinkling; covering stockpiles; speed control
Vehicle Emissions	Temporary rise in NO _x , SO ₂ , CO, PM from machinery	Low	Use PUC-certified vehicles; equipment maintenance
Noise	Noise due to construction machinery & vehicles	Low–Medium	Use silencers; restrict nighttime work; PPE for workers

Table 1.6: Air Quality – Construction Phase

Source	Impact	Duration/Extent	Mitigation
Earthwork, Excavation	High fugitive dust (PM)	Short-term, Localized	Water sprinkling; phased excavation
Material Movement	Dust release from loading/unloading	Short-term	Covered trucks; avoid overloading
Vehicle Exhaust	Increase in NO _x , SO ₂ , CO, HC	Short-term	PUC vehicles; regular servicing
Stockpiles	Wind-blown dust	Local	Cover stockpiles; stabilize heights
Construction Debris Handling	Dust and particulate release	Local	Covered disposal; designated waste areas

1.7.2 OPERATION PHASE IMPACTS & MITIGATION

Table 1.7: Land Use & Physical Environment – Operation Phase

Aspect	Impact During Operation	Significance	Mitigation Measures
Land Use	Permanent shift from agriculture to industrial use	Minor–Moderate	Job creation; CSR livelihood support
Topography	No further alteration expected	Insignificant	Maintain contour integrity

Aspect	Impact During Operation	Significance	Mitigation Measures
Hydrology	No discharge—Zero Liquid Discharge (ZLD) system	Insignificant	Continuous monitoring; stormwater management
Traffic	Increased raw material & product transportation	Moderate	Road safety plan; speed limits; paved roads
Noise	Increased noise from mills, fans, transport	Low–Medium	Acoustic enclosures; greenbelt; PPE
Air Pollution (Fugitive)	Dust from material handling, storage, transfer	Moderate	Bag filters; enclosed conveyors; paved roads
Air Pollution (Stack)	PM, SO _x , NO _x , CO emissions from kiln/CPP	Moderate	ESP, Bag House, Low-NO _x burners, lime dosing

Table 1.8: Air Quality – Operation Phase

Fugitive Emissions

Source	Impact	Extent/Duration	Mitigation
Raw Material Handling	PM dispersion	Local, Continuous	Bag filters; enclosed conveyors
Crushing (Limestone/Coal)	Dust and PM	Local, Continuous	Dust extraction system; APC equipment
Clinker & Cement Grinding	Process dust	Local	High-efficiency Bag House
Packing & Dispatch	Fugitive PM	Local	Dust collectors; spill recovery
Vehicular Movement	Dust + NO _x , SO ₂	Plant premises	Paved roads; speed control (10–20 km/h)

Table: 1.9: Stack Emissions

Source	Pollutants	Impact	Mitigation
Kiln/Calcliner	PM, SO _x , NO _x , CO	Increase in regional air load	ESP/Bag House; Low-NO _x burners; De-NO _x system

Source	Pollutants	Impact	Mitigation
Cement Mill	PM	Local air deterioration	Bag House; enclosed systems
CPP Boiler	PM, SO _x , NO _x	Air quality deterioration	ESP; lime dosing; Low-NO _x burners
Co-processing	Dioxins & Furans	Minor trace-level emissions	High-temp combustion; strict emission monitoring

1.7.3 SUMMARY OF IMPACT DIFFERENTIATION

Table 1.10: Construction Phase vs. Operation Phase – Comparison

Environmental Component	Construction Phase	Operation Phase
Land Use	Temporary disturbance	Permanent agricultural-to-industrial conversion
Topography	Minor contour modification	No further change
Air Quality	Short-term dust (PM) and vehicle exhaust	Continuous stack emissions + fugitive dust
Water Environment	No discharge; risk only from spills	ZLD; no outside impact
Noise	Machinery and vehicle noise	Industrial noise from mills, fans, transport
Soil Quality	Limited disturbance	Possible deposition of dust; controlled by greenbelt
Ecology	Temporary disturbance from construction	Long-term habitat alteration; greenbelt mitigation
Socio-economic	Temporary jobs	Long-term employment; CSR/SEDP benefits

The financial viability of the project is assessed by examining the following key areas:

- **Investment and Operational Costs:** This includes a detailed estimation of the total investment cost, which incorporates the Environment Management Plan, as well as the projected costs for operation and maintenance.

- **Cost-Benefit Analysis:** The assessment provides crucial financial statements, such as the Profit and Loss Statement, Projected Cash Flow Statement, and Balance Sheet, to analyze the project's profitability.
- **Key Financial Indicators:** The financial viability is measured through standard indicators, including the Internal Rates of Return on both investment and equity, the Break-Even Point, and the project's Payback Period.
- **Sensitivity Analysis:** The study concludes with an analysis of how the Break-Even Point would be affected by various changes or potential variables.

1.8 Environmental Monitoring Programme:

Details of the environmental monitoring schedule / frequency, which will be undertaken for various environmental components, as per conditions EC/CTE/CTO are given in the Table – 1.11

Table No. 1.11 Post Project Monitoring

S. No.	Description	Frequency of Monitoring	Location
1.	Meteorological Data	Continuous	Plant Site
2.	Ambient Air Quality	Twice a Week & Continuous Online Monitoring	Near to the entrance Gate of Plant Site and towards the Villages in upwind & downwind direction from the plant site, as per the max. GLC obtained and as per EC / CTO conditions.
3.	Fugitive Emission	Quarterly or as per EC/CTO	Cement Mill, Packing Plant, Raw Materials Handling Area & Coal Yard
4.	Stack Emission Monitoring	Continuous Online Monitoring	Raw Mill & Kiln, Coal/Petcoke Mill, Clinker Cooler, Cement Mill and CPP Boiler
5.	Water Quality	Twice in a year / As per NOC from CGWA	Nearby Ground water sources and as per CTO conditions.
6.	Waste Water Monitoring (STP)	Monthly & as per CTO	Sewage Treatment Plant as per CTO.

	Outlet)		
7.	Water Level	Every Season/ As per NOC from CGWA	Nearby Ground water sources and as per CTO Conditions
8.	Noise Level Monitoring		
(i)	Ambient Noise Monitoring	Monthly & as per EC / CTO	Near to the entrance Gate of Plant Site, Health Centre
9.	Medical Checkup of Employee	Yearly or as per Factories Act	Health Centre /Dispensary
10.	Performance evaluation of APCE's / Adequacy Study	Six Monthly	Raw Mill / Kiln Bag house, Coal Mill Bag House, Cement Mill Bag House, Clinker Cooler ESP and CPP ESP.

1.9 Additional Studies:

Additional Studies conducted in relation to Risk Assessment and Disaster Management Plan as per ToR points issued by SEIAA, Meghalaya vide File No. ML/SEAC/SEIAA/PP/EJH/126/2025 and ToR identification No. TO25B1101ML5999209N, dated 15th Oct 2025.

1.10 Project Benefits

The proposed project will play a significant role in meeting the rising demand for cement and will contribute positively to the economic growth of the region as well as the country. Shree Cement Ltd. is committed to actively supporting

socio-economic development in the villages surrounding the plant site. Key focus areas will include improvement of physical infrastructure, promotion of education, enhancement of health and family welfare services, development of community facilities, and support for cultural and social initiatives.

A comprehensive Social and Economic Development Plan (SEDP) has been prepared to address local needs, including the issues, concerns, and suggestions raised during the Public Hearing and the requirements identified in the Social Impact Assessment (SIA). The implementation of these measures will contribute significantly to improving the quality of life and ensuring sustainable development of the surrounding communities.

1.11 Environmental Management Plan

1.11.1 Environmental Management Plan (Executive Summary – Concise Version)

The Environmental Management Plan (EMP) outlines the key measures to prevent, minimize, and manage environmental impacts during construction and operation of the proposed Integrated Cement Plant. The plan complies with all applicable environmental laws, CPCB guidelines, and industry best practices.

Key Focus Areas of EMP

- Air quality management
- Noise control
- Wastewater & stormwater management
- Solid & hazardous waste management
- Energy and resource conservation
- Rainwater harvesting & maximum reuse of treated water
- Greenbelt development
- Occupational health & safety
- Socio-economic development
- Budget allocation for all environmental safeguards

1.12.2 EMP Objectives

- Keep emissions and waste within statutory limits
- Ensure efficient use of water and energy
- Maintain safe working and environmental conditions
- Strengthen disaster preparedness and risk reduction
- Monitor environmental performance for continual improvement
- Enhance ecological buffer through plantation and greenbelt

1.12.3 EMP Budgetary Provisions

The EMP ensures that environmental impacts from construction and operation are effectively controlled through strong mitigation, monitoring, and institutional mechanisms. The project will also generate substantial direct and indirect employment, improve local infrastructure, and support socio-economic development—enhancing overall sustainability in the region.

Table No. 1.12 EMP Details.

Sr. No.	Particulars	Capital Cost (Rs. Lakhs)	Recurring Cost (Rs. Lakhs/Year)
1	Pollution Control during Construction Stage (Dust suppression, wastewater treatment & disposal, roads, monitoring, muck disposal)	50.00	5.00
2	Air Pollution Control	1840.00	218.00
3	Water Pollution Control	38.00	19.50
4	Noise Pollution Control	20.00	3.50
5	Environmental Monitoring	308.00	29.00
6	Hazardous Waste Storage & Handling	5.00	5.00
7	Occupational Health & Safety	50.00	5.00
8	Greenbelt Development & Plantation	41.35	15.00
Total	—	2352.00	300.00

1.13 Occupational Health Hazard:

Shree Cement Ltd. will implement a comprehensive Safety, Health and Environment (SHE) Policy to control and minimize workplace risks. The key objectives are to prevent hazards, ensure a safe working environment, and safeguard the health of all employees. A dedicated budget of Rs. 50 Lakhs (capital) and Rs. 5 Lakhs (annual recurring) has been allocated for the first three years to establish and maintain robust occupational health and safety systems.

1.14 Conclusions

The proposed project will generate significant socio-economic benefits for the surrounding communities through improved infrastructure, enhanced education and healthcare services, and increased employment opportunities. It will also contribute to government revenue through taxes and duties.

Environmental impacts are expected to remain within permissible limits due to the adoption of effective pollution control measures and continuous monitoring. Extensive greenbelt development around and within the plant will further mitigate emissions and enhance the local environment. Overall, the project is anticipated to support sustainable regional development while maintaining strong environmental safeguards.

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Abbreviations used in the EIA/EMP report of this project.

1 Regulatory, Legal & Institutional

- **MoEF&CC** – Ministry of Environment, Forest and Climate Change
 - **EAC** – Expert Appraisal Committee
 - **SEAC** – State Expert Appraisal Committee
 - **SEIAA** – State Environment Impact Assessment Authority
 - **EC** – Environmental Clearance
 - **TOR** – Terms of Reference
 - **CTE** – Consent to Establish
 - **CTO** – Consent to Operate
 - **SPCB** – State Pollution Control Board
 - **CPCB** – Central Pollution Control Board
 - **NABET** – National Accreditation Board for Education & Training
 - **QCI** – Quality Council of India
 - **FC** – Forest Clearance
 - **NBWL** – National Board for Wildlife
 - **CRZ** – Coastal Regulation Zone
 - **FAR** – Floor Area Ratio (for township planning in EIA)
 - **OCMMS** – Online Consent Management & Monitoring System
 - **NOC** – No Objection Certificate
 - **EP Act** – Environmental Protection Act
 - **Air Act** – Air (Prevention and Control of Pollution) Act
 - **Water Act** – Water (Prevention and Control of Pollution) Act
-

2 Environmental Assessment Process

- **EIA** – Environmental Impact Assessment
- **EMP** – Environmental Management Plan
- **RA** – Risk Assessment
- **DMP** – Disaster Management Plan

- ***HIRA*** – Hazard Identification and Risk Assessment
 - ***QRA*** – Quantitative Risk Assessment
 - ***CAAQMS*** – Continuous Ambient Air Quality Monitoring System
 - ***CEPI*** – Comprehensive Environmental Pollution Index
 - ***PEIA*** – Preliminary Environmental Impact Assessment
 - ***SEIA*** – Social & Environmental Impact Assessment
 - ***SIA*** – Social Impact Assessment
 - ***LCA*** – Life Cycle Assessment
-

3 ***Air Environment***

- ***AAQ*** – Ambient Air Quality
- ***AAQM*** – Ambient Air Quality Monitoring
- ***NAAQS*** – National Ambient Air Quality Standards
- ***SPM*** – Suspended Particulate Matter
- ***PM*** – Particulate Matter
- ***PM₁₀*** – Particulate Matter < 10 µm
- ***PM_{2.5}*** – Particulate Matter < 2.5 µm
- ***SO₂*** – Sulphur Dioxide
- ***NO_x*** – Oxides of Nitrogen
- ***CO*** – Carbon Monoxide
- ***O₃*** – Ozone
- ***VOC*** – Volatile Organic Compounds
- ***TPM*** – Total Particulate Matter
- ***FES*** – Fugitive Emission Sources
- ***APCD*** – Air Pollution Control Device
- ***ESP*** – Electrostatic Precipitator
- ***GCT*** – Gas Conditioning Tower
- ***BF*** – Bag Filter
- ***ID Fan*** – Induced Draft Fan
- ***FD Fan*** – Forced Draft Fan

- **SCR** – *Selective Catalytic Reduction*
 - **SNCR** – *Selective Non-Catalytic Reduction*
-

4 *Water Environment*

- **ETP** – *Effluent Treatment Plant*
 - **STP** – *Sewage Treatment Plant*
 - **RO** – *Reverse Osmosis*
 - **MEE** – *Multiple Effect Evaporator*
 - **ZLD** – *Zero Liquid Discharge*
 - **COD** – *Chemical Oxygen Demand*
 - **BOD** – *Biochemical Oxygen Demand*
 - **TDS** – *Total Dissolved Solids*
 - **TSS** – *Total Suspended Solids*
 - **pH** – *Potential of Hydrogen*
 - **DO** – *Dissolved Oxygen*
 - **WQI** – *Water Quality Index*
-

5 *Soil, Land & Geology*

- **DSR** – *District Survey Report*
 - **USCS** – *Unified Soil Classification System*
 - **NPK** – *Nitrogen, Phosphorus, Potassium*
 - **CEC** – *Cation Exchange Capacity*
 - **SG** – *Specific Gravity*
 - **GSI** – *Geological Survey of India*
 - **LULC** – *Land Use Land Cover*
 - **BM** – *Bench Mark (surveying)*
-

6 *Noise & Vibration*

- **dB(A)** – *A-weighted decibels*
- **Leq** – *Equivalent Continuous Sound Level*

- **L10** – Noise level exceeded for 10% of time
 - **L90** – Noise level exceeded for 90% of time
 - **CPCB Noise Rules** – Ambient Noise Regulations
-

7 Meteorology & Climate

- **IMD** – India Meteorological Department
 - **WD** – Wind Direction
 - **WS** – Wind Speed
 - **RH** – Relative Humidity
 - **SR** – Solar Radiation
 - **AT** – Ambient Temperature
 - **MM5 / WRF** – Weather Research & Forecasting Models
 - **AQI** – Air Quality Index
-

8 Cement Plant Engineering & Process Terms

- **TPH** – Tons Per Hour
- **TPD / TPA** – Tons Per Day / Tons Per Annum
- **CPP** – Captive Power Plant
- **WHRB** – Waste Heat Recovery Boiler
- **VRM** – Vertical Roller Mill
- **RM** – Raw Mill
- **CM** – Cement Mill
- **LS** – Limestone
- **PH** – Pre-Heater
- **PC** – Pre-Calcliner
- **CF Silo** – Continuous Flow Silo
- **CCP** – Clinker Cooling Process
- **AFR** – Alternative Fuels & Raw Materials (tyres, plastic waste, RDF)
- **SNCR** – Selective Non-Catalytic Reduction
- **CI** – Clinker

- **Gypsum (GY)** – Set retarder in cement
 - **RABH** – Reverse Air Bag House
-

9 **Energy & Power Systems**

- **DG Set** – Diesel Generator
 - **VFD** – Variable Frequency Drive
 - **SCADA** – Supervisory Control and Data Acquisition
 - **PLC** – Programmable Logic Controller
 - **SPV** – Solar Photovoltaic
 - **GCV** – Gross Calorific Value
 - **NCV** – Net Calorific Value
-

10 **Hydrology & Drainage**

- **SWD** – Storm Water Drainage
 - **HFL** – High Flood Level
 - **CWC** – Central Water Commission
 - **GWD** – Ground Water Depth
 - **CGWB** – Central Ground Water Board
-

11 **Ecology & Biodiversity**

- **IUCN** – International Union for Conservation of Nature
 - **CR/EN/VU** – Critical/Endangered/Vulnerable
 - **WPA** – Wildlife Protection Act
 - **PA** – Protected Area
 - **ESA** – Ecologically Sensitive Area
 - **BHS** – Biodiversity Heritage Site
-

12 **Socio-Economic**

- **R&R** – Rehabilitation & Resettlement
- **CSR** – Corporate Social Responsibility

- **CER** – *Corporate Environment Responsibility*
 - **HDI** – *Human Development Index*
 - **BPL** – *Below Poverty Line*
 - **PAP** – *Project Affected People*
-

1 3 Occupational Health & Safety

- **OHS** – *Occupational Health & Safety*
 - **OHCS** – *Occupational Health Centre & Services*
 - **PPE** – *Personal Protective Equipment*
 - **MSDS** – *Material Safety Data Sheet*
 - **ILO** – *International Labour Organisation*
-

1 4 Emission Dispersion Modelling

- **AERMOD** – *American Meteorological Society/EPA Model*
 - **ISCST3** – *Industrial Source Complex Model*
 - **CALPUFF** – *Puff Dispersion Model*
 - **ADMS** – *Atmospheric Dispersion Modelling System*
 - **FDM** – *Fugitive Dust Model*
 - **UAM** – *Urban Airshed Model*
-

1 5 Monitoring Instruments

- **PM Analyzer** – *Particulate Monitors*
- **NDIR** – *Non-Dispersive Infrared (gas analyzer)*
- **FTIR** – *Fourier Transform Infrared Spectrometer*
- **GC-MS** – *Gas Chromatography–Mass Spectrometry*
- **ICP-AES** – *Inductively Coupled Plasma Atomic Emission Spectroscopy*
- **AAS** – *Atomic Absorption Spectrophotometer*



File No: ML/SEAC/SEIAA/PP/EJH/126/2025

Government of India
Ministry of Environment, Forest and Climate Change
(Issued by the State Environment Impact Assessment
Authority(SEIAA), MEGHALAYA)



Dated: 15/10/2025



To,

Sunil Raosaheb Deshmukh
Shree Cement Limited
Shree Cement Ltd. Bangur Nagar, Post Box No. 33, Beawar 305901, Rajasthan, India, Beawar, Beawar,
RAJASTHAN, Shree Cement Ltd., Bangur Nagar, Post Box No. 33, 305901
sunil.deshmukh@shreecement.com

Subject: Grant of Terms of Reference under the provision of the EIA Notification 2006-regarding.

Sir/Madam,

This is in reference to your application for Grant of Terms of Reference under the provision of the EIA Notification 2006-regarding in respect of project Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, Elaka: Nongkhlieh Dolloiship, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd. submitted to Ministry vide proposal number SIA/ML/IND1/552331/2025 dated 29/09/2025.

2. The particulars of the proposal are as below:

(i) TOR Identification No.	TO25B1101ML5999209N
(ii) File No.	ML/SEAC/SEIAA/PP/EJH/126/2025
(iii) Clearance Type	TOR
(iv) Category	B1
(v) Project/Activity Included Schedule No.	3(b) Cement plants ,1(d) Thermal Power Plants,1(d) Thermal Power Plants Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, Elaka: Nongkhlieh Dolloiship, District of East Jaintia Hills (Meghalaya) by Shree
(vii) Name of Project	

(viii) Name of Company/Organization	Cement Ltd.
(ix) Location of Project (District, State)	Shree Cement Limited
(x) Issuing Authority	EAST JAINTIA HILLS, MEGHALAYA
(xi) Applicability of General Conditions	SEIAA
(xii) Applicability of Specific Conditions	no
	no

Plot/Survey Khasra Nos.: Khara Siang Lum Pyrshin

3. In view of the particulars given in the Para 1 above, the project proposal interalia including Form-1(Part A and B) were submitted to the State Environment Impact Assessment Authority(SEIAA) for an appraisal by the State Expert Appraisal Committee (SEAC) under the provision of EIA notification 2006 and its subsequent amendments.
4. The above-mentioned proposal has been considered by State Environment Impact Assessment Authority(SEIAA) in the meeting held on 15/10/2025. The minutes of the meeting and all the Application and documents submitted [(viz. Form-1 Part A, Part B, Part C EIA, EMP)] are available on PARIVESH portal which can be accessed by scanning the QR Code above.
5. The brief about configuration of plant/equipment, products and byproducts and salient features of the project along with environment settings, as submitted by the Project proponent in Form-1 (Part A, B and C)/EIA & EMP Reports/presented during SEIAA are annexed to this EC as Annexure (2).
6. The SEIAA, in its meeting held on 15/10/2025, based on information & clarifications provided by the project proponent and after detailed deliberations recommended the proposal for grant of Terms of Reference under the provision of EIA Notification, 2006 and as amended thereof subject to stipulation of specific and general conditions as detailed in Annexure (1).
7. The SEIAA has examined the proposal in accordance with the Environment Impact Assessment (EIA) Notification, 2006 & further amendments thereto and after accepting the recommendations of the SEAC hereby decided to grant Terms of Reference for instant proposal of M/s. Sunil Raosaheb Deshmukh under the provisions of EIA Notification, 2006 and as amended thereof.
8. The Ministry reserves the right to stipulate additional conditions, if found necessary.
9. The Terms of Reference to the aforementioned project is under provisions of EIA Notification, 2006. It does not tantamount to approvals/consent/permissions etc. required to be obtained under any other Act/Rule/regulation. The Project Proponent is under obligation to obtain approvals /clearances under any other Acts/ Regulations or Statutes, as applicable, to the project.
10. This issues with the approval of the Competent Authority.

Copy To

1. The Deputy Commissioner, East Jaiñtia Hills District, Khliehriat for information.
2. The Divisional Forest Officer, Jaiñtia Hills Territorial Division, Jowai for information.
3. The Member Secretary, Meghalaya Pollution Control Board, 'Arden', Lumpyngngad, Shillong – 793014 for information.

Annexure 1

Specific Terms of Reference s for (Cement Plants)

1. Specific Additional Conditions

S. No	Terms of Reference
1.1	I. Baseline Data Requirements To understand the existing environment conditions <u>prevailing within</u> the project area, the following <u>exercise</u> shall be conducted and <u>related/relevant data</u> collected and documented: 1. Meteorology & Climatology - o Hourly data for at least one season: temperature, wind speed & direction, humidity, rainfall, solar radiation, barometric pressure. - o Rainfall intensity / storm patterns (Meghalaya is one of the wettest regions). 2. Topography, Geology, Soil - o Topographical survey; slope stability, landslide risk. - o Soil types; infiltration rates; erosion potential. - o Geological faults, seismicity. 3. Hydrology & Water Resources - o Identification of local surface water bodies (rivers, streams, springs), their flow data (seasonal), downstream uses. - o Groundwater: water table, quality, recharge zones, seasonal fluctuation. - o Water rights / customary use by local communities. 4. Ambient Air Quality - o For at least one season (pre-monsoon, monsoon, post-monsoon, winter): measurement of PM₁₀, PM_{2.5}, SO₂, NO, CO, O₃, VOCs. - o At least 3–5 stations: upwind, downwind, close by villages or sensitive receptors (schools, health centres). 5. Noise Levels - o Measurements at different times (day, evening, night) at nearest human settlements and sensitive receptors. 6. Ecology / Biodiversity - o Flora and fauna survey of the site and its surroundings (within a radius, e.g. 10 km), with special attention to protected/endemic species. - o Assessment of forest patches, wildlife corridors. 7. Socio-Economic Studies - o Demography of nearby villages: population, livelihood, health status, existing infrastructure. - o Land ownership / tribal land status. - o Baseline public health data. 8. Existing Land Use & Infrastructure - o Land use map: forest, agricultural land, residential, infrastructure. - o Existing roads, power supply, drainage, community services II. Environmental Conditions / Operational Requirements at Plant Site: 1. Air Pollution Control · Emissions from all stacks (kiln, raw mill, coal mill, cement mill, cooler, CPP etc.) to conform with CPCB standards. · Install & maintain high efficiency dust control equipment: bag filters, ESPs, wet scrubbers, etc. For clinker cooler especially, use ESP or hybrid filter. · Fugitive dust control measures: covered conveyors, enclosures, water spraying, regular cleaning, wind-breaks. · Online Continuous Emission Monitoring Systems (OCEMS) in major stacks. · Ambient Air Quality Monitoring Stations (AAQMS) around the plant: at least 3–5 stations in downwind, upwind & populated zones. 2. Noise & Vibration · Maintain noise levels within prescribed limits as per notification (day / night). Provide acoustic enclosures, mufflers, buffer zones. · Vibration control especially if blasting / quarrying occurs. 3. Water & Wastewater Management

S. No	Terms of Reference
	· Total water requirement to be minimized; preference for reuse / recycling of process water. · Effluent (process & domestic) to be treated to meet the standards before discharge. Treated wastewater should be reused (dust suppression, green belt, etc.). · Storm water management: properly designed drains; check for runoffs; containment to avoid contamination. · Rainwater harvesting to offset fresh water usage. 4.Solid, Hazardous Wastes & By-Products · Identification of waste streams: kiln dust, ash, sludge, scrap, spent chemicals etc. · Plan for utilization of by-products (fly ash, kiln dust) wherever possible. · Safe storage, handling, transport & disposal of hazardous wastes. · Monitoring of leachates if landfill or dust ponds are used. 5.Land Use, Quarrying & Biodiversity status · Quarries: plans for land restoration / reclamation; slope stabilization; control of dust & noise. · If site is near protected area or eco-sensitive zone (e.g. Narpuh Wildlife Sanctuary), ensure buffer zones, avoid habitat fragmentation. · Green belt development around plant boundary and along roads using native species. 6.Energy Efficiency & GHG Emissions · Use Waste Heat Recovery Systems (WHRS) where feasible. · Use of alternative / cleaner fuels if viable. · Optimise energy efficiency in all major operational units. 7.Traffic, Transport & Infrastructure · Assess impact of transport of raw materials (limestone, coal etc.) on local roads; ensure that trucks are covered; maintain roads. · Plan for traffic management, parking, gates, weigh bridges etc. · Ensure no spillage of material during transport. 8.Socio Economic, Local Communities & Public Health · Provide a grievance redress mechanism for nearby communities. · Use local labour as far as possible; provide training. · Conduct health impact assessment if required; periodic medical camps. · CSR initiatives especially focusing on environmental restoration, livelihood support, water supply etc.

Standard Terms of Reference for Industrial Projects - 1

1. Preliminary Requirements

S. No	Terms of Reference
1.1	EIA/EMP report cover page shall consists of project title with location, applicable schedule of the EIA Notification, 2006, ToR letter No. with date, study period along with EIA consultant & laboratory details with QCI/NABET/NABL accreditation certificate detail.
1.2	Besides, following points shall be compiled as per QCI/NABET norms: a. Disclaimer by the EIA consultant. b. Declaration by the Functional Area Experts contributed to the EIA study and declaration by the head of the accredited consultant organization/authorized person. c. Undertaking by the project proponent owning the contents (information and data) of the EIA/EMP report. d. Undertaking by the EIA consultant regarding compliance of ToR issued by MoEF&CC. e. Consultant shall submit the Plagiarism Certificate for the EIA/EMP Report.

2. Executive Summary

S. No	Terms of Reference
2.1	Table of Contents of the EIA report including list of tables/figures/annexures/abbreviations/symbols/notations.
2.2	Point wise compliance to the ToR issued by MoEF&CC.

2.1 Introduction

S. No	Terms of Reference
2.1.1	Name of the project along with applicable schedule and category as per EIA, 2006.
2.1.2	Location and accessibility

2.2 Project Description

S. No	Terms of Reference
2.2.1	Resource requirements (Land; water; fuel; manpower)
2.2.2	Operational activity
2.2.3	Key pollution concerns

2.3 Baseline Environment Studies

S. No	Terms of Reference
2.3.1	Ambient air quality
2.3.2	Ambient Noise quality
2.3.3	Traffic study
2.3.4	Surface water quality
2.3.5	Ground water quality
2.3.6	Soil quality
2.3.7	Biological Environment
2.3.8	Land use
2.3.9	Socio-economic environment

2.4 Anticipated Impacts

S. No	Terms of Reference
2.4.1	Impact on ambient air quality
2.4.2	Impact on ambient noise quality
2.4.3	Impact on road and traffic
2.4.4	Impact on surface water resource and quality
2.4.5	Impact on ground water resource and quality
2.4.6	Impact on terrestrial and aquatic habitat
2.4.7	Impact on socio-economic environment

2.5 Alternative Analysis

S. No	Terms of Reference
2.5.1	No Data Found

2.6 Environmental Monitoring Program

S. No	Terms of Reference
2.6.1	Ambient air, noise, water and soil quality
2.6.2	Noise quality management plan
2.6.3	Emission and discharge from the plant
2.6.4	Green Belt
2.6.5	Social Parameters

2.7 Additional Studies

S. No	Terms of Reference
2.7.1	Risk assessment
2.7.2	Public consultation
2.7.3	Action plan to address the issues raised during public consultation as per MoEF&CC O.M. dated 30/09/2020

2.8 Project Benefits

S. No	Terms of Reference
2.8.1	No Data Found

2.9 Environment Management Plan

S. No	Terms of Reference
2.9.1	Air quality management plan
2.9.2	Noise quality management plan
2.9.3	Solid and hazardous waste management plan
2.9.4	Effluent management plan
2.9.5	Storm water management plan
2.9.6	Occupational health and safety management plan
2.9.7	Green belt development plan
2.9.8	Socio-economic management plan
2.9.9	Project cost and EMP implementation budget.

3. Introduction

S. No	Terms of Reference
3.1	Background about the project
3.2	Need of the project
3.3	Purpose of the EIA study
3.4	Scope of the EIA study

4. Project Description

4.1 Site Details

S. No	Terms of Reference
4.1.1	Location of the project site covering village, Taluka/Tehsil, District and State.
4.1.2	Site accessibility
4.1.3	A digital toposheet in pdf or shape file compatible to google earth of the study area of radius of 10km and site location preferably on 1:50,000 scale. (including all eco-sensitive areas and

S. No	Terms of Reference
	environmentally sensitive places).
4.1.4	Latest High-resolution satellite image data having 1 m - 5 m spatial resolution like quickbird, Ikonos, IRS P-6 pan sharpened etc., along with delineation of plant boundary co-ordinates. Area must include at least 100 m all around the project location.
4.1.5	Environment settings of the site and its surrounding along with map.
4.1.6	A list of major industries with name, products and distance from plant site within study area (10km radius) and the location of the industries shall be depicted in the study area map.
4.1.7	In case if the project site is in vicinity of the water body, 50 meters from the edge of the water body towards the site shall be treated as no development/construction zone. If it's near the wetland, Guidelines for implementing Wetlands (Conservation and Management) Rules, 2017 may be followed.
4.1.8	In case if the project site is in vicinity of the river, the industry shall not be located within the river flood plain corresponding to one in 25 years flood, as certified by concerned District Magistrate/Executive Engineer from State Water Resources Department (or) any other officer authorized by the State Government for this purpose as per the provisions contained in the MoEF&CC Office Memorandum dated 14/02/2022.
4.1.9	In case of canal/ nala/ seasonal drain and any other water body passing through project site, the PP shall submit the suitable steps /conservation plan/mitigation measures along with contouring, Run - off calculations, disposal etc. A robust and full proof Drainage Conservation scheme to protect the natural drainage/water bodies and its flow parameters; along with Soil conservation scheme and multiple Erosion control measures shall be provided in the report.
4.1.10	Type of land, land use of the project site needs to be submitted.
4.1.11	Status of acquisition of land. If acquisition is not complete, stage of the acquisition process as per the MoEF&CC O.M. dated 7/10/2014 shall be furnished.
4.1.12	Project proponent shall prepare Engineering layout plan showing all internal roads minimum 6 m width and 9 m turning radius for smooth traffic flow inside including fire tender as per NBC. Road network shall connect all service areas in layout. This drawing shall include area statement showing plot area, area under roads, parking, green belt with calculations and % with respect to plot area of project site and proper indexing. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.
4.1.13	Project proponent shall submit contour map of project site along with drainage disposal system with calculations and drawings supported with proper indexing including Rain Water Harvesting details with calculations mentioning about GW recharge along with relevant drawing.
4.1.14	A detailed report covering all aspects of Fire Safety Management and Fire Emergency Plan shall be submitted.
4.1.15	Details of drone survey for the site, needs to be included in report and presented before the EAC during appraisal of the project.

4.2 Forest And Wildlife Related Issues (If Applicable)

S. No	Terms of Reference
4.2.1	Status of Forest Clearance for the use of forest land shall be submitted.
4.2.2	Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife if the project site located within notified Eco-Sensitive Zone, 10 km radius of national park/sanctuary wherein final ESZ notification is not in place as per MoEF&CC Office Memorandum dated 8/8/2019.
4.2.3	The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, Eco-sensitive Zone and Eco-sensitive areas, the project proponent shall submit the map duly authenticated by Divisional Forest Officer showing the distance between the project site and the said areas.
4.2.4	Wildlife Conservation Plan duly authenticated by the Competent Authority of the State Government for conservation of Schedule I fauna along with budget and action plan, if any exists in the study area.

4.3 Salient Features Of The Project

S. No	Terms of Reference
4.3.1	Products with capacities in Tons per Annum for the proposed project.
4.3.2	If expansion project, status of implementation of existing project, details of existing/proposed products with production capacities in Tons per Annum.
4.3.3	Site preparatory activities.
4.3.4	List of raw materials required and their source along with mode of transportation.
4.3.5	Other than raw materials, other chemicals and materials required with quantities and storage capacities.
4.3.6	Manufacturing process details along with process flow diagram of proposed units.
4.3.7	Consolidated materials and energy balance for the project.
4.3.8	Total requirement of surface/ ground water and power with their respective sources, status of approval.
4.3.9	Water balance diagram
4.3.10	Details of Emission, effluents, hazardous waste generation and mode of disposal during construction as well as operation phase.
4.3.11	Man-power requirement.
4.3.12	Cost of project and scheduled time of completion.

S. No	Terms of Reference
4.3.13	In case of expansion projects, project proponent shall submit structural stability certificate showing whether existing structure withstand for proposed expansion activity.
4.3.14	Brief on present status of compliance (Expansion/modernization proposals) a. Cumulative Environment Impact Assessment for the existing as well as the proposed expansion/modernization shall be carried out. b. Cumulative Impact Assessment need to be carried out by greenfield projects considering the nearby industries. c. In case of ground water drawl for the existing unit, action plan for phasing out of ground water abstraction in next two years except for domestic purposes and shall switch over to 100 % use of surface water from nearby source. d. Copy of all the Environment Clearance(s) including Amendments/validity of extension/transfer of EC, there to obtained for the project from MoEF&CC/SEIAA shall be attached as Annexures. A Certified Compliance Report (CCR) of the Integrated Regional Office of the Ministry of Environment, Forest and Climate Change/ or concerned authority as per OM No. IA3-22/10/2022-IA.III [E 1772581], dated 8th June, 2022 on the status of compliance of conditions stipulated in all the existing environment clearances including amendments shall be provided. A Certified Compliance Report (CCR) issued by the concerned Authority shall be valid for a period of one year from the date of inspection. e. In case the existing project has not obtained Environment Clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. A proper justification needs to be submitted along with documentary proof. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 1994 or 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of CTO from the Regional Office of the SPCB shall be submitted, as per OM No. IA3-22/10/2022-IA.III [E 1772581], dated 8th June, 2022. CCR on CTO conditions issued by the concerned SPCBs/PCCs shall be valid for a period of one year from the date of inspection of the project.

5. Description Of The Environment

S. No	Terms of Reference																																	
5.1	Study period																																	
5.2	Approach and methodology for data collection as furnished below																																	
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S. No	Terms of Reference
	• Cloud cover • Environmental • Lapse Rate • Sampling as per CPCB guidelines • Collection of AAQ data (except in monsoon season) • Locations of various stations for different parameters should be related to the characteristic properties of the parameters. • The monitoring stations shall be based on the NAAQM standards as per GSR 826(E) dated 16/11/2009 and take into account the predominant wind direction, population zone and sensitive receptors including reserved forests, • Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAAQM Notification of 16/11/2009 along with min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report. Pollutants • PM10 • SO2 • NOx • CO • HC • Other parameters relevant to the project and topography of the area Noise Hourly equivalent noise levels At least 8-12 locations s per CPCB norms Water Parameters for water quality Samples for water quality should be collected and analyzed as per:

S. No	Terms of Reference
	- pH, temp, turbidity, magnesium hardness, total alkalinity, chloride, sulphate, nitrate, fluoride, sodium, potassium, salinity - IS: 2488 (Part 1-5) methods for sampling and testing of Industrial effluents - Standard methods for examination of water and wastewater analysis published by American Public Health Association - Total nitrogen, total phosphorus, DO, BOD, COD, Phenol - Heavy metals - Total coliforms, faecal coliforms - Phyto plankton - Zoo plankton For River Bodies - Total Carbon - pH - Dissolved Oxygen - Biological Oxygen Demand - Free NH₄ - Boron - Sodium Absorption Ratio - Electrical Conductivity Surface water quality of the nearest River (60m upstream and downstream) and other surface water bodies - Yield of water sources to be measured during critical season - Standard methodology for collection of surface water (BIS standards) For Ground Water Ground water monitoring data should be collected at minimum of 8 locations (from existing wells /tube wells/existing current records) from the study area and shall be included. Traffic Study Type of vehicles - Frequency of vehicles for transportation of materials - Additional traffic due to proposed project Land Environment Soil - Particle size distribution - Texture - pH Soil samples be collected as per BIS specifications

S. No	Terms of Reference
	• Electrical conductivity • Cation exchange capacity • Alkali metals • Sodium Absorption Ratio (SAR) • Permeability • Water holding capacity • Porosity Land use/Landscape • Location code • Total project area • Topography • Drainage (natural) Cultivated, forest, plantations, water bodies, roads and settlements Biological Environment 1. Aquatic • Primary productivity • Aquatic weeds • Enumeration of phyto plankton, zoo plankton and benthos • Fisheries • Diversity indices • Trophic levels • Rare and endangered species • Marine Parks/ Sanctuaries/ closed areas /coastal regulation zone (CRZ) 2. Terrestrial • Vegetation-species list, economic importance, forest • Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. Indicator species which indicate ecological and environment degradation should be identified and included to clearly state whether the proposed project would result in to any adverse effect on any species. • Samples to collect from upstream and downstream of discharge point, nearby tributaries at downstream, and also from dug wells close to activity site. • For forest studies, direction of wind should be considered while selecting forests. • Secondary data to collect from Government offices, NGOs, published literature.

S. No	Terms of Reference												
	produce,medicinal value • Importance value index (IVI) of trees • Fauna • Avi fauna • Rare and endangered species • Sanctuaries / National park / Biosphere reserve • Migratory routes socio-economic Demographic structure Infrastructure resource base Economic resource base Health status:Morbidity pattern Cultural and aesthetic attributes. Education Socio-economic survey is based on proportionate, stratified and random sampling method. • Primary data collection through questionnaire • Secondary data from census records, statistical hard books, topo sheets, health records and relevant official records available with Govt. agencies Approach and methodology for data collection as furnished below <table><tr><th>Attributes</th><th>Sampling</th><th>Remarks</th></tr><tr><td>Air Environment</td><td>Network</td><td></td></tr><tr><td>Micro-Meteorological</td><td>Frequency</td><td></td></tr><tr><td> • Wind speed (Hourly) • Wind direction • Dry bulb temperature • Wet bulb temperature • Relative humidity • Rainfall • Solar radiation • Cloud cover </td><td> Minimum 1 site in the project hourly continuous impact area </td><td> IS 5182 Part 1-20 • Site specific primary data is essential • Secondary data from IMD, New Delhi • CPCB guidelines to be considered. </td></tr></table>	Attributes	Sampling	Remarks	Air Environment	Network		Micro-Meteorological	Frequency		• Wind speed (Hourly) • Wind direction • Dry bulb temperature • Wet bulb temperature • Relative humidity • Rainfall • Solar radiation • Cloud cover	Minimum 1 site in the project hourly continuous impact area	IS 5182 Part 1-20 • Site specific primary data is essential • Secondary data from IMD, New Delhi • CPCB guidelines to be considered.
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S. No	Terms of Reference
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S. No	Terms of Reference
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S. No	Terms of Reference
	• Cation exchange capacity • Alkali metals • Sodium Absorption Ratio (SAR) • Permeability - Water holding capacity • Porosity Land use/Landscape • Location code • Total project area • Topography • Drainage (natural) Cultivated, forest, plantations, water bodies, roads and settlements Biological Environment 1. Aquatic • Primary productivity • Aquatic weeds • Enumeration of phyto plankton, zoo plankton and benthos • Fisheries - Diversity indices • Trophic levels • Rare and endangered species • Marine Parks/ Sanctuaries/ closed areas /coastal regulation zone (CRZ) 2. Terrestrial • Vegetation-species list, economic importance, forest produce, medicinal • Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. Indicator species which indicate ecological and environment degradation should be identified and included to clearly state whether the proposed project would result in to any adverse effect on any species. • Samples to collect from upstream and downstream of discharge point, nearby tributaries at downstream, and also from dug wells close to activity site. • For forest studies, direction of wind should be considered while selecting forests. • Secondary data to collect from Government offices, NGOs, published literature.

S. No	Terms of Reference
	value • Importance value index (IVI) of trees • Fauna • Avi fauna • Rare and endangered species • Sanctuaries / National park / Biosphere reserve • Migratory routes socio-economic Demographic structure • Infrastructure resource base • Economic resource base • Health status: Morbidity pattern • Cultural and aesthetic attributes. • Education Socio-economic survey is based on proportionate, stratified and random sampling method. • Primary data collection through questionnaire • Secondary data from census records, statistical hard books, topo sheets, health records and relevant official records available with Govt. agencies
5.3	Interpretation of each environment attribute shall be enumerated and summarized as given below: • Ambient air quality • Ambient Noise quality • Surface water quality • Ground water quality • Soil quality • Biological Environment • Land use • Socio-economic environment
5.4	The PP should submit the photograph of monitoring stations & sampling locations. The photograph should bear the date, time, latitude & longitude of the monitoring station/sampling location. In addition to this PP should submit the original test reports and certificates of the labs which will analyze the samples.

6. Anticipated Environment Impacts And Mitigation Measures (In Case Of Expansion, Cumulative Impact Assessment Shall Be Carried Out)

S. No	Terms of Reference								
6.1	Identification of potential impacts in the form of a matrix for the construction and operation phase for all the environment components <table><thead><tr><th>Activity</th><th>Environment</th><th>Ecological</th><th>Socio-economic</th></tr></thead><tbody><tr><td>Construction phase</td><td></td><td></td><td></td></tr></tbody></table>	Activity	Environment	Ecological	Socio-economic	Construction phase			
Activity	Environment	Ecological	Socio-economic						
Construction phase									

S. No	Terms of Reference
	Operation phase
6.2	Impact on ambient air quality (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase • Details of stack emissions from the existing as well as proposed activity. • Assessment of ground level concentration of pollutants from the stack emission based on AQIP Modelling The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any along with wind rose map for respective period • Impact on ground level concentration, under normal, abnormal and emergency conditions. Measures to handle emergency situations in the event of uncontrolled release of emissions.
6.3	Impact on ambient noise quality (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase
6.4	Impact on traffic (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase
6.5	Impact on soil quality (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase
6.6	Impact on land use (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase
6.7	Impact on surface water resource and quality (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase
6.8	Impact on ground water resource and quality (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase
6.9	Impact on terrestrial and aquatic habitat (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase
6.10	Impact on socio-economic environment (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase
6.11	Impact on occupational health and safety (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase

7. Analysis Of Alternatives (Technology & Site)

S. No	Terms of Reference
7.1	No project scenario
7.2	Site alternative
7.3	Technical and social concerns

S. No	Terms of Reference
7.4	Conclusion

8. Environmental Monitoring Program

S. No	Terms of Reference																		
8.1	Details of the Environment Management Cell																		
8.2	Performance monitoring schedule for all pollution control devices shall be furnished.																		
8.3	Corporate Environment Policy a. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report. b. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environment or forest norms / conditions? If so, it may be detailed in the EIA. c. What is the hierarchical system or Administrative order of the company to deal with the environment issues and for ensuring compliance with the environment clearance conditions? Details of this system may be given. Page 9 of 10 d. Does the company have system of reporting of non compliances / violations of environment norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report																		
8.4	Action plan for post-project environment monitoring matrix: <table><thead><tr><th>Activity</th><th>Aspect</th><th>Monitoring Parameter</th><th>Location</th><th>Frequency</th><th>Responsibility</th></tr></thead><tbody><tr><td>Construction phase</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Operation phase</td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>	Activity	Aspect	Monitoring Parameter	Location	Frequency	Responsibility	Construction phase						Operation phase					
Activity	Aspect	Monitoring Parameter	Location	Frequency	Responsibility														
Construction phase																			
Operation phase																			

9. Additional Studies

S. No	Terms of Reference
9.1	Project proponent shall submit a study report on Decarbonisation program, which would essentially consist of company's carbon emissions, carbon budgeting/ balancing, carbon sequestration activities and carbon capture, use and storage after offsetting strategies. Further, the report shall also contain time bound action plan to reduce its carbon intensity of its operations and supply chains, energy transition pathway from fossil fuels to Renewable energy etc. All these activities/ assessments should be measurable and monitorable with defined time frames.
9.2	Details of adoption/ implementation status/plan to achieve the goal of Glasgow COP26 Climate Submit with regard to enhance the non-fossil energy, use of renewable energy, minimization of net carbon emission and carbon intensity with long-term target of "net Zero" emission.
9.3	Implementation status/measures adopted for avoiding the generation of single used plastic waste.

S. No	Terms of Reference																			
9.4	In cases the project is located in Critically and Severely Polluted Areas, additional mitigation measures adopted and detailed action plan to be submitted in the EIA/EMP Report as per MoEF&CC O.M. No. 22-23/2028-IA.III dated 31/10/2019 and MoEF&CC O.M. No. 22-23/2028-IA.III dated 5/07/2022 has to be submitted.																			
9.5	Public consultation details (Entire proceedings as separate annexure along with authenticated English Translation of Public Consultation proceedings).																			
9.6	As part of Corporate Environment Responsibility (CER) activity, company shall adopt nearby villages based on the socio-economic survey and undertake community developmental activities in consultation with the village Panchayat and the District Administration. In this regard, time bound action plan as per the MoEF&CC Office Memorandum dated 30/09/2020 shall be submitted.																			
9.7	Summary of issues raised during public consultation along with action plan to address the same as per MoEF&CC O.M. dated 30/09/2020 <table> <tr> <th colspan="3">Physical activity and action plan</th> <th colspan="3">Year of implementation</th> <th rowspan="3">Total Expenditure (Rs. in Crores)</th> </tr> <tr> <th>S.No</th> <th>Name of the Physical Activity</th> <th>plan</th> <th colspan="3">(Budget in INR)</th> </tr> <tr> <th></th> <th></th> <th>Targets</th> <th>1st</th> <th>2nd</th> <th>3rd</th> </tr> </table>	Physical activity and action plan			Year of implementation			Total Expenditure (Rs. in Crores)	S.No	Name of the Physical Activity	plan	(Budget in INR)					Targets	1st	2nd	3rd
Physical activity and action plan			Year of implementation			Total Expenditure (Rs. in Crores)														
S.No	Name of the Physical Activity	plan	(Budget in INR)																	
		Targets	1st	2nd	3rd															
9.8	Risk assessment - Methodology - Hazard identification - Frequency analysis - Consequence analysis - Risk assessment outcome																			
9.9	Emergency response and preparedness plan																			

10. Project Benefits

S. No	Terms of Reference
10.1	Environment benefits
10.2	Social infrastructure
10.3	Employment and business opportunity
10.4	Other tangible benefits

11. Environment Cost Benefit Analysis

S. No	Terms of Reference
11.1	Net present value
11.2	Internal rate of return
11.3	Benefit cost ratio
11.4	Cost effectiveness analysis

12. Environment Management Plan (Construction And Operation Phase)

S. No	Terms of Reference
12.1	Air quality management plan
12.2	Noise quality management plan
12.3	Action plan for hazardous waste management
12.4	Action plan for solid waste management
12.5	Action plan for e-waste management.
12.6	Action plan for plastic waste management, considering the Plastic Waste Management Rules 2016.
12.7	Action plan for construction and demolition waste management.
12.8	Effluent management plan
12.9	Storm water management plan
12.10	Rain water harvesting plan
12.11	Plan for maximum usage of waste water/treated water in the Unit
12.12	Occupational health and safety management plan
12.13	Green belt development plan: An action plan for Green Belt development consisting of 3 tiers of plantations of native species all along the periphery of the project of adequate width shall be raised in 33% of total area with a tree density shall not less than 2500 per ha within a time frame of one year shall be submitted. Survival rate of green belt shall be monitored on periodic basis to ensure that survival rate not be less than 80 %.
12.14	Socio-economic management plan
12.15	Wildlife conservation plan (In case of presence of schedule I species)
12.16	Total capital cost and recurring cost/annum for environment pollution control measures shall be included.

S. No	Terms of Reference
12.17	Explore possibilities for recycling and reusing of treated water in the unit to reduce the freshwater demand and waste disposal.
12.18	An Action Plan for improving the house-keeping activities in the raw material handling area need to be submitted
12.19	Action plan for the stock piles with impervious floor, provision of garland drains and catch pits to trap run off material shall be submitted.
12.20	Action plan to limit the dust emission from all the stacks below 30 mg/Nm ³ shall be furnished.
12.21	Action plan for fugitive emission control in the plant premises shall be provided.

13. Conclusion Of The Eia Study

S. No	Terms of Reference
13.1	No Data Found

14. In Addition To The Above, Any Litigation Pending Against The Project And/or Any Direction/order Passed By Any Court Of Law Against The Project, If So, Details Thereof Shall Also Be Included. Has The Unit Received Any Notice Under The Section 5 Of Environment (Protection) Act, 1986 Or Relevant Sections Of Air And Water Acts? If So, Details Thereof And Compliance/atr To The Notice(s) And Present Status Of The Case.

S. No	Terms of Reference
14.1	No Data Found

15. Air Cooled Condensors Shall Be Used In The Power Plant.

S. No	Terms of Reference
15.1	No Data Found

16. Details Of Dry Ash Handling System Along With Supplementary Coal Handling System Shall Be Submitted.

S. No	Terms of Reference
16.1	No Data Found

17. Plan For Transportation Of Coal Shall Be Submitted.

S. No	Terms of Reference
17.1	No Data Found

18. Plan Along With Technical Details Of Scr Shall Be Submitted.

S. No	Terms of Reference
18.1	No Data Found

19. In Case Of Expansion Project, Status Of Ash Utilization Of Previous Years (Up To 5 Years), Action Plan For 100% Ash Utilization Along With Timeline Need To Be Submitted

S. No	Terms of Reference
19.1	No Data Found

Standard Terms of Reference for (Cement plants)**1.**

S. No	Terms of Reference
1.1	Limestone and coal linkage documents along with the status of environment clearance of limestone and coal mines.
1.2	Quantum of production of coal and limestone from coal & limestone mines and the projects they cater to;
1.3	Present land use shall be prepared based on satellite imagery. High-resolution satellite image data having 1m-5m spatial resolution like quickbird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area.
1.4	If the raw materials used have trace elements, an environment management plan shall also be included.
1.5	Plan for the implementation of the recommendations made for the cement plants in the Corporate Responsibility for Environmental Protection (CREP) guidelines shall be prepared.
1.6	Energy consumption per ton of clinker and cement grinding
1.7	Provision of waste heat recovery boiler
1.8	Arrangement for co-processing of hazardous waste in cement plant.
1.9	Provision of Alternate fuels.
1.10	Details of Implementation of Fly Ash Management Rules
1.11	Emission/Effluent norms as per GSR 496 (E) dated 9/5/2016 [EPA Rules 1986].
1.12	Action plan for the stock piles with impervious floor, provision of garland drains and catch pits to

S. No	Terms of Reference
	trap run off material shall be submitted.
1.13	Action plan to limit the particulate matter emission from all the stacks below 30 mg/Nm ³ shall be furnished.
1.14	PP shall explore the possibility of plastic waste utilization in the Plant/Unit process.
1.15	Action plan for 100 % solid waste utilization shall be submitted.
1.16	PM (PM ₁₀ and P _{2.5}) present in the ambient air must be analysed for source analysis – natural dust/RSPM generated from plant operations (trace elements) of PM ₁₀ to be carried over.

Additional Terms of Reference

N/A

Annexure 2

Details of Products & By-products

Name of the product /By-product	Product / By-product	Quantity	Unit	Mode of Transport / Transmission	Remarks (eg. CAS number)
Clinker	Clinker	0.95	million TPA	Combination of two or three modes	
Cement (OPC, PPC, LC3, PSC, SRC, RHPC & Composite Cement)	Cement (OPC, PPC, LC3, PSC, SRC, RHPC & Composite Cement)	0.99	million TPA	Combination of two or three modes	
CPP	CPP	15	Mega Watt (MW)	Captive use	
WHRS	WHRS	5	Mega Watt (MW)	Captive use	
DG Set	DG Set	2500	kVA	For Emergency and Back-up Purpose	

Signature Not Verified

Digitally Signed by: Badonlang Wahlang
IFS
Member Secretary, SEIAA

Date: 15/10/2025

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Compliance of ToR Point

Standard Terms of Reference for Industrial Projects - 1

S. No	Terms of Reference Condition	Terms of Reference Reply	Reference in EIA Report
1.	Preliminary Requirements		
1.1	EIA/EMP report cover page shall consist of project title with location, applicable schedule of the EIA Notification, 2006, ToR letter No. with date, study period along with EIA consultant & laboratory details with QCI/ NABET /NABL accreditation certificate detail.	Details such as project title with location, applicable schedule of the EIA Notification, 2006, ToR letter No. with date, study period along with EIA consultant & laboratory details with QCI/NABET/NABL accreditation certificate are mentioned on the cover page of the EIA/EMP Report.	Cover Page
1.2	Besides, following points shall be compiled as per QCI/NABET norms:		
a.	Disclaimer by the EIA consultant.	Disclaimer by EIA Consultant has been given in the Declaration which is enclosed along with EIA/EMP Report.	Declaration
b.	Declaration by the Functional Area Experts contributed to the EIA study and declaration by the head of the accredited consultant organization/ authorized person.	Declaration of the Functional Area Experts (FAEs) involved in the EIA study and declaration by head of accredited consultant Organization /authorized person is enclosed along with the EIA/EMP Report.	Declaration
c.	Undertaking by the project proponent owning the contents (information and data) of the EIA/EMP report.	Undertaking by the project proponent owning the contents (information and data) of the EIA/EMP report is incorporated in this EIA/EMP Report.	Undertaking by the project proponent
d.	Undertaking by the EIA consultant regarding compliance of ToR issued by MoEF&CC.	Undertaking by the EIA consultant regarding the compliance of ToR is incorporated in this EIA/EMP Report.	Undertaking by the EIA consultant
e.	Consultant shall submit the Plagiarism Certificate for the EIA/EMP Report.	Plagiarism certificate is incorporated in this EIA/EMP Report.	Plagiarism Certificate enclosed in EIA/EMP report.
2.	Executive Summary		
2.1	Table of Contents of the EIA report including list of tables/ figures/annexures/abbreviations /symbols/notations.	Table of contents including list of tables/ figures/ annexures/ abbreviations/ symbols/ notations is incorporated in this EIA/EMP Report.	Content List

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Compliance of ToR Point

2.2	Point wise compliance to the ToR issued by MoEF&CC.	Pointwise compliance to the ToR issued by MoEF&CC is incorporated in this EIA/EMP Report.	ToR Reply Page No.
2.1	Introduction		
2.1.1	Name of the project along with applicable schedule and category as per EIA, 2006.	Name of the project, schedule and category as per EIA, 2006 and location and accessibility details has been incorporated in the cover page. Same has been enclosed along with the EIA/EMP Report.	Cover Page
2.1.2	Location and accessibility	Name of the project, schedule and category as per EIA, 2006 and location and accessibility details has been incorporated in the Executive summary. Same has been enclosed along with the EIA/EMP Report.	Executive Summary Page No. 1 of 21.
2.2	Project Description		
2.2.1	Resource requirements (Land; water; fuel; manpower)	Details of Resource requirements (Land; water; fuel; manpower), Operational Activity, Key Pollution concerns have been incorporated in the Executive summary. Same has been enclosed along with the EIA/EMP Report.	Executive Summary Page No. 3 of 21.
2.2.2	Operational Activity	Details of Resource requirements (Land; water; fuel; manpower), Operational Activity, Key Pollution concerns have been incorporated in the Executive summary. Same has been enclosed along with the EIA/EMP Report.	Executive Summary Page No. 6 of 21 onwards
2.2.3	Key Pollution concerns	Details of Resource requirements (Land; water; fuel; manpower), Operational Activity, Key Pollution concerns have been incorporated in the Executive summary. Same has been enclosed along with the EIA/EMP Report.	Executive Summary Page No. 6 of 21
2.3	Baseline Environment Studies		
2.3.1	Ambient Air Quality	Baseline Environment studies covering 8 locations for Ambient Air and 5 locations for Noise quality, Detailed Traffic Study, 2 locations for Surface water quality, 4 locations for Ground water quality, 5	Details has been given in Chapter 3 on Page No. 110 onwards
2.3.2	Ambient Noise Quality		
2.3.3	Traffic Study		
2.3.4	Surface water Quality		
2.3.5	Groundwater Quality		

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Compliance of ToR Point

2.3.6	Soil Quality	locations for Soil Quality, Biological Environment, Land Use, Socio Economic Environment have been incorporated in Chapter 3.	
2.3.7	Biological Environment		
2.3.8	Land Use		
2.3.9	Socio Economic Environment		
2.4	Anticipated Impacts		
2.4.1	Impact on Ambient Air Quality	Anticipated impact on Ambient Air Quality, Ambient Noise Quality, Impact on road and traffic, surface water resource and quality, groundwater resource and quality, impact on terrestrial and aquatic habitat along with socio economic environment have been incorporated in the Executive summary. Same has been enclosed along with the EIA/EMP Report.	Executive Summary Page No. 85-86
2.4.2	Impact on Ambient noise quality		
2.4.3	Impact on road and traffic		
2.4.4	Impact on surface water resource and quality		
2.4.5	Impact on ground water resource and quality		
2.4.6	Impact on terrestrial and aquatic habitat		
2.4.7	Impact on socio-economic environment		
2.5.	Alternative Analysis		
2.5.1	No Data Found		
2.6	Environmental Monitoring program		
2.6.1	Ambient air, noise, water and soil quality	Details of Environmental Monitoring Program including details of Ambient air, noise, water and soil quality have been incorporated in Chapter X.	Details has been given in Chapter 6.
2.6.2	Noise quality management plan	Details of Environmental Monitoring Program including details of Noise quality management plan have been incorporated in Chapter X.	
2.6.3	Emission and discharge from the plant	Details of Environmental Monitoring Program including details of Emission and discharge from the plant have been incorporated in Chapter X.	
2.6.4	Green Belt	Details of Environmental Monitoring Program including details of Greenbelt have been incorporated in Chapter X.	

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Compliance of ToR Point

2.6.5	Social Parameters	Details of Environmental Monitoring Program including details of social parameters have been incorporated in Chapter X.	
2.7	Additional Studies		
2.7.1	Risk Assessment	Details of Risk Assessment have been incorporated in the Executive summary of the EIA / EMP Report.	Details has been given in Chapter 7
2.7.2	Public consultation	The proposed project to be submitted as a draft EIA/EMP, once the public hearing conducted, then the details for the same will be incorporated in EIA/EMP report.	
2.7.3	Action plan to address the issues raised during public consultation as per MoEF&CC O.M. dated 30/09/2020	The proposed project to be submitted as a draft EIA/EMP, once the public hearing conducted, then the details for the same will be incorporated in EIA/EMP report.	
2.8	Project Benefits	Details regarding Environment benefits, social infrastructure, Employment and business opportunity, Other tangible benefits have been incorporated in this EIA/EMP Report	Details has been given in Chapter 8
2.9	Environment Management Plan		
2.9.1	Air quality management plan	Details of Environment Management Plan for Air Quality management plan has been incorporated in Chapter 10 of the EIA /EMP Report.	Details has been given in Chapter 10
2.9.2	Noise quality management plan	Details of Environment Management Plan for Noise Quality has been incorporated in Chapter 10 of the EIA /EMP Report.	
2.9.3	Solid and hazardous waste management plan	Details of Environment Management Plan for Solid and hazardous waste has been incorporated in Chapter 10 of the EIA /EMP Report.	
2.9.4	Effluent Management Plan	Details of Environment Management Plan for Effluent management plan has been incorporated in Chapter 10 of the EIA /EMP Report.	

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Compliance of ToR Point

2.9.5	Storm water management plan	Details of Environment Management Plan for Storm water management plan has been incorporated in Chapter 10 of the EIA /EMP Report.	
2.9.6	Occupational health and safety management plan	Details of Environment Management Plan for Occupational health and safety management plan has been incorporated in Chapter 10 of the EIA /EMP Report.	
2.9.7	Green belt development plan	Details of Environment Management Plan for greenbelt development plan has been incorporated in Chapter 10 of the EIA /EMP Report.	
2.9.8	Socio-economic management plan	Details of Environment Management Plan for Socio-economic management plan has been incorporated in Chapter 10 of the EIA /EMP Report.	
2.9.9	Project cost and EMP implementation budget	Details of Environment Management Plan for Project cost and EMP implementation budget has been incorporated in Chapter 10 of the EIA /EMP Report.	
3.0	Introduction		
3.1	Background about the project	This is a Greenfield project. Based on market demand and scenario, company has proposed to install Integrated Cement Plant in Khara Siang Lum Pyrshim in Daistong Village, Elaka - Nongkhlieh Dolloiship, District- East Jaintia Hills, State-Meghalaya.	Chapter- 1 Section Page no. 39
3.2	Need of the project	To meet the demand of the Cement in the national, state and regional level, the company is proposing this Integrated Cement Plant. Details regarding the same are given in this EIA/EMP Report.	Chapter - 2 Section - Page no. 47
3.3	Purpose of the EIA Study	Purpose of the EIA study for the project has been incorporated in this EIA/EMP Report.	Chapter - 1 Section Page no. 38

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Compliance of ToR Point

3.4	Scope of the EIA	Scope of this EIA study is to cover all the points given in the Terms of Reference (ToR) letter issued by SEIAA, Meghalaya vide File No. ML/SEAC/SEIAA/PP/EJH/126/2025 and ToR Identification No. TO25B1101ML5999209N, dated 15 th Oct. 2025.- Details of the same are given in this EIA/EMP Report.	Chapter - 1
4.	Project Description		
4.1	Site Details		
4.1.1	Location of the project site covering village, Taluka /Tehsil, District and State.	The Proposed Project site is located at Khara Siang Lum Pyrshim in Daistong Village, Elaka - Nongkhlieh Dolloiship, District- East Jaintia Hills, State- Meghalaya. Location map of the plant site has been incorporated in this EIA/EMP Report.	Chapter - 2 Section Page no. 49 Figure – 2.1(a) Page no. 50
4.1.2	Site accessibility	The Proposed Project site is well accessible with NH- 6 (~18.93 km in SW direction). Ditokcherra Railway station (~36.90 km in SE direction), and Nearest Airport is Silchar Airport (~63.35 km in SE direction) & Guwahati Airport (~128.21 km in NW direction).	Chapter - 2 Section Page no. 54
4.1.3	A digital Toposheet in pdf or shape file compatible to google earth of the study area of radius of 10km and site location preferably on 1:50,000 scale. (Including all eco-sensitive areas and environmentally sensitive places).	A digital Toposheet showing 10 km radius (including all eco-sensitive areas and environmentally sensitive places) and site location on 1:50,000 scale has been incorporated in this EIA/EMP Report.	Chapter - 3, Figure 3.1(a) Page no.90

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Compliance of ToR Point

4.1.4	Latest High-resolution satellite image data having 1m-5m spatial resolution like quick bird, Ikonos, IRS P-6 pan sharpened etc., along with delineation of plant boundary co-ordinates. Area must include at least 100m all around the project location.	Present land use / land cover map has been prepared, based on satellite imagery, using RESOURCESAT - 2A (LISS 4) digital data which was procured from National Remote Sensing Centre, Hyderabad; and the same have been incorporated in this EIA/EMP Report.	Chapter - 3, Figure 3.4(a) Page no. 101
4.1.5	Environment settings of the site and it's surrounding along with map.	Map showing environment settings of the site and its surrounding on SOI toposheet map with 1:50,000 scale has been incorporated in this EIA/EMP Report.	Chapter - 3, Figure 3.1(a) Page no-90
4.1.6	A list of major industries with name, products and distance from plant site within study area (10km radius) and the location of the industries shall be depicted in the study area map.	List of major industries with name, products and distance from proposed plant site within study area (10km radius); along with the location of the industries depicted on the google earth map has been incorporated this EIA/EMP Report.	Chapter - 3, Table Page no.90
4.1.7	In case if the project site is in vicinity of the water body, 50 meters from the edge of the water body towards the site shall be treated as no development /construction zone. If it's near the wetland, Guidelines for implementing Wetlands (Conservation and Management) Rules, 2017 may be followed.	No water body & wetland exist in the vicinity of the Proposed Project site.	

4.1.8	In case if the project site is in vicinity of the river, the industry shall not be located within the river flood plain corresponding to one in 25 years flood, as certified by concerned District Magistrate/Executive Engineer from State Water Resources Department (or) any other officer authorized by the State Government for this purpose as per the provisions contained in the MoEF&CC Office Memorandum dated 14/02/2022.	The Project site is not located in the vicinity of any river; River (Wah Chyrmit) about 4.48 NW Direction; Pal Lam Kankalang River about 8.50 NE Direction. Therefore, the point is not applicable.	
4.1.9	In case of canal/ nala/ seasonal drain and any other water body passing through project site, the PP shall submit the suitable steps/conservation plan/ mitigation measures along with contouring, Run-off calculations, disposal etc. A robust and full proof Drainage Conservation scheme to protect the natural drainage/water bodies and its flow parameters; along with Soil conservation scheme and multiple Erosion control measures shall be provided in the report.	Not applicable, as no canal/ nala/ seasonal drain and any other water body is passing through project site. However, a seasonal nala is passing at a distance of 108 m in West direction of the project site for which No Objection Certificate (NOC) will be obtained from concerned authority.	
4.1.10	Type of land, land use of the project site needs to be submitted.	Total plant area is 25.08 ha Land Use: There is no forest land involved in the proposed project. Present land use of the project site is Pvt. Land, which will be used for industrial purpose after its conversion into Industrial land use. Details regarding land area is also given in this EIA/EMP Report.	Chapter - 2, Section – 2.3.4 Page no.54

4.1.11	Status of acquisition of land. If acquisition is not complete, stage of the acquisition process as Per the MoEF & CC O.M. dated 7/10/2014 shall be furnished.	The total area for the proposed Integrated plant is 25.08 ha (61.95 Acres) and complete land has been purchased in the name of applicant company i.e., Shree Cement Limited. The Copy of the land documents are enclosed as <i>Annexure – 1</i> along with this EIA/EMP Report.	Chapter 2 Section Page no <i>Annexure - 1</i> <i>Page no. -</i>
4.1.12	Project proponent shall prepare Engineering layout plan showing all internal roads minimum 6 m width and 9 m turning radius for smooth traffic flow inside including fire tender as per NBC. Road network shall connect all service areas in layout. This drawing shall include area statement showing plot area, area under roads, parking, green belt with calculations and % with respect to plot area of project site and proper indexing. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.	Engineering layout plan showing the plot area, area under roads, parking, green belt with calculations and % with respect to plot area of project site and proper indexing and also showing all internal roads minimum 6 m width and 9 m turning radius for smooth traffic flow inside including fire tender as per NBC, is incorporated in this EIA/EMP Report. Project site is not located in Industrial area / Estate / Complex.	Chapter - 2 Figure:2.3(a) Plant Layout Page no. 56
4.1.13	Project proponent shall submit contour map of project site along with drainage disposal system with calculations and drawings supported with proper indexing including Rain Water Harvesting details with calculations mentioning about GW recharge along with relevant drawing.	Contour map of Project site along with drainage disposal system with calculations and drawings supported with proper indexing including Rain Water Harvesting details with calculations is incorporated in this EIA/EMP Report.	Chapter -2 Fig No. .2.1 (b)

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Compliance of ToR Point

4.1.14	A detailed report covering all aspects of Fire Safety Management and Fire Emergency Plan shall be submitted.	A detailed report covering all aspects of Fire Safety Management and Fire Emergency Plan is incorporated in this EIA/EMP Report.	Chapter - 7
4.1.15	Details of drone survey for the site, needs to be included in report and presented before the EAC during appraisal of the project.	Drone survey covering all features of the Project site along with connecting approach road and close proximity of the area will be conducted before EC Appraisal Meeting.	-
4.2	Forest and Wildlife related issues (if applicable)		
4.2.1	Status of Forest Clearance for the use of forest land shall be submitted.	No forest land is involved in the project	Annexure II
4.2.2	Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife if the project site located within notified Eco- Sensitive Zone, 10km radius of national park/sanctuary wherein final ESZ notification is not in place as per MoEF&CC Office Memorandum dated 8/8/2019.	Not applicable; Being this is a Greenfield Project.	-
4.2.3	The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, Eco-sensitive Zone and Eco- sensitive areas, the project proponent shall submit the map duly authenticated by Divisional Forest Officer showing the distance between the project site and the said areas.	There is no National Park & Elephant/ Tiger Reserve exist in the 10 km radius area of Project Boundary. However, the nearest forest i.e., Saipung Reserved Forest located at a distance of ~6.35 km in SE direction. A location map showing exact distance of the nearest forest from the plant boundary has been obtained from Divisional Forest Office, Jaintia Hills Wildlife Division, Jowai vide letter no. MWL/JH/299/Mining Plan/2125-26/889, dated 08.10.25. Copy of the authenticated letter and map is enclosed as Annexure - II along with this EIA/EMP Report.	Chapter - 3, Page No. Annexure – II Page No. 140 Table No. 3.18

4.2.4	Wildlife Conservation Plan duly authenticated by the Competent Authority of the State Government for conservation of Schedule I fauna, if any exists in the study area.	As per primary field survey and secondary data collected; flora & fauna inventory list was prepared according to the Wildlife (Protection) Amendment Act, 2022. The faunal composition of the study area, encompassing 15 species protected under Schedule I of the Wildlife (Protection) Act, 1972	Page No. 159												
4.3	Salient features of the project														
4.3.1	Products with capacities in Tons per Annum for the proposed project.	Products with capacities in Tons per Annum for the proposed project as given as below: <table><tr><th>Particular</th><th>Capacity</th></tr><tr><td>Clinker</td><td>0.95 million TPA</td></tr><tr><td>Cement (OPC, PPC, PSC, SRC, RHPC & Composite Cement)</td><td>0.99 million TPA</td></tr><tr><td>Captive Power Plant (CPP)</td><td>15 MW</td></tr><tr><td>Waste Heat recovery System (WHRS)</td><td>7 MW</td></tr><tr><td>DG Sets</td><td>2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA)</td></tr></table>	Particular	Capacity	Clinker	0.95 million TPA	Cement (OPC, PPC, PSC, SRC, RHPC & Composite Cement)	0.99 million TPA	Captive Power Plant (CPP)	15 MW	Waste Heat recovery System (WHRS)	7 MW	DG Sets	2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA)	Chapter - 1
Particular	Capacity														
Clinker	0.95 million TPA														
Cement (OPC, PPC, PSC, SRC, RHPC & Composite Cement)	0.99 million TPA														
Captive Power Plant (CPP)	15 MW														
Waste Heat recovery System (WHRS)	7 MW														
DG Sets	2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA)														
4.3.2	If expansion project, status of implementation of existing project, details of existing/proposed products with production capacities in Tons per Annum.	Not Applicable; as this is a greenfield Project.													
4.3.3	Site preparatory activities.	Site preparatory activities will be done after grant of EC from MoEF&CC, New Delhi & Consent to Establish from State Pollution Control Board. The details of proposed site preparatory activities have been incorporated in this EIA/EMP Report.	-												
4.3.4	List of raw materials required and their source along with mode of transportation.	List of raw materials required with quantity and source along with their mode of transportation has been incorporated in this EIA/EMP Report.	Chapter - 2, Table 2.7(a), (b) Page no. 59												

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Compliance of ToR Point

4.3.5	Other than raw materials, other chemicals and materials required with quantities and storage capacities.	Details of the quantity and storage facility are given in this EIA/EMP Report.	Chapter - 2,
4.3.6	Manufacturing process details along with process flow diagram of proposed units.	Manufacturing process of Cement (OPC, PPC, PSC, SRC, LC3, RHPC and Composite) along with process flow diagram of cement plant units is given in this EIA/EMP Report.	Chapter - 2,
4.3.7	Consolidated materials and energy balance for the project	Consolidated materials and energy balance for the proposed project has been incorporated in this EIA/EMP Report.	Chapter - 2,
4.3.8	Total requirement of surface/ground water and power with their respective sources, status of approval.	<u>Water requirement:</u> The water requirement for the proposed project is estimated as 600 KLD (Including Fresh Water Requirement: 515 KLD & Recycled Water from STP & RO Rejects: 85 KLD). Status of Approval: Application for ground water withdrawal of 515 KLD has been submitted to Ground Water Board. The copy of application submission is enclosed as <i>Annexure</i> - along with this EIA / EMP Report. However, as when the mine pit will develop, the reliability on groundwater will gradually decrease, and water will be sourced from the mine pit itself. <u>Power Requirement -</u> Total power requirement for the plant will be 18 MW. Source: CPP, WHRS, State Grid, DG Sets for Back-up. State Permission will be obtained from concerned authority while initiate the project at site. Details regarding the same has been given in this EIA/EMP Report.	Chapter - 2 Page No. 63
4.3.9	Water balance diagram	Water balance has been given in this EIA/EMP Report.	Chapter - 2 Figure – 2.5 Page no. 64

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Compliance of ToR Point

4.3.10	Details of Emission, effluents, hazardous waste generation and mode of disposal during construction as well as operation phase.	Details regarding emission, effluents, solid & hazardous waste generation and their management are given in this EIA/EMP Report.		Chapter - 2,
4.3.11	Man-power requirement.	The total manpower requirement for the proposed project will be around 450 persons during operation phase and around 900 persons during construction phase. Details of the same are given in this EIA/EMP Report.		Chapter - 2,
4.3.12	Cost of project and scheduled time of completion.	Total Cost of the Project	Rs. 1264 Crores	Chapter- 2
		Time of completion	24 Months (<i>after getting all the regulatory approvals</i>). Details of activities along with time required have been incorporated in this EIA/EMP Report.	
4.3.13	In case of expansion projects, project proponent shall submit structural stability certificate showing whether existing structure withstand for proposed expansion activity.	Not Applicable; as this is a greenfield Project.		
4.3.14	Brief on present status of compliance (Expansion/modernization proposals)	Not applicable; as this is a greenfield project.		
a.	Cumulative Environment Impact Assessment for the existing as well as the proposed expansion/modernization shall be carried out.	Not applicable; as this is a greenfield project.		
b.	Cumulative Impact Assessment need to be carried out by greenfield projects considering the nearby industries.	The project is Greenfield project and Cumulative Impact Assessment considering nearby sources has been assessed by using AERMOD version 10.2.1. Details are incorporated in this EIA/EMP Report.		Chapter - 4

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Compliance of ToR Point

c.	In case of ground water drawl for the existing unit, action plan for phasing out of ground water abstraction in next two years except for domestic purposes and shall switch over to 100 % use of surface water from nearby source.	Not applicable; as this is a greenfield project.	-
d.	Copy of all the Environment Clearance(s) including Amendments/ validity of extension/ transfer of EC, there to obtained for the project from MoEF&CC/ SEIAA shall be attached as Annexures. A Certified Compliance Report (CCR) of the Integrated Regional Office of the Ministry of Environment, Forest and Climate Change/ or concerned authority as per OM No. IA3-22/10/2022-IA.III [E 1772581], dated 8 th June, 2022 on the status of compliance of conditions stipulated in all the existing environment clearances including amendments shall be provided. A Certified Compliance Report (CCR) issued by the concerned Authority shall be valid for a period of one year from the date of inspection.	Not applicable; as this is a greenfield project.	

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Compliance of ToR Point

e.	In case the existing project has not obtained Environment Clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. A proper justification needs to be submitted along with documentary proof. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 1994 or 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of CTO from the Regional Office of the SPCB shall be submitted, as per OM No. IA3-22/10/2022-IA.III [E 1772581], dated 8 th June, 2022. CCR on CTO conditions issued by the concerned SPCBs/PCCs shall be valid for a period of one year from the date of inspection of the project.	Not Applicable; as this is a Greenfield project.	
5.	Description of the Environment		
5.1	Study period	The study period for baseline monitoring & data collection is Summer Season (March 2025 to May 2025).	Chapter - 3,
5.2	Approach and methodology for data collection as furnished below -		

A.	Air Environment Micro-Meteorological (Minimum 1 site in the project impact area) (Hourly continuous) Wind Speed (Hourly) Wind direction Dry Bulb Temperature Wet bulb Temperature Relative humidity Rainfall Solar radiation Cloud cover Environmental Lapse rate Pollutants PM10 SO2 NOx CO HC Other parameters relevant to the project and topography of the area.	Site-specific meteorological data (dry & wet bulb temperature, relative humidity, wind speed, wind direction (hourly) was collected during Summer Season (March 2025 to May 2025). Hourly meteorological data has been enclosed as <i>Annexure</i> - along with the EIA/EMP Report. Details regarding rainfall, solar radiation, cloud cover & Environmental Lapse rate have been incorporated in this EIA/EMP Report. AAQ monitoring was carried out at 08 locations for PM10, PM2.5, SO2, NO2, CO and PAHs during Summer Season (March 2025 to May 2025) within 10 km radius study area. The monitoring stations were selected considering the dominant wind direction, population zone and sensitive receptors etc. Detail of the same has been incorporated in this EIA/EMP Report. Raw data of all AAQ measurement / detailed AAQM Tables of all AAQ stations along with min., max. Values for each of the AAQ parameters have been enclosed as <i>Annexure</i> - along with the EIA/EMP Report.	Chapter - 3, Section – 3.5.3.1 Page no. 107
B.	Noise Hourly equivalent noise levels	Noise level monitoring was carried at 05 locations within the study area during Summer Season (March 2025 to May 2025). Details of the same have been incorporated in this EIA/EMP Report.	Chapter - 3

C.	Water Parameters for water quality pH, temp, turbidity, magnesium, hardness, total alkalinity, chloride, sulphate, nitrate, fluoride, sodium potassium, salinity Total nitrogen, total phosphorous, DO, BOD, COD, Phenol Heavy metals Total coliforms, fecal coliforms Phyto plankton Zoo plankton For River Bodies Total Carbon pH Dissolved Oxygen Biological Oxygen Demand Free NH₄ Boron Sodium Absorption Ratio Electrical Conductivity For Ground Water	No waste water will be discharged outside the plant premises; therefore, this point is not applicable. Surface water sampling was carried out at 02 locations in the study area during Summer Season (March 2025 to May 2025). Details of the same have been incorporated in this EIA/EMP Report. Out of the 04 selected locations for groundwater monitoring, samples were only obtained from 03 location. Consequently, monitoring was conducted solely at this location during the -Summer Season (March 2025 to May 2025). Details of the locations and the analysis results are included in this EIA/EMP Report.	Chapter - 3 Page No. 128
D.	Traffic Study Type of vehicles Frequency of vehicles for transportation of materials Additional traffic due to proposed project	Traffic survey was conducted for 24 hours at NH- 6 about 18.93 km in SW direction) in June., 2025 for type of vehicles, Frequency of vehicles for transportation of materials, Additional traffic due to proposed project and Parking arrangement. Details regarding traffic due to the Proposed project are given in this EIA/EMP Report.	Chapter - 3

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Compliance of ToR Point

E.	Land Environment Soil Particle size Distribution Texture pH Electrical Conductivity Cation exchange capacity Alkali metals Sodium Absorption Ratio (SAR) Permeability Water holding Capacity Porosity Land use/ Landscape Location code Total project area Topography Drainage (natural) cultivated, forest, plantations, water bodies, roads and settlements	Soil sampling was done at 05 locations within the study area during Summer Season (March 2025 to May 2025). Details regarding the same have been incorporated in this EIA/EMP Report. Total Project area is 25.08 Ha and the proposed Project will be done within the plant premises. The topography of the Project site is almost unduler terrain with slightly undulating with an elevation of ~ 224 m. The maximum and minimum elevations in the project area are 920 m and 862 m respectively resulting in ground level. Details are given in this EIA/EMP Report. Drainage pattern of the project site and 10 km radius study area has been incorporated in the EIA/EMP Report. Land use details of the study area along with location code have also been incorporated in this EIA/EMP Report.	Chapter - 3
F.	Biological Environment		

	Aquatic Primary productivity Aquatic weeds Enumeration of Phyto plankton, zooplankton and benthos Fisheries Diversity indices Trophic levels Rare and endangered species Marine Parks/ Sanctuaries/ closed areas /coastal regulation zone (CRZ) Terrestrial Vegetation-species list, economic importance, forest produce, medicinal value Importance value index (IVI) of trees Fauna Avi fauna Rare and endangered species Sanctuaries / National Park /Biosphere reserve Migratory Issues	Detailed description of flora and fauna (Aquatic & Terrestrial) in the study area (10 km radius of the project site) with special reference to rare and endangered species have been incorporated in this EIA/EMP Report. The area doesn't fall near Marine Parks / Sanctuaries / closed areas / coastal regulation zone (CRZ). There is no National Park & Elephant/ Tiger Reserve exist in the 10 km radius area of Project Boundary. However, the nearest forest i.e., Saipung Reserved Forest located at a distance of ~6.35 km in SE direction. A location map showing exact distance of the nearest forest from the plant boundary has been obtained from Divisional Forest Office, Jaintia Hills Wildlife Division, Jowai vide letter no. MWL/JH/299/Mining Plan/2125-26/889, dated 08.10.25.	Annexure – II
3.	Socio - Economic Demographic Structure Infrastructure resource base Economic resource base Health status: Morbidity pattern Cultural and aesthetic attributes Education	Socio-economic environment covering Demographic Structure, Infrastructure resource base, Economic resource base, Health status: Morbidity pattern, Cultural and aesthetic attributes, Education of 10 km radius of the study area has been incorporated in this EIA/EMP Report.	Chapter - 3 Section – 3.5.9 Page no. - 171

5.3	Interpretation of each environment attribute shall be enumerated and summarized as given below: Ambient air quality Ambient Noise quality Surface water quality Ground water quality Soil quality Biological Environment Land use Socio-economic environment	Details of each environment attribute along with detailed interpretation and summarization been incorporated in the EIA/EMP Report.	Chapter - 3
5.4	The PP should submit the photograph of monitoring stations & sampling locations. The photograph should bear the date, time, latitude & longitude of the monitoring station/sampling location. In addition to this PP should submit the original test reports and certificates of the labs which will analyze the samples.	Photograph bearing the date, time, latitude & longitude of the monitoring station/ sampling location are enclosed as Annexure – III with this EIA / EMP Report.	Annexure – III
6	Anticipated Environment Impacts and mitigation measures (In case of expansion, cumulative impact assessment shall be carried out)		
6.1	Identification of potential impacts in the form of a matrix for the construction and operation phase for all the environment components. Construction phase Operation phase	The potential impacts in the form of a matrix for the construction and operation phase for all the environment components like Land, Air, Noise, Soil Water, Biological environment etc. has been done and incorporated in this EIA/EMP Report.	Chapter - 4 Table – Page no.

6.2	Impact on ambient air quality (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase Details of stack emissions from the existing as well as proposed activity. Assessment of ground level concentration of pollutants from the stack emission based on AQIP Modelling The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any along with wind rose map for respective period Impact on ground level concentration, under Normal, abnormal and emergency conditions. Measures to handle emergency situations in the event of uncontrolled release of emissions.	Impacts on Air Quality with the sources control measures, their assessment and mitigation measures for both construction and operation phase has been incorporated in this EIA/EMP Report. Proposed Stack Emission details have been incorporated in this EIA/EMP Report. Ground level concentration of pollutants have been assessed by using AERMOD Version 10.2.1 and Isopleths showing air quality contours plotted on location map have been incorporated in this EIA/EMP Report. Details reg. impact on ground level concentration, under normal, abnormal and emergency conditions has been incorporated in this EIA/EMP report	Chapter - 4 Figure – 4.7,4.8, 4.9 & 4.10 Page no.198
6.3	Impact on ambient noise quality (Sources; Embedded control measures; Assessment Mitigation measures; Residual impact) Construction phase Operation phase	Impacts on Ambient Noise Quality with the sources control measures, their assessment and mitigation measures for both construction and operation phase has been incorporated in this EIA/EMP Report.	Chapter - 4
6.4	Impact on traffic (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact). Construction phase Operation phase	Impact on Traffic with the expected sources, control measures, their assessment and mitigation measures has been incorporated in this EIA/EMP Report.	Chapter - 4 Section - Page no.

6.5	Impact on soil quality (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) Construction phase Operation phase	Impacts on Soil Quality with the sources control measures, their assessment and mitigation measures for both construction and operation phase has been incorporated in this EIA/EMP Report.	Chapter - 4
6.6	Impact on land use (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) Construction phase Operation phase	Impacts on Land Use with the sources control measures, their assessment and mitigation measures for both construction and operation phase has been incorporated in this EIA/EMP Report.	Chapter - 4
6.7	Impact on surface water resource and quality (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) Construction phase Operation phase	Impacts on surface water resource with the expected sources control measures, their assessment and mitigation measures for both construction and operation phase has been incorporated in this EIA/EMP Report.	Chapter - 4
6.8	Impact on ground water resource and quality (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) Construction phase Operation phase	Impacts on ground water resource with the expected sources control measures, their assessment and mitigation measures for both construction and operation phase has been incorporated in this EIA/EMP Report.	Chapter - 4
6.9	Impact on terrestrial and aquatic habitat (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) Construction phase Operation phase	Impacts on terrestrial habitat and aquatic habitat with the expected sources control measures, their assessment and mitigation measures for both construction and operation phase has been incorporated in this EIA/EMP Report.	Chapter - 4
6.10	Impact on socio-economic environment (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) Construction phase Operation phase	Impacts on socio-economic environment with the expected sources control measures, their assessment and mitigation measures for both construction and operation phase has been incorporated in this EIA/EMP Report.	Chapter - 4 Section – Page no.

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6.11	Impact on occupational health and safety (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact). Construction phase Operation phase	Impacts on occupational health and safety with the expected sources control measures, their assessment and mitigation measures for both construction and operation phase has been incorporated in this EIA/EMP Report.	Chapter - 4
7.	Analysis of Alternatives (Technology & Site)		
7.1	No project scenario	Details and description regarding no project scenario have been incorporated in this EIA/EMP Report.	Chapter - 5 Page no.2289
7.2	Site alternative	Three alternative sites were studied for the Proposed Project and based on the environmental considerations, proximity to raw materials, availability of land and other aspects; the proposed project site at Khara Siang Lum Pyrshin in Daistong village has been selected. Details of the same have been incorporated in EIA/EMP Report	Chapter - 5 Section no. – 5.3 Page no.228
7.3	Technical and social concern	A brief note on technical and social concerns along with the conclusion has been incorporated in this EIA/EMP Report.	Chapter - 5
7.4	Conclusion	A brief note on technical and social concerns along with the conclusion has been incorporated in this EIA/EMP Report.	Chapter - 5
8.	Environmental Monitoring Program		
8.1	Details of the Environment Management Cell	Detail regarding Environment Management Cell (EMC) its structure and responsibilities has been provided in this EIA/EMP Report.	Chapter - 10
8.2	Performance monitoring schedule for all pollution control devices shall be furnished.	Performance monitoring schedule for all pollution control devices has been prepared in Post Project Monitoring schedule and given in this EIA/EMP Report.	Chapter - 6 Table.6.2
8.3	Corporate Environment Policy		

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a.	Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.	Yes, the company has a laid down Corporate Environment Policy approved by its Board of Directors; and the same has been given in this EIA/EMP Report.	Chapter - 10
b.	Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environment or forest norms /conditions? If so, it may be detailed in the EIA.	Yes, the Environment Policy prescribes for standard operating process to implement the environmental standards.	-
c.	What is the hierarchical system or administrative order of the company to deal with the environment issues and for ensuring compliance with the environment clearance conditions? Details of this system may be given.	The hierarchical system or administrative order of the SCL is included in the Corporate Environmental Policy.	Chapter - 10
d.	Does the company have system of reporting of non-compliances / violations of environment norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report.	Yes, the company have system of reporting of non-compliances / violations of environment norms to the Board of Directors of the company.	
8.4	Action plan for post-project environment monitoring matrix:	Action plan for post-project environment monitoring matrix along with monitoring parameters, location, frequency and responsibility for both construction and implementation phase is incorporated in this EIA/EMP Report.	Chapter - 6
9.	Additional Studies		

9.1	Project proponent shall submit a study report on Decarbonization program, which would essentially consist of company's carbon emissions, carbon budgeting/ balancing, carbon sequestration activities and carbon capture, use and storage after offsetting strategies. Further, the report shall also contain time bound action plan to reduce its carbon intensity of its operations and supply chains, energy transition pathway from fossil fuels to Renewable energy etc. All these activities/ assessments should be measurable and monitorable with defined time frames.	Details of Decarbonization program such as company's carbon emissions, carbon budgeting/ balancing, carbon sequestration activities and carbon capture, use and storage after offsetting strategies has been incorporated in of EIA / EMP Report.	Chapter - 10
9.2	Details of adoption/ implementation status/plan to achieve the goal of Glasgow COP 26 Climate Submit with regard to enhance the non-fossil energy, use of renewable energy, minimization of net carbon emission and carbon intensity with long-term target of "Net Zero" emission.	Details of adoption/ implementation status/plan to achieve the goal of Glasgow COP26 Climate Submit with regard to enhance the non-fossil energy, use of renewable energy, minimization of net carbon emission and carbon intensity with long-term target of "net Zero" emission is incorporated in this EIA/EMP Report.	Chapter - 10
9.3	Implementation status/measures adopted for avoiding the generation of single used plastic waste.	Implementation status/measures adopted for avoiding the generation of single used plastic waste has been incorporated in of EIA/ EMP Report.	Chapter - 10

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9.4	In cases the project is located in Critically and Severely Polluted Areas, additional mitigation measures adopted and detailed action plan to be submitted in the EIA/EMP Report as per MoEF&CC O.M. No. 22- 23/2028-IA.III dated 31/10/2019 and MoEF&CC O.M. No. 22-23/2028-IA.III dated 5/07/2022 has to be submitted.	The Project site is not located in Critically / Severely Polluted. Hence, the ToR point is not applicable.	-
9.5	Public consultation details (Entire proceedings as separate annexure along with authenticated English Translation of Public Consultation proceedings).	The proposed project to be submitted as a draft EIA/EMP, once the public hearing conducted, then the details for the same will be incorporated in EIA/EMP report.	
9.6	As part of Corporate Environment Responsibility (CER) activity, company shall adopt nearby villages based on the socio-economic survey and undertake community developmental activities in consultation with the village Panchayat and the District Administration. In this regard, time bound action plan as per the MoEF&CC Office Memorandum dated 30/09/2020 shall be submitted.	As per Office Memorandums of MoEF&CC dated 30 th Sept., 2020, & 20 th Oct., 2020, Socio- Economic Developmental plan will be formulated on the basis of the issues raised during Public Hearing which will be addressed in Environment management Plan (EMP) & implemented in a time bound manner with the commissioning of the proposed project. Public hearing is yet to be conducted for proposed project. Hence the details will be incorporated after conducting public hearing along with budgetary action plan. Details have been prepared and incorporated in this EIA/EMP Report.	-
9.7	Summary of issues raised during public consultation along with action plan to address the same as per MoEF&CC O.M. dated 30/09/2020.	The proposed project to be submitted as a draft EIA/EMP, once the public hearing conducted, then the details for the same will be incorporated in EIA/EMP report.	

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9.8	Risk assessment Methodology Hazard identification Frequency analysis Consequence analysis Risk assessment outcome	The risk assessment along with the details has been prepared and incorporated in this EIA/EMP Report.	Chapter - 7 Section Page no.
9.9	Emergency response and preparedness plan	The Emergency response and preparedness plan has been prepared and incorporated in this EIA/EMP Report.	Chapter - 7 Section no. Page no.
10.	Project Benefits		
10.1	Environment benefits	Details regarding Environment benefits, social infrastructure, Employment and business opportunity, Other tangible benefits have been incorporated in this EIA/EMP Report.	Details has been given in Chapter 7
10.2	Social infrastructure		
10.3	Employment and business opportunity		
10.4	Other tangible benefits		
11.	Environmental Cost Benefit Analysis		
11.1	Net present value	A separate chapter on Environment Cost Benefit Analysis has been prepared and incorporated in this EIA/EMP Report.	Chapter - 9 Page no. 494 -502
11.2	Internal rate of return		
11.3	Benefit cost ratio		
11.4	Cost effectiveness analysis		
12.	Environment Management Plan (Construction and Operation phase)		
12.1	Air quality management plan	Details regarding Air quality management plan has been incorporated in this EIA/EMP Report.	Chapter - 10 Section no. Page no.
12.2	Noise quality management plan	Details regarding Noise quality management plan has been incorporated in this EIA/EMP Report.	Chapter - 10 Section – Page no.
12.3	Action plan for hazardous waste management	Action plan for hazardous waste management has been incorporated in this EIA/EMP Report.	Chapter - 10 Section no. Page no.
12.4	Action Plan for solid waste management	Action plan for Solid waste management has been incorporated in this EIA/EMP Report.	Chapter - 10 Section no. Page no.

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12.5	Action Plan for E-waste management	E - waste (Used Electrical equipment, cables, CFL/LED Lights) (–0.125 TPA) generated during plant maintenance will be sold to registered vendors as per E-Waste Management Rules, 2022.	Chapter - 10 Table Page no.
12.6	Action plan for plastic waste management, considering Management Rules 2016.	Action plan for Plastic waste management has been incorporated in chapter - 10 of the EIA/EMP Report.	Chapter - 10 Table Page no.
12.7	Action plan for construction and demolition waste management.	Construction waste generated during plant construction will be used for levelling. No demolition is involved in the proposed project.	-
12.8	Effluent management plan	No industrial effluent will be generated from the proposed project. Domestic effluent / waste water (16 KLD) generated from plant will be treated in STP of 20 KLD capacity and treated water will be used for greenbelt development and plantation.	-
12.9	Storm water management plan	Details regarding Storm water management plan & Rain water harvesting plan has been incorporated in this EIA/EMP Report.	Chapter - 10 Section no. Page no.
12.10	Rain water harvesting plan		
12.11	Plan for maximum usage of waste water/treated water in the Unit	Domestic effluent / waste water (16 KLD) generated from plant will be treated in STP of 20 KLD capacity and treated water will be used for greenbelt development and plantation.	Chapter - 10 Section no. Page no.
12.12	Occupational health and safety management plan	Occupational health and safety management plan has been incorporated in this EIA/EMP Report.	Chapter - 10 Section no. Page no.

12.13	Green belt development plan: An action plan for Green Belt development consisting of 3 tiers of plantations of native species all along the periphery of the project of adequate width shall be raised in 33% of total area with a tree density shall not less than 2500 per ha within a time frame of one year shall be submitted. Survival rate of green belt shall be monitored on periodic basis to ensure that survival rate not be less than 80 %.	The total plant area is 25.08 ha, out of which, 33% area (8.274 ha.) has been earmarked to be developed as greenbelt development/plantation and 15 m wide greenbelt will be done along the plant boundary and 20-meter width towards the habitation of Daistong Village to attenuate the air pollution. The proposed greenbelt development & plantation area will be developed in upcoming 3 years with 20675 numbers of trees with density of plantation are 2500 trees per ha. Detailed Green belt development plan has been incorporated in this EIA/EMP Report.	Chapter - 10
12.14	Socio-economic management plan	Details regarding Socio-economic management plan has been incorporated in this EIA/EMP Report.	Chapter - 8 Section no. Page no.
12.15	Wildlife conservation plan (In case of presence of schedule I species)	species have been prepared with the budget of 65.00 lakhs Copy of Conservation Plan has been enclosed as Annexure – IV along with this EIA/EMP Report.	Annexure – IV
12.16	Total capital cost and recurring cost/annum for environment pollution control measures shall be included.	Cost for Environmental Protection Measures: Detailed breakup of cost has been included in this EIA/EMP report.	Chapter - 10 Table no. 10.1
12.17	Explore possibilities for recycling and reusing of treated water in the unit to reduce the freshwater demand and waste disposal.	Company will be recycling the wastewater and reusing the treated water in various activities in the cement plant.	-
12.18	An Action Plan for improving the house- keeping activities in the raw material handling area need to be submitted.	All the raw materials are transported automatically via covered belt conveyors and road. Sweeping machines will be used on roads near the raw material handling area to capture the fugitive emissions. Raw material will be unloaded in closed enclosures.	-

12.19	Action plan for the stock piles with impervious floor, provision of garland drains and catch pits to trap run off material shall be submitted.	Action plan for the stock piles with impervious floor, provision of garland drains and catch pits to trap run off material has been given in chapter - 10 of the EIA / EMP Report.	Chapter - 10 Section Page no.
12.20	Action plan to limit the dust emission from all the stacks below 30 mg/Nm ³ shall be furnished.	Company will take appropriate measures to keep the dust emission from all stacks below 30 mg/Nm ³ at all times. Bag House will be installed at Raw mill and Kiln which has an efficiency of 99.99%, Bag filter will be installed at Cement mill & Coal mill which has an efficiency of 99.99%, ESP will be installed at Clinker Cooler & CPP boiler which has an efficiency of 99.95% company will maintain the emission below the prescribed standards. Details for the same has been incorporated in this EIA/EMP Report.	Chapter - 2, Section no. Page no.
12.21	Action plan for fugitive emission control in the plant premises shall be provided.	Company will take the following measures to control fugitive emission in plant: All raw materials will be transferred via covered belt conveyor. Bag filters will be provided at all transfer points. Closed Silos and Sheds will be provided for storage of raw materials. The speed of vehicles will be limited to 20 kmph to reduce the fugitive dust generated due to movement of vehicles 20 m wide Greenbelt will be developed all along the periphery of the plant to suppress and stop the dust from going outside the boundaries of the plant.	-
13.	Conclusion of the EIA Study	Conclusion & summary of the project has been incorporated in the Executive Summary of the EIA/EMP Report.	Chapter - 11, Page No.
13.1	No Data found		

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14.	In addition to the above, any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.	No litigation is pending against the project and/or any direction/order passed by any Court of Law against the project. The unit has not received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts.	-
14.1	No Data Found		
15.	Air cooled condensers shall be used in the power plant.	Air Cooled Condensers will be installed in the proposed captive power plant of 18 MW.	-
15.1	No Data found		
16.	Details of Dry Ash handling system along with supplementary coal handling system shall be submitted.	Fly ash generated from the captive thermal power plant will be handled carefully.	Chapter - 10 Page No.
16.1	No Data found		
17.	Plan for transportation of coal shall be submitted.		
17.1	No Data Found	Coal will be transported via rail and road.	
18.	Plan along with technical details of SCR shall be submitted.	Not Applicable as SCR technology will not be installed at the Plant.	
18.1	No Data Found		
19.	In case of expansion project, Status of Ash Utilization of previous years (up to 5 years), action plan for 100% ash utilization along with timeline need to be submitted.	Not Applicable.	
19.1	No Data Found		

Standard Terms of Reference for conducting Environment Impact Assessment Study for Cement plants

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1.1	Limestone and coal linkage documents along with the status of environmental clearance for limestone and coal mines.	Details of the captive mine are given in this EIA/EMP Report.	Chapter - 2
1.2	Quantum of production of coal and limestone from coal & limestone mines and the projects they cater to.	Details are given in Chapter- 2.	Chapter - 2
1.3	Present land use shall be prepared based on satellite imagery. High-resolution satellite image data having 1m-5m spatial resolution like quick bird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area.	Present land use / land cover map has been prepared, based on satellite imagery, using RESOURCESAT - 2A (Liss 4) digital data which was procured from National Remote Sensing Centre, Hyderabad having vintage date 13 th October 2025; and the same have been incorporated in this EIA/EMP Report.	Chapter - 3, Figure no. Page no.
1.4	If the raw materials used have trace elements, and environment management plan shall also be included.	Trace metals in the raw materials will be dissolved in the cement manufacturing itself.	-
1.5	Plan for the implementation of the recommendations made for the cement plants in the CREP guidelines shall be prepared.	Plan for the implementation of the recommendations made for the cement plants in the CREP guidelines have been prepared and incorporated in this EIA / EMP Report.	Chapter - 10
1.6	Energy consumption per ton of clinker and cement grinding.	Energy consumption per ton of Clinker: 48.2 Kwh and Energy consumption per ton of Cement is 25-51 kWh.	Chapter - 2 Section – Page no.
1.7	Provision of waste heat recovery boiler.	Company is proposing to install Waste Heat Recovery System of 7 MW. Details of the same have been incorporated in this EIA/EMP Report.	Chapter - 2 Section no. Page no.
1.8	Arrangement for co-processing of hazardous waste in cement plant.	Details regarding arrangement for co-processing of hazardous waste which will be done in the cement plant are given in this chapter - 2 EIA/EMP Report.	Chapter - 2 Section no. Page no.

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1.9	Provision of Alternate fuels	AFR will be used in Kiln. Details regarding the same has been incorporated in the EIA/EMP Report.	Chapter - 2 Page no.
1.10	Details of Implementation of Fly Ash Management Rules	Fly ash will be transported through closed trucks (bulkers) and loading unloading will be done through pneumatic system. Company is utilizing 100% fly ash which will be generated in the proposed CPP as per the fly Ash management rules.	-
1.11	Emission/Effluent norms as per GSR 496 (E) dated 9/5/2016 [EPA Rules 1986].	Since, in the Integrated Cement Plant, AFR will be utilized in co -processing in the rotary kiln and accordingly company will follow norms as per the GSR 497 (E) dated 10/5/2016 issues by MoEF&CC for Cement Plant with co – processing of waste.	-
1.12	Action plan for the stock piles with impervious floor, provision of garland drains and catch pits to trap run off material shall be submitted.	Action plan for the stock piles with impervious floor, provision of garland drains and catch pits to trap run off material has been given in chapter - 10 of the EIA / EMP Report.	Chapter - 10 Page no.
1.13	Action plan to limit the particulate matter emission from all the stacks below 30 mg/Nm ³ shall be furnished.	Action plan to limit the particulate matter emission from all the stacks below 30 mg/Nm ³ has been given in EIA/EMP report.	Chapter - 2 Section - Page No.
1.14	PP shall explore the possibility of plastic waste utilization in the Plant/Unit process.	As per availability Plastic waste will be used as an alternative fuel to replace fossil fuel.	Chapter - 2 Section - Page No.
1.15	Action plan for 100 % solid waste utilization shall be submitted.	Action plan for 100 % solid waste utilization has been given in EIA/EMP report	Chapter - 2 Section - Page No.

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Compliance of ToR Point

1.16	PM (PM10 and PM2.5) present in the ambient air must be analyzed for source analysis – natural dust/RSPM generated from plant operations (trace elements) of PM10 to be carried over.	PM (PM10 and PM2.5) present in the ambient air has been analyzed during the baseline study conducted during Summer Season (March 2025 to May 2025) of the study area which has been incorporated in this EIA/EMP Report. Source analysis - natural dust/RSPM generated from plant operations (trace elements) of PM10 to will be carried out after the operation of the plant.	Chapter - 3 Section no. Page No.

Environment Impact Assessment (EIA) and EMP is a process used to identify the environmental, social & economic impacts of a project prior to decision making. It is a decision-making tool, which guides the decision makers in taking appropriate decisions for proposed projects. It aims predicting environmental impacts at an early stage of project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision makers. By using EIA, both environmental & economic benefits can be achieved. By considering environmental effects prediction & mitigation, early benefits in project planning, protection of environment, optimum utilization of resources, thus saving overall time & cost of the project.

1.0 PURPOSE OF THE REPORT

Environmental Impact Assessment (EIA) and EMP is one of the proven management tools for integrating environmental concerns in development process and for improved decision making as there is a need to harmonize the developmental activities with the environmental concerns into the larger interest of the society. The Ministry of Environment & Forests, Govt. of India, made environmental clearance (EC) for certain development projects mandatory through its notification of 27/01/1994 under the Environment Protection Act, 1986. Keeping in view of the experience gained in environmental clearance process over a period of one decade, the MOEF&CC came out with Environment Impact Notification, SO 1533(E), dated 14th September 2006, as amended thereof. It has been made mandatory to obtain environmental clearance for different kinds of developmental, infrastructure, mining & industrial projects and also for expansion, modernization or renewal projects. The conditions are applicable as per the MOEF&CC Guidelines and EIA notifications issued and amended time to time.

This report has been prepared in reference to the ToR letter issued by SEIAA, Meghalaya vide File No. File No. ML/SEAC/SEIAA/PP/EJH/126/2025 and TOR Identification No. TO25B1101ML5999209N, dated 15th October 2025 for carrying out the Environmental Impact Assessment (EIA) study for the Proposed Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

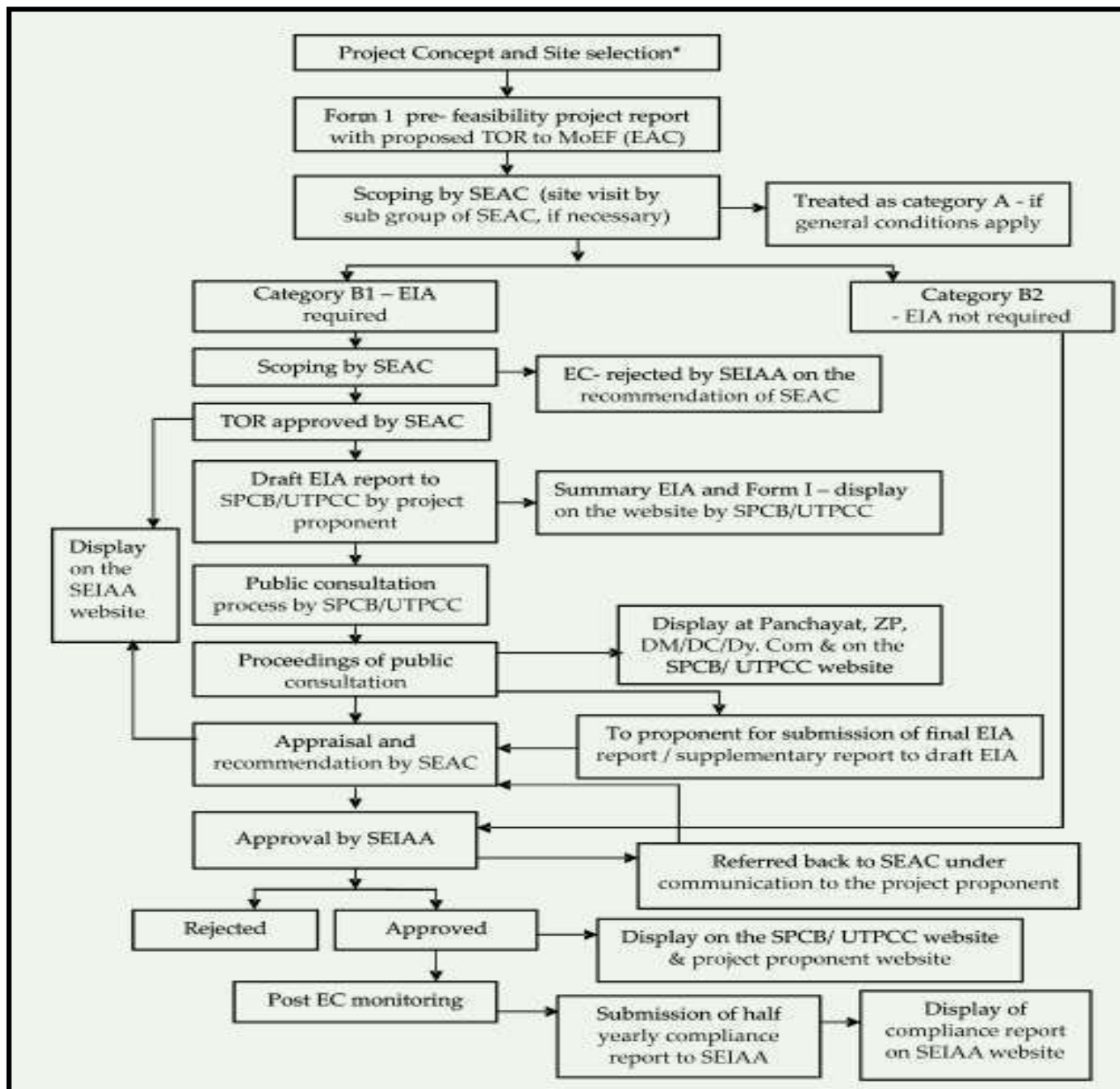
This document serves to provide a comprehensive analysis of all significant project impacts and outline the necessary measures for their elimination and mitigation. It includes essential details on several key aspects:

- The strategies the project proponent will employ to ensure environmental and social accountability.
- An evaluation of both direct, sector-specific impacts and the combined cumulative effects resulting from this and related projects.
- Proposed controls for pollution and other remedial actions to lessen adverse effects.
- A strategic action plan for implementing the suggested remedial initiatives.
- A monitoring framework to assess the effectiveness of the various environmental control measures adopted.
- Financial appraisals for the proposed environmental control plans.
- Information to aid the relevant regulatory body in its decision-making process, covering any mandatory terms and conditions for project authorization.
- Materials designed to inform the public about the project and its probable consequences for people and the surrounding environment.
- Information on necessary permits from all relevant statutory authorities.

1.1 EIA PROCESS FOR THE PROPOSED PROJECT

Environment Clearance from the competent authority, which is mandated by the EIA notification of 2006 and subsequent amended notifications issued by MOEF&CC.

- ✓ **Screening**
- ✓ **Scoping**
- ✓ **Public Consultation or Public Hearing**
- ✓ **Appraisal**



1.2 CATEGORISATION OF THE PROPOSED PROJECT:

As per EIA Notification dated 14th Sept., 2006 as amended thereof; this project falls under Category “B1”, Project or Activity ‘3(b)’ Cement Plants. It is also proposed to install CPP of 15 MW Capacity and WHRS of 7 MW Capacity within the premises of proposed Integrated Cement Plant under minor category which falls under S. No. 1 (Thermal Power Plants), Project Activity ‘1 (d)’ Thermal Power Plant.

1.3 IDENTIFICATION OF THE PROJECT

1.3.1 BACKGROUND OF THE PROJECT

The Proposed Integrated Cement Plant with production capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

The Terms of Reference (ToR) Application was submitted to SEIAA on 20.09.2025, subsequently, the project was considered in 92nd meeting of the State Expert Appraisal Committee (Meghalaya) held on 03rd Oct., 2025 and ToR letter issued by SEIAA, Meghalaya vide File No. ML/SEAC/SEIAA/PP/EJH/126/2025 and TOR Identification No. TO25B1101ML5999209N, dated 15th October 2025.

Subsequently, the Draft EIA/EMP Report along with the Executive Summary (English & Khasi) has been prepared for submission to Meghalaya State Pollution Control Board (MSPCB) for conducting the public hearing as per the provisions of the EIA Notification, 2006 (as amended thereof). The District Collector will finalized the date, time, and venue for conducting public hearing upon MSPCB's request.

1.3.2 PLANT PROJECT PROPOSAL

The Proposed Integrated Cement Plant with production capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd. Details Production Capacity of the proposal are given in Table - 1.1

Table: 1.1: Production Capacities of the Proposed Project

Particular	Unit	Proposed Capacity
Clinker	Million TPA	0.95
Cement	Million TPA	0.99
CPP	MW	15
WHRS	MW	7
DG Sets	KVA	2500 KVA (1 x 2500 KVA or 2 x 1000 KVA & 1 x 500 KVA or 1 x 1000 KVA, 2 x 500 KVA & 2 x 250 KVA)
Project Site Area	Ha	25.08 ha (61.95 Acres)

1.3.3 Status of the Proposed Project with respect to Environmental Clearance for Proposed Integrated Cement Plant

The chronology of the project activities undertaken so far with respect to the process of getting Environment Clearance for Cement Plant are as given in Table - 1.2:

Table : 1.2: Status of the Proposed Project w.r.t. Environment Clearance

S. No.	Project Activity	Details
1.	Application (Form- 1/ ToR and Pre-Feasibility Report) uploaded on Parivesh Portal	20 th September., 2025
2.	Baseline Monitoring & Data Collection	Summer Season (March, 2025 to May,2025)
3.	EDS - 1 generated by MS, SEAC, Meghalaya	29 th September., 2025
4.	EDS - 1 reply Submitted to MS, SEAC, Meghalaya	29 th September., 2025
5.	First Technical Presentation (for ToR approval) held before SEAC, Meghalaya	03 rd October, 2025
6.	Terms of Reference (ToR) issued by SEIAA, Meghalaya vide File No. ML/SEAC/SEIAA/PP/EJH/126/2025 and TOR Identification No. TO25B1101ML5999209N	15 th October, 2025

1.3.4 Introduction of the Project Proponent

Project Proponent

Shree Cement Limited (SCL) is a Public Limited Company and environment friendly business organization incorporated under the Companies Act, 1956 on 25th October 1979. The Company's Cement and Clinker manufacturing facilities are located at Beawar, Ras & Nawalgarh in Rajasthan, Balodabazar - Bhatapara in Chhattisgarh, Sedam in Karnataka, Guntur in Andhra Pradesh and Ras Al Khaimah (RAK) in United Arab Emirates (UAE). It has split grinding units at twelve locations viz. Khushkhera, Suratgarh, Jobner in Rajasthan, Roorkee in Uttarakhand, Aurangabad in Bihar, Bulandshahar & Etah in Uttar Pradesh, Panipat in Haryana, Hansda in Jharkhand, Cuttack in Odisha, Patas in Maharashtra and Purulia in West Bengal.

Presently, the cement production capacity of SCL group stands at 62.8 million TPA. Total thermal power plants capacity is 1084.94 MW (including 503.0 MW Thermal, 242.50 MW WHRS, 283.14 MW Solar Plant and 56.3 MW Wind Plant).

1.4 BRIEF DESCRIPTION OF NATURE, SIZE, LOCATION OF THE PROJECT AND ITS

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

**CHAPTER-I
INTRODUCTION**

IMPORTANCE TO THE COUNTRY, REGION

1.4.1 Brief Description of Nature, Size and Location of Project

Brief Description of Nature, Size and Location of the Project is given in Table - 1.3

Table :1.3: Brief Description of Nature, Size and Location of the Project

S. No.	Particulars	Details	
1.	Type of Project	Greenfield Project	
2.	Name of Unit	Integrated Cement Plant (A Unit of Shree Cement Limited)	
3.	Size & Configuration of Project	✓ Clinker: 0.95 million TPA ✓ Cement: 0.99 million TPA (OPC, PPC, PSC, LC3, Composite Cement, RHPC & SRC) ✓ CPP: 15 MW ✓ WHRS: 7 MW ✓ DG Sets: 2500 KVA (1 x 2500 KVA or 2 x 1000 KVA & 1 x 500 KVA or 1 x 1000 KVA, 2 x 500 KVA & 2 x 250 KVA) ✓ Project Site Area: 25.08 ha (61.95 Acres)	
4.	Location		
	Villages	Daistong	
	Elaka	Elaka – Nongkhlieh Dolloiship	
	District	East Jaintia Hills	
	State	Meghalaya	
5.	Geographical extents of project site	Latitude	Longitude
		25°21'01.823"N to 25°20'59.918"N	92°33' 27.501"E to 92°33'27.104"E
	Toposheet No.	Core & Buffer Zone: 83C/11 & 83C/7	
6.	Project Details		
	Capital Cost of the project	Rs. 1264 Crores	
	Cost for Environmental Protection measures	• Capital Cost: Rs. 23.5 Crores • Recurring Cost: Rs. 0.30 Crores/annum	
7.	Project Basic Requirement		
	Area	Total Plant Area	25.08 ha (61.95 Acres)
		Greenbelt Development & Plantation	Approx. 8.27 ha (20.44 Acre) (~33% of total plant area)
	Water Requirement (KLD)	1070 KLD (Including Fresh Water Requirement: 985 KLD & Recycled Water from STP & RO Rejects: 85 KLD). <i>Source: Water requirement will be fulfilled by the ground water and nearby surface water bodies with prior statutory permission from the concerned</i>	

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

**CHAPTER-I
INTRODUCTION**

S. No.	Particulars	Details
		<i>State government.</i>
	Power Requirement (MW)	Total Power Requirement: 18 MW ❖ Energy consumption per ton of Clinker: 48.2 Kwh ❖ Energy consumption per ton for Cement Grinding: • OPC, PPC, RHPC, LC3 & SRC Cement: 25 to 30 Kwh, • PSC Cement: 28 to 51 Kwh, • Composite Cement: 28 to 36 Kwh Thermal Energy consumption of Clinker: 670 Kcal/Kg Source: Proposed Captive Power Plant, WHRS and State Grid Power Supply & DG sets (for back up)
8.	Manpower Requirement	
	Implementation (Construction) Phase	Permanent: 100 Nos. Contractual: 500 Nos.
	Operation Phase	Permanent: 150 Nos. Contractual: 300 Nos.
9.	Project Site Vicinity Details	
	Nearest Village	Village Daistong (~1.43 km in ESE direction)
	Nearest Major Town City	Mutong (~5.51 km in ESE direction)
	Nearest National /State Highway	NH- 6 (~18.93 km in SW direction)
	Nearest Railway Station	Ditokcherra Railway station (~36.90 km in SE direction)
	Nearest Airport	Silchar Airport (~63.35 km in SE direction) Guwahati Airport (~128.21 km in NW direction)
	Nearby Water Bodies	River (Wah Chyrmir) about 4.48 NW Direction. Pal Lam Kankalang River about 8.50 NE Direction
	National Park, Wildlife Sanctuary, Tiger/ Elephant Reserve, Eco-Sensitive Zone etc.	No National Park, Wildlife Sanctuary, Tiger/ Elephant Reserve, exist within 10 km radius study area.
	Reserved/ Protected Forest within 10 km radius	No Reserved/ Protected Forest within 10 km Study area. Saipung Reserved Forest (~6.35 in SE direction)
	CPA/SPA/OPA within study area	There is no CPA/SPA within 10 km radius study area.
	Archaeological site	None within 10 km radius
	Seismic Zone	Zone - V as per IS: 1893 (Part-I): 2002

1.4.2 Need for the project and its importance to the country and or region

To cater the cement demand for increasing infrastructure development activities of private and governmental projects of region including construction of highways, roads, flyovers, bridges, building apartments and townships for their increasing demand of cement, Shree Cement Ltd. has proposed an Integrated Cement Plant at Village: Daistong, Elaka: Nongkhlieh Dolloiship, District: East Jaintia Hills (Meghalaya).

National Importance

- The Cement Industry in India is among the core Industries that is vital for economic growth and development. Ever since the Industry was de-licensed in 1991, there has been remarkable growth that metamorphosed it to a globally competitive market, making India the second largest producer of cement after China in the world. It has become synonymous with construction activity and the per capita consumption of cement is accepted as an important indicator of the country's economic growth.
- The Government of India has been laying a massive emphasis on infrastructure development, with 100 smart cities, modernization of 500 cities, affordable housing for all by 2027, cement concreting of national highways, provision of sanitation facilities, etc. all in the pipeline for development over the course of the next years. These all leads to future growth of Indian Cement Industry.

Regional Importance

- The Indian cement sector has a robust demand profile, stimulated mostly by government plans to build physical and social infrastructure like Pradhan Mantri Awaas Yojana (PMAY-G and PMAY-U) (Housing for All by 2029), Pradhan Mantri Gramin Sadak Yojana (PMGSY) (Prime Minister's Rural Road Scheme), Concrete Roads, Smart cities, Swachh Bharat (Clean India), Construction of hospitals and educational institutions, Canal lining projects, Cold chain storage projects etc.
- The proposed project will generate direct employment to about 300 people on permanent basis and additionally approximately 500 persons on contractual basis during operational phase of the proposed project. The integrated cement project will result in the growth of the surrounding areas by increasing direct and indirect employment opportunities in the region including ancillary development and supporting infrastructure. Special emphasis on Financial and Social benefits will be given to the local people in the area. Development of social amenities will be in the form of medical facilities, education to underprivileged and creation of self-help groups. Increased revenue to the State & Central exchequer. In addition, various rural development initiatives for the upliftment of the nearby communities will be undertaken under Socio-economic developmental plan.

1.4.3 Demand- Supply Gap

Indian cement production reached 453 million tonnes in FY25-26, a 6.3% year-on-year (YoY) increase from FY24-25. The industry is expanding capacity, with plans to add 70-75 million tonnes per annum (MTPA) in the next two

years. This growth is driven by government infrastructure spending and a rebound in housing and construction sectors. Despite a challenging start in the first half of fiscal year 2025 (FY25-26), demand is expected to pick up, supported by favourable policies and infrastructure projects. This robust growth is driven primarily by government housing initiatives like the Pradhan Mantri Awas Yojana (PMAY) and ongoing infrastructure development projects. Supported by a revival in construction activity and increased government capital expenditure, the real estate sector's expansion will continue to fuel strong cement demand. *(Source: Indian Cement Industry Report)*

The housing sector is the biggest demand driver of cement, accounting for about 67 percent of the total consumption in India. The other major consumers of cement include infrastructure at 13 percent, commercial construction at 11 percent and industrial construction at nine percent. To meet the rise in demand, cement companies are expected to add 95 million Tonnes (MT) capacity over the next four years. The country's per capita consumption stands at around 240 kg against global average of 530 kg per capita, which shows significant potential for the growth of industry.

The Government of India is strongly focused on infrastructure development to boost economic growth and is aiming for World Class Cement Concrete Highways, Creation of 100 Smart cities, Dedicated Freight Corridors, Clean India Mission, Ultra Mega Power Projects, Connectivity improvement including Water Transport. The government also intends to expand the capacity of the railways and the facilities for handling and storage to ease the transportation of cement and reduce transportation costs. These measures would lead to increased construction activity thereby boosting cement demand.

1.4.4 Imports vs. Indigenous production

The proposed project will utilize locally available raw material and cement produced in the state, which will be consumed domestically.

1.4.5 Export Possibility

The proposed project has been envisaged to cater to domestic cement market within India. Thus, no cement exports have been considered for the proposed project.

1.4.6 Domestic/Export Market

Demand targeted for Cement market for the proposed project would be East & Central India. This market has been identified keeping in mind the economic transportation system, distance and location of other supplying clusters and existing grinding units of SCL

1.4.7 Employment Generation (Direct and Indirect) due to the project sourcing

SCL follows the “Son of the Soil” policy, wherein the preference will be given to local people based on requirement and qualification. Only where skills are not available locally, staff will be hired from outside. Total manpower for the project is estimated around 150 permanent and 300 Contractual labours.

1.5 SCOPE OF EIA STUDY (DETAILS OF REGULATORY SCOPING CARRIED OUT (AS PER TOR))

Scope of this study covers all the points given in the Terms of Reference (ToR) prescribed by the MoEF&CC; New Delhi *vide* letter no. IA-J-11011/200/2023-IA-II (IND-I) dated 30th July, 2024 as amended on 28th Dec., 2024. The regulatory scoping of the project as per the ToR letter has been covered and mentioned in “*Point-wise reply of ToR*” on Page No. 01 to 35. This EIA/EMP Report includes total twelve chapters as per Appendix-III of the EIA Notification, 2006, as amended thereof.

Chapter	Description
Chapter - 1	Introduction
Chapter - 2	Project Description
Chapter - 3	Description of the Environment
Chapter - 4	Anticipated Environmental Impacts and Mitigation Measures
Chapter - 5	Analysis of Alternatives (Technology & Site)
Chapter – 6	Environmental Monitoring Plan
Chapter – 7	Additional Studies
Chapter – 8	Project Benefits
Chapter – 9	Environment Cost Benefit Analysis
Chapter – 10	Environment Management Plan
Chapter – 11	Summary & Conclusion
Chapter – 12	Disclosure of Consultants Engaged

1.6 REGULATORY SCOPING

The study covers the requirements of various acts and rules applicable for Cement industry related to air pollution, water pollution, solid waste management and CREP guidelines etc. as mentioned below -

- Factory Act, 1948
- The Environment (Protection) Act, 1986, as amended thereof
- Environmental (Protection) Rules, 1986, as amended thereof
- EIA Notification dated 14th September, 2006, as amended thereof
- Air (Prevention and Control of Pollution) Act, 1981 and 1987, as amended thereof
- Water (Prevention and Control of Pollution) Act, 1974 and 1988, as amended thereof
- Water (Prevention and Control of Pollution) Rules, 1975 as amended thereof
- Hazardous Waste (Management & Handling) Rules, 1989, 2000, 2003 & 2016, as amended thereof
- Noise (Prevention and Control of Pollution) Rule, 2000, as amended thereof
- National Ambient Air Quality Standards, 2009,
- CPCB guidelines for greenbelt, air & water etc.
- Corporate Responsibility for Environmental Protection March, 2003, as amended thereof

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

***CHAPTER-I
INTRODUCTION***

- Wildlife Protection Act, 1972, 2002, 2003 & subsequent amendment
- ESZ Notification June, 2024

2.0 GENERAL: This Chapter of an Environmental Impact Assessment (EIA) report, titled "Project Description," details the nature, size, and location of the proposed project, size or magnitude of operation, requirements of the project, Schematic representation of the feasibility drawings which give information for EIA purpose (e.g. process flow chart; material balance; water balance; etc.), proposed schedule for approval and implementation, technology & process description, major equipment & machineries, infrastructural facilities, description of mitigation measures and assessment of new & tested technology for the risk of technological failure. Crucially, this chapter identifies the aspects of the project likely to cause environmental effects and outlines initial embedded mitigation measures designed to meet environmental standards. It also discusses the consideration of alternatives, justifying why the selected option is the preferred choice, and sets the stage for the detailed impact analysis that follows in later chapters.

2.1 TYPE OF THE PROJECT

As mentioned in the EIA/EMP Report, this is a proposed project (Greenfield) - which falls under Category “B1”, Project or Activity ‘3(b)’ Cement Plants. It is also proposed to install CPP and WHRS in the Integrated Cement Plant premises under minor category which falls under S. No. 1 (Thermal Power Plants), Project Activity ‘1 (d)’ Thermal Power Plants in which cement plant will be installed by Shree Cement Limited.

The Proposed Integrated Cement Plant with production capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

2.2 NEED OF THE PROJECT

To cater the cement demand for increasing infrastructure development activities of private and governmental projects of region including construction of highways, roads, flyovers, bridges, building apartments and townships for their increasing demand of cement, Shree Cement Ltd. has proposed an Integrated Cement Plant at Village: Daistong, Elaka: Nongkhlieh Dolloiship, District: East Jaintia Hills (Meghalaya).

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➤ The Cement Industry in India is among the core Industries that is vital for economic growth and development. Ever since the Industry was de-licensed in 1991, there has been remarkable growth that

metamorphosed it to a globally competitive market, making India the second largest producer of cement after China in the world. It has become synonymous with construction activity and the per capita consumption of cement is accepted as an important indicator of the country's economic growth.

➤ The Government of India has been laying a massive emphasis on infrastructure development, with 100 smart cities, modernization of 500 cities, affordable housing for all by 2027, cement concreting of national highways, provision of sanitation facilities, etc. all in the pipeline for development over the course of the next years. These all leads to future growth of Indian Cement Industry.

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➤ The proposed project will generate direct employment to about 300 people on permanent basis and additionally approx. 500 persons on contractual basis during operational phase of the proposed project. The integrated cement project will result in the growth of the surrounding areas by increasing direct and indirect employment opportunities in the region including ancillary development and supporting infrastructure. Special emphasis on Financial and Social benefits will be given to the local people in the area. Development of social amenities will be in the form of medical facilities, education to underprivileged and creation of self-help groups. Increased revenue to the State & Central exchequer. In addition, various rural development initiatives for the upliftment of the nearby communities will be undertaken under Socio-economic developmental plan.

2.2.1 Demand- Supply Gap

Indian cement production reached 453 million tonnes in FY25-26, a 6.3% year-on-year (YoY) increase from FY24-25. The industry is expanding capacity, with plans to add 70-75 million tonnes per annum (MTPA) in the next two years. This growth is driven by government infrastructure spending and a rebound in housing and construction sectors. Despite a challenging start in the first half of fiscal year 2025 (FY25-26), demand is expected to pick up, supported by favourable policies and infrastructure projects. This robust growth is driven primarily by government housing initiatives like the Pradhan Mantri Awas Yojana (PMAY) and ongoing infrastructure development projects. Supported by a revival in

construction activity and increased government capital expenditure, the real estate sector's expansion will continue to fuel strong cement demand. (Source: Indian Cement Industry Report).

The housing sector is the biggest demand driver of cement, accounting for about 67 percent of the total consumption in India. The other major consumers of cement include infrastructure at 13 percent, commercial construction at 11 percent and industrial construction at nine percent. To meet the rise in demand, cement companies are expected to add 95 million Tonnes (MT) capacity over the next four years. The country's per capita consumption stands at around 240 kg against global average of 530 kg per capita, which shows significant potential for the growth of industry.

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2.2.2 Imports vs. Indigenous production

The proposed project will utilize locally available raw material and cement produced in the state, which will be consumed domestically.

2.2.3 Export Possibility

The proposed project has been envisaged to cater to domestic cement market within India. Thus, no cement exports have been considered for the proposed project.

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Demand targeted for Cement market for the proposed project would be East & Central India. This market has been identified keeping in mind the economic transportation system, distance and location of other supplying clusters and existing grinding units of SCL

2.2.5 Employment Generation (Direct and Indirect) due to the project sourcing

SCL follows the “Son of the Soil” policy, wherein the preference will be given to local people based on requirement and qualification. Only where skills are not available locally, staff will be hired from outside. Total manpower for the project is estimated around 150 permanent and 300 Contractual labours.

2.3 LOCATION OF THE PROJECT

The proposed an Integrated Cement Plant at Village: Daistong, Elaka: Nongkhlieh Dolloiship, District: East Jaintia Hills (Meghalaya).

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

**CHAPTER-2
PROJECT DESCRIPTION**

2.3.1 LOCATION MAP

The map showing general location of the plant site is as given in Figure - 2.1 (a) and also map showing contour of the project site in Figure - 2.1 (b).

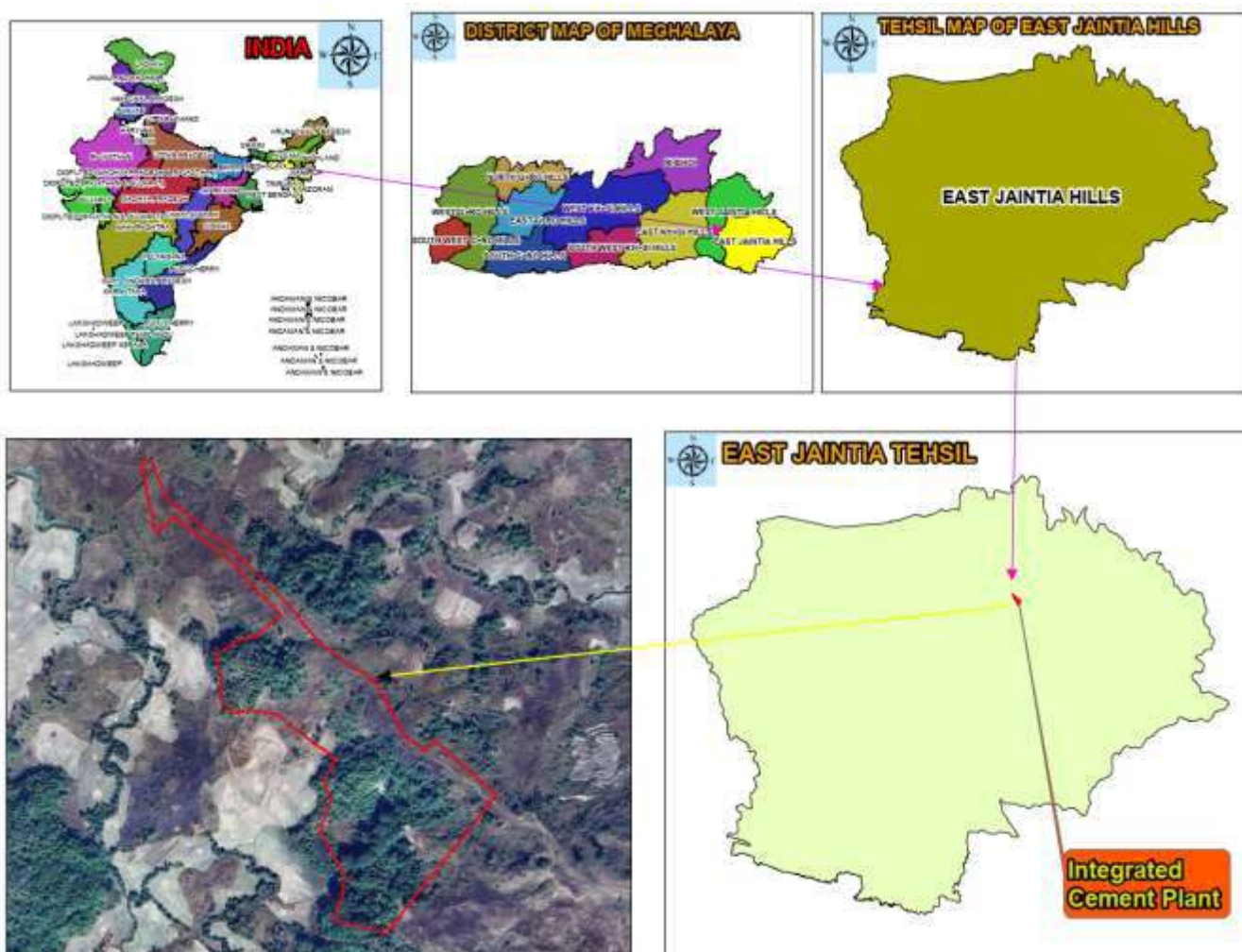


Figure :2.1(a): Location map of Proposed Plant Site

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

CHAPTER-2 PROJECT DESCRIPTION

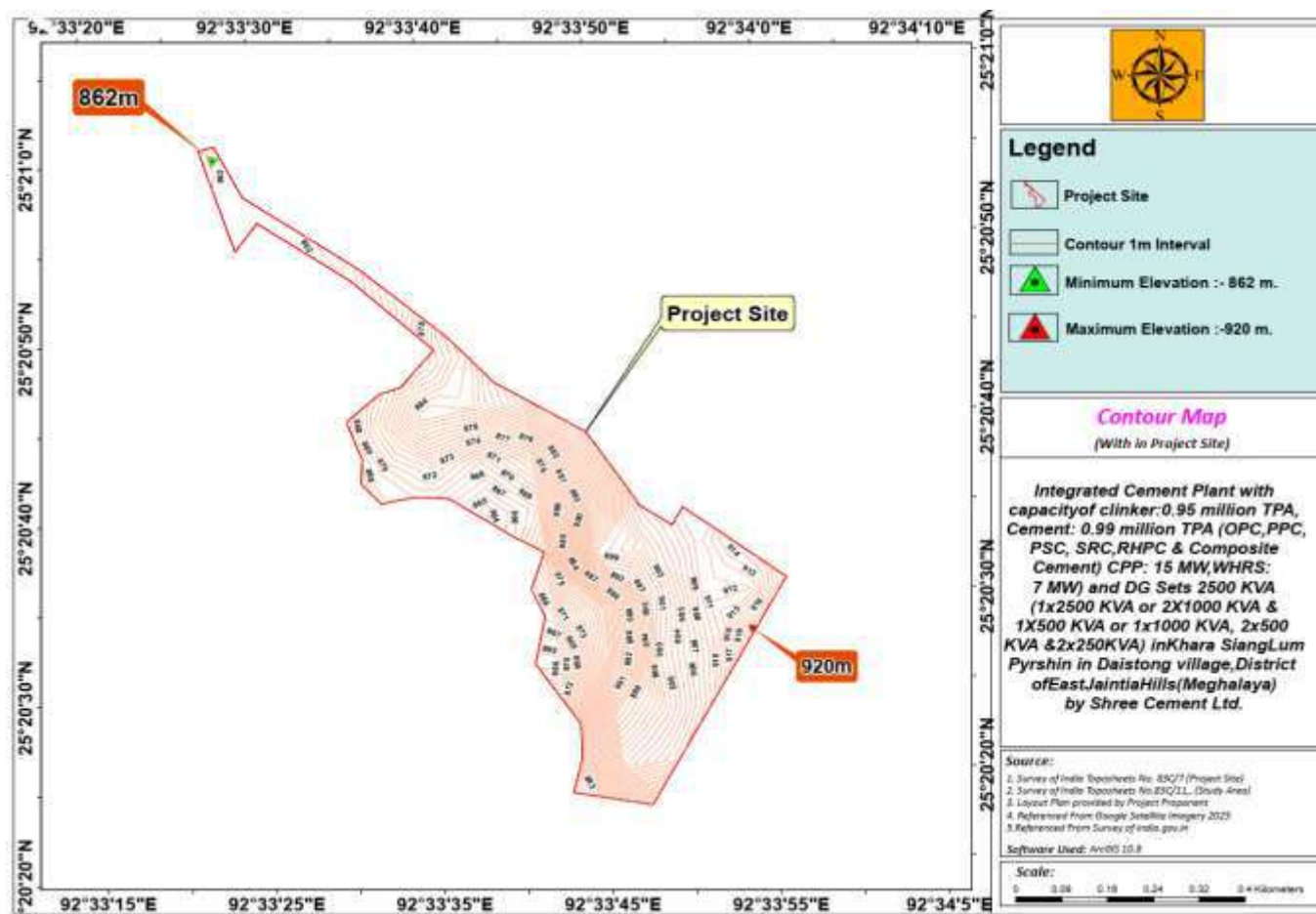


Figure: 2.1(b): Contour map of Proposed Plant Site

2.3.2 SPECIFIC LOCATION MAP

The map showing the project layout boundary, project components and facilities is shown in **Figure- 2.2** given below:

Corner Co-ordinates of Plant site is given below –

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

**CHAPTER-2
PROJECT DESCRIPTION**

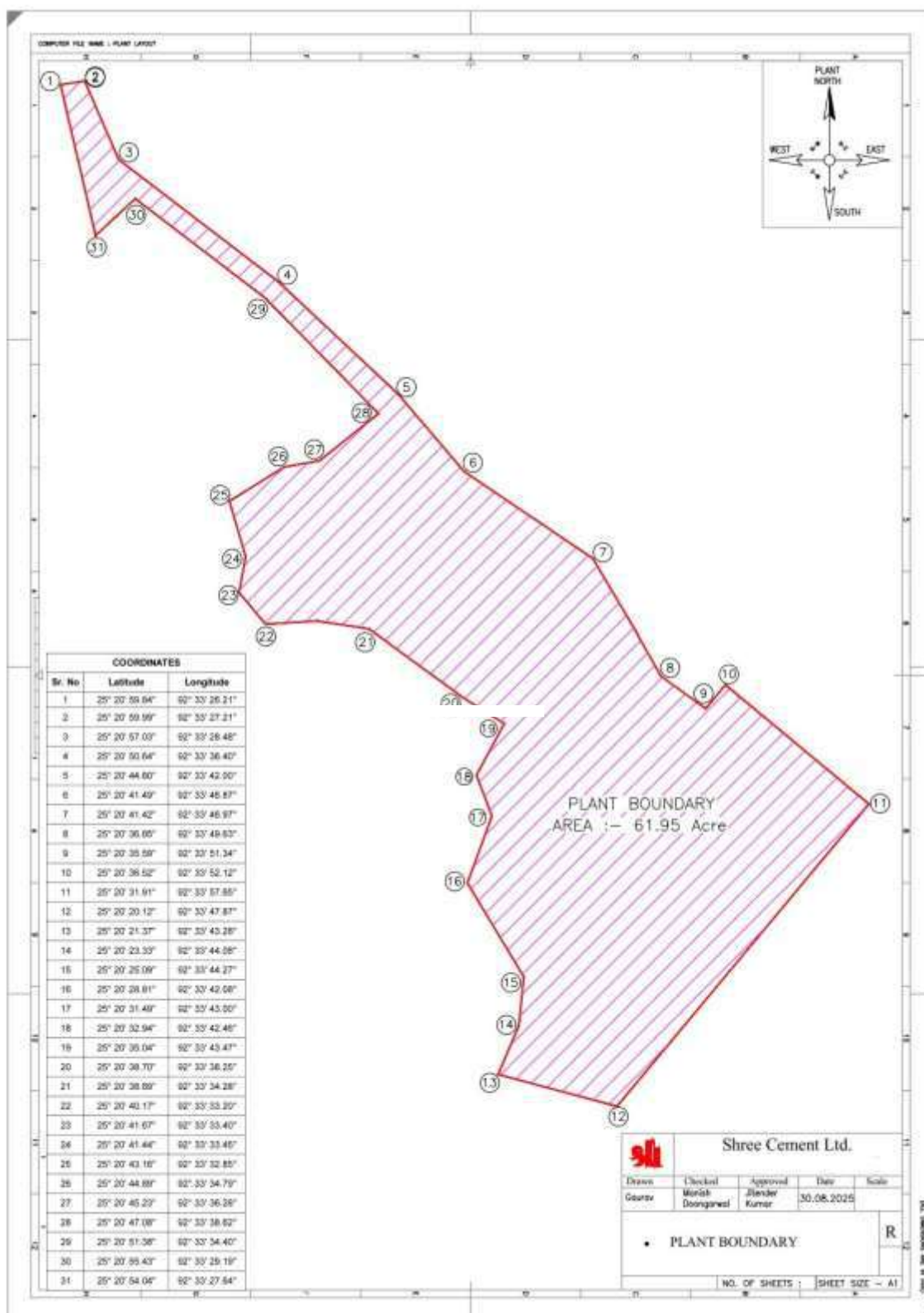


Figure: 2.2: Layout boundary of Proposed Plant Site with Coordinates

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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The project Coordinates is shown in **Table- 2.1(a)** given below:

Table: 2.1 (a) Coordinates of Project Site for Integrated Cement Plant

Sr. No.	Latitude	Longitude	Sr. No.	Latitude	Longitude
1	25° 20' 59.84"	92° 33' 26.21"	17	25° 20' 31.49"	92° 33' 43.00"
2	25° 20' 59.99"	92° 33' 27.21"	18	25° 20' 32.94"	92° 33' 42.46"
3	25° 20' 57.03"	92° 33' 28.48"	19	25° 20' 35.04"	92° 33' 43.47"
4	25° 20' 50.64"	92° 33' 36.40"	20	25° 20' 38.70"	92° 33' 38.25"
5	25° 20' 44.80"	92° 33' 42.00"	21	25° 20' 38.89"	92° 33' 34.28"
6	25° 20' 41.49"	92° 33' 46.87"	22	25° 20' 40.17"	92° 33' 33.20"
7	25° 20' 41.42"	92° 33' 46.97"	23	25° 20' 41.67"	92° 33' 33.40"
8	25° 20' 36.85"	92° 33' 49.63"	24	25° 20' 41.44"	92° 33' 33.45"
9	25° 20' 35.59"	92° 33' 51.34"	25	25° 20' 43.16"	92° 33' 32.85"
10	25° 20' 36.52"	92° 33' 52.12"	26	25° 20' 44.89"	92° 33' 34.79"
11	25° 20' 31.91"	92° 33' 57.65"	27	25° 20' 45.23"	92° 33' 36.28"
12	25° 20' 20.12"	92° 33' 47.87"	28	25° 20' 47.08"	92° 33' 38.62"
13	25° 20' 21.37"	92° 33' 43.28"	29	25° 20' 51.38"	92° 33' 34.40"
14	25° 20' 23.33"	92° 33' 44.08"	30	25° 20' 55.43"	92° 33' 29.19"
15	25° 20' 25.09"	92° 33' 44.27"	31	25° 20' 54.04"	92° 33' 27.64"
16	25° 20' 28.81"	92° 33' 42.08"			

2.3.3 Project Site Accessibility

Shree Cement Limited is proposing an Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya).

Project Site Vicinity Details are given in below **Table – 2.2:**

Table: 2.2: Details of Project Site Vicinity

Project Site Vicinity Details	
Nearest Village	Village Daistong (~1.43 km in ESE direction)
Nearest Major Town City	Mutong (~5.51 km in ESE direction)
Nearest National /State Highway	NH- 6 (~18.93 km in SW direction)
Nearest Railway Station	Ditokcherra Railway station (~36.90 km in SE direction)
Nearest Airport	Silchar Airport (~63.35 km in SE direction) Guwahati Airport (~128.21 km in NW direction)
Nearby Water Bodies	River (Wah Chyrmit) about 4.48 NW Direction. Pal Lam Kankalang River about 8.50 NE Direction
National Park, Wildlife Sanctuary, Tiger/ Elephant Reserve, Eco-Sensitive Zone etc.	No National Park, Wildlife Sanctuary, Tiger/ Elephant Reserve, exist within 10 km radius study area.
Reserved/ Protected Forest within 10 km radius	No Reserved/ Protected Forest within 10 km Study area. Saipung Reserved Forest (~6.35 km in SE direction)
CPA/SPA/OPA within study area	There is no CPA/SPA within 10 km radius study area.
Archaeological site	None within 10 km radius
Seismic Zone	Zone - V as per IS: 1893 (Part-I): 2002

2.3.4 Land from Land use and land ownership

The total land area for the proposed plant is 25.08 ha (61.95 Acres). There is no forest land involved in the proposed project. Present land use of the project site is Pvt. Land, which will be used for industrial purpose after its conversion into Industrial land use. Application for allotment of Pvt. Land has been submitted.

The Land breakup is given below:

Table: 2.3: Land Breakup of Project Site

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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S. No.	Particulars	Land Area Details		Area (%)
		(In Acre)	(In Ha.)	
1	Greenbelt & Plantation	20.44	8.27	32.99% (Say 33%)
2	Raw Material Unloading	0.33	0.14	0.54
3	Material Storage	9.87	4.00	15.94
4	Plant - Clinkerization	2.29	0.93	3.70
5	Plant - Cement Grinding and Packing Plant	1.92	0.78	3.09
6	Non-Plant Building	2.75	1.11	4.44
7	Road & Cemented area	8.06	3.26	13.01
8	Open Area	12.95	5.24	20.90
9	Power Plant	2.66	1.08	4.30
10	Rain Water Harvesting storage pond	0.68	0.27	1.09
	Total	61.95	25.08	100.00

Source: Pre-feasibility Report and Plant Layout

2.3.5 Site Precatory Activities

The maximum and minimum elevations in the project area are 920 m and 862 m respectively resulting in ground level (Source: Contour Map : 2.1(b)). The Study area has hill topography. The total land area for the proposed plant is 25.08 ha (61.95 Acres). There is no forest land involved in the proposed project. Present land use of the project site is Pvt. Land, which will be used for industrial purpose after its conversion into Industrial land use. Application for allotment of Pvt. Land has been submitted.

There are no existing structures at the site; as it is a Greenfield project. The plant layout showing proposed units indicating Clinkerization Unit, Cement Mill, CPP, WHRS, Storage Areas, allied infrastructure facilities, Greenbelt & Plantation area etc. is given on the next page (Figure - 2.3 (a)).

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

CHAPTER-2 PROJECT DESCRIPTION



Figure: 2.3 (a): Plant layout showing plant machinery and road network

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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PROJECT DESCRIPTION

2.3.6 Project Site Photographs



2.4 SIZE OR MAGNITUDE OF OPERATIONS

Shree Cement Limited is proposing a Check Status- Clinker: 0.95 million TPA; Cement: 0.99 million TPA (OPC, PPC, LC3, PSC, SRC, RHPC & Composite Cement); CPP: 15 MW; WHRS: 7 MW; DG Sets: 2500 KVA (1 x 2500 KVA or 2 x 1000 KVA & 1 x 500 KVA or 1 x 1000 KVA, 2 x 500 KVA & 2 x 250 KVA) located at Village: Daistong, Elaka: Nongkhlieh Dolloiship, District: East Jaintia Hills (Meghalaya).

Size or Magnitude of Operation in terms of Capacity and Cost for the proposed Integrated Cement Plant are given in Table - 2.4 and Table - 2.5, respectively:

Table: 2.4 Size or Magnitude of Operation in terms of Capacity for Proposed Plant

Particular	Unit	Proposed Capacity
Clinker	Million TPA	0.95
Cement	Million TPA	0.99

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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Particular	Unit	Proposed Capacity
CPP	MW	15
WHRS	MW	7
DG Sets	KVA	2500 KVA (1 x 2500 KVA or 2 x 1000 KVA & 1 x 500 KVA or 1 x 1000 KVA, 2 x 500 KVA & 2 x 250 KVA)
Project Site Area	Ha	25.08 ha (61.95 Acres)

Table: 2.5 Magnitude of Operation in terms of Cost

S. No.	Particular	Details
1.	Total Cost of the Project	Rs. 1264 Crores
2.	Cost for Environmental Protection Measures	Capital Cost: Rs. 23.5 Crores Recurring Cost: Rs. 0.30 Crores per annum

Facilities/ Activities for the Proposed Project

The major facilities and associated activities of proposed project are as given below in Table - 2.6:

Table: 2.6: Facilities/ Activities for the Proposed Integrated Cement Plant

S. No.	Unit	Major facilities and associated activities proposed
1.	Cement Plant	– Limestone stacker and Reclaimer – Corrective Crusher – Raw Mill (VRM / Roller Press /ball mill) – Coal / Petcoke Mill – Rotary Kiln (Pyro-processing) – Clinker Cooler – Cement Mill (VRM) – Hot Air Generator (HAG) – Packing Plant
2.	CPP	– Circulating Fluidized Bed Combustion Boiler – Steam Turbine – Generator – Air Cooled Condenser
3.	WHRS	– Waste Heat Recovery Boilers with Pre-heater and Clinker Cooler – Steam Turbine – Generator
5.	D.G. Set	– Diesel Generator with Storage of fuel
6.	Others	– Sewage Treatment Plant, Water Treatment Plant,

S. No.	Unit	Major facilities and associated activities proposed
		– RO Plant & Oxygen Plant – Ready Mix Concrete Unit

2.5 REQUIREMENTS FOR THE PROJECT

The project requirements such as raw material, fuel, water, power, manpower with source of supply is described in the sections provided below:

2.5.1 Raw Material Requirement

Major raw material required for Clinker & Cement production is Limestone, Iron Ore, Bauxite, Gypsum (Mineral, Synthetic, Chemical & Imported), Fly ash and Slag. Details regarding quantity of raw materials required their source along with distance and mode of transportation are given in Table - 2.7 (a & b):

Table: 2.7(a): Details of Raw Material Requirement along with source and Mode of Transport

S. No.	Name of Raw Material	Basis	Quantity (Million TPA)	Source	Mode of Transport.
1.	Limestone	1.5 T/T of Clinker	1.43	Captive Mine	~ 0.1 km; Combination of Two or three modes.
2.	Iron Ore (Laterite)	0.015 T/ T of Clinker	0.014	Nearby Area	~60 km; Combination of Two or three modes.
3.	Bauxite	0.044 T/ T of Clinker	0.042	Nearby Area	Combination of Two or three modes.
4.	Gypsum	0.07 T / T of Cement	0.07	Bhutan Imported	~60 km; Combination of Two or three modes.
5.	Fly ash	0.35 T/T of Cement	0.34	Nearby Area	Combination of Two or three modes.
6.	Slag	0.55 T/T of Cement	0.54	Nearby Area	Combination of Two or three modes.
7.	Dolochar		0.095	Nearby Spong Iron Plant	~60 km; Combination of Two or three modes.
8.	Petcock as feed Stock		0.095	--	~60 km; Combination of Two or three modes.
9.	Biomass		0.56	Nearby Agriculture Field	~60 km; Combination of Two or three modes.

Table: 2.7(b): Details of Raw Material Requirement for Cement Manufacturing

Requirement (in Million TPA) for Cement (OPC/PPC/Composite Cement/PSC/RHPC/LC3/SRC)

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

CHAPTER-2
PROJECT DESCRIPTION

Production

S. No.	Raw Material	OPC / RHPC/ SRC	PPC	PSC	LC3	Composite Cement
1.	Clinker	0.92	0.57	0.38	0.50	0.38
2.	Gypsum	0.07	0.07	0.07	0.07	0.07
3.	Fly ash	0.00	0.35	0.00	-	0.35
4.	Slag	0.00	0.00	0.00	-	-
5.	Calcined Clay	-	-	-	0.33	-
6.	Limestone	-	-	-	0.10	-
	Total Capacity (MTPA)**	0.99	0.99	0.99	0.99	0.99

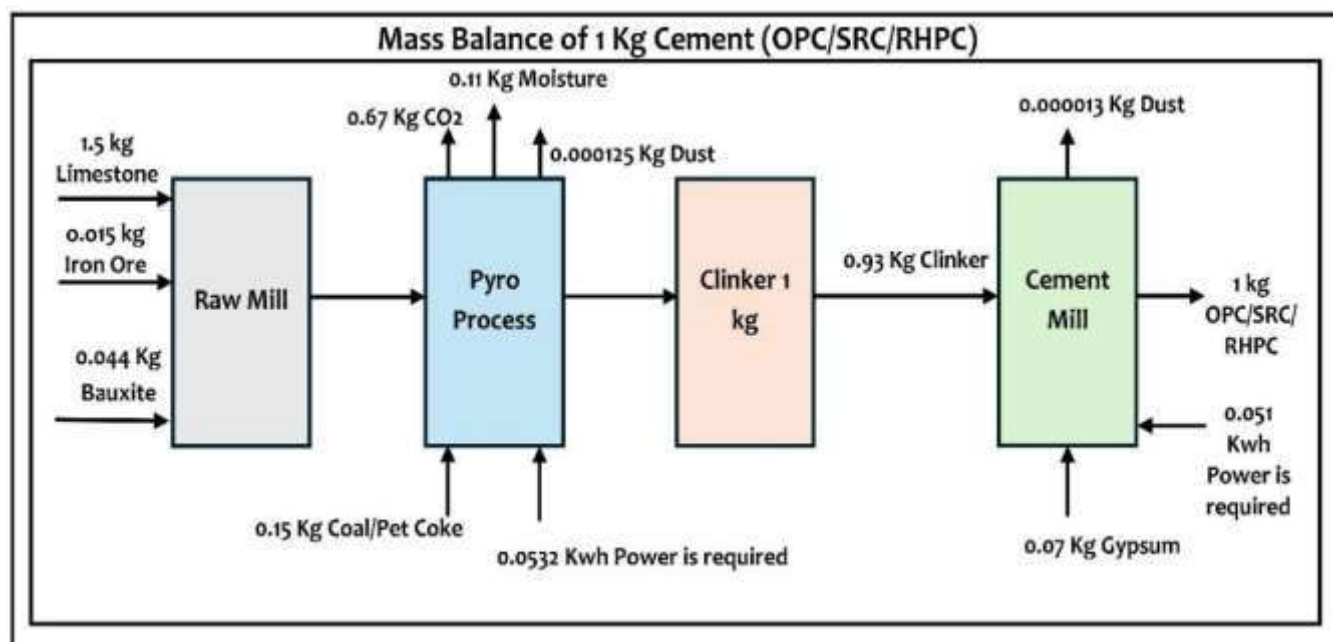
Note:

*Clinker will also be sent to the sister grinding units, market sale and will also be received from outside (Other SCL Plants), if Clinkerization plant is not in operation or in case of shortfall of Clinker.

** Cement production will be 0.99 million TPA only either from various options as OPC/RHPC/SRC/LC3/PPC /PSC/Composite Cement.

2.5.2 Mass Balance Diagram

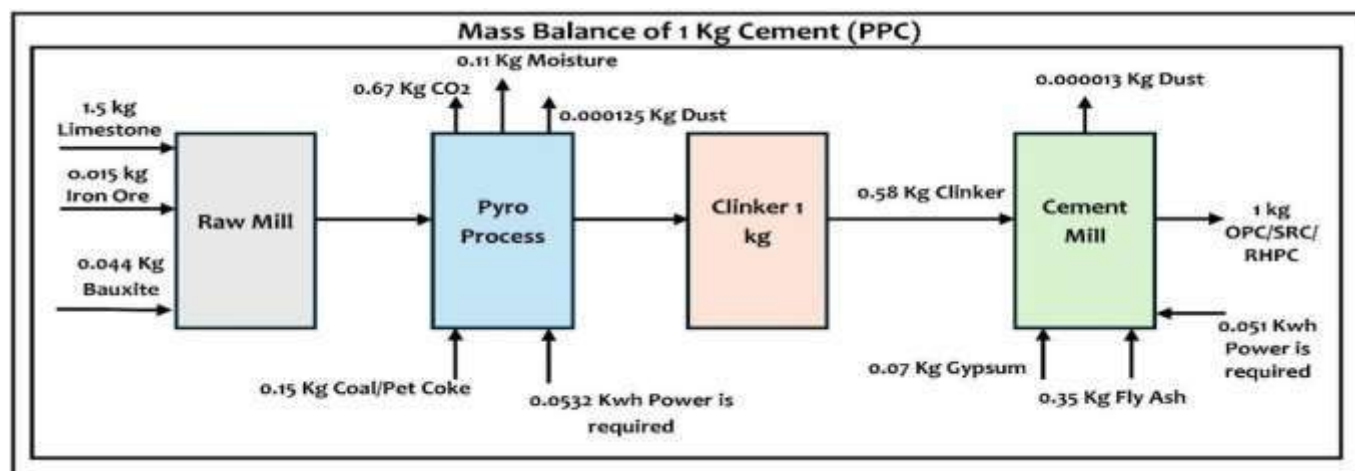
Mass Balance Diagram for the proposed project for manufacturing of clinker and different types of Cement (OPC/RHPC/SRC, PPC, PSC and Composite Cement) is shown in Figure - 2.4



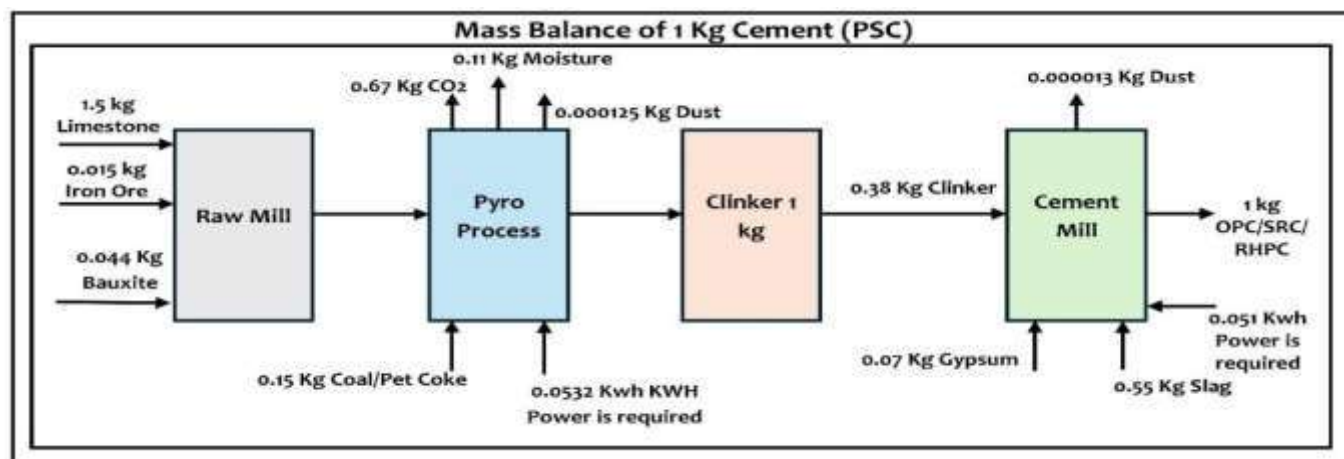
Mass Balance Diagram For OPC/RHPC/SRC

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

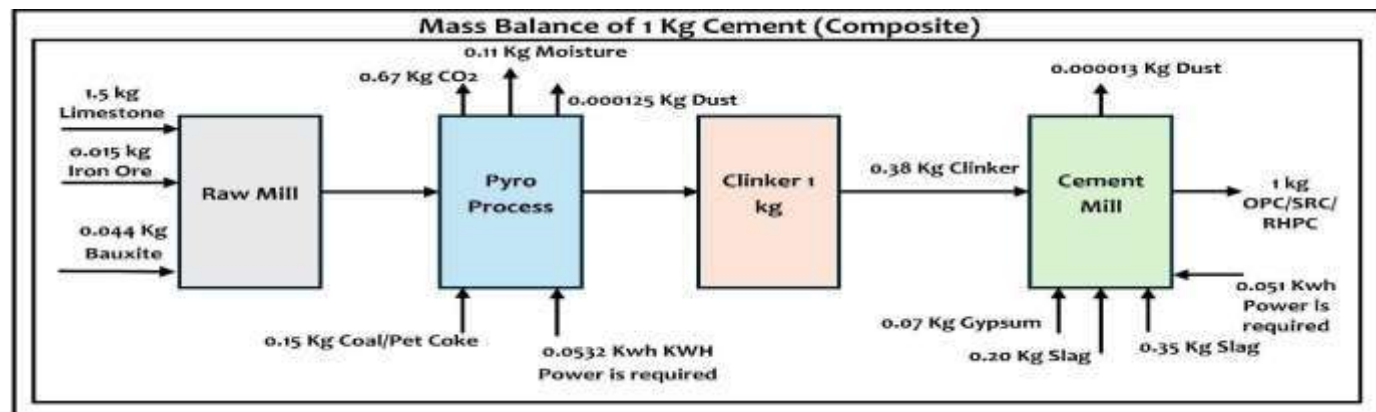
CHAPTER-2
PROJECT DESCRIPTION



Mass Balance Diagram For PPC



Mass Balance Diagram For PSC



Mass Balance Diagram for Composite Cement

Figure :2.4: Mass Balance Diagram of OPC/ RHPC & SRC, PPC, LC3, PSC, Composite Cement

2.5.3 Fuel / Feed stock Requirement

Details regarding quantity of Fuel/Feed Stock required, their source along with distance and mode of transportation for proposed Integrated Cement Plant is given in Table - 2.8

Table: 2.8 Fuel Requirement for Proposed Integrated Cement plant

S. No.	Name of Feed Stock	Quantity (Million TPA)	Source	Calorific Value (Kcal/kg)	Ash (in %)	Sulphur (in %)	Distance & Mode of Transportation
For Cement Plant							
1.	Indian & Imported Coal	0.36	<i>Indigenous Coal:</i> Nearby Coal Mines	4200-4800	30-35	0.4-0.5	Local Area ~20 to 200 km by Road
			<i>Imported Coal:</i> USA, South Africa, Australia and Indonesia through Calcutta Port / Calcutta or Paradeep or Vizag etc.	5000-5800	6-10	0.5-0.6	Calcutta Port / Calcutta or Paradeep or Vizag – ~650 km by Road
2.	Petcoke as feed stock	0.24	Petcoke USA / Saudi Arabia / Turkey / Canada through Calcutta Port / Calcutta or Paradeep or Vizag etc.	7800 - 8300	0.5-2	6-9	Calcutta Port / Calcutta or Paradeep or Vizag – ~650 km by Road
3.	Dolochar	0.24	Nearby Sponge Iron Plant	2500-2700	68.18	0.32	~100 to 300 km by Road
4.	Biomass	0.30	Nearby Agriculture Fields	2300-2500	5- 29	0.15 - 0.22	~100 km by Road
For Captive Power Plant							
1	100% Indian Coal	0.225	Indigenous Coal: Nearby Coal Mines	4200-4800	30-35	0.4-0.5	Local Area ~20 to 200 km by Road
2	100% Imported Coal	0.12	USA, South Africa, Australia and Indonesia through Calcutta Port /	5000-5800	6-10	0.5-0.6	Calcutta Port / Calcutta or Paradeep or Vizag ~650 km by Road

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

CHAPTER-2
PROJECT DESCRIPTION

S. No.	Name of Feed Stock	Quantity (Million TPA)	Source	Calorific Value (Kcal/kg)	Ash (in %)	Sulphur (in %)	Distance & Mode of Transportation
			Calcutta or Paradeep or Vizag Port etc.				
3	Biomass	0.26	Nearby Agriculture fields	2300-2500	5- 29	0.15 - 0.22	~100 km by Road

2.5.4 Water requirement:

Total water requirement for proposed project will be 600 KLD; which will be sourced from Water from Dihang River/ Ground water/ Mine Pit water based on the availability.

Table: 2.9: Water Requirement

S. No.	Descriptions / Particulars	Total Water Requirement (KLD)		Remarks
		Fresh Water (KLD)	Recycled Water (RO Reject/ Domestic waste) (KLD)	
A.	Cement Plant Process Requirements			
	Cement Mill Spray	120	-	70 KLD Cooling water blow down & RO Reject Water will be used in Mill Spray, Stackers & Recamier
	Cooling Water	60	-	
	Stackers & Reclaimer	10	-	
	Raw Mill Section	10	-	
	Coal Mill	5	-	
B.	WHRS	40	15	
C.	CPP	160	50	
D.	Drinking & Domestic requirement for Plant	25	15	Sewage water will be treated in STP & 15 KLD treated STP water will be used for greenbelt & plantation development
E.	Plantation & Greenbelt Requirement	85	15	
Grand Total (A + B + C + D + E)		515	85	515 KLD Raw Water + 86 KLD Recycled water (from STP Treated, Blowdown & RO Reject)

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

CHAPTER-2
PROJECT DESCRIPTION

Note: Total Water Requirement 600 KLD {including Fresh requirement 515 KLD & Recycled water from STP & RO rejects 85 KLD}.

Summary of Water requirement:

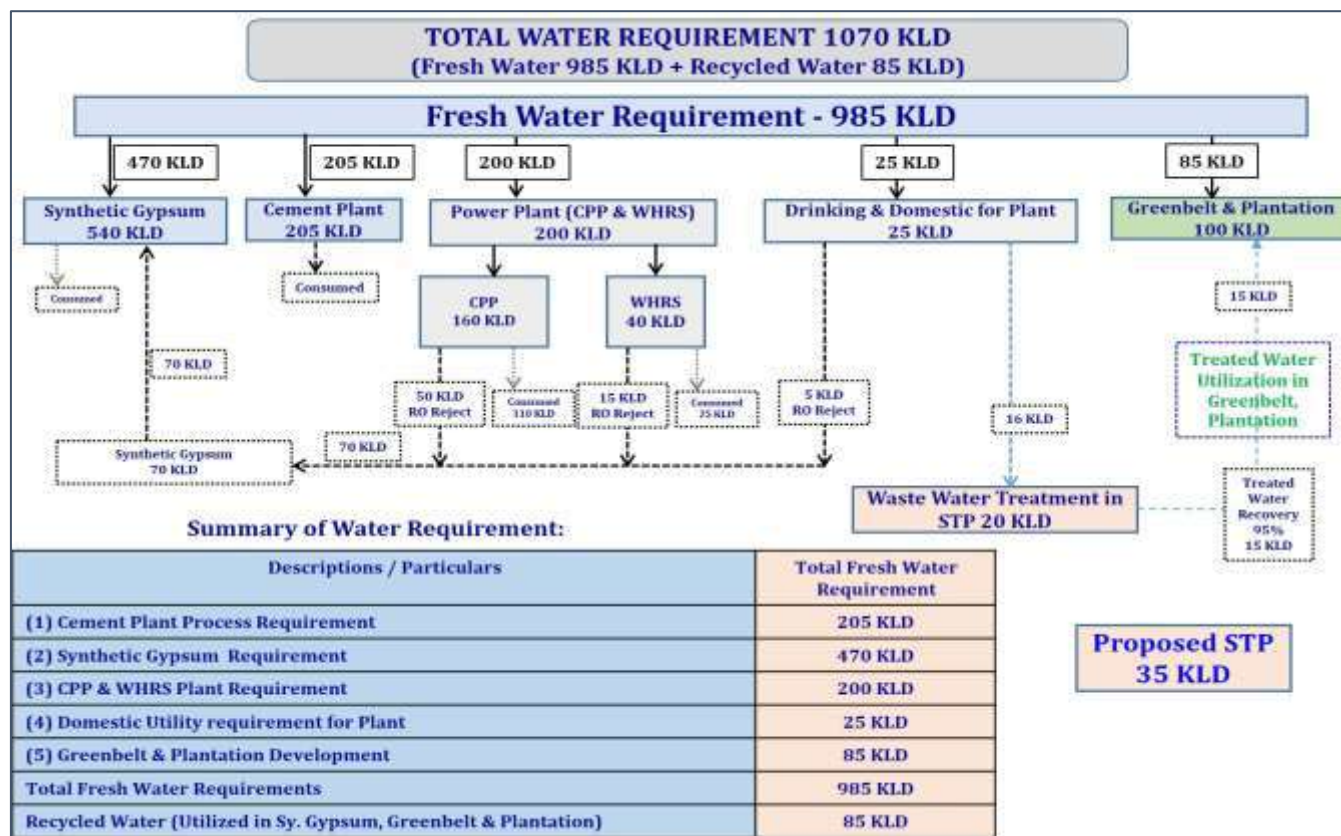


Figure :2.5: Water Balance Diagram

2.5.5 Power Requirement:

Total power requirement for the plant will be 18 MW; which will be sourced from proposed Captive Thermal Power Plant (13 MW) & Waste Heat Recovery System (5 MW), State Grid and DG Sets (for emergency backup).

2.5.6 Employment Manpower Requirement

SCL follows the “Son of the Soil” policy, wherein the preference will be given to local people based on requirement and qualification. Only where skills are not available locally, staff will be hired from outside. Total manpower for the project is estimated around 150 permanent and 300 Contractual labours.

Table: 2.10(a): Break-up of Manpower Requirement for Construction phase

Manpower Requirement	No. of permanent employment (Nos.) [A]	Period of employment (No. Of days) [B]	No. of man-days [X]=[A]*[B]
Construction phase			

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

CHAPTER-2
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Manpower Requirement	No. of permanent employment (Nos.) [A]	Period of employment (No. Of days) [B]	No. of man-days [X]=[A]*[B]
Permanent employment	100	660	66000
Contractual employment	500	660	330000
Total	900	-	396000

Table: 2.10(b): Break-up of Manpower Requirement for operational phase

Manpower Requirement	No. of Permanent Employment (Nos.) [A]	Period of Employment (No. of days) [B]	No. of Man-days [X]=[A]*[B]
Operation phase			
Permanent employment	150	345	51750
Contractual employment	300	345	103500
Total	450	-	155250

2.6 PROPOSED SCHEDULE FOR APPROVAL AND IMPLEMENTATION

The construction work will be started after getting Environmental Clearance from the SEIAA, Meghalaya and Consent to Establish (CTE) from Meghalaya State Pollution Control Board. The proposed commissioning work will be completed in 24 months.

Table: 2.11: Proposed Schedule for the Project

S. No.	Project Activity	Months											
		2	4	6	8	10	12	14	16	18	20	22	24
1.	Land Acquisition												
2.	Boundary Wall civil work												
3.	Detail Engineering												
4.	Plant machine and Auxiliary order placement												
5.	Civil Construction												
6.	Equipment Delivery												
7.	Fabrication												
8.	Erection												
9.	Final Commissioning												

*Day one will be considered from the issuance of Consent to Establish by Meghalaya State Pollution Control Board

2.7 TECHNOLOGY AND PROCESS DESCRIPTION

Process Description

The manufacturing of cement will be based on dry process technology and essentially consist of the following unit operation steps:

- Crushing of limestone at the mine site.
- Pre-blending of crushed limestone by Stacker & Reclaimer.
- Grinding-cum-Drying of Raw Materials and Coal/ Petcoke/ Dolochar/ Biomass in VRM
- Homogenization of raw meal in a blending silo.
- Clinkerization of the raw meal in a rotary kiln with preheater, calciner and Cooler.
- Grinding, storage and packing of cement
- Transportation of Clinker & Cement through Road & Rail Networks

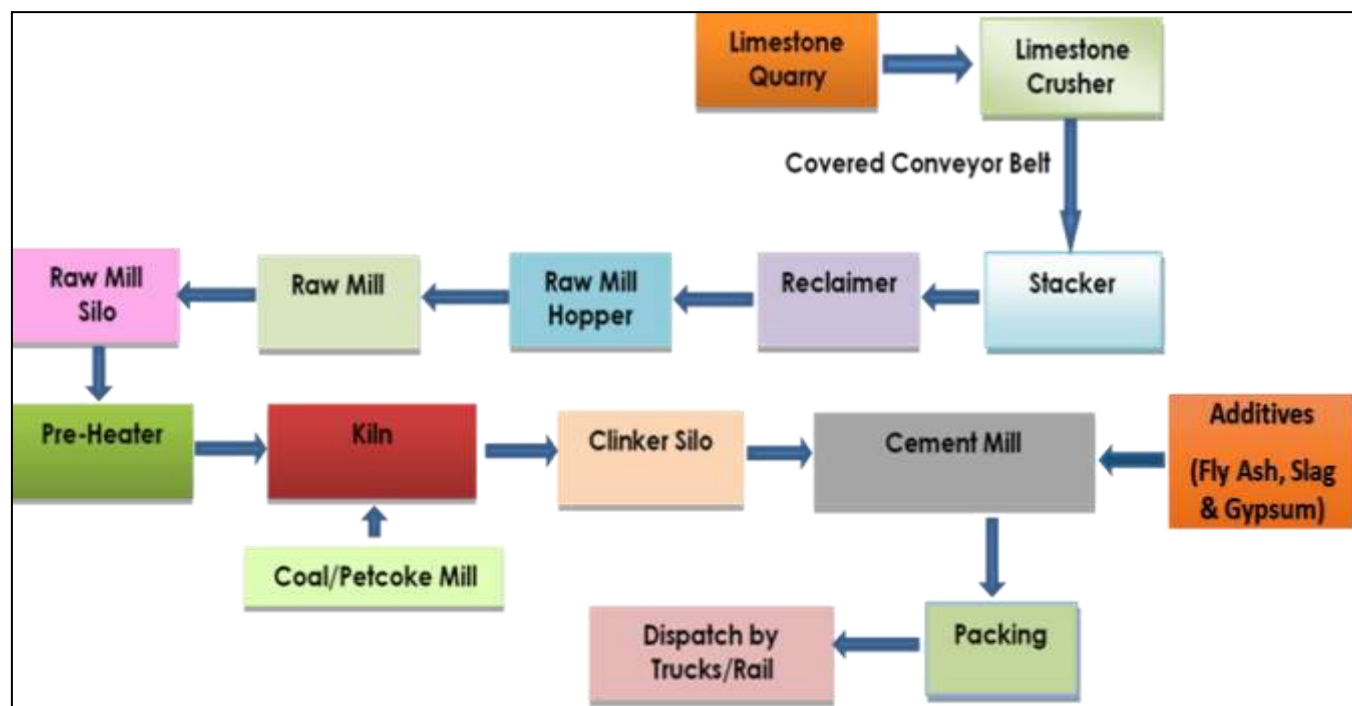


Figure: 2.7: Process Flow Sheet of Cement Plant

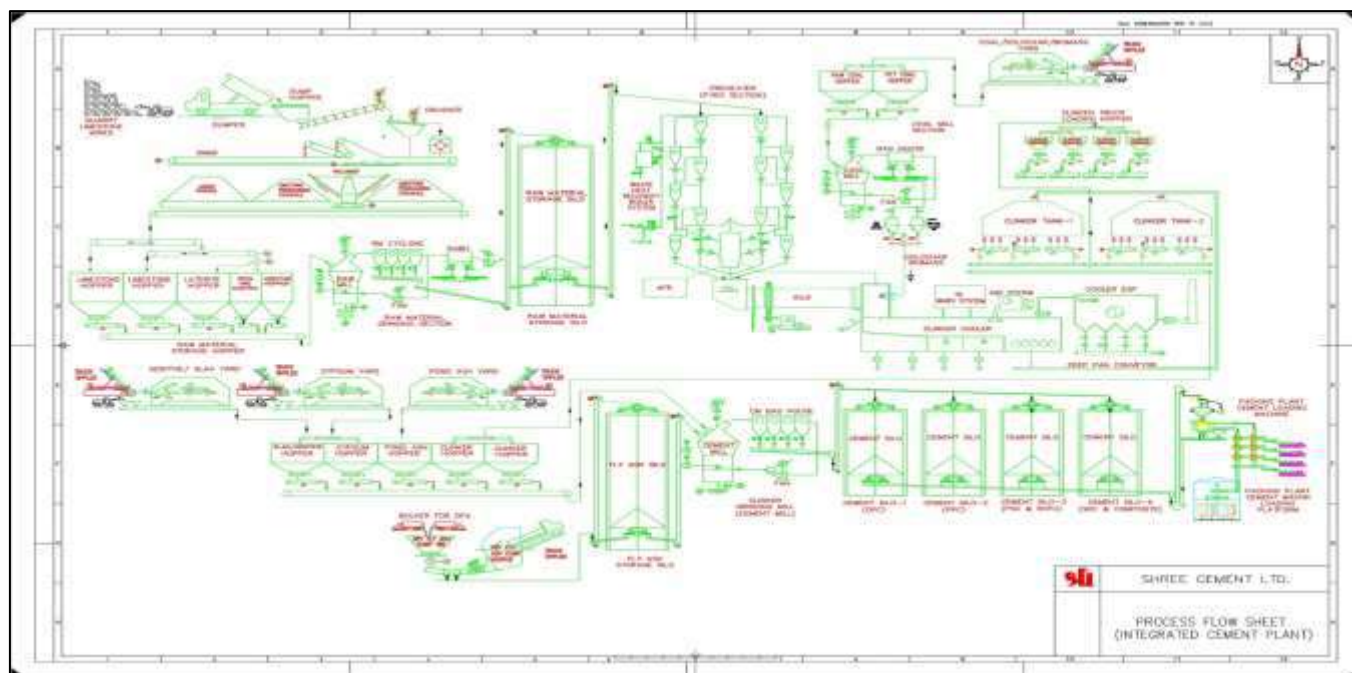


Figure: 2.7(a): Process Flow Diagram

2.7.1 Cement Plant

Technology Description of Cement Plant

○ **Crushing of Limestone at the Mine Site**

The ROM Limestone is fed to crusher Wobbler where >90 mm part is fed into crusher, where it is crushed to <90 mm size. The <90 mm size from crusher Wobbler conveyed for stacking & reclaiming (pre-blending).

○ **Pre-blending of crushed limestone by Stacker & Reclaimer**

The ROM limestone stacked through stacker and reclaimed by Reclaimer.

○ **Grinding-cum- Drying of Raw Materials and Coal & Petcoke in VRM**

Reclaimed limestone with corrective materials (sand, clay, laterite etc.) fed in VRM for grinding. Hot air of pre-heater used for drying of raw-material.

Coal/Petcoke is highly abrasive, therefore, its crushing will be done usually in a roll crusher. The same system is proposed to be used. Grinding of coal & pet coke will be done in ball mill or in vertical roller mill. Use of alternate fuel (hazardous & non-hazardous) will also be considered as per the availability. Because of saving in energy and better drying capacity VRM is proposed for use. Use of Dolochar & Biomass as a fuel will also be considered as per the availability.

○ **Homogenization of raw meal in a blending silo.**

The ground raw meal is conveyed to blending-cum-storage silo(s) by mechanical conveyors. The variation in the quality of raw meal is reduced by using continuous blending silo.

- **Clinkerization of the raw meal in a rotary kiln with preheater, calciner and Cooler:**

In cyclone preheater system, an efficient heat transfer takes place to finally dispersed raw material particles by counter flow with hot gases and grinded raw meal. The preheater is multi stage cyclone system connected with gas ducts and meal chutes. The raw meal is fed into top stage gas duct. The material gets separated from gas in cyclones and then travels downwards and through meal chute is discharged into next lower stage gas duct. In this way, material comes into contact with high temperature gases and gets preheated and partially calcined and then enters the pre-calcinator.

Firing takes place in the calciner and back end of kiln called burning zone. In the calciner, calcination takes place by firing of pulverized coal & pet coke and then material is discharged to the kiln. The feed travels down as the kiln rotates. The chemical reaction completes when the material reaches the burning zone and clinker is formed.

- **Cooling of Clinker**

The clinker is discharged from kiln at around 1000 Deg. C temp and is cooled in a high efficiency grate cooler. The cooled clinker is then transported to clinker storage silo by a set of Deep Bucket Conveyor (DBC).

- **Final Grinding, storage and packing of cement:**

Clinker will be grinded in Cement Mill. Hot air is required for removal of moisture from raw materials. Hot air generated from hot air generator (HAG) having capacity of 8.5 M Kcal/hr. will be installed and Coal (Indian and imported coal), Dolochar & Biomass will be used as fuel in HAG. The hot air generated through a HAG is used for grinding inside the mill and the air exhausted through the mill exhaust and Bag House stack. The grinded cement is conveyed to cement silos for storage of different types of cement (OPC, PPC, LC3, PSC, SRC, RHPC & Composite Cement) from where it is extracted and packed in HDPE bags by electronic rotary packing machines and dispatched to consumers by road. Mechanized loading system for loading of packed bags on trucks is envisaged. NH - 6 located nearest to the proposed project site and same will be used for transportation of raw materials & final products Clinker & Cement.

- **Transportation of Clinker & Cement**

Cement & Clinker will be dispatched to consumers and sister grinding units respectively by road for transportation of material and finish products.

- **SCR Technical Details for reduction of NOx emission**

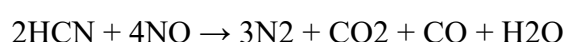
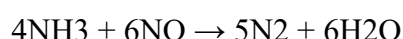
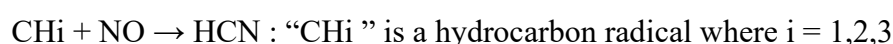
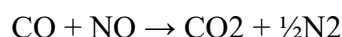
SCR technology will be used for NO_x reduction in rotary kiln. The technical details are given below:–

❖ It works by staging the introduction of fuel, combustion of air and raw meal in a manner to minimize NO_x formation and reduce NO_x to nitrogen. Low NO_x burners & De-NO_x system will be done with Incline Calciner for low NO_x formation and analyzer will also be installed at the inlet of Kiln to monitor O₂ & NO_x

❖ NO_x formed is reduced by maintaining a reducing atmosphere at the kiln feed end by firing fuel in this region. The reducing atmosphere is maintained in the calciner region by controlling combustion air such that the calcining fuel is first burned under reducing conditions to reduce NO_x, and then burned under oxidizing conditions to complete the combustion reaction.

❖ **Creating hot bottom Calciner:** Feed shall be taken from the top stage cyclone and introduced in the middle of calciner. Diverter gate to be added new. One distribution box has to be added new in the calciner and one in the 3 to 2 riser duct. Feed pipe routing and Feed pipe accessories like expansion joints and sluice flaps to be added new.

❖ The following reaction set shows a simplified version of what happens in the process of reducing NO_x.



With this modifications, fresh air availability in the pyro firing was replaced and instead of NO_x generation, quantity of N₂ & CO may increase, resulting NO_x reduction.

❖ **Capacity Enhancement & NO_x Mitigation:**

➤ Clinker Production requires fuel consumption & hence the high NO_x emissions but to overcome impacts on NO_x emissions, installation of new modified NO_x mitigation system will be done & by creating reduction zone to improve fuel combustion result in reduction of NO_x emission naturally within system without adding any additive.

➤ With minor changes in running conventional operational philosophy & additional technological solutions with newly modified system changed the fuel combustion process with effective reduction in NO_x emissions & reliable at higher Production level, but it will require high capital Investment.

Consequently, impacts are reduction in Production level with high power & Heat cost, low plant capacity utilization etc.

Use of High Calorific Hazardous Waste as Alternative Fuels and Raw Material (AFR) in Cement Plant

The co-processing of waste in cement industry is much beneficial option, whereby wastes are not only incinerated at a higher temperature of around 1400 °C and longer residence time but its inorganic content gets fixed within the clinker apart from using the energy content of the wastes. Apart from this, no residues are left, which in case of incineration still requires being land filled as incinerator ash. Further the acidic gases, if any generated during co-processing gets neutralized, since the raw material is alkaline in nature. Such phenomenon also reduces resources requirements such as coal and limestone.

Taking the cognizance of above advantages of co-processing the waste, SCL has explored few hazardous wastes in the area generated by other units for use as AFR, Dolochar and Biomass based on the feasibility and availability of the waste in the area.

Approx. 15% TSR (Thermal Substitution Rate) is proposed in co-processing of Hazardous Waste to reduce the dependency of natural resources i.e., Coal. This TSR may further increase/ decrease depending on the availability of AFR.

Thus, taking the cognizance of above advantages of co-processing the waste, Shree Cement Ltd. have explored few hazardous wastes in the area generated by other units and will be utilizing them as AFR.

Based on the availability of waste in nearby area, the above-mentioned wastes will be used as AFR. Proper storage and feeding system will be installed for proper utilization of waste. Prior authorization will be obtained from GPCB. Details of feeding system to be installed is given below:

Equipment

- **Ground hopper-** Ground hopper of 10 MT capacity at ground floor of preheater tower for feeding AFR to Conveying System Mono rail hoist or bucket elevator.
- **Mono Rail Hoist/ Bucket elevator-** To lift/ transport the waste from preheater ground floor to the floor where AFR/ Waste is actually entered into the kiln inlet/ Calciner.
- **Feed Hopper of 2 m³ Capacity-** To keep buffer stock of 0.5 Ton at preheater floor where feeding takes place.
- **Sacrificial belt conveyor-** The material from feed hopper is fed to variable speed drive to feed AFR in into the kiln/ calciner in a controlled way.
- **Double flap valve-** from Sacrificial belt conveyor material enters to double flap valve where two

pneumatically controlled gates operate in a sequence in such a way that at a time one gate always remains closed to avoid false air intake into kiln.

- **Automatic Shut gate-** For safety of other equipment like conveyor etc. pneumatically operated shut gate provided at entry of waste/AFR into calciner/ kiln inlet which automatically closes along with other equipment when kiln stops or is under positive Pressure.

Approved Hazardous waste by CPCB and MSPCB will be only used in co-processing after taking prior permission from concerned competent authority.

Final Grinding, storage and packing of cement:

Clinker will be grinded in Cement Mill. Hot air is required for removal of moisture from raw materials. Hot air generated from hot air generator (HAG) having capacity of 8.5 M Kcal/hr. will be installed and Coal (Indian and imported coal), Dolochar & Biomass will be used as fuel in HAG. The hot air generated through a HAG is used for grinding inside the mill and the air exhausted through the mill exhaust and Bag House stack. The grounded cement is conveyed to cement silos for storage of different types of cement (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) from where it is extracted and packed in HDPE bags by electronic rotary packing machines and dispatched to consumers by road. Mechanized loading system for loading of packed bags on trucks is envisaged. National Highway (SH- 6) located nearest to the proposed project site and same will be used for transportation of raw materials & final products Clinker & Cement.

Transportation of Clinker & Cement

Cement & Clinker will be dispatched to consumers and sister grinding units respectively by road networks for transportation of materials and finish products.

Process Flow Diagram

Process Flow Diagram of cement manufacturing process is given in Figure – 7(a).

2.7.2 Technology Description of Captive Power Plant (Air Cooled) - 1 x 15 MW

In the proposed Captive Power Plant, power will be generated by the utilization of thermal energy of steam to rotate the turbine that in turn rotates an alternator. The steam will be generated in the boiler by burning of coal as the fuel. The generated steam will be utilized to rotate the Steam Turbine, which will in turn rotate an alternator (electric generator) to generate electricity/power.

Coal will be transported by truck at project site where the trucks will be unloaded by truck tippler in the Coal bunker. The Coal will be fed in the coal crusher to crush it into the required size through a vibro-

feeder that regulates the flow. The crushed coal will be fed into the boiler bunkers through the belt conveyor.

After receiving the coal in the CFBC boiler bunkers, it will be fed into the boiler furnace through rotary/drag chain feeders in controlled quantities. The coal will be combusted into the furnace & the resulted heat will be utilized to heat the water & convert it into steam. The flue gases which will be generated will be passed through the tubes of economizer & air pre-heater to utilize the heat carried by the flue gases going outside, to capture the waste heat. Now, the flue gases would pass through the ESP (Electro Static Precipitator) to the chimney. Limestone will be fed to capture the emissions of SO₂.

The water will be received by raw water treatment plant. Here, water will be treated to get the required quality then it will be treated with lime & dolomite in the High-Rate Solid Contact Clarifier. Then clarified water will be fed to the RO plant where its properties will be fine-tuned to the required quality for DM system. In the DM plant, the required properties of water will be obtained and this DM water will be fed to the boiler to generate steam. The cooling tower will be fed with the RO water for its replenishment. The generated steam in the boiler at required parameters will be passed through the turbine through the control valve. In turbine, the thermal energy of steam will be utilized to rotate it. The turbine in turn will rotate an alternator. The generated electricity will be evacuated from the alternator through a bus bar arrangement.

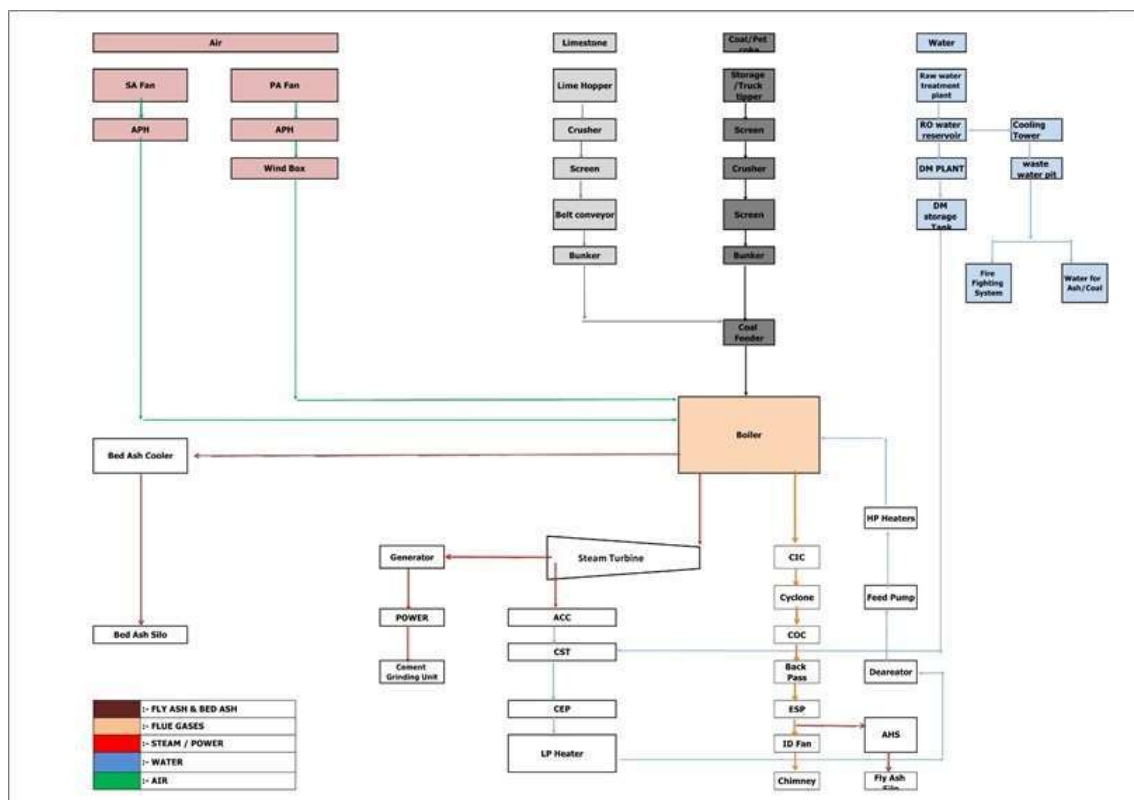


Figure:2.8: Process Flow Diagram - Captive Power Plant

2.8 OTHER PROJECT ASSOCIATED ACTIVITIES

2.8.1 Waste Heat Recovery System (7 MW)

SCL is also proposing to install Waste Heat Recovery System (WHRS) of 7 MW for re-utilization of the exhaust gases from the Pre - heater / cooler to generate electric power and consequently reduce consumption of grid power.

There is a good amount of waste heat available from the expelled gases of Pre-Heaters (PH) and Air Quenched Coolers (AQC). The energy used in cement plant consists of heat energy and electrical energy. About 90% of the energy is used as heat energy in process, a large amount of heat is consumed for burning limestone at more than 1450-degree C to form clinker. From the total heat consumed in this process, around 55% is utilized and the rest 45% is discharged as sensible heat through the exhaust gases of Pre-Heater (PH), AQC, radiation & sensible heat carried out by clinker.

However, around 10% of the heat, extracted from the PHs & AQCs, is used in drying the raw material and coal while grinding. The rest 35% is generally emitted to the atmosphere as waste heat. For reutilization of this waste heat from the exhaust gases of the PH & AQC, this Waste Heat Recovery

System is used to generate the electrical power. A typical heat flow in cement plants with waste heat recovery system is shown below:

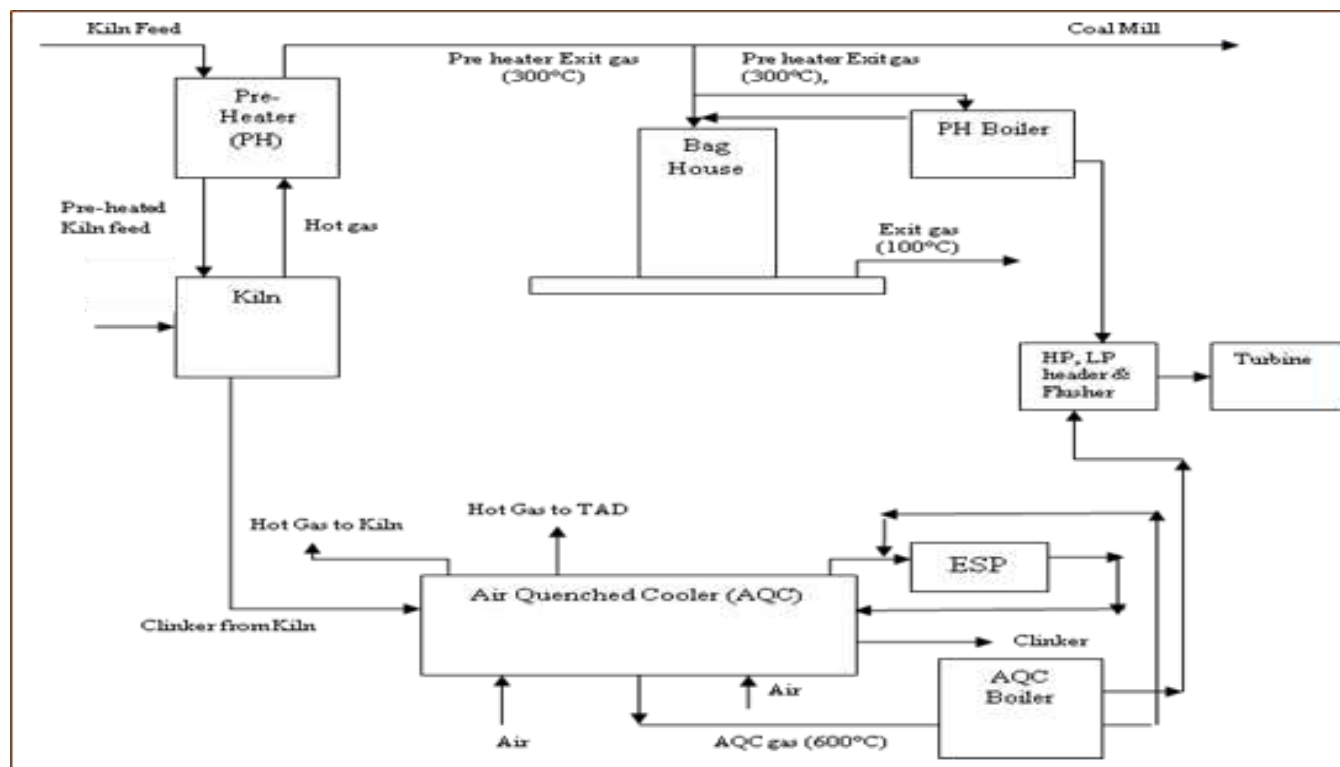


Figure: 2.9: Process Flow Diagram for WHRS

Considering the above, SCL decided to install one Waste Heat Recovery System (WHRS) at kiln Pre-heater and one Waste Heat Recovery System (WHRS) at AQC (Mid tap-off). Steam generated will be combined and fed to steam turbine for power generation. In this scheme, Waste Heat Recovery System (WHRS) at Kiln Pre-heater will be installed. In normal conditions, the flue gas from the top of the Pre-heater directly goes to bag house but now, the flue gas from the top of the Pre-heater will go to the WHRB and after that it will enter to Bag house. WHRS is used for re - utilization of the exhaust gases from the Pre - heater / Cooler to generate electric power and consequently reduce consumption of grid power. The project will contribute to the more efficient use of energy and will reduce reliance on exhaustible fossil fuel.

In the cement plant, WHRS will consist of two waste heat recovery boilers viz.

Pre Heater (PH) boiler: PH boiler will be installed after Pre - heater and recovers heat from Pre – heater exhaust gases.

➤ **Clinker Cooler (AQC) boiler:** Clinker cooler or Air Quenching Cooler (AQC) boiler will be installed

at clinker cooler and recovers heat from Clinker cooler exhaust gases.

The PH boiler will be a vertical configuration single drum boiler. AQC boiler will be vertical single drum boiler. Both the boilers are top supported, outdoor unit suitable for the specified Pre-heater and clinker cooler exhaust of cement plant.

The waste heat coming out of Pre- heater and cooler will be used in WHRS to produce low pressure steam which is further fed to turbine for producing power of 7 MW.

Table: 2.12: Design Basis for WHRS

Sr. No.	Description	Unit	Kiln	
			AQC	PH
1.	Clinker Capacity	Million TPA	0.81	
		TPD	2462	
2.	Flue gas flow	Nm ³ /Hr	111101	129346
3.	Inlet temperature	°C	600	295
4.	Specific heat	kcal/Nm ³ c	0.35	0.36
5.	Exhaust Gas temperature	°C	140	130
6.	Heat Available	Crore Kcal/Hr	1.787	0.77
7.	Total Heat Available	Crore Kcal/Hr	2.56	
8.	Max. Heat (Low Grade Energy) available	MW	29.73	
9.	Power Generation	MW	6.99 (Say 7 MW)	

➤ **Benefits of Waste Heat Recovery**

Benefits of ‘waste heat recovery’ can be broadly classified in two categories:

❖ **Direct Benefits:**

Recovery of waste heat has a direct effect on the efficiency of the process. This is reflected by reduction in the utility consumption & costs and process cost.

❖ **Indirect Benefits:**

- **Reduction in pollution:** A number of toxic combustible wastes such as carbon monoxide gas, sour gas, carbon black off gases, oil sludge, and other plastic chemicals etc. releasing to atmosphere if/ when burnt in the incinerators serves dual purpose i.e., recovers heat and reduces the environmental pollution levels.
- **Reduction in equipment sizes:** Waste heat recovery reduces the fuel consumption, which leads to reduction in the flue gas produced. This results in reduction in equipment sizes of all flue gas handling equipment such as fans, stacks, ducts, burners, etc.

- Reduction in auxiliary energy consumption: Reduction in equipment sizes gives additional benefits in the form of reduction in auxiliary energy consumption like electricity for fans, pumps etc.

2.9 SEWAGE TREATMENT PLANT

The domestic effluent will be treated in Sewage Treatment Plant of 20 KLD capacity and treated water will be used for greenbelt development & plantation.

Process description of STP plant Screen:

Screen is mechanical filter used to remove large objects from wastewater. The Sewage is first allowed to pass through screen chamber where heavy waste, floating materials are trapped. Due to this blockage or choking of downstream equipment's is avoided.

Equalization:

The sewage from the bar screen chamber, grit trap and oil & grease stripper comes to the equalization tank. It is first collection tank of the STP, it acts as buffer: to collect the incoming raw sewage that comes at widely fluctuating rates, and pass it on to the rest of the STP at a constant flow rate.

Biological Treatment:

The equalized sewage is passed into the MBBR tank. The bulk of the treatment is provided here, employing microbes/bacteria for the process, where BOD and COD treatments are enhanced. Oxygen is supplied by means of diffused aeration system. The components of the aeration tank are mixed completely. For higher surface area for micro-organisms, floating media (MBBR) is provided on which their growth takes place. The MBBR process works on the principle of attached growth system and uses rotating bio-media to retain an active biomass to reduce the influent BOD levels.

Sludge Settling:

The bio treated waste water passed through the settling tank, where the biomass gets settle at the bottom and the clear water overflows from the top of settling tank for filtration. Settled sludge has been pumped periodically.

Membrane diffuser:

Dual Media Filter (DMF): The treated sewage is passed to Dual Media Filter (DMF) for removing of turbidity, suspended solids and odour of treated sewage. Dual media filters provide very efficient particle removal under the conditions of high filtration rate.

Activated Carbon Filter (ACF): It receives the water that is already filtered by the Pressure Sand Filter and improves the multiple quality parameters of the water like BOD, COD, turbidity, colour and odour.

Softener: After filtration water is passed through Softener to reduce total hardness.

Disinfection: The treated water is then disinfected using Sodium hypochlorite (NaOCl)/ UV treatment to kill and render harmless disease-causing organisms, such as bacteria, viruses, etc. Sodium Hypochlorite is dosed for disinfection of the treated water.

Finally, the treated water will be collected in the treated water tank for further uses in greenbelt development & plantation and gardening activities.

Table : 2.13 Parameters of Raw Sewage and Treated Water

S. No.	Parameters	Expected Quality of Raw Sewage	Quality of Treated Sewage
1.	pH	6.0 - 9.0	6.5 - 7.5
2.	BOD	250 - 300 mg/L	< 10 mg/L
3.	Total Suspended Solids	300 - 450 mg/L	< 200 mg/L
4.	COD	300 - 400 mg/L	< 50 mg/L
5.	Oil & Grease	10 - 20 mg/L	< 10 mg/L

The schematic diagram for sewage treatment plant has been shown in Figure - 2.13.

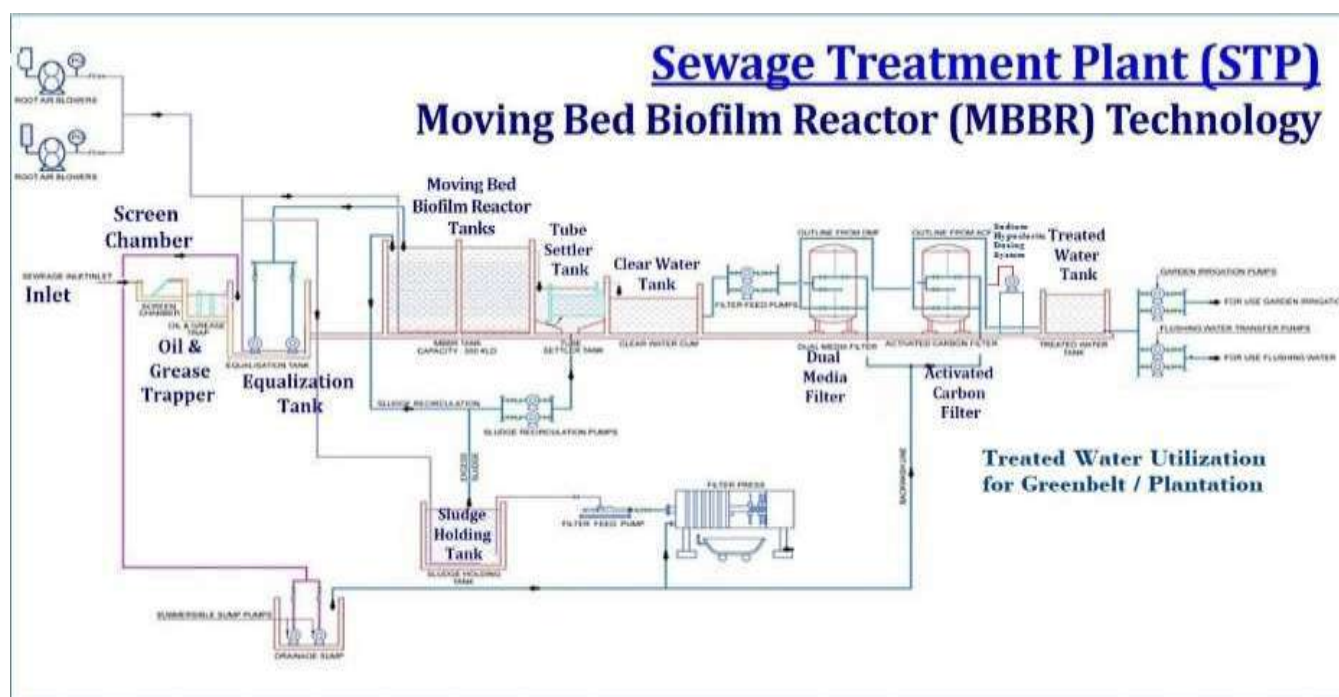


Figure: 2.10: Schematic Diagram for Sewage Treatment Plant

2.10 Reverse Osmosis (RO) Process Description

The reverse osmosis process consists of three main steps: (1) Pre-treatment, (2) Membrane Assembly System and (3) post-treatment.

Pre-treatment

The purpose of the pre-treatment step is to avoid any risk of clogging, fouling or scaling of the membrane. Pre-treatment is an important aspect of RO system. All RO devices require pre- treatment to remove the suspended solids, scalants, foulants and colloidal matter. In the pre- treatment system, some chemicals are usually used before the filtration step. Chlorine is often injected to disinfect feed water. Sodium Meta bisulphate is used to dechlorinate the feed water. Ferric chloride, alum or polymers are the typical coagulants used at the prefilter stage. In the filtration stage, a gravity filter with different sand particle sizes is used. Then a fine cartridge filter is used after the sand filtration. For ground water treatment, Hydrochloric acid and sodium hexameta phosphate (SHMP) is often used to prevent carbonate scale. The exact dosage of each chemical depends on the chemical analysis of the feed water.

Membrane Assembly System

Several types of RO membranes are commercially available. These are prepared either as flat sheet or as hollow fibers made from cellulose acetate (CA) ester or polyamide (PA). There are different ways of packing RO membranes. Of these, three configurations have been produced commercially: tubular, spiral wound (SW) and hollow fine fiber (HFF). Hollow fine fiber and spiral wound modules have proved to be appropriate for several types of raw water in RO desalination systems. Spiral wound has found many applications in the wastewater reclamation. The success of the spiral-bound device has been related to the capability to package a relatively large amount of membrane surface area into a relatively small element while maintaining a certain degree of "cleavability", which, of course, is particularly important for wastewater processes.

Post-treatment

In the post-treatment step, product water passes through a decarbonation system, a pH adjustment system and water passing through UV light. Generally, Sodium Carbonate (Food Grade) is added to the product water to adjust its alkalinity. The purpose of passing the water through UV is to eliminate the presence of microorganisms during storage and distribution.

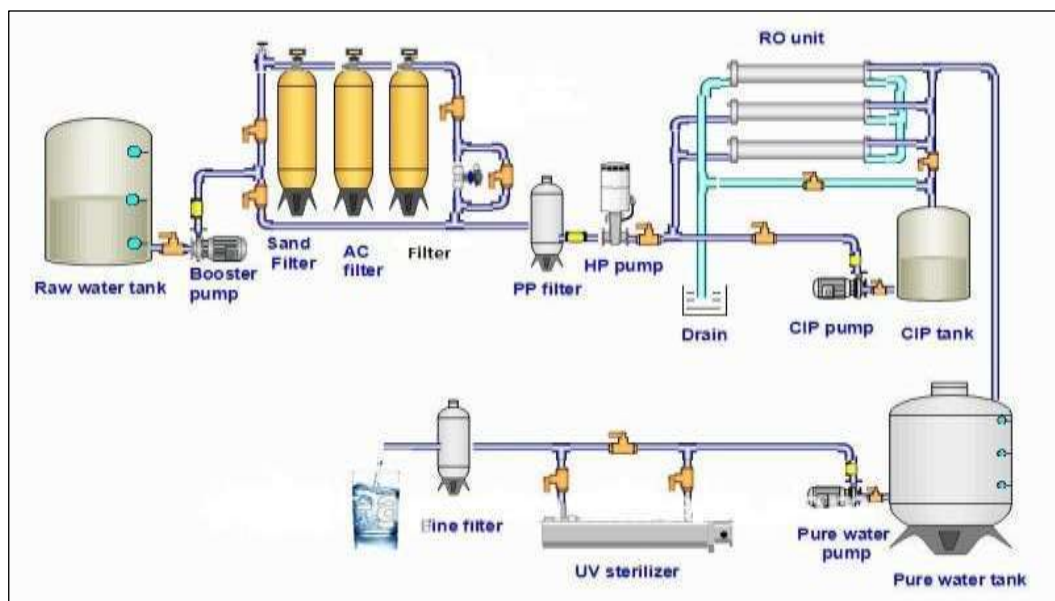


Figure :2.11: Schematic Diagram for Reverse Osmosis

2.11 EQUIPMENT DETAILS - CEMENT PLANT

Equipment Selection

A list of equipment and storages capacities are given below. In selecting a particular type of equipment or storage for the project, among others, the following issues have been considered:

- Equipment costs
- Energy consumption
- Raw material characteristics
- Sizes in which the equipment is available
- Lead times for particular types of equipment
- Operating experience with various types of equipment
- Ease of operation of equipment
- Product to be manufactured
- Site conditions
- Local skills available
- Environmental issues

2.11.1 Plant Equipment Sizing

Table: 2.14: Major Equipment and Storage Capacity

S.No.	Section	Unit	Specifications
A	Pyro section		
1.1	Lime Stone Crusher	TPH	500

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

CHAPTER-2
PROJECT DESCRIPTION

1.2	Lime Stone Stacker	TPH	550
1.3	Lime Stone Reclaimer	TPH	500
1.4	Lime Stone Hopper (RCC) (02 No's)	MT	350
1.5	Correctives (03 No's)	MT	125
2.1	Raw Mill VRM/Ball Mill	TPH	225
2.2	Raw Meal Silo	MT	5000
2.3	Raw mill/ kiln bag house	m3/hr	525000m3/hr PJBH
3.1	Coal Mill		VRM
		TPH	15
3.2	Coal Mill Bag House	m3/hr	95000
3.3	Raw Coal Hoppers (02 No's)	MT	100
3.4	Fine coal storage bin x 2 Nos	MT	100
4.1	Preheater		Single String
4.2	Kiln	TPD	3000 tpd/ 0.95 MTPA
4.3	Cooler	m2	75
4.4	DPC	TPH	250
4.5	Clinker tank	MT	1 x 35000
4.6	Truck Clinker loading hopper	MT	2 x 400
B	Grinding unit 01 No.		
1	Cement Mill	VRM	145 tph/ 0.99 MTPA
1.1	Bag house	m3/hr	4,50,000
1.2	Cement mill feed hoppers		
a	Clinker hopper		250 MT x 02 No
b	Gypsum hopper		200 MT x 01 No
c	Pond ash hopper		200 MT x 01 No
d	Gitty Hopper		200 MT x 01 No
2	Flyash Handling System		
2.1	Fly Ash Silo (Steel)	MT	2500
3	Raw material unloaders		
3.1	For Gypsum /pond ash		1 No x Cap. 100 T
3.2	For Coal		1 No x Cap. 100 T
3.3	For Corrective		1 No x Cap. 100 T
3.5	For fly ash		Pneumatically unloading
8	Cement silo		
8.1	OPC silo	No.	1 x 5000
8.2	PPC silo	No.	1 x 5000
8.3	Composite silo	No.	1 x 2000
8.4	Rapid Hardening Portland Cement	No.	
9	Packing plant		
9.1	ROTO Packer (16 Spout)	No.	2
9.2	Truck loader	No.	6
C	Storage Capacity (Covered yard)		
1	LS Stock Pile	MT	2 x 35000
2	Correctives	MT	3 x 3500

3	Pond ash	MT	5000
4	Gypsum/ Slag	MT	5000
5	Coal	MT	5000

2.11 INFRASTRUCTURE FACILITIES

Recognizing manpower as a key factor of production, the following infrastructure facilities will be provided for laborers and employees to ensure their well-being, safety, and productivity.

A. During Construction Phase

The following worker welfare facilities will be established at the construction site:

- **Accommodation Standards:** Provision of adequate living space with a defined minimum floor area per person or family.
- **Potable Water Supply:** Ensured supply of safe and sufficient water for all personal and domestic needs.
- **Sanitation & Waste Management:** Installation of adequate sewage systems and dedicated facilities for garbage disposal.
- **Shelter & Safety:** Provision of accommodation that offers appropriate protection from weather elements (heat, cold, damp), noise, and fire hazards.
- **Health & Hygiene Amenities:** Access to adequate sanitary, laundry, and cooking facilities, along with proper storage, ventilation, and lighting.
- **On-Site Medical Care:** Availability of medical facilities to address health concerns promptly.

B. During Operation Phase

The following facilities will be maintained for the long-term workforce:

- **Workplace Amenities:** Designated facilities such as canteens, restrooms, and dedicated rest areas for breaks.
- **Occupational Health & Safety:** Implementation of comprehensive OHS protocols, including readily available first-aid facilities.
- **Personnel Security:** Measures to ensure the safety and security of all workers within the premises.
- **Employee Healthcare:** Continued access to medical facilities for all operational staff.

2.12 DESCRIPTION OF MITIGATION MEASURES

To ensure the project meets all environmental standards, this section details specific measures to manage plant-generated emissions, wastewater, and solid and hazardous waste. The goal of these actions is to

minimize the project's environmental footprint. Comprehensive mitigation plans covering these areas are further elaborated in Chapters 4 and 10.

Table:2.15: Details of Emissions from the Plant and their mitigation

Emissions	Source		Proposed APCE's/ Mitigation measures
	Plant Unit	Section	
PM	Cement Plant	Raw Mill & Kiln	1 Nos. Bag House
		Coal Mill	1 Nos. Bag House
		Clinker Cooler	1 Nos. ESP
		Cement Mill	1 Nos. Bag House / Bag Filters
	CPP	CFBC Boiler	1 Nos. ESP
SO ₂	Cement Plant	Raw Mill & Kiln	Due to the interaction of raw materials and kiln gases, rotary kiln systems have inherent SO ₂ removal efficiencies ranging between 40-99% of the Sulphur input to the system.
NO _x	Cement Plant	Raw Mill & Kiln	- Low NO_x burners & De-NO_x system - Incline Calciner for low NO_x formation Installation of analyzer at the inlet of Kiln to monitor O ₂ & NO _x
	CPP	Boiler	Adequate stack height (as per CPCB guidelines) will be provided.
Fugitive Emission	Cement Plant & CPP	Raw Material Handling & Storage	Iron Ore, Bauxite & Pond ash will be stored in the covered sheds/Yards. 35 Nos. Bag filter at Clinkerization Pyro Plant, 33 Nos. Bag filter at Cement Mill and 5 Nos. Bag filter at CPP Boiler will be installed to control
		Transportation activity	Proposed APCE's/ Mitigation measures fugitive emission. - Covered Conveyor belts will be used for transfer of raw materials / finished products inside the plant. - Fly ash will be received through closed bulkers & fed into silo through pneumatic system. - Raw Meal, Clinker, Fly ash and Cement will be stored in the silos. - Gypsum, Slag, Dolochar, Biomass, Coal and Petcoke will be stored in the covered sheds. - Sulphuric Acid will be stored in Storage Tanks with an additional Blank tank. - Water sprinkling will be done to control dust. - Proper maintenance of vehicles will be done to reduce gaseous emissions.

			- o Using/allowing PUC certified vehicles inside the plant premises. - o All the movement area will be concreted. - o Using Vacuum sweeping machine for better housekeeping. - o 32.99% (Say 33%) of area (8.27 ha) will be developed under greenbelt & plantation

Stack Emissions

To keep the PM emissions from stack below 30 mg/Nm³, all major sources of air pollution (i.e., Raw Mill & Kiln, Clinker Cooler, Coal Mill & Cement Mill) will be provided with adequate state of art, latest & high efficiency Air Pollution Control Equipment such as Bag House, ESP & Bag Filters. Venturi Scrubber & ESP. List of air pollution control equipment along with sources is given in Table - 2.18.

Table :2.16: List of Air Pollution Control Equipment

S. No.	Source	No. of Pollution Control Equipment	Proposed Pollution Control Equipment	Efficiency
1.	Raw Mill & Kiln	1	Bag House	99.99%
2.	Coal Mill	1	Bag House	99.99%
3.	Clinker Cooler	1	ESP	99.95%
4.	Cement Mill	1	Bag House/ Bag Filters	99.99%
5.	CPP	1	ESP	99.95%
6.	Limestone Crusher	1	Bag Filter	99.99%

Emissions Monitoring and Control

Routine monitoring of all stack emissions is mandated to track pollutant concentrations. A comprehensive maintenance program for the baghouse includes the scheduled replacement of filter bags, performance evaluations, and the upkeep of ID fans. The facility will also gather performance data on both the baghouse and ESP in relation to process and production variables to maximize efficiency. The integrated cement plant will use bag filters and baghouses specifically engineered for superior performance under higher loads and gas flow, guaranteeing adherence to environmental regulations.

Material Transfer and Fugitive Dust Control

Dust generation from conveyor belt transfer points will be managed through the following measures:

- Clinker will be moved to its silo using enclosed conveyor belts to minimize fugitive dust.
- Fly ash will be transferred pneumatically from bulkers to prevent emissions during transport.

- To further mitigate dust, efficient bag filters will be installed at all material transfer points. Specifications for these bag filters are available in the table below.

Table: 2.17: Details of Proposed Bag Filters for Clinkerization Pyro Plant

CLINKERISATION								
S. No.	Application		Material	Qty	Capacity (m3/hr)	Inlet Dust Load (g/m³)	Outlet Dust Load (g/m³)	Temp. °C
A	Bag House & ESP							
1	Clinker Cooler ESP		Clinker dust	1	475000	20	≤20	300
2	Raw mill Bag House		Clinker dust	1	525000	100	≤10	260
3	Coal Mill Bag House		Coal Dust	1	95000	300	≤10	120
B	Bag Filter for Plant							
a	Limestone / Kiln Feed							
1	Primary Crusher	At Primary crusher house	LS DUST	1	35000	50	<10	50
2	Tranfer tower 1	Limestone Belt Conveyor to Stacker	LS DUST	1	7500	50	<10	50
3	Tranfer tower 2	Limestone Belt Conveyor to Stacker	LS DUST	1	7500	50	<10	50
4	Tranfer tower 3	Limestone Belt Conveyor to Stacker	LS DUST	1	7500	50	<10	50
5	Tranfer tower 1	Limestone belt con from stacker to RM Hopper	LS DUST	1	7500	50	<10	50
6	RM hopper	At Lime stone hopper top	LS DUST	1	10000	50	<10	50
7	RM hopper Extraction	At RM hopper Extraction	LS DUST	1	10000	50	<10	50
8	RM hopper	At Laterite hopper top	LS DUST	1	7500	50	<10	50
9	Raw Mill - Recirculation	At Raw mill building top	LS DUST	1	15000	50	<10	100
		At Raw mill building bottom	LS DUST	1	10000	50	<10	100
10	Raw meal transport	At Cyclone Building (BE + AS)	LS DUST	1	7500	50	<10	100
		At silo BE boot, AS, Kiln feed bin BE boot and CC from RABH	LS DUST	1	7500	50	<10	100
11	Blending silo	At silo Top	LS DUST	1	10000	50	<10	100
12	Blending silo	At silo bottom	LS DUST	1	15000	50	<10	100
13	For Blending silo Bin	At Control bin	LS DUST	1	5000	50	<10	100

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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14	Kiln feed bin	For Kiln Feed Bin feed, extraction, PH feed BE boot	LS DUST	1	15000	50	<10	100
15	Preheater	PH Building Top	LS DUST	1	10000	50	<10	100
b	Laterite							
16	Dump Hopper	Bagfilter at Laterite Dump Hopper	LATERITE DUST	1	20000	50	<10	50
17	Transfer tower 6	Laterite Belt Conveyor	LATERITE DUST	1	6500	50	<10	50
18	At Laterite Hopper Top	Laterite Belt Conveyor	LATERITE DUST	1	6500	50	<10	50
c	Coal							
19	Transfer tower	Coal Belt Conveyor	Coal dust	1	5000	50	<10	50
20	Coal mill building	Coal mill building reject recirculation	Coal dust	1	6500	50	<10	50
21	Coal Mill Hopper Top	Raw coal hopper top	Coal	1	10000	50	<10	50
22	At Fine coal Storage	Fine coal building	Coal dust	1	6500	50	<10	50
d	Clinker tank extraction & Clinker Loading							
23	DPC	At deep pan conveyor						
24	Clinker tank -1 top	At Top of the clinker tank-1	Clinker Dust	1	35000	50	<10	175
25	Clinker tank-1 extraction head end	Bag filter for clinker Extraction at head clinker silo-1	Clinker Dust	1	15000	50	<10	150
		Bag filter for clinker Extraction at head clinker silo-1	Clinker Dust	1	15000	50	<10	150
26	Clinker tank-1 extraction tail end	Bag filter for clinker Extraction at Tail clinker silo-1	Clinker Dust	1	10000	50	<10	150
		Bag filter for clinker Extraction at Tail clinker silo-1	Clinker Dust	1	10000	50	<10	150
30	Transfer tower	Clinker Belt Conveyor	Clinker Dust	2	10000	50	<10	150
32	At Clinker TL hopper	At Clinker truck loading hopper	Clinker Dust	2	10000	50	<10	150
33	Truck loading	Bag Filter for Clinker Truck Loading	Clinker Dust	2	5000	50	<10	120
Total Quantity				35				

Table :2.18: Details of Air Pollution Control Measures (Grinding Section) List of Bag Dust Collectors (Grinding Section)

GRINDING SECTION								
S. No.	Application		Material	Quantity	Capacity (m3/hr)	Inlet Dust Load (g/m³)	Outlet Dust Load (g/m³)	Temp. °C
A	Bag House							
1	Cement Mill Bag House		Cement Dust	1	450000	450	≤10	120
B	Bag Filter for Plant							
a	Clinker Transport & Grinding							
1	Clinker hopper	Bag Filter for Clinker Hopper 1 & 2 Top	Clinker Dust	1	15000	50	<10	100
2	Mill hopper extraction	For Hopper Extraction Weigh Feeders	Clinker Dust	1	10000	30	<10	120
3	Tranfer tower	Cement Mill Hopper Ext.Belt Conveyor	Clinker Dust	1	7500	30	<10	120
4	Mill Recirculation	Mill Recirculation	Clinker Dust	1	7500	30	<10	120
b	Coal							
5	Coal dump hopper	At Coal dump hopper	Coal dust	1	15000	30	<10	50
6	Tranfer tower	Coal Belt Conveyor	Coal dust	1	7500	30	<10	50
7	Tranfer tower	Coal Belt Conveyor	Coal dust	1	7500	30	<10	50
c	Dry Flyash Handling							
8	Flyash silo top	Dry Flyash Silo venting	Flyash	1	10000	30	<10	50
9	Flyash silo bottom	Dry Flyash Silo Bin venting	Flyash	1	5000	30	<10	50
10	Flyash extraction elevator	Dry Flyash Silo Extraction	Flyash	1	5000	30	<10	50
d	Gypsum Handling							
11	Dump hopper	Bagfilter at Gypsum Dump Hopper	Gypsum Dust	1	20000	30	<10	50
12	Tranfer tower	Gypsum/ Gitti Belt Conveyor	Gypsum Dust	1	6500	30	<10	50
13	Cement mill-Gypsum Hopper	Gypsum/ Gitti hopper	Gypsum Dust	1	10000	30	<10	50
e	Pond Ash Handling							

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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14	Dump hopper	Bagfilter at Pond ash Dump Hopper	Gypsum Dust	1	20000	30	<10	50
15	Transfer tower	Pond ash Belt Conveyor	Gypsum Dust	1	6500	30	<10	50
f	Cement transport, storage & Packing							
16	Cement mill building top	Bag House Transport Airslide	Cement Dust	1	15000	30	<10	120
17	Cement mill building bottom	Airslide & elevator bottom	Cement Dust	1	10000	30	<10	120
18	Silo-1	PPC Silo Top	Cement Dust	1	10000	30	<10	120
19	Silo-2	OPC Silo Top	Cement Dust	1	7500	30	<10	100
20	Silo-3	Composite Silo Top	Cement Dust	1	7500	30	<10	100
22	Silo-1	PPC Silo Extraction	Cement Dust	1	5000	30	<10	100
23	Silo-2	OPC Silo Extraction	Cement Dust	1	5000	30	<10	100
24	Silo-3	Composite Silo Extraction	Cement Dust	1	5000	30	<10	100
26	Silo-1	Silo Bin venting	Cement Dust	1	5000	30	<10	100
27	Silo-2	Silo Bin venting	Cement Dust	1	5000	30	<10	100
28	Silo-3	Silo Bin venting	Cement Dust	1	5000	30	<10	100
30	Packer 1	Airslide and Elevator Boot	Cement Dust	1	7500	30	<10	100
31		Roto packer dedusting	Cement Dust	1	40000	30	<10	100
32		Roto packer aux. dedusting	Cement Dust	1	20000	30	<10	100
33	Packer 2	Airslide and Elevator Boot	Cement Dust	1	7500	30	<10	100
34		Roto packer dedusting	Cement Dust	1	40000	30	<10	100
35		Roto packer aux. dedusting	Cement Dust	1	20000	30	<10	100
36	Bulk Loading	Cement Bulk Loading	Cement Dust	1	5000	30	<10	100

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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Total Quantity		33			

2.13 TECHNOLOGY AND TECNOLOGICAL ASSESSMENT

- **Production Process:** The plant will utilize modern, tested dry-process technology, including a vertical raw mill and rotary kiln for clinker, and a roller press system for cement production.
- **Efficiency:** High-efficiency separators and advanced, energy-efficient equipment will be used to minimize fuel and power consumption.
- **Environmental Compliance:** State-of-the-art pollution control equipment will ensure all emissions meet the standards prescribed by the MoEF&CC.
- **Automation:** The plant will be fully automated with the latest technology for streamlined and reliable operations.

2.14 SUMMARY & CONCLUSION

Shree Cement Limited is proposing a Check Status- Clinker: 0.95 million TPA; Cement: 0.99 million TPA (OPC, PPC, LC3, PSC, SRC, RHPC & Composite Cement); CPP: 15 MW; WHRS: 7 MW; DG Sets: 2500 KVA (1 x 2500 KVA or 2 x 1000 KVA & 1 x 500 KVA or 1 x 1000 KVA, 2 x 500 KVA & 2 x 250 KVA) located at Village: Daistong, Elaka: Nongkhlieh Dolloiship, District: East Jaintia Hills (Meghalaya). The plant will use modern, dry-process technology and will be fully automated to reduce technological risks and optimize energy use. The company plans to use waste materials as alternative fuels and maintain "Zero Liquid Discharge" by treating and reusing water. The project is intended to meet regional cement demand and will create direct and indirect employment opportunities.

3.0 INTRODUCTION

This chapter aims to establish the baseline environmental conditions around the proposed plant site, which is a critical step for identifying, predicting, and assessing the project's potential impacts. Between March 2025 and May 2025, a field assessment was performed within a 10 km radius, gathering data on key environmental components, including meteorology, air, noise, water, soil, biology, and socio-economics. The study was conducted in accordance with guidelines from the Ministry of Environment, Forest and Climate Change (MoEF&CC).

3.1 ENVIRONMENTAL SETTINGS OF THE STUDY AREA

For this study, the area has been divided into a core zone, comprising the marked plant site, and a buffer zone, which extends in a 10 km radius around the site. The primary environmental characteristics for the proposed cement plant are presented in Table 3.1. A map illustrating the environmental setting of the plant is shown in Figure 3.1(a) & 3.1(b) for the Proposed Integrated Cement Plant with production capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

Table: 3.1: Project Site Vicinity Details

Project Site Vicinity Details	
Nearest Village	Village Daistong (~1.43 km in ESE direction)
Nearest Major Town City	Mutong (~5.51 km in ESE direction)
Nearest National /State Highway	NH- 6 (~18.93 km in SW direction)
Nearest School/College	Twinkle Stars LPS - Primary school, Daistong about 1.60 Km in E direction.
Nearest Railway Station	Ditokcherra Railway station (~36.90 km in SE direction)
Nearest Airport	Silchar Airport (~63.35 km in SE direction) Guwahati Airport (~128.21 km in NW direction)
Nearby Water Bodies	River (Wah Chyrmit) about 4.48 NW Direction. Pal Lam Kankalang River about 8.50 NE Direction
National Park, Wildlife Sanctuary, Tiger/ Elephant Reserve, Eco-Sensitive Zone etc.	No National Park, Wildlife Sanctuary, Tiger/ Elephant Reserve, exist within 10 km radius study area.
Reserved/ Protected Forest within 10 km radius	No Reserved/ Protected Forest within 10 km Study area. Saipung Reserved Forest (~6.35 km in SE direction)

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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CPA/SPA/OPA study area	within	There is no CPA/SPA within 10 km radius study area.
Archaeological site		None within 10 km radius
Seismic Zone		Zone - V as per IS: 1893 (Part-I): 2002

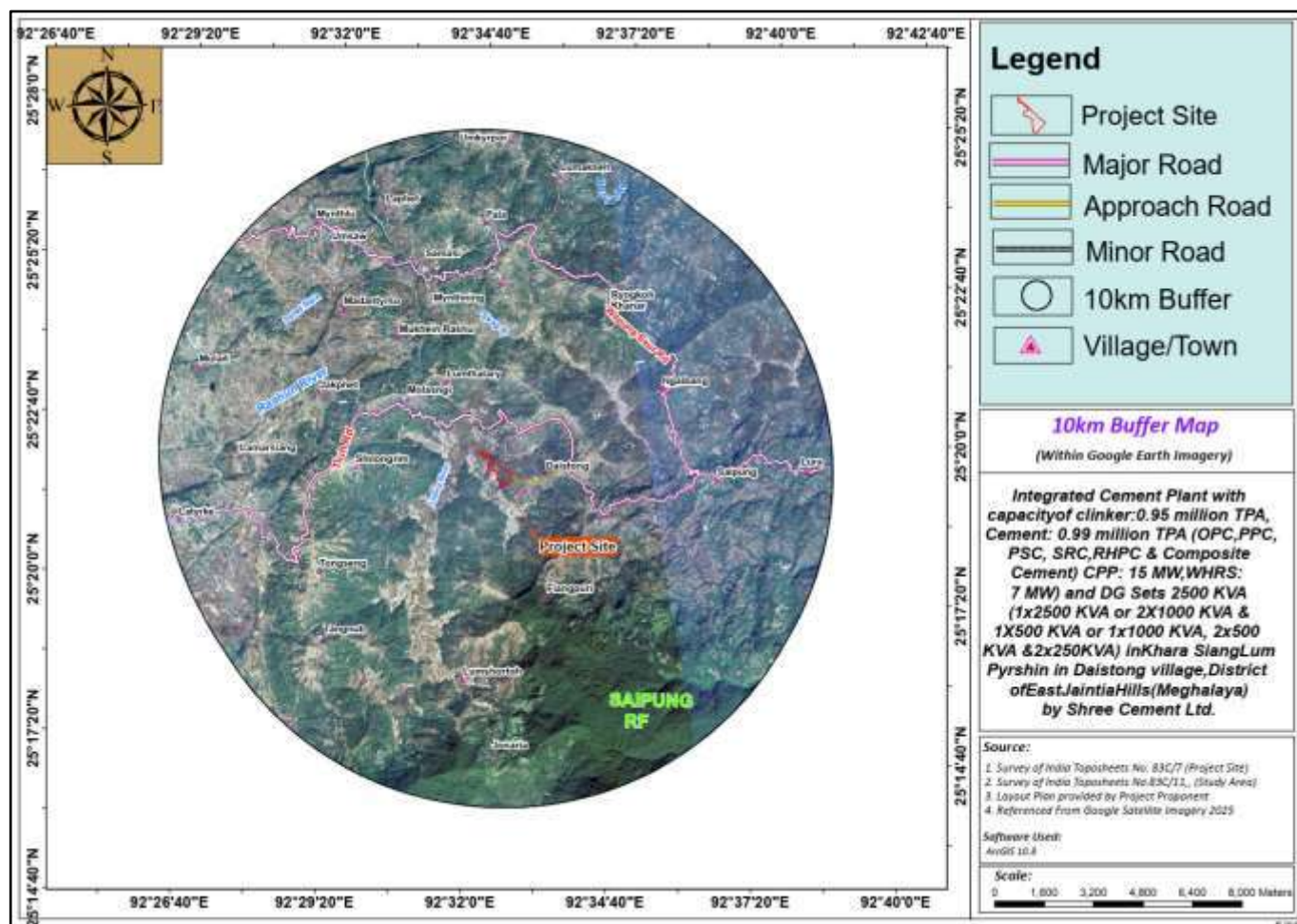


Figure: 3.1(a): Map Showing Environmental Settings of 10 km radius Study Area for Proposed Integrated Cement Plant (Google earth)

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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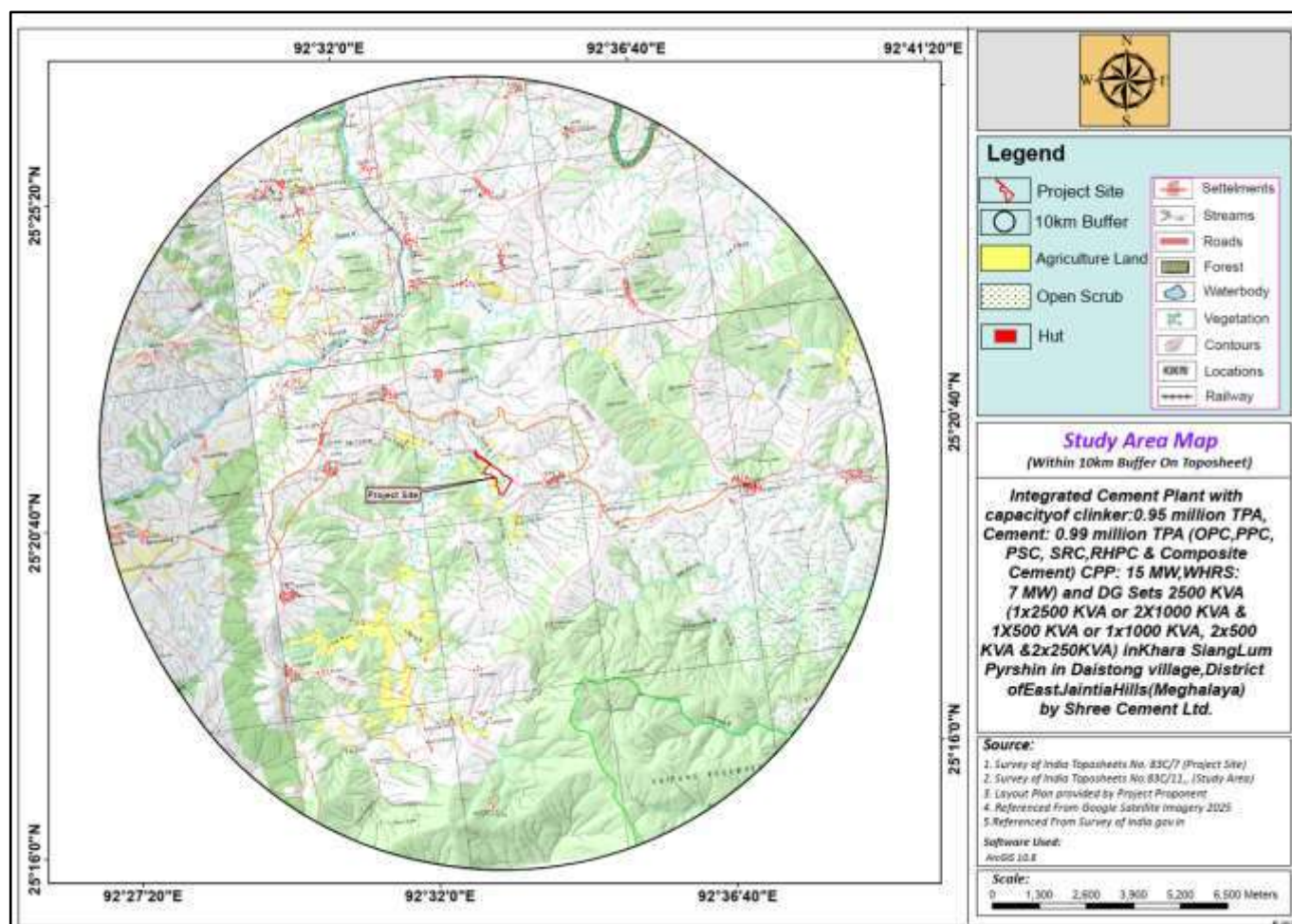


Figure: 3.1(b): Map Showing Environmental Settings of 10 km radius Study Area for Proposed Integrated Cement Plant (Toposheet)

3.2 BASELINE PERIOD

A comprehensive collection of primary and secondary data was undertaken during the Summer of 2025 i.e., March 2025 to May 2025. This effort, which covered the project's core zone and a 10 km buffer area, followed established guidelines for EIA studies. The purpose of this data collection was to assess how the proposed project would impact the physical, biological, and social environment of the region due to establishment of Integrated Cement Plant at Village: Daistong, Elaka: Nongkhlieh Dolloiship, District: East Jaintia Hills (Meghalaya).

3.3 ENVIRONMENTAL COMPONENTS

Information on the following components / parameters was collected to study the present scenario of the area:

1. Land (including Geology, Topography, Drainage Pattern, Land Use & Land Cover etc.)

2. Meteorology
3. Air Environment
4. Noise Environment
5. Water Environment
6. Soil Environment
7. Biological Environment
8. Socio-economic Environment

3.4 ESTABLISHMENT OF BASELINE FOR VALUED ENVIRONMENTAL COMPONENTS

To support the environmental impact assessment, primary and secondary data were collected from March 2025 to May 2025, encompassing the project's core area and a surrounding 10 km buffer. All sample handling, from collection and preservation to transport and analysis, was conducted by Noida Testing Laboratories, a laboratory approved by both NABL accredited and MoEF&CC recognised. The project's EIA Coordinator and Functional Area Experts provided supervision throughout this monitoring period, the specifics of which are detailed in Table 3.4.

Table: 3.2: Baseline Data Collection

S. No.	Environmental Component	Primary data				Secondary data
		Parameters	Frequency	Monitoring / Sampling Locations	Methodology	
1.	Land	Agriculture Habitation Industry Stony waste/ Quarries Forest area Plantation/ Vegetation Open scrub Water bodies	Once in a Study period Season	10 km radius Buffer from Project site (Core zone)	Primary and secondary data collection using field survey and authenticated credentials Processing using DIP technique and preparation of LULC using ERDAS Imagine 9.2.	Satellite image from NRSC, Hyderabad. Survey of India Toposheet
2.	Meteorology	Temperature, Relative Humidity, Wind Speed, Wind Direction Rainfall	Hourly for one Season	01 (Project site)	Automatic Weather monitoring station	IMD book (Climatological normal 1981-2010), Past year Rainfall data for Meghalaya.
3.	Air	PM10, PM2.5, SO ₂ , NO ₂ , CO	(24 hourly), twice a	08	Sampling: CPCB Guidelines/NAAQS/ IS 5182 and Instrument	—

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		and PAHs	week as per NAAQS- 2009		Manual Analysis: CPCB Guidelines / IS 5182	
4.	Noise	Equivalent noise levels in Leq in dB (A)	Once in a season (day & night time)	05	Sampling: IS 9989 Analysis: CPCB Guidelines/IS 9989	--
5.	Water					
a.	Surface Water	Parameters as per IS	Once in a season	02	Sampling: CPCB Guideline & APHA	--
b.	Ground Water	10500 - 2012	Once in a season	(Sample was available at 4 locations)	22nd edition 2012 Analysis: IS 10500- 2012/ IS 3025/ APHA 22 nd edition 2012	--
6.	Traffic Study Type of vehicles Frequency of vehicles for transportation of material Additional traffic due to proposed project Parking Arrangement	Type of vehicle	-	Tluh Road	Manual by observation	IRC guideline: 64- 1990
7.	Soil	Parameters As per IS 2720/USDA	Once in a season	05	Sampling: USDA Analysis: As per IS 2720/USDA	-
8.	Biological Environment	Flora and fauna	Once in a season	Study area	Quadrante sampling method/ random sampling	Forest working plan and Local Information
9.	Socio- Economic Environment	Economic Demography	Once in a season	Study area	Economic Parameter Random Sampling of the villages. Survey Conduction, Through Questionnaire approach. Group Discussions.	• Demographic Data: Census data, 2011. • List of prevailing diseases from Public Health Centre • List of villages where public health Centre are set up • List of schools Map of taluka

3.5 BASELINE STATUS OF THE VARIOUS ENVIRONMENTAL COMPONENTS

3.5.1 LAND ENVIRONMENT

3.5.1.1 Geology, Topography

"Khara Siang Lum Pyrshin" is likely a local Khasi or Pnar name for a specific natural feature near Daistong village, precise information is unavailable in the search results. However, the broader topography of the East Jaintia Hills provides a strong context for its probable characteristics. The region is dominated by a distinctive karst landscape, an undulating plateau of limestone and dolomite that has been sculpted by the dissolving action of water over millennia. This has resulted in a terrain characterized by prominent rolling hills ("Lum" in the local dialect), deep gorges, and extensive subterranean systems. The region is also famous for its numerous limestone caves, like the nearby Krem Liat Prah, making it plausible that "Khara Siang Lum Pyrshin" could refer to a specific hill, cave, or a related geological feature. Surface features like sinkholes and disappearing streams are common in such landscapes, which are often covered in grasslands and subtropical forests, with rivers and streams carving out valleys. The high rainfall typical of Meghalaya further accelerates this process, ensuring a constant and dynamic evolution of the land. Therefore, whatever

the specific feature, it is part of this unique and geologically active hill system defined by limestone, water, and dramatic terrain. **The Contour map showing topography within project site area shown in Figure :3.2 (a) and topography in Study area has been shown in Figure :3.2 (b).**

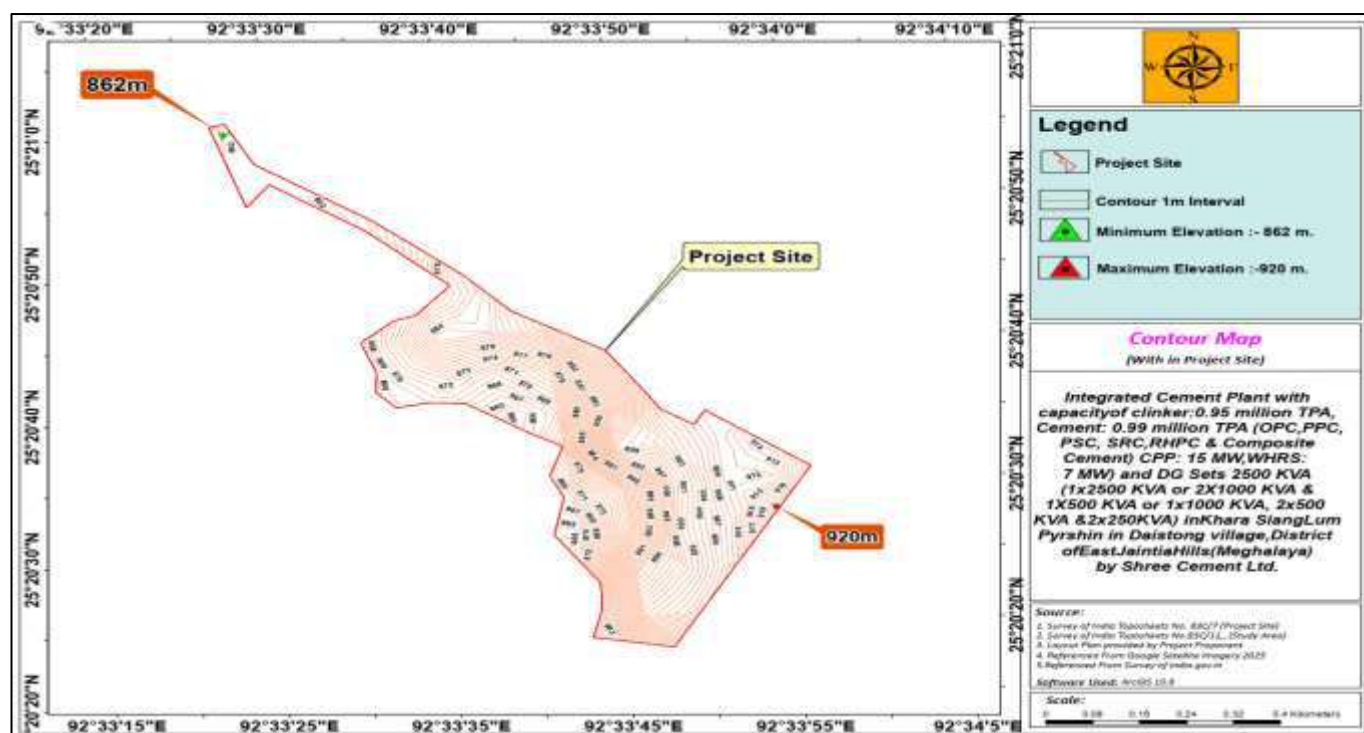


Figure :3.2(b): Map Showing Contour within Proposed Integrated Cement Plant

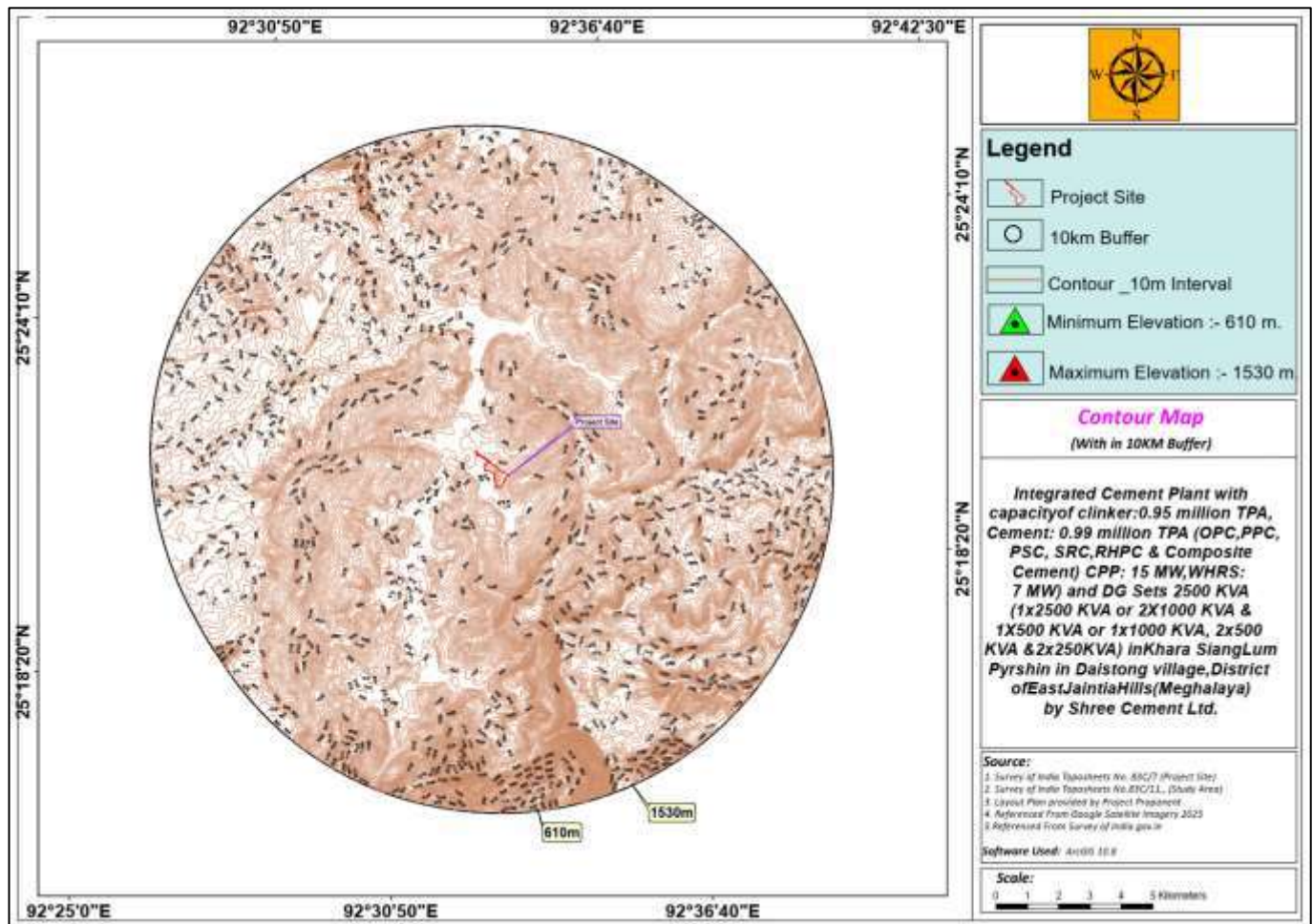


Figure 3.2(b): Map Showing Contour in 10 Km Study area of Proposed Integrated Cement Plant

3.5.1.2 Drainage Pattern

Khara Siang Lum Pyrshin in Daistong village, East Jaintia Hills, likely features a **dendritic drainage pattern**, which is common throughout Meghalaya due to its hilly terrain and geology. This pattern is characterized by streams and rivers that branch out like the roots of a tree, following the slope of the land and converging with a larger, central stream or river. The region's limestone and coal deposits may also contribute to specific localized drainage features.

Key characteristics of the drainage pattern:

- **Dendritic pattern:** The overall drainage system is expected to be dendritic, with smaller streams flowing down from higher elevations and joining larger water bodies. This pattern is typically found in areas where the underlying rock structure is uniform and does not strongly influence the flow direction.

- **Influenced by local geology:** While the overall pattern is likely dendritic, local geology, such as the region's prominent limestone formations, could create variations.
- **High rainfall impact:** Meghalaya receives extremely high rainfall, which significantly influences the drainage system. Heavy rainfall contributes to strong surface runoff, and the streams and rivers are fed by a continuous supply of water. This leads to deep gorges and incisive valleys, which are characteristic of Meghalaya's landscape.
- **Controlled by topography:** The hilly and undulating topography of East Jaintia Hills dictates the direction of water flow. The streams follow the natural contours of the hills, contributing to the dendritic pattern.
- **Tributary to larger river systems:** Daistong is part of the larger drainage system of the East Jaintia Hills, which either flows northward towards the Brahmaputra system in Assam or southward into the Meghna/Surma system in Bangladesh. The local Khara Siang Lum Pyrshin stream would eventually feed into one of these major river basins.

In summary, the Khara Siang Lum Pyrshin drainage in Daistong village is likely part of a dendritic pattern, characterized by tree-like branching of streams across the sloping, hilly terrain of East Jaintia Hills. The region's high rainfall and geological formations, including limestone, significantly influence the specific features of this drainage system.

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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DESCRIPTION OF THE ENVIRONMENT

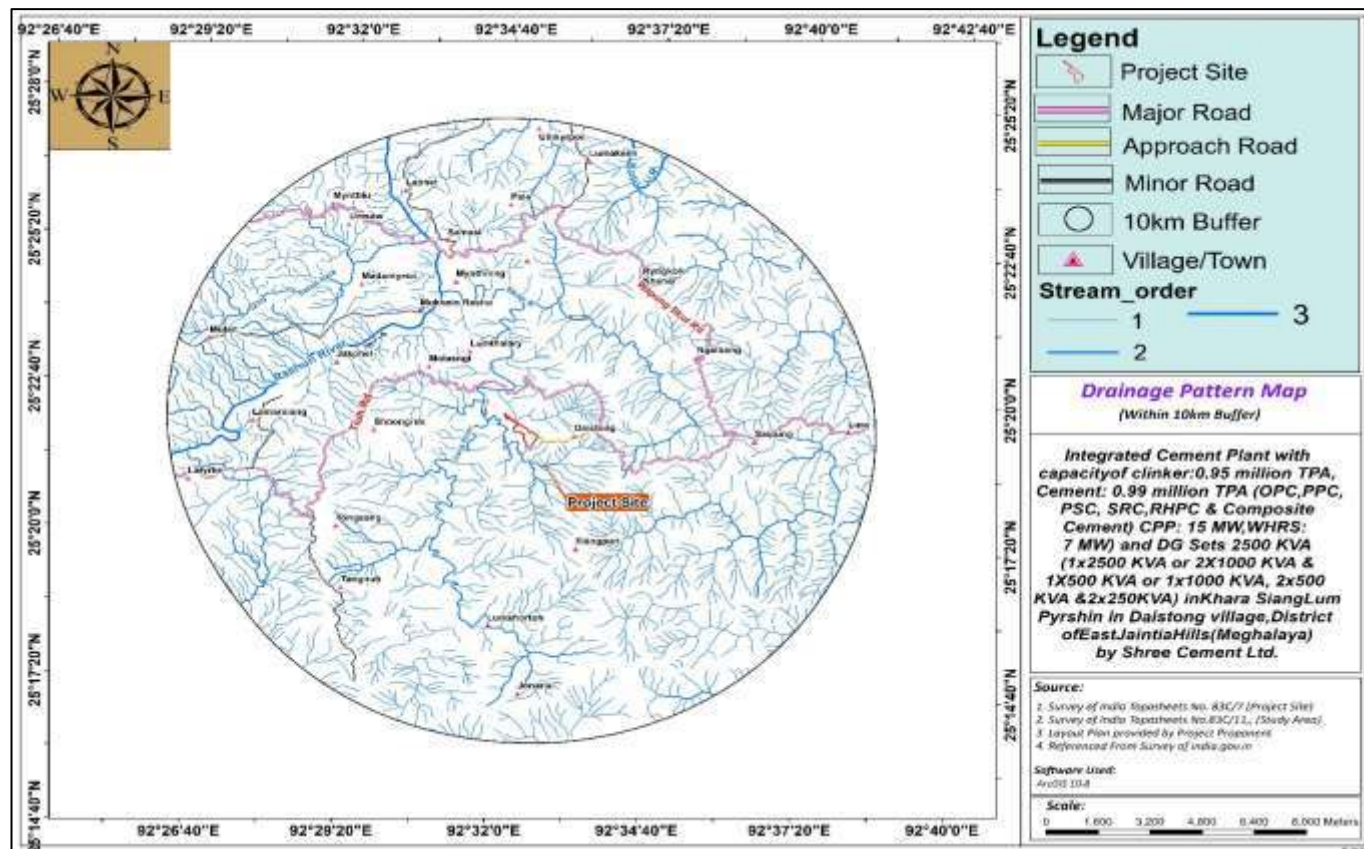


Figure 3.3(a): Map Showing Contour in 10 Km Study area of Proposed Integrated Cement Plant

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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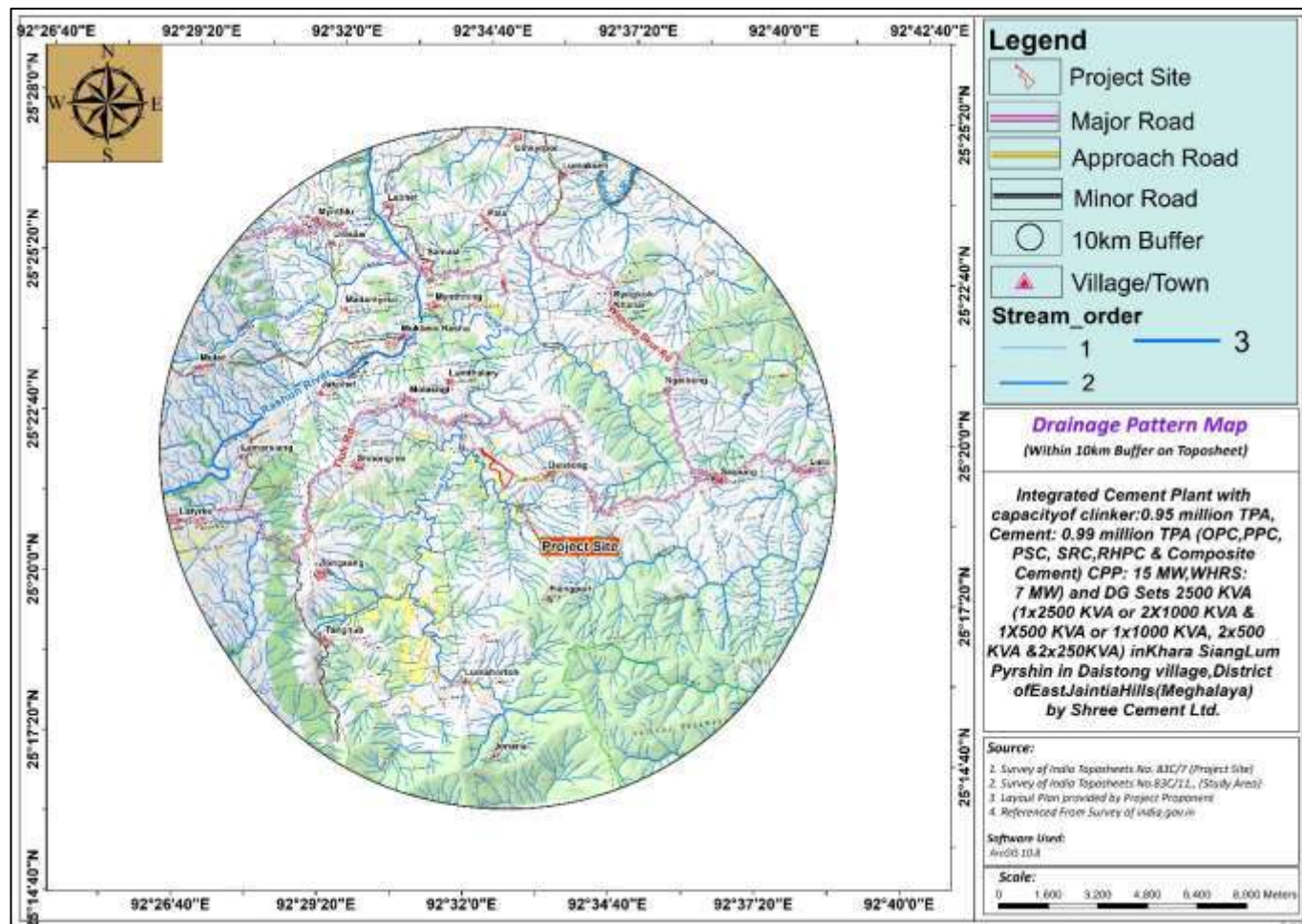


Figure: 3.3(c): Map Showing Contour in 10 Km Study area of Proposed Integrated Cement Plant (Toposheet)

3.5.1.3 Land Use & Land Cover

Specific information on " Khara Siang Lum Pyrshin" land use must be inferred from the documented patterns of the broader East Jaintia Hills and Daistong village. The area's land use is characterized by a mix of agriculture, forest land, and historically, mining, with recent shifts towards sustainability. Traditional, predominantly rainfed agriculture focuses on subsistence crops like rice, maize, and vegetables, but faces challenges from low soil fertility and acidity. The landscape also includes significant forest cover, though it has been impacted by historical deforestation due to activities like jhum cultivation and mining. There is now an increasing emphasis on diversifying livelihoods towards agriculture, horticulture, and sustainable ecological initiatives, reflecting efforts by local communities and government bodies to restore and manage natural resource. Details of land use for the Project site area and 10 Km study area has been given in Table 3.3 and Table 3.4 respectively. Also, the details of land use of project site area have been given in Figure 3.4 (a) and land use of 10 Km study area have been given in Figure 3.4 (b).

The total land area for the proposed plant is 25.08 ha (61.95 Acres). There is no forest land involved in the proposed project. Present land use of the project site is Pvt. Land, which will be used for industrial purpose after its conversion into Industrial land use. Application for allotment of Pvt. Land has been submitted.

The purpose of this LULC study is to generate a comprehensive land use and land cover map for the project area (Core Zone) and its 10 km buffer, utilizing specific land coordinates. The study will then identify and characterize key LULC features within this mapped area using both primary field observations and secondary data. The ultimate goal is to assess the potential impacts of the proposed project on the existing land cover within the buffer zone and develop effective mitigation strategies for sustainable land use and conservation. For the study's land use and land cover (LULC) thematic map, we utilized recent digital False Color Composite (FCC) data from the Indian Remote Sensing Satellite RESOURCESAT 2A (LISS - 4), which was obtained from the National Remote Sensing Centre in Hyderabad. A base layer, which includes features such as road and rail networks, village locations, and the plant site, was prepared using a 1:50,000 scale Survey of India Toposheet. This toposheet also served as the reference for geo-referencing the satellite imagery.

Technical description:

- ❖ Satellite Image : RESOURCESAT - 2A (LISS- 4)
- ❖ Satellite Data Source : NRSC, Hyderabad
- ❖ Satellite Vintage : 13th October 2025
- ❖ SOI Toposheet No. : 83C7 & 83C11
- ❖ Software Used : Earth Resources Data Analysis System (ERDAS) Imagine 9.1

The Land breakup is given below:

Table: 3.3: Land Breakup for Project site area

S. No.	Particulars	Land Area Details		Area (%)
		(In Acre)	(In Ha.)	
1	Greenbelt & Plantation	20.44	8.27	32.99 (Say 33%)
2	Raw Material Unloading	0.33	0.14	0.54
3	Material Storage	9.87	4.00	15.94
4	Plant - Clinkerization	2.29	0.93	3.70
5	Plant - Cement Grinding and Packing Plant	1.92	0.78	3.09
6	Non-Plant Building	2.75	1.11	4.44
7	Road & Cemented area	8.06	3.26	13.01
8	Open Area	12.95	5.24	20.90
9	Power Plant	2.66	1.08	4.30
10	Rain Water Harvesting storage pond	0.68	0.27	1.09
	Total	61.95	25.08	100.00

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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Table: 3.4: Land Breakup for 10 Km study area

S. No.	Land use Classification	Area In Hectare	Area In%
	Crop land	2088.63	5.936498793
1	Deciduous	15010.4	42.66395747
2	Built-up (rural)	548.449	1.558852849
3	Mining Area	972.151	2.76313815
4	Barren land	10779.4	30.63821505
5	Scrub Forest	3124.98	8.882109325
6	Evergreen	2505.49	7.121337126
7	Waterbodies	153.359	0.435891239
	Total	35182.859	100



Figure: 3.4 (a): Plant layout showing summary of area Back-up Details

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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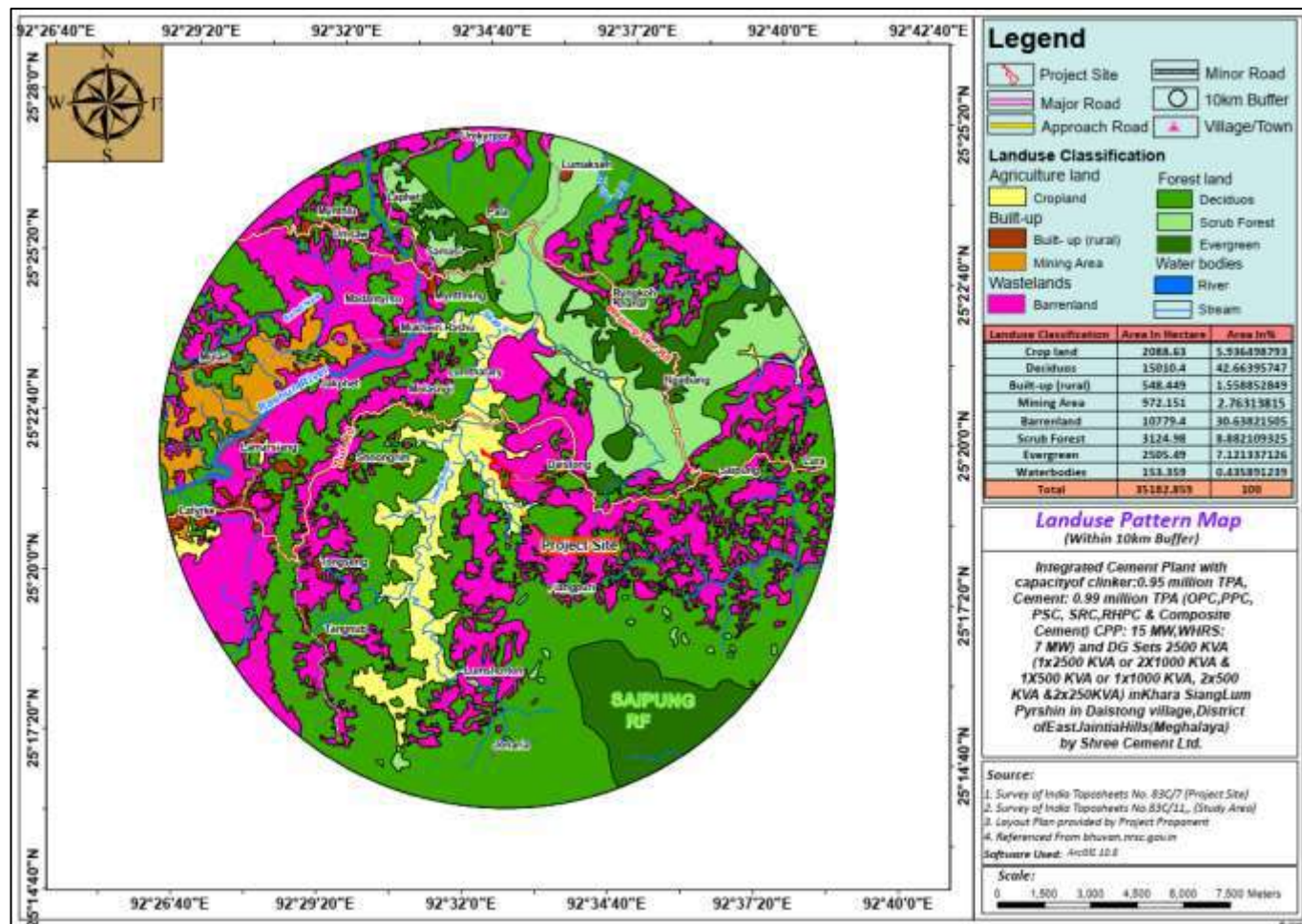


Figure: 3.4 (b): Land-Use Map of 10 Km Study area

Table :3.5: Sources of Impacts on Land use

Pollution Source	Activity	Impacts	Mitigation measures and its implementation
Building and large construction projects	Construction and operation phases	Change of land use, Removal of vegetation, removal of top soil, Construction waste, municipals waste during construction and operation phase	Construction activity should not use agricultural land or forest land for this purpose, use existing urban land; Minimum removal of trees from the plot; top soil should be securely removed and reused for landscaping; defined site for construction material and construction waste; conversion of biodegradable waste into manure and its reuse; proper management of municipal solid waste,

	Construction and operation phases	Energy Excess electricity consumption	Use of clean energy, renewable energy for 30 to 40 % reduction in operation cost; incorporate latest techniques and technologies, design of building to provide maximum open places for sunlight; high efficiency building performance; energy efficient building envelope; efficient lighting; efficient heating/cooling system to reduce energy use
	Construction and operation phases	Transport issue Increase in external road traffic, internal road traffic problems,	Collaborate with municipal authorities for temporary/ permanent road widening; avoid truck traffic during morning and evening rush hours as well as during night time; access road should be of required width and permanent; sufficiently wide internal roads with traffic signs; traffic management at exit and entry; adequate parking space in the site; separate exit/entry for residential area and commercial area; traffic analysis on main road for its improvement.

3.5.1.4 Seismicity and Flood Hazard Zonation of the Area

An analysis of the area's potential flood and seismic risks is underpinned by an investigation into its seismicity. Seismicity studies are essential for comprehending the Earth's dynamic processes and for estimating the seismic risk in a given region. The Indian subcontinent has experienced earthquakes since ancient times, and while medieval records are limited, more comprehensive documentation began during the colonial period. Despite some limitations, these historical records offer a good representation of earthquake distribution in the last 200 years, informing contemporary hazard assessments.

Bureau of Indian Standards [IS - 1893 (Part-1): 2002], has grouped the country into four seismic zones viz. Zone - II, III, IV and V of these, Zone - V is the most seismically active region, while Zone- II is the least. The Modified Mercalli Intensity (MMI) scale, which measures the impact of the earthquakes on the surface of the earth, broadly associated with various zones is given in table 3.5.

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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S. No.	Seismic Zone	Risk	Intensity on MMI Scale
1.	Zone - II	Low Risk Zone	VI & below
2.	Zone - III	Moderate Risk Zone	VII
3.	Zone - IV	High Risk Zone	VIII
4.	Zone - V	Very High-Risk Zone	IX & above

Table :3.6 Seismic Zones in India

Source: IMD & NIDM

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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Figure: 3.5: Seismic Zone Map

Conclusion:

The proposed project site as well as 10 km study area lies in Zone-V, Very High-Risk Zone of Seismic Zoning Map of India, updated by “Vulnerability Atlas – 3rd Edition (updated on 2nd March, 2019); Peer Group, Ministry of Health (MoH) and UPA; based on digitized data of SOI, GOI; Seismic Zones of India Map, IS 1893 – 2002, BIS, GOI, Seismic tectonic Atlas of India and its environs, GIS, GOI’s.

Flood Problem in Meghalaya

The state of Meghalaya is bordered on the northwest by mighty Brahmaputra river. Heavy led incessant rainfall followed by frequent overspill of water from Brahmaputra river on the northwest side of the state has led to floods in the West Garo Hills and South west Garo hills. Although the state has many rivers, the main cause of floods is mostly riverine pertaining to spill over from Brahmaputra. Floods were witnessed during the years of 2014, 2019, 2022 . Heavy torrential rains have lashed the Garo Hills region due to heavy rains in Upper catchment areas of Brahmaputra river followed by rise in water levels during fourth week of September 2014. NRSC/ISRO has acquired Resourcesat-2 A WiFS image of 30-Sep-2014. Major flood events in Meghalaya is listed in Table 3.7 for which satellite derived spatial flood inundation maps were generated and disseminated to state / central government disaster support management organizations.

Table: 3.7: Major flood events in Meghalaya state

S. No.	Year	Description of the flood event	Districts affected
1	2004	Floods hit Meghalaya due to incessant rains in the North-Eastern India during the second week of July	2
2	2014	Floods were reported during 4th week of Sep 2014 due to heavy rains	1
3	2020	Floods occurred in various parts of Meghalaya state in the third week of July 2020 due to heavy rains	-
4	2022	Floods were reported during the second week of June, 2022 under the influence of heavy incessant rains	2

Flood Affected Area in Meghalaya

Cumulative flood inundation maps were utilised for generation of total flood affected area map in Meghalaya and is estimated as 8,787 ha. Flood Affected Area Map and district wise flood affected area statistics. Two districts in Meghalaya have flood affected area.

S. No.	District	Flood Affected Area (ha)
1	West Garo Hills	7513
2	South West Garo Hills	1275
Total		8787

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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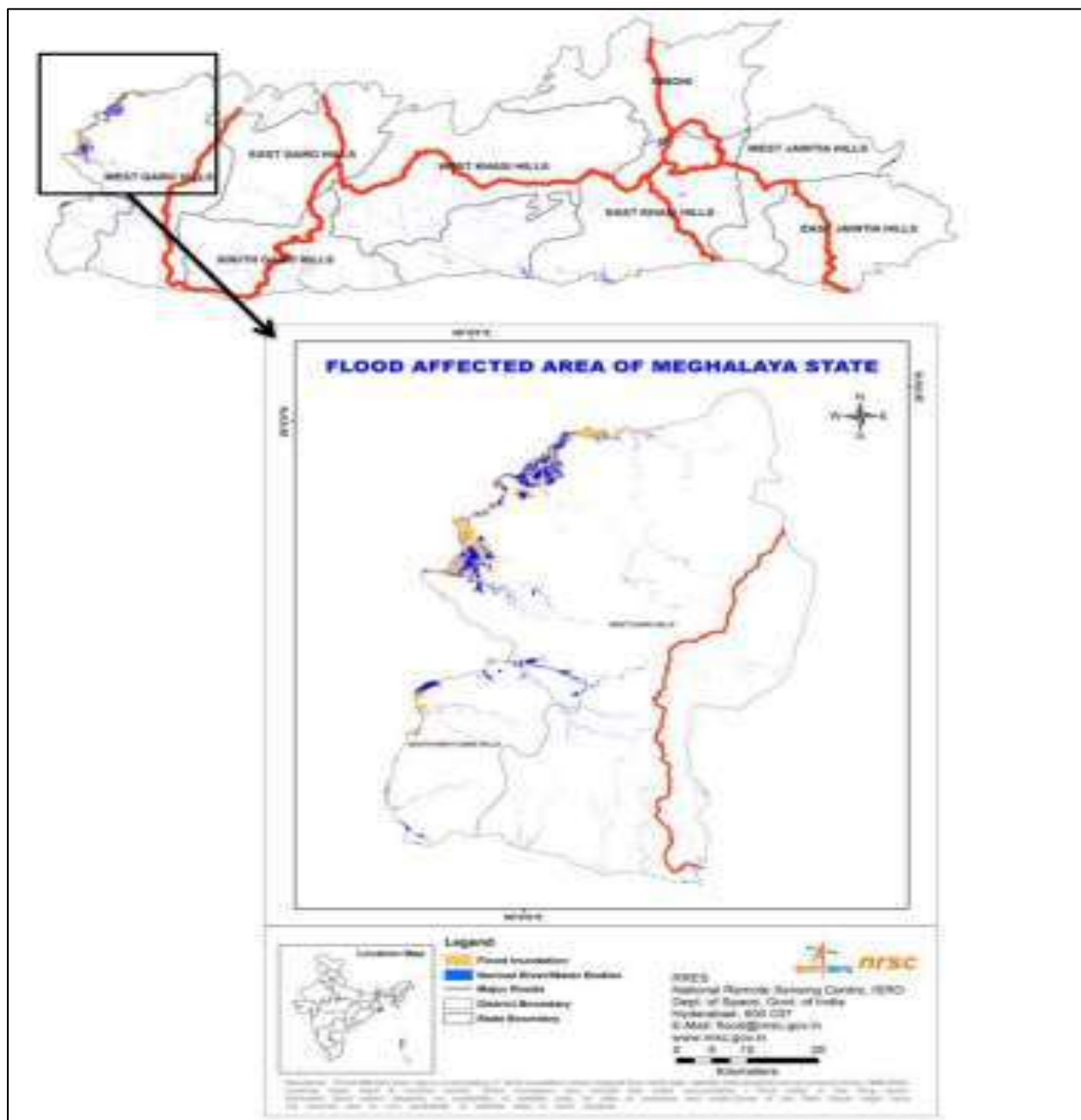


Figure: 3.6: Flood affected area in Meghalaya State

Source: Flood Affected Area Atlas of India (1998-2022) - Satellite based Study by National Remote Sensing Centre (NRSC), Indian Space Research Organization (ISRO)

3.5.2 Climate & Rainfall

Meghalaya is one of the wettest places on Earth, and the state's rainfall is influenced by the southwest monsoon. The East Jaintia Hills receive heavy orographic rainfall as moisture-laden winds from the Bay

of Bengal are forced to rise by the hills. The highest rainfall in the state is recorded in the nearby Khasi Hills, with some areas receiving an annual average of up to 12,000 mm.

Table: 3.8: Climate and Rainfall Data for East Jaintia Hills District (Daistong village)

Parameter	Details
Climate	Humid subtropical monsoon climate, generally pleasant year-round.
Seasons	• Rainy Season: Mid-May to September • Autumn: October and November • Winter: December to February
Temperature	• Coldest Month (January): 7.8°C (min) to 15.6°C (max) • Hottest Month (August): 18.4°C (min) to 24.5°C (max)
Rainfall	• The district receives heavy orographic rainfall from the southwest monsoon. • Meghalaya is one of the wettest regions on Earth, with rainfall averages in some parts of the state exceeding 12,000 mm annually.

3.5.1.5 Meteorology

Meteorology plays a crucial role in determining how air pollutants are transported and dispersed in the atmosphere. The key influencing factors include horizontal convective transport (mean wind speed and direction), vertical convective transport (atmospheric stability), and the topographical features of the region.

Understanding the meteorological characteristics of a site is essential for evaluating potential environmental impacts and for developing an effective environmental management plan. Since meteorological parameters vary over time, meaningful interpretations can only be derived from long-term, reliable datasets.

For baseline data collection, the meteorological conditions of the project area were analyzed using annual records from the India Meteorological Department (IMD) covering the period 1991–2020. The primary objective of examining wind speed and direction data was to identify suitable locations for ambient air quality monitoring based on the prevailing wind patterns and dominant meteorological conditions.

3.5.1.6 Methods for Monitoring

The Central Pollution Control Board (CPCB) has published comprehensive document on emission testing regulations (“Emission Regulations Part-3, 1985”). Those procedures relevant to the particulate monitoring are summarized below:

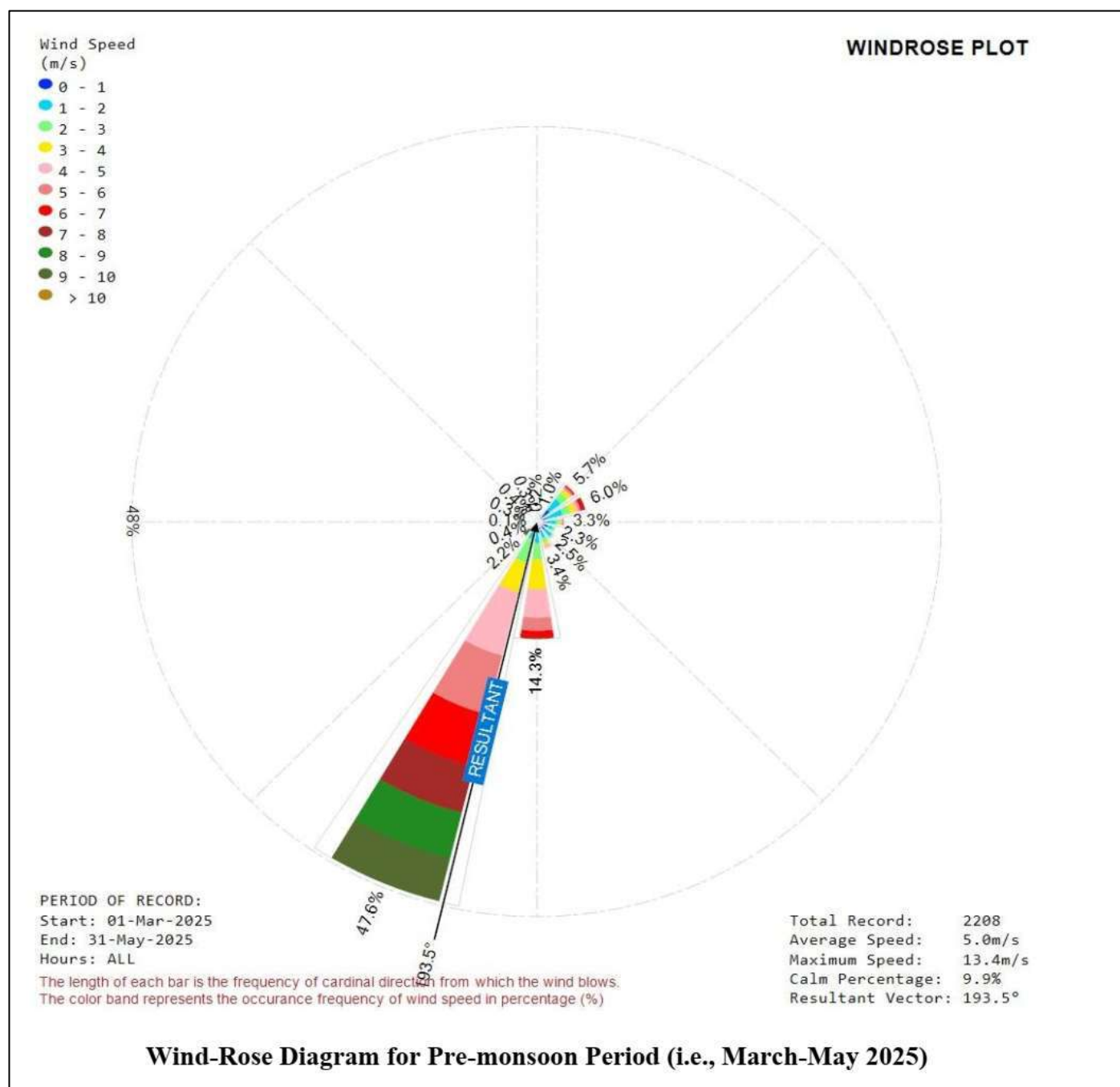
Table: 3.9: Methods adopted for PM2.5, PM10, SO2 and NOX (as NO2)

Parameters	Technique	Technical Protocol	Minimum Detectable Limit

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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PM2.5	Gravimetric method	US EPA Method	10 ($\mu\text{g}/\text{m}^3$)
PM 10	Gravimetric method	IS 5182 (Part-XXIII)	10 ($\mu\text{g}/\text{m}^3$)
Sulphur Dioxide	West and Gaeke	IS-5182 (Part-II)	5 ($\mu\text{g}/\text{m}^3$)
Nitrogen Oxide	Jacob & Hochheiser	IS-5182 (Part-VI)	5 ($\mu\text{g}/\text{m}^3$)
CO	Gas chromatography with detector (FID)	IS: 5182, (P-10),	0.5 mg/m ³



3.5.1.7 Micro-Meteorology at Site

Meteorological station was set-up at site to record surface meteorological parameter during Summer Season (March 2025 to May 2025).

Theoretically, meteorological parameters such as Temperature, Humidity and wind speed/ wind direction, Rainfall are the basic parameter which helps in determining the ambient environment quality of the area. Thus, primary data for the Wind speed /wind direction, Temperature, Humidity and rainfall was recorded during the study period. Based on the collected meteorological data, relative percentage frequencies of different wind directions and speed were calculated and plotted as a wind rose diagram. The percentage calculated for all parameters wind speed, wind direction, rainfall, temperature can influence the Quality, dispersion and movement of the pollutant thereby helps in the determining the Impacts caused by the plant activity.

Summary of the micro-meteorology at site is given in Table - 3.10. (a & b) Detailed Hourly Meteorological Data has been enclosed as *with* this EIA / EMP Report

Table: 3.10: Micro-Meteorology at Site Study Period: Pre-Monsoon Season (March 2025 to May 2025)

Month	Temperature (°C) Dry bulb		Temperature (°C) Wet bulb		Wind Speed (m / sec.)		Relative Humidity (%)	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
March, 2025	30.9	12.2	24.6	8.9	5.0	0.1	75.5	25.2
April, 2025	29.3	8.2	22.0	7.4	4.1	1.5	82.5	23.1
May, 2025	32.1	12.8	26.5	8.8	3.5	1.2	78.3	21.4

3.6 AMBIENT AIR ENVIRONMENT

Ambient air quality monitoring has been carried out within the 10 km study area of the Integrated Cement Plant to determine the baseline concentration of various air pollutants in the ambient air. The ambient air quality depends upon the emission sources, meteorological conditions and the background concentration of specific pollutants. Samples were collected from the 10 km study area to observe the ambient air quality conditions throughout the region. It helps in providing a data base for evaluation of the anticipated impacts in 10 km radius study area by the activities of the proposed Integrated Cement project. It will also be useful in ascertaining the quality of air environment in conformity to standards of the ambient air quality during operation phase of the project.

Monitoring Parameters

The samples were collected for the following air quality determinants:

- Particulate Matter (PM₁₀ and PM_{2.5})
- Sulphur Dioxide (SO₂)
- Nitrogen Dioxide (NO₂)

Methodology

The methodology adopted for ambient air quality monitoring is given below in Table - 3.11.

Table: 3.11 Details of Test Procedures

S. No.	Parameters*	Test Method Specification against which tests are performed	Range of testing	Limit of detection	Equipment used for monitoring	
					Equipment required for Sampling	Equipment required for Analysis
1.	Sulphur Dioxide (SO ₂)	IS: 5182, (P-2), 2001 Reaffirmed 2017	5 µg/m ³ to 1050 µg/m ³	5 µg/m ³	Respirable dust sampler/Low flow Pump	UV spectrophotometer
2.	Nitrogen Dioxide (NO ₂)	IS: 5182, (P-6), 2006 Reaffirmed 2017	5 µg/m ³ to 750 µg/m ³	5 µg/m ³	Respirable dust sampler/Low flow Pump	UV spectrophotometer
3.	Particulate Matter (PM ₁₀)	IS: 5182, (P-23), 2006 Reaffirmed 2017	10 µg/m ³ to 1000 µg/m ³	10 µg/m ³	Respirable dust sampler,	Desiccators, high accuracy weighing balance
4.	Particulate Matter (PM _{2.5})	IS: 5182, (P-24), 2019	10 µg/m ³ to 500 µg/m ³	10 µg/m ³	Fine Particulate sampler	Desiccators, high accuracy weighing balance
5.	Carbon Monoxide (CO)	IS: 5182, (P-10), 1999 Reaffirmed 2014	0.5 mg/m ³ to 50 mg/m ³	0.5 mg/m ³	Sampling in Tedlar Bag with low flow pump	Gas chromatography with detector (FID)

Protocol Used: *CPCB Guidelines IS-5182, RDS: Respirable Dust Sampler, FPS: Fine Particulate Sampler*

Monitoring Locations

Sampling locations in the downwind and upwind were selected for AAQ Monitoring keeping in view the pre-dominant wind direction prevailing in the area during the study period and as per the IMD data.

Table: 3.12 Monitoring Locations

Location Code	Location	Direction	Distance (Km)	Project area/Study Area	Coordinates	
					Latitudes	Longitudes
AAQ1	Shree Cement Plant	--	0.01	Project area	25°20'37.37"N	92°33'50.06"E

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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AAQ2	Daistong Presbyterian Church, Daistong	E	1.49	Study Area	25°20'26.46"N	92°34'40.87"E
AAQ3	Saipung PHC, Mutong	ESE	5.60	Study Area	25°20'11.31"N	92°37'11.53"E
AAQ4	St Joseph's Church, Khahnar	NE	5.56	Study Area	25°23'0.04"N	92°36'8.50"E
AAQ5	Tangnub Presbyterian Church, Lumpdeng	SW	7.52	Study Area	25°18'6.83"N	92°30'5.23"E
AAQ6	Samasi Presbyterian Church, Samasi	N	5.81	Study Area	25°24'7.50"N	92°32'51.14"E
AAQ7	Jongria Old L.P School, Jongria Old	SW	7.15	Study Area	25°16'45.96"N	92°32'52.94"E
AAQ 8	Shnongrim sc playground, Shnongrim	E	4.32	Study Area	25°21'5.65"N	92°30'52.97"E

Source: Google Earth

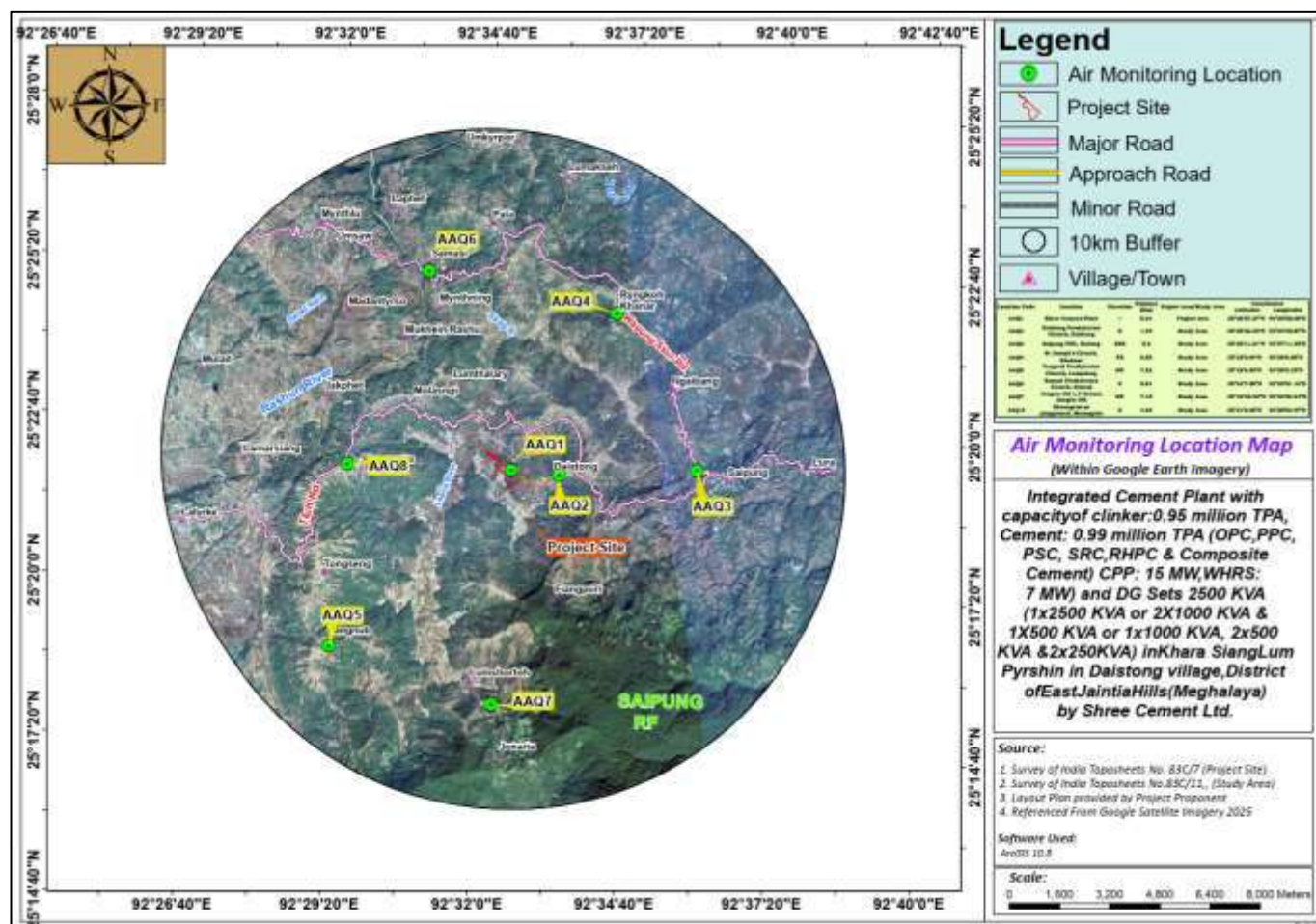


Figure: 3.7: Map showing Ambient Air Quality Monitoring Locations

Ambient Air Quality Monitoring

The maximum and minimum concentrations of air pollutants, as recorded at different monitoring locations during the study, are presented in Table 3.13. For a comprehensive list of all pollutant observations for each site, please refer to the Ambient Air Quality Monitoring Tables enclosed in Annexure 8 of the EIA/EMP Report.

Table: 3.13: Ambient Air Quality Monitoring Results

Table - 3.13(a): AAQ1 (Shree Cement Plant, Project Site) Results

S. No	Date	Particulate Matter PM10 ($\mu\text{g}/\text{m}^3$)	Particulate Matter PM2.5 ($\mu\text{g}/\text{m}^3$)	Sulphur Dioxide SO ₂ ($\mu\text{g}/\text{m}^3$)	Nitrogen Dioxide NO ₂ ($\mu\text{g}/\text{m}^3$)	Carbon Monoxide (CO) (mg/m ³)
		IS:5182 (Part-23)	IS:5182 (Part-24)	IS:5182 (Part-2)	IS:5182 (Part-6)	IS: 5182 (Part-10)
1	03/01/2025	59.67	32.89	2.54	4.56	0.153
2	03/04/2025	61.57	31.76	3.16	5.21	0.156
3	03/07/2025	60.97	30.64	2.98	4.86	0.152
4	03/11/2025	62.41	32.56	2.53	5.33	0.154
5	03/15/2025	58.95	31.78	3.12	4.75	0.156
6	03/19/2025	61.05	32.22	2.97	5.34	0.157
7	03/24/2025	62.39	31.74	3.05	4.89	0.159
8	03/27/2025	59.46	30.13	2.56	5.02	0.156
9	04/01/2025	57.12	22.45	3.77	3.97	0.234
10	04/04/2025	56.23	20.89	2.32	4.56	0.236
11	04/08/2025	53.74	21.56	3.19	3.34	0.362
12	04/11/2025	54.83	23.05	3.21	4.58	0.241
13	04/15/2025	55.96	22.78	2.88	3.61	0.461
14	04/21/2025	52.98	21.45	3.75	3.97	0.350
15	04/25/2025	54.62	22.53	2.96	4.32	0.246
16	04/29/2025	53.09	23.11	3.15	5.45	0.342
17	05/01/2025	39.67	17.89	2.63	4.89	0.228
18	05/05/2025	34.23	16.74	3.18	5.21	0.250
19	05/08/2025	37.86	15.92	2.72	5.47	0.229
20	05/13/2025	38.94	16.75	3.44	4.12	0.224
21	05/15/2025	35.16	17.34	2.76	5.89	0.248
22	05/19/2025	37.90	16.78	3.13	4.38	0.392
23	05/21/2025	36.23	15.46	2.89	4.55	0.247
24	05/24/2025	37.65	16.73	3.57	5.12	0.227
Minimum		34.23	15.46	2.32	3.34	0.15
Maximum		62.41	32.89	3.77	5.89	0.46
Average		50.95	23.55	3.02	4.72	0.24
98 th Percentile		62.40	32.74	3.76	5.70	0.43

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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NAAQS, For 24 Hourly Monitoring	100.0	60.0	80.0	80.0	2.0

Table - 3.13(b): AAQ2 (Daistong Presbyterian Church, Daistong) Results

S. No	Date	Particulate Matter PM10 ($\mu\text{g}/\text{m}^3$)	Particulate Matter PM2.5 ($\mu\text{g}/\text{m}^3$)	Sulphur Dioxide SO ₂ ($\mu\text{g}/\text{m}^3$)	Nitrogen Dioxide NO ₂ ($\mu\text{g}/\text{m}^3$)	Carbon Monoxide (CO) (mg/m3)
		IS:5182 (Part-23)	IS:5182 (Part-24)	IS:5182 (Part-2)	IS:5182 (Part-6)	IS: 5182 (Part-10)
1	03/01/2025	63.21	32.45	3.64	4.56	0.332
2	03/04/2025	61.45	31.89	3.16	5.21	0.495
3	03/07/2025	59.64	34.56	3.95	4.86	0.580
4	03/11/2025	62.34	33.14	4.78	5.33	0.627
5	03/15/2025	58.96	31.56	3.12	4.75	0.560
6	03/19/2025	62.31	32.60	4.12	5.34	0.407
7	03/24/2025	59.67	34.25	3.05	4.89	0.473
8	03/27/2025	61.44	31.85	4.35	5.02	0.479
9	04/01/2025	58.91	23.89	3.77	4.87	0.361
10	04/04/2025	57.85	21.45	4.89	4.56	0.408
11	04/08/2025	59.21	20.66	3.19	5.72	0.466
12	04/11/2025	56.33	21.47	3.21	4.58	0.474
13	04/15/2025	54.40	22.58	4.56	5.65	0.398
14	04/21/2025	57.46	23.91	3.75	4.19	0.447
15	04/25/2025	54.79	20.45	4.87	4.32	0.512
16	04/29/2025	53.14	21.47	3.70	5.45	0.395
17	05/01/2025	37.89	18.46	4.22	4.89	0.329
18	05/05/2025	35.87	16.94	3.18	5.21	0.347
19	05/08/2025	33.14	17.62	4.75	5.47	0.455
20	05/13/2025	34.86	15.99	3.44	4.12	0.297
21	05/15/2025	32.52	18.02	4.65	5.92	0.357
22	05/19/2025	34.11	16.44	3.13	4.38	0.369
23	05/21/2025	36.87	18.31	4.55	4.55	0.330
24	05/24/2025	34.76	17.86	3.57	5.12	0.358
Minimum		32.52	15.99	3.05	4.12	0.30
Maximum		63.21	34.56	4.89	5.92	0.63
Average		50.88	24.08	3.90	4.96	0.43
98 th Percentile		62.81	34.42	4.88	5.83	0.61
NAAQS, For 24 Hourly Monitoring		100.0	60.0	80.0	80.0	2.0

Table - 3.13(c): AAQ3 (Saipung PHC, Mutong) Results

S. No	Date	Particulate Matter PM10 ($\mu\text{g}/\text{m}^3$)	Particulate Matter PM2.5 ($\mu\text{g}/\text{m}^3$)	Sulphur Dioxide SO ₂ ($\mu\text{g}/\text{m}^3$)	Nitrogen Dioxide NO ₂ ($\mu\text{g}/\text{m}^3$)	Carbon Monoxide (CO) (mg/m3)
		IS:5182 (Part-23)	IS:5182 (Part-24)	IS:5182 (Part-2)	IS:5182 (Part-6)	IS: 5182 (Part-10)
1	03/01/2025	62.43	32.56	4.87	5.12	0.246
2	03/04/2025	61.55	33.78	3.16	4.41	0.348
3	03/07/2025	59.64	31.43	3.95	4.86	0.277
4	03/11/2025	60.43	33.45	4.78	5.33	0.280
5	03/15/2025	57.65	31.70	3.12	4.75	0.229
6	03/19/2025	56.98	30.56	4.12	5.34	0.282
7	03/24/2025	61.57	31.45	3.56	4.89	0.246
8	03/27/2025	59.14	32.89	4.35	5.02	0.333
9	04/01/2025	57.96	23.98	3.77	4.87	0.357
10	04/04/2025	54.16	21.47	4.92	4.56	0.380
11	04/08/2025	59.64	22.63	3.19	5.72	0.361
12	04/11/2025	58.33	24.56	3.21	4.58	0.304
13	04/15/2025	59.67	22.31	4.56	5.65	0.346
14	04/21/2025	59.24	21.48	3.75	4.19	0.447
15	04/25/2025	56.89	20.56	4.87	4.32	0.398
16	04/29/2025	54.78	23.34	3.70	5.45	0.461
17	05/01/2025	37.15	18.10	4.22	4.89	0.407
18	05/05/2025	35.42	15.98	3.18	5.21	0.347
19	05/08/2025	38.94	16.32	4.75	5.47	0.429
20	05/13/2025	34.58	17.24	3.44	4.89	0.361
21	05/15/2025	33.40	15.98	4.65	5.90	0.396
22	05/19/2025	37.85	17.53	3.13	4.38	0.369
23	05/21/2025	36.75	15.23	4.55	4.55	0.396
24	05/24/2025	33.42	16.47	3.21	5.12	0.378
Minimum		33.40	15.23	3.12	4.19	0.23
Maximum		62.43	33.78	4.92	5.90	0.46
Average		51.15	23.79	3.96	4.98	0.35
98 th Percentile		62.03	33.63	4.90	5.82	0.45
NAAQS, For 24 Hourly Monitoring		100.0	60.0	80.0	80.0	2.0

Table - 3.13(d): AAQ4 (St Joseph's Church, Khahnar) Results

S. No	Date	Particulate Matter PM10 ($\mu\text{g}/\text{m}^3$)	Particulate Matter PM2.5 ($\mu\text{g}/\text{m}^3$)	Sulphur Dioxide SO ₂ ($\mu\text{g}/\text{m}^3$)	Nitrogen Dioxide NO ₂ ($\mu\text{g}/\text{m}^3$)	Carbon Monoxide (CO) (mg/m3)

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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		IS:5182 (Part-23)	IS:5182 (Part-24)	IS:5182 (Part-2)	IS:5182 (Part-6)	IS: 5182 (Part-10)
1	03/01/2025	60.12	32.56	3.78	4.52	0.395
2	03/04/2025	61.55	30.15	4.05	5.12	0.476
3	03/07/2025	59.64	31.43	3.95	4.86	0.378
4	03/11/2025	60.43	33.45	4.78	5.46	0.477
5	03/15/2025	57.65	31.70	3.43	4.75	0.558
6	03/19/2025	61.97	30.56	4.12	5.34	0.489
7	03/24/2025	60.15	31.45	3.56	4.89	0.472
8	03/27/2025	59.14	32.89	4.35	5.02	0.456
9	04/01/2025	57.96	23.98	3.77	3.89	0.461
10	04/04/2025	54.16	21.47	4.33	4.56	0.473
11	04/08/2025	59.64	22.63	3.19	3.48	0.501
12	04/11/2025	58.33	24.56	3.21	4.21	0.525
13	04/15/2025	59.67	22.31	4.56	3.47	0.484
14	04/21/2025	59.24	21.48	3.75	4.19	0.548
15	04/25/2025	56.89	20.56	4.22	4.32	0.453
16	04/29/2025	54.78	22.44	3.70	3.47	0.473
17	05/01/2025	37.15	18.10	4.22	4.89	0.435
18	05/05/2025	35.42	15.98	3.64	4.15	0.373
19	05/08/2025	38.94	15.31	4.75	3.11	0.461
20	05/13/2025	34.58	17.24	3.44	4.05	0.458
21	05/15/2025	34.52	15.98	3.82	3.46	0.464
22	05/19/2025	37.85	16.10	3.20	4.32	0.674
23	05/21/2025	36.75	17.89	4.55	3.75	0.449
24	05/24/2025	35.46	15.23	3.66	4.23	0.460
Minimum		34.52	15.23	3.19	3.11	0.37
Maximum		61.97	33.45	4.78	5.46	0.67
Average		51.33	23.56	3.92	4.31	0.47
98 th Percentile		61.78	33.19	4.77	5.40	0.62
NAAQS, For 24 Hourly Monitoring		100.0	60.0	80.0	80.0	2.0

Table - 3.13(e): AAQ5 (Tangnub Presbyterian Church, Lumpdeng) Results

S. No	Date	Particulate Matter PM10 ($\mu\text{g}/\text{m}^3$)	Particulate Matter PM2.5 ($\mu\text{g}/\text{m}^3$)	Sulphur Dioxide SO ₂ ($\mu\text{g}/\text{m}^3$)	Nitrogen Dioxide NO ₂ ($\mu\text{g}/\text{m}^3$)	Carbon Monoxide (CO) (mg/m3)
		IS:5182 (Part-23)	IS:5182 (Part-24)	IS:5182 (Part-2)	IS:5182 (Part-6)	IS: 5182 (Part-10)
1	03/01/2025	59.47	31.45	3.12	4.37	0.461
2	03/04/2025	60.45	29.84	4.34	5.12	0.515
3	03/07/2025	58.96	32.45	3.95	4.86	0.539

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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4	03/11/2025	60.23	31.23	4.86	5.52	0.586
5	03/15/2025	61.23	30.89	3.43	4.75	0.545
6	03/19/2025	62.47	30.56	4.12	5.34	0.526
7	03/24/2025	59.47	31.57	3.56	4.89	0.575
8	03/27/2025	61.22	20.75	4.35	5.02	0.465
9	04/01/2025	58.96	24.62	3.77	3.89	0.461
10	04/04/2025	55.47	21.54	4.33	4.56	0.434
11	04/08/2025	56.32	24.37	3.54	3.48	0.511
12	04/11/2025	54.12	22.63	3.21	4.21	0.525
13	04/15/2025	57.63	20.85	4.56	3.47	0.493
14	04/21/2025	55.34	21.48	3.75	4.19	0.553
15	04/25/2025	56.89	20.56	4.22	4.32	0.475
16	04/29/2025	54.78	21.67	3.70	3.47	0.436
17	05/01/2025	37.15	16.23	4.22	4.89	0.390
18	05/05/2025	33.58	15.76	3.64	4.15	0.412
19	05/08/2025	35.22	16.32	4.75	4.52	0.463
20	05/13/2025	34.58	14.65	3.44	4.05	0.373
21	05/15/2025	33.43	15.12	3.82	3.46	0.398
22	05/19/2025	36.51	16.33	3.20	4.32	0.423
23	05/21/2025	34.29	15.65	4.55	3.75	0.456
24	05/24/2025	35.76	16.88	3.66	4.23	0.461
Minimum		33.43	14.65	3.12	3.46	0.37
Maximum		62.47	32.45	4.86	5.52	0.59
Average		50.56	22.64	3.92	4.37	0.48
98 th Percentile		61.90	32.05	4.81	5.44	0.58
NAAQS, For 24 Hourly Monitoring		100.0	60.0	80.0	80.0	2.0

Table - 3.13(f): AAQ6 (Samasi Presbyterian Church, Samasi) Results

S. No	Date	Particulate Matter PM10 ($\mu\text{g}/\text{m}^3$)	Particulate Matter PM2.5 ($\mu\text{g}/\text{m}^3$)	Sulphur Dioxide SO ₂ ($\mu\text{g}/\text{m}^3$)	Nitrogen Dioxide NO ₂ ($\mu\text{g}/\text{m}^3$)	Carbon Monoxide (CO) (mg/m ³)
		IS:5182 (Part-23)	IS:5182 (Part-24)	IS:5182 (Part-2)	IS:5182 (Part-6)	IS: 5182 (Part-10)
1	03/01/2025	61.30	30.58	4.23	5.46	0.349
2	03/04/2025	60.45	29.84	3.59	4.87	0.357
3	03/07/2025	57.64	32.45	3.47	5.12	0.343
4	03/11/2025	59.84	31.23	4.56	4.78	0.465
5	03/15/2025	60.13	30.89	3.43	5.11	0.411
6	03/19/2025	61.45	30.56	4.12	5.62	0.495
7	03/24/2025	59.47	31.57	3.56	4.89	0.400
8	03/27/2025	60.44	20.75	4.35	5.02	0.507

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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9	04/01/2025	56.32	24.62	3.77	3.89	0.446
10	04/04/2025	53.14	21.54	4.33	4.56	0.452
11	04/08/2025	54.76	24.37	3.54	3.48	0.462
12	04/11/2025	56.57	22.63	3.21	4.21	0.495
13	04/15/2025	57.63	20.85	4.56	3.47	0.472
14	04/21/2025	55.34	21.48	3.75	4.19	0.481
15	04/25/2025	56.89	20.56	4.22	4.32	0.456
16	04/29/2025	57.26	21.67	3.70	4.78	0.471
17	05/01/2025	37.15	16.23	4.22	4.89	0.453
18	05/05/2025	33.58	15.76	3.64	4.15	0.455
19	05/08/2025	35.22	16.32	4.75	4.52	0.361
20	05/13/2025	34.47	15.08	3.44	4.05	0.462
21	05/15/2025	32.98	16.23	3.82	3.78	0.441
22	05/19/2025	33.87	15.87	3.20	4.32	0.428
23	05/21/2025	34.29	15.65	4.55	3.75	0.447
24	05/24/2025	33.98	16.74	3.66	4.23	0.433
Minimum		32.98	15.08	3.20	3.47	0.34
Maximum		61.45	32.45	4.75	5.62	0.51
Average		50.17	22.64	3.90	4.48	0.44
98 th Percentile		61.38	32.05	4.66	5.55	0.50
NAAQS, For 24 Hourly Monitoring		100.0	60.0	80.0	80.0	2.0

Table - 3.13(g): AAQ7 (Jongria Old L.P School, Jongria Old) Results

S. No	Date	Particulate Matter PM10 ($\mu\text{g}/\text{m}^3$)	Particulate Matter PM2.5 ($\mu\text{g}/\text{m}^3$)	Sulphur Dioxide SO ₂ ($\mu\text{g}/\text{m}^3$)	Nitrogen Dioxide NO ₂ ($\mu\text{g}/\text{m}^3$)	Carbon Monoxide (CO) (mg/m ³)
		IS:5182 (Part-23)	IS:5182 (Part-24)	IS:5182 (Part-2)	IS:5182 (Part-6)	IS: 5182 (Part-10)
1	03/01/2025	59.60	28.64	3.14	5.46	0.236
2	03/04/2025	58.23	30.28	2.56	4.89	0.281
3	03/07/2025	60.57	29.64	3.47	4.32	0.227
4	03/11/2025	61.21	31.76	2.98	5.98	0.348
5	03/15/2025	58.62	28.56	3.56	5.66	0.331
6	03/19/2025	57.46	27.45	2.65	5.14	0.357
7	03/24/2025	58.11	29.31	3.47	4.23	0.315
8	03/27/2025	59.64	28.64	2.99	5.20	0.420
9	04/01/2025	55.64	22.16	3.64	3.49	0.342
10	04/04/2025	56.76	21.79	2.29	4.86	0.397
11	04/08/2025	51.37	23.78	3.97	3.97	0.423
12	04/11/2025	54.79	20.98	2.46	4.35	0.339
13	04/15/2025	55.86	21.89	3.77	3.75	0.346

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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14	04/21/2025	54.85	23.54	2.46	4.56	0.332
15	04/25/2025	52.32	21.37	3.77	3.77	0.383
16	04/29/2025	53.64	22.47	2.41	4.89	0.342
17	05/01/2025	36.98	14.78	3.96	4.96	0.360
18	05/05/2025	34.16	15.23	2.27	5.02	0.241
19	05/08/2025	33.87	16.93	3.32	4.89	0.229
20	05/13/2025	35.64	15.82	2.75	5.23	0.246
21	05/15/2025	32.14	14.98	3.67	4.11	0.310
22	05/19/2025	31.79	15.21	2.85	5.40	0.345
23	05/21/2025	33.84	14.75	2.33	4.15	0.258
24	05/24/2025	32.56	16.47	3.96	4.32	0.298
Minimum		31.79	14.75	2.27	3.49	0.23
Maximum		61.21	31.76	3.97	5.98	0.42
Average		49.15	22.35	3.11	4.69	0.32
98 th Percentile		60.92	31.08	3.97	5.83	0.42
NAAQS, For 24 Hourly Monitoring		100.0	60.0	80.0	80.0	2.0

Table - 3.13(h): AAQ8 (Shnongrim sc playground, Shnongrim) Results

S. No	Date	Particulate Matter PM10 ($\mu\text{g}/\text{m}^3$)	Particulate Matter PM2.5 ($\mu\text{g}/\text{m}^3$)	Sulphur Dioxide SO ₂ ($\mu\text{g}/\text{m}^3$)	Nitrogen Dioxide NO ₂ ($\mu\text{g}/\text{m}^3$)	Carbon Monoxide (CO) (mg/m ³)
		IS:5182 (Part-23)	IS:5182 (Part-24)	IS:5182 (Part-2)	IS:5182 (Part-6)	IS: 5182 (Part-10)
1	03/01/2025	57.16	28.64	3.46	5.07	0.281
2	03/04/2025	56.98	30.28	2.51	4.31	0.358
3	03/07/2025	60.88	29.64	3.47	4.40	0.461
4	03/11/2025	58.64	30.47	2.98	5.75	0.417
5	03/15/2025	57.61	28.56	3.56	5.43	0.473
6	03/19/2025	59.64	27.45	2.65	5.32	0.348
7	03/24/2025	58.11	29.13	3.47	4.61	0.361
8	03/27/2025	58.37	28.64	2.99	5.22	0.457
9	04/01/2025	55.64	22.16	3.64	4.30	0.345
10	04/04/2025	56.76	21.79	2.29	4.86	0.342
11	04/08/2025	51.37	23.78	3.90	3.97	0.363
12	04/11/2025	54.79	20.98	2.46	4.35	0.367
13	04/15/2025	55.86	21.89	3.77	3.75	0.465
14	04/21/2025	54.85	23.54	2.46	4.56	0.373
15	04/25/2025	52.32	21.37	3.77	3.77	0.475
16	04/29/2025	53.64	22.47	2.41	4.89	0.346
17	05/01/2025	36.98	14.78	3.37	3.62	0.395

18	05/05/2025	34.16	15.23	2.49	5.02	0.359
19	05/08/2025	33.87	16.70	3.32	4.89	0.374
20	05/13/2025	35.64	15.82	2.75	5.23	0.438
21	05/15/2025	33.46	14.98	3.67	4.70	0.447
22	05/19/2025	32.48	15.21	2.85	5.47	0.461
23	05/21/2025	34.12	14.88	2.33	4.46	0.456
24	05/24/2025	32.56	15.39	3.54	5.09	0.441
Minimum		32.48	14.78	2.29	3.62	0.28
Maximum		60.88	30.47	3.90	5.75	0.48
Average		49.00	22.24	3.09	4.71	0.40
98 th Percentile		60.31	30.38	3.84	5.62	0.47
NAAQS, For 24 Hourly Monitoring		100.0	60.0	80.0	80.0	2.0

Observation:

Ambient Air Quality Monitoring reveals that the minimum & maximum and 98th percentile concentrations of PM₁₀ for all the 8 AQ monitoring stations were found to be 32.48 µg/m³ (at AAQ8) & 63.21 µg/m³ (AAQ 2) and 60.31 µg/m³ to 62.81 µg/m³ respectively. Ambient Air Quality Monitoring reveals that the minimum, maximum and 98th percentile concentrations of PM_{2.5} for all the 8 AQ monitoring stations were found to be 14.65 µg/m³ (at AAQ 5) & 34.56 µg/m³ (at AAQ 2) and 30.38 µg/m³ to 34.42 µg/m³ at respectively. As far as the gaseous pollutants SO₂ and NO₂ are concerned, the prescribed CPCB limit of 80 µg/m³ for residential and rural areas has never surpassed at any station. The minimum, maximum and 98th percentile concentrations of SO₂ were found to be 2.29 µg/m³ (at AAQ 8), 4.92 µg/m³ (at AAQ 3) and 3.76 µg/m³ to 4.90 µg/m³ respectively. The minimum, maximum and 98th percentile concentrations of NO₂ were found to be 3.11 µg/m³ (at AAQ 4), 5.98 µg/m³ (at AAQ 7) and 5.40 µg/m³ to 5.83 µg/m³ and The minimum, maximum and 98th percentile concentrations of CO were found to be 0.15 mg/m³ (at AAQ 1), 0.67 mg/m³ (at AAQ 7) and 0.43 mg/m³ to 0.67 mg/m³. respectively. The results thus obtained indicate that the concentrations of PM₁₀, PM_{2.5}, SO₂, NO₂ and other Gaseous pollutants were low, with SO₂ between 2.29–4.92 µg/m³ and NO₂ between 3.11–5.98 µg/m³, All other monitored air quality parameters (including CO, O₃, NH₃, Pb, Ni, As, and Benzene) were also well within National Ambient Air Quality Standards (NAAQS), confirming overall compliance.

The results thus obtained indicate that the concentrations of PM₁₀, PM_{2.5}, SO₂ and NO₂ in the Ambient Air are well within the National Ambient Air Quality (NAAQ) standards for Industrial, Residential, Rural and other areas.

Interpretation:

The air quality in the region is primarily determined by local human activities interacting with natural weather patterns. An analysis of ambient air quality monitoring results (using both primary and secondary data) within a 10 km study area revealed that the main human-caused sources of pollution are classified as "point" and "line" sources.

The specific major sources identified within the 10 km radius are:

- **Point Sources:** Emissions from various industrial/Mining activities, ranging from large to small scale.
- **Line Sources:** Emissions from vehicle movements, including transportation of industrial raw materials and finished products, private and public transport, and agricultural/construction-related vehicles (tractors, trolleys and Dumpers).
- **Area Sources:** Incomplete combustion from domestic activities like cooking and heating in certain villages.

Overall Conclusion:

All monitored air quality parameters were found to be within the limits set by the National Ambient Air Quality Standards (NAAQS). Shree Cement Ltd. has committed to implementing detailed measures to control air emissions, which are further described in Chapters 4 and 10 of the full EIA/EMP Report.

3.5.5 AMBIENT NOISE ENVIRONMENT

The noise levels within the study area were recorded using Sound Level Meter and noise monitoring results were compared with the Ambient Noise Quality Standard notified under Environment Protection Act, 1986. The levels recorded are as stated in Table 3.14(a).

Table: 3.14: Study of Ambient Noise Monitoring

Category	Details
Objective	To determine baseline ambient noise levels in and around the plant site and study area villages.
Sampling Frequency	Once during the study period.
Sampling Periods	Daytime and Night-time.

Table - 3.14(a): Locations of Ambient Noise Monitoring Stations

Location Code	Location	Direction	Distance (Km)	Project area/Study Area	Coordinates	
					Latitudes	Longitudes
NQ1	Shree Cement Project Site	--	0.01	Project area	25°20'37.37"N	92°33'50.06"E
NQ2	Saipung PHC, Mutong	ESE	5.60	Study Area	25°20'11.31"N	92°37'11.53"E

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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Location Code	Location	Direction	Distance (Km)	Project area/Study Area	Coordinates	
					Latitudes	Longitudes
NQ3	St Joseph's Church, Khahnar	NE	5.56	Study Area	25°23'0.04"N	92°36'8.50"E
NQ4	Tangnub Presbyterian Church, Lumpdeng	SW	7.52	Study Area	25°18'6.83"N	92°30'5.23"E
NQ5	Shnongrim sc playground, Shnongrim	E	4.32	Study Area	25°21'5.65"N	92°30'52.97"E

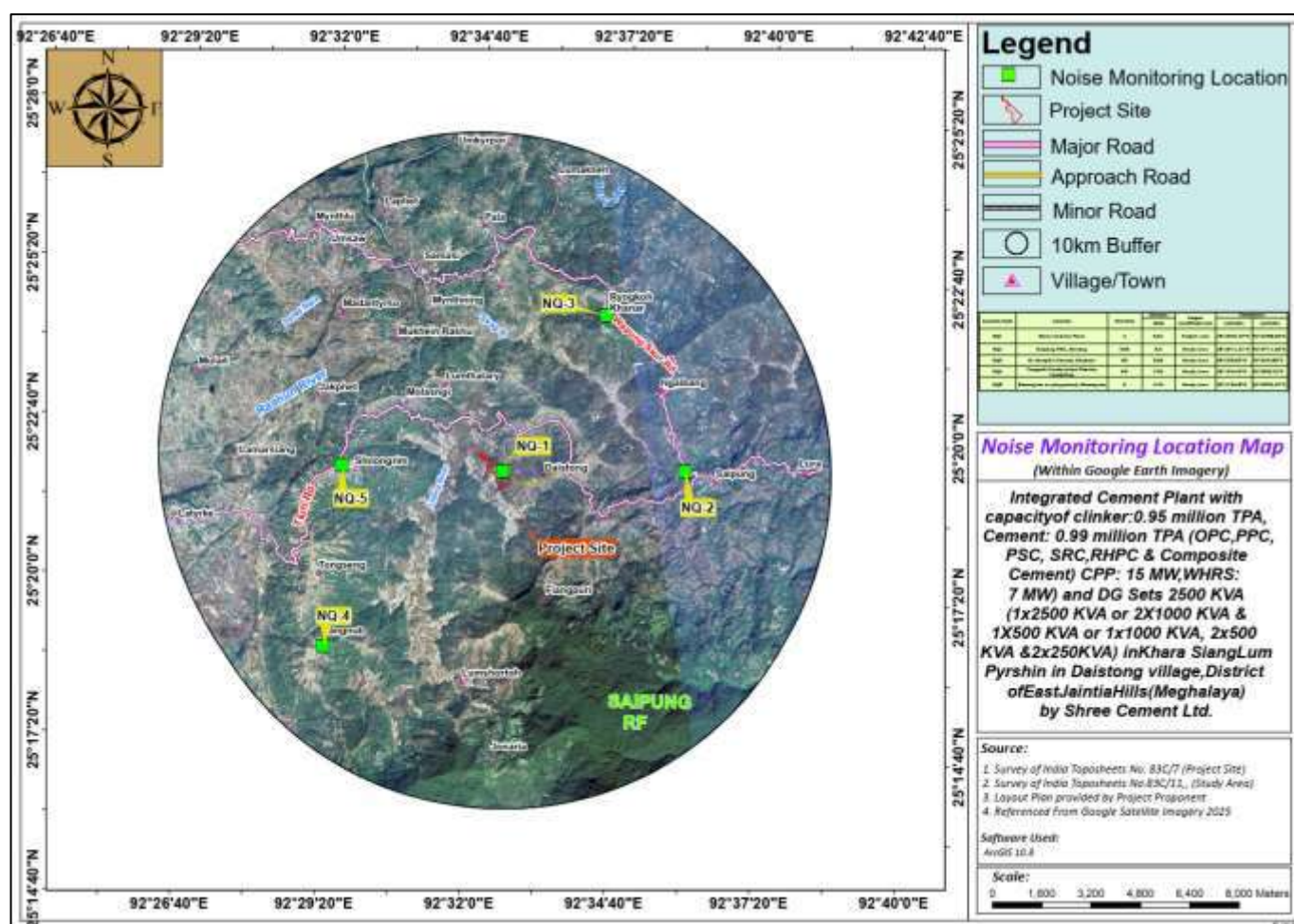


Figure: 3.8: Map showing Ambient Noise Quality Monitoring Locations

Ambient Noise Level Monitoring Results

Ambient noise levels monitored at different locations (as mentioned in Table - 3.14(a)) during the study period are given in Table - 3.14(b).

Table: 3.14(b): Ambient Noise Level Monitoring Results

Station	Locations	Date of Monitoring	Results		Units
			Day	Night	
NQ 1	Near Project Site (Within 500m)	08.03.2025	49.8	42.6	dB(A)
NQ 2	Saipung PHC, Mutong	21.03.2025	48.5	40.8	dB(A)
NQ 3	St Joseph's Church, Khahnar	03.04.2025	51.4	39.6	dB(A)
NQ 4	Tangnub Presbyterian Church, Lumpdeng	17.04.2025	49.7	38.1	dB(A)
NQ 5	Shnongrim sc playground, Shnongrim	06.05.2025	52.9	40.3	dB(A)
Requirement (as per CPCB Guidelines Limits in dB (A) Leq					
Category of Area/ Zone		Day Time	Night Time		
Industrial Area		75	70		
Residential Area		55	45		
Commercial Area		65	55		
Silence Zone		50	40		

Results

Noise monitoring reveals that the minimum & maximum noise levels at day time were recorded as 48.50 dB(A) at NQ 2 & 52.9 dB(A) at NQ 5 respectively. The minimum & maximum noise levels at night time were found to be 38.1 dB(A) at NQ 4 & 42.6 dB(A) at NQ 1 respectively. There are several other sources in the 10 km radius of study area, which contributes to the local noise level of the area. o Within the 10 km radius of study area the noise levels at the sampling locations are under the prescribed limits as given by the CPCB.

The conclusions regarding ambient noise:

- Current noise levels in the study area are within the limits mandated by the Noise Pollution (Regulation and Control) Rules, 2000.
- Future noise levels are predicted to increase due to transportation activities associated with the proposed project.
- The primary impacts are expected in villages located within 0.95 km of the plant site in East direction, as these areas currently experience low baseline noise levels.
- Shree Cement Ltd. has committed to adopting specific mitigation measures to control these anticipated noise impacts.
- Detailed mitigation strategies are outlined in Chapters 4 and 10 of the EIA/EMP Report.

3.5.6 WATER QUALITY ENVIRONMENT

To gain a comprehensive understanding of the baseline water quality within the study area, local water resources were categorized into two primary types for monitoring and analysis:

1. **Groundwater Resources:** This category encompasses water accessed via tube wells, open wells, and hand pumps.
2. **Surface Water Resources:** This category includes bodies of water such as streams, nallahs (drains/rivulets), rivers and canals.

3.5.6.1 Ground Water Quality

Groundwater accessed via bore-wells serves as the primary source of potable water for the area.

To evaluate the quality of this groundwater, a study was conducted by collecting a total of **four (04) water samples** from various available water resources located within the 10 km study radius.

Table: 3.15(a): Locations of Ground Water Monitoring Stations

Location Code	Sample collected from	Direction	Distance (Km)	Project area/Study Area	Coordinates	
					Latitudes	Longitudes
GW – 1	Saipung PHC, Mutong	ESE	5.60	Study Area	26°30'2.43"N	90°56'21.12"E
GW – 2	St Joseph's Church, Khahnar	NE	5.56	Study Area	26°29'30.36"N	90°52'31.70"E
GW – 3	Tangnub Presbyterian Church, Lumpdeng	SW	7.52	Study Area	26°26'18.54"N	90°52'10.43"E
GW – 4	Shnongrim sc playground, Shnongrim	E	4.32	Study Area	25°21'5.65"N	92°30'52.97"E

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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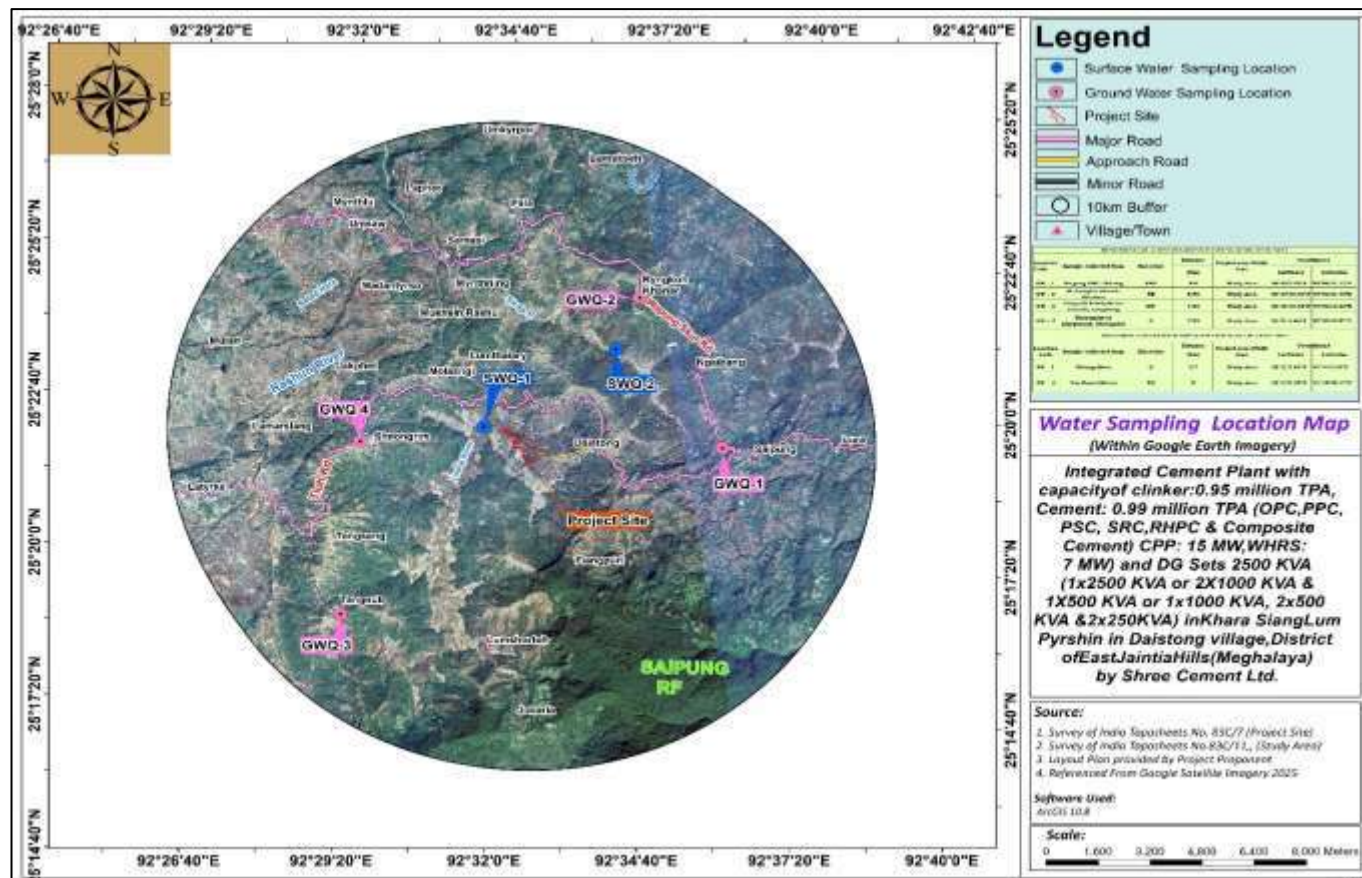


Figure: 3.9: Map showing Ground Water Monitoring Locations

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

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Table: 3.15(b): Physico-chemical properties of ground water

S. No.	Parameters	Unit	Saipung PHC, Mutong	St Joseph's Church, Khahnar	Tangnub Presbyterian Church, Lumpdeng	Shnongrim se playground, Shnongrim	Specification as per IS 10500- 2012	
							Requirement Acceptable Limit	Permissible Limit in the Absence of Alternate Source
1.	pH (at 25°C)	-	5.90	5.86	5.60	5.32	6.5-8.5	No Relaxation
2.	Colour	Hazen Unit	<1.0	<1.0	<1.0	<1.0	5	15
3.	Turbidity	NTU	<1.0	<1.0	<1.0	<1.0	1	5
4.	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5.	Taste	-	Un-Agreeable	Un-Agreeable	Un-Agreeable	Un-Agreeable	Agreeable	Agreeable
6.	Total Hardness as CaCO ₃	mg/l	135.20	140.4	148.6	156.8	200	600
7.	Calcium as Ca	mg/l	42.5	44.2	46.4	48.2	75	200
8.	Alkalinity as CaCO ₃	mg/l	180.6	189.0	192.5	185.8	200	600
9.	Chloride as Cl	mg/l	34.2	38.2	34.6	36.2	250	1000
10.	Cyanide as CN	mg/l	<0.02	<0.02	<0.02	<0.02	0.05	No Relaxation
11.	Magnesium as Mg	mg/l	8.7	8.4	8.6	9.2	30	100
12.	Total Dissolved Solids	mg/l	238.0	248.0	234.6	236.8	500	2000
13.	Sulphate as SO ₄	mg/l	18.2	19.4	25.2	21.0	200	400
14.	Nitrate as NO ₃ -N	mg/l	8.6	9.8	8.4	8.1	45	No Relaxation
15.	Iron as Fe	mg/l	<0.05	<0.05	<0.05	<0.05	1.0	No Relaxation
16.	Boron	mg/l	<0.05	<0.05	<0.05	<0.05	0.50	2.4
17.	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	0.001	0.002
18.	Anionic Detergents as MBAS	mg/l	<0.02	<0.02	<0.02	<0.02	0.2	1
19.	Hexa Chromium as Cr ⁺⁶	mg/l	<0.03	<0.03	<0.03	<0.03	--	--
20.	Chromium as Cr	mg/l	<0.005	<0.005	<0.005	<0.005	0.05	No Relaxation
21.	Zinc as Zn	mg/l	<0.1	<0.1	<0.1	<0.1	5	15
22.	Copper as Cu	mg/l	<0.02	<0.02	<0.02	<0.02	0.05	1.5
23.	Manganese as Mn	mg/l	8.1	8.0	8.2	8.4	0.1	0.3
24.	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	0.003	No Relaxation
25.	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	0.01	No Relaxation
26.	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	0.01	No Relaxation
27.	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	0.001	No Relaxation
28.	Sodium as Na	mg/l	4.5	4.2	5.2	5.9	--	--
29.	Potassium as K	mg/l	3.2	3.8	4.1	4.5	--	--
30.	Phosphate as PO ₄	mg/l	<0.02	<0.02	<0.02	<0.02	--	--

31.	Nickel	mg/l	<0.005	<0.005	<0.005	<0.005	0.02	No Relaxation
32.	Conductivity	μS/cm	385.0	390.0	415.0	414.0	--	--
33.	Total Suspended Solid	mg/l	<0.01	<0.01	<0.01	<0.01	--	--

Interpretation of Ground Water Quality Results

The physio-chemical quality of groundwater was compared with drinking water standard (IS: 10500- 2012). The sample was taken from four locations i.e., Saipung PHC, Mutong, St Joseph's Church, Khahnar, Tangnub Presbyterian Church, Lumpdeng & Shnongrim sc playground, Shnongrim as there is easily available of ground water. The pH of the ground water ranges from 5.32 to 5.90 indicating slightly acidic in nature.

The concentration of chloride was found to be (34.2 to 38.2 mg/l) and sulphate was (18.2 to 25.2 mg/l). The concentrations of other micro and macro nutrients were i.e., nitrate (8.1 to 9.8 mg/l), calcium (42.5 to 48.2 mg/l), Magnesium (8.4 to 9.2 mg/l), and iron (<0.05 mg/l).

Conclusion

Groundwater analysis indicates variable baseline water quality; certain samples comply with IS 10500-2012 standards, while others show elevated acidic. The current water quality makes it suitable for animal consumption, but often unfit for human drinking water standards.

The project is designed to be a "zero discharge" facility, with no water bodies within the site and all wastewater contained internally, ensuring no adverse environmental impact on external water quality. To address the existing shortage of safe drinking water in the area, SCL plans proactive measures under its EMP and SEDP, specifically funding and implementing desalination processes to make the local water potable for the community.

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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3.5.6.2 Surface Water Quality

Surface water accessed from Water Bodies fall within the 10 km radius of the study area serves as the primary source of potable water for the area.

To evaluate the quality of this Surface water, a study was conducted by collecting a total of **four (02)** **water samples** from various available water resources located within the 10 km study radius.

Table: 3.16(a): Locations of Surface water Sampling Stations

Location Code	Sample collected from	Direction	Distance (Km)	Project area /Study Area	Coordinates	
					Latitudes	Longitudes
SW – 1	Dihang River	E	0.70	Study Area	25°21'4.63"N	92°33'4.23"E
SW – 2	Um Pawal (River)	NE	5.0	Study Area	25°22'9.25"N	92°35'35.17"E

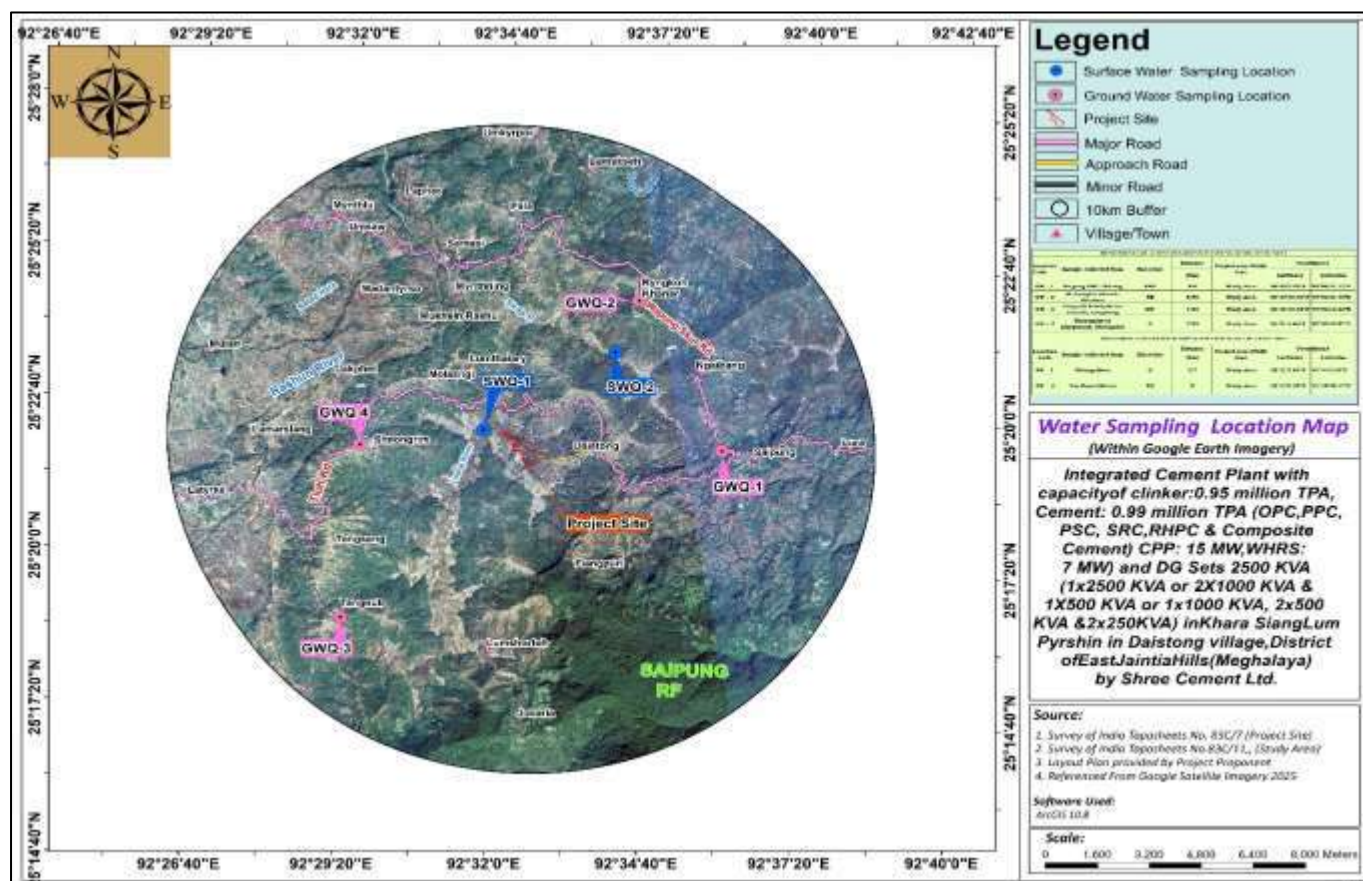


Figure: 3.10: Map showing Surface Water Monitoring Locations

Surface water sample was collected from the above water body. As per CPCB guidelines; upstream & downstream samples of the above surface water body. Cement plant is based on dry process technology

and there will be no discharge outside the plant premises. Zero Liquid Discharge (ZLD) will be followed.

Surface water analysis results of the sampled locations are given in Table - 3.16(b).

Table: 3.16(b): Surface Water Analysis

S. No.	Parameters	Unit	Dihang River	Um Pawal River
1.	pH (at 25°C)	--	5.4	5.8
2.	Colour	Hazen Unit	<5.0	<5.0
3.	Turbidity	NTU	15	18
4.	Odour	--	Agreeable	Agreeable
5.	Total Hardness as CaCO ₃	mg/l	85.43	82.69
6.	Calcium as Ca	mg/l	22.21	24.41
7.	Alkalinity as CaCO ₃	mg/l	190.0	219.0
8.	Chloride as Cl	mg/l	18.12	20.30
9.	Residual free Chlorine	mg/l	< 0.20	< 0.20
10.	Cyanide as CN	mg/l	< 0.02	< 0.02
11.	Magnesium as Mg	mg/l	7.5	8.2
12.	Total Dissolved Solids	mg/l	225.0	212.0
13.	Sulphate as SO ₄	mg/l	24.70	24.40
14.	Fluoride as F	mg/l	<0.01	<0.01
15.	Nitrate as NO ₃	mg/l	0.5	0.6
16.	Iron as Fe	mg/l	0.17	0.19
17.	Aluminum as Al	mg/l	< 0.03	< 0.03
18.	Phenolic Compounds	mg/l	<0.001	<0.001
19.	Hexa Chromium as Cr ⁺⁶	mg/l	<0.001	<0.001
20.	Zinc as Zn	mg/l	<1.0	<1.0
21.	Copper as Cu	mg/l	< 0.02	< 0.02
22.	Lead as Pb	mg/l	< 0.002	< 0.005
23.	Arsenic as As	mg/l	<0.01	<0.01
24.	Mercury as Hg	mg/l	< 0.001	< 0.001
25.	Total Suspended Solid	mg/l	242.0	239.0
26.	Biochemical Oxygen Demand	mg/l	4.2	4.8
27.	Chemical Oxygen Demand	mg/l	24.6	25.2
28.	Dissolve Oxygen	mg/l	6.8	7.6
29.	Potassium as K	mg/l	3.58	3.46
30.	Conductivity	µs/cm	373.0	384.0
31.	Nickel	mg/l	< 0.005	< 0.005
32.	Sodium as Na	mg/l	19.0	20.2
33.	Phenol	mg/l	< 0.001	< 0.001
34.	Total Coliform Cells/100ml	MPL	44	46

Observation:

- The analysis results indicate that the pH ranges between 5.4 and 5.8.

- Dissolved Oxygen (DO) was observed in the range of 6.8 to 7.6 mg/l against the minimum requirement of 4 mg/l. BOD values were observed to be in the range of 4.2 -4.8 mg/l.
- The chlorides and Sulphates were found to be in the range of 18.12 – 20.30 mg/l and 24.70 – 24.40 mg/l respectively.
- Bacteriological examination of surface water samples revealed the presence of total coliform in range of 44 MPN/100 ml to 46 MPN/100 ml.

Based on the results it is evident that most of the parameters of the samples comply with 'Category 'A' standards of CPCB indicating their suitability for Drinking water source after conventional treatment and disinfection.

3.5.7 SOIL QUALITY ENVIRONMENT

Soil Quality Assessment Methodology

- **Data Collection Methods:** Information was gathered using a two-pronged approach: reviewing data from secondary sources and conducting on-site sampling.
- **Sampling Objective:** The goal was to establish the baseline characteristics of the soil profile surrounding the Integrated Cement Project site.
- **Impact Assessment Focus:** Sampling locations were strategically chosen to allow for the determination of the anticipated impact of future plant operations on soil quality.
- **Sampling Scope:** Nine representative soil samples were collected from various specified locations within the study area and plant site boundary.
- **Analytical Procedures:** Standardized procedures were strictly followed for both the collection of samples and the subsequent analysis of their physical and chemical parameters.

Table: 3.17 Standard Soil Classification

S. No.	Parameters	Classification
1.	pH	<4.5 extremely acidic 4.51 - 5.0 very strong acidic 5.01 - 5.5 strongly acidic 5.51 - 6.0 moderately acidic 6.1 - 6.5 slightly acidic 6.51 - 7.3 Neutral 7.31-7.8 slightly alkaline 7.81-8.5 moderately alkaline 8.51 - 9.0 strongly alkaline >9.0 Very strongly alkaline

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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2.	Salinity Electrical Conductivity (mho/cm) 1 mho/cm = 640 ppm	Up to 1.0 average 1-2 harmful to germination 2-3 harmful to crops
3.	Nitrogen (kg/ha)	Up to 50 very less 51-100 less 110-150 good 151-300 better >300 sufficient
4.	Phosphorus (kg/ha)	Up to 15 very less 15 - 30 less 31-50 medium 51-65 On average sufficient 66-80 sufficient >80 more than sufficient
5.	Potassium (kg/ha)	0-120 very less 120-180 less 180-240 medium 241-300 average 301-360 better >360 more than sufficient

Table: 3.17(a): Locations of Soil Sampling Stations

Location Code	Location	Direction	Distance (Km)	Project area/ Study Area	Coordinates	
					Latitudes	Latitudes
SQ1	Shree Cement Project Site	--	0.01	Project area	25°20'37.37"N	92°33'50.06"E
SQ2	Saipung PHC, Mutong	ESE	5.60	Study Area	25°20'11.31"N	92°37'11.53"E
SQ3	St Joseph's Church, Khahnar	NE	5.56	Study Area	25°23'0.04"N	92°36'8.50"E
SQ4	Tangnub Presbyterian Church, Lumpdeng	SW	7.52	Study Area	25°18'6.83"N	92°30'5.23"E
SQ5	Shnongrim sc playground, Shnongrim	E	4.32	Study Area	25°21'5.65"N	92°30'52.97"E

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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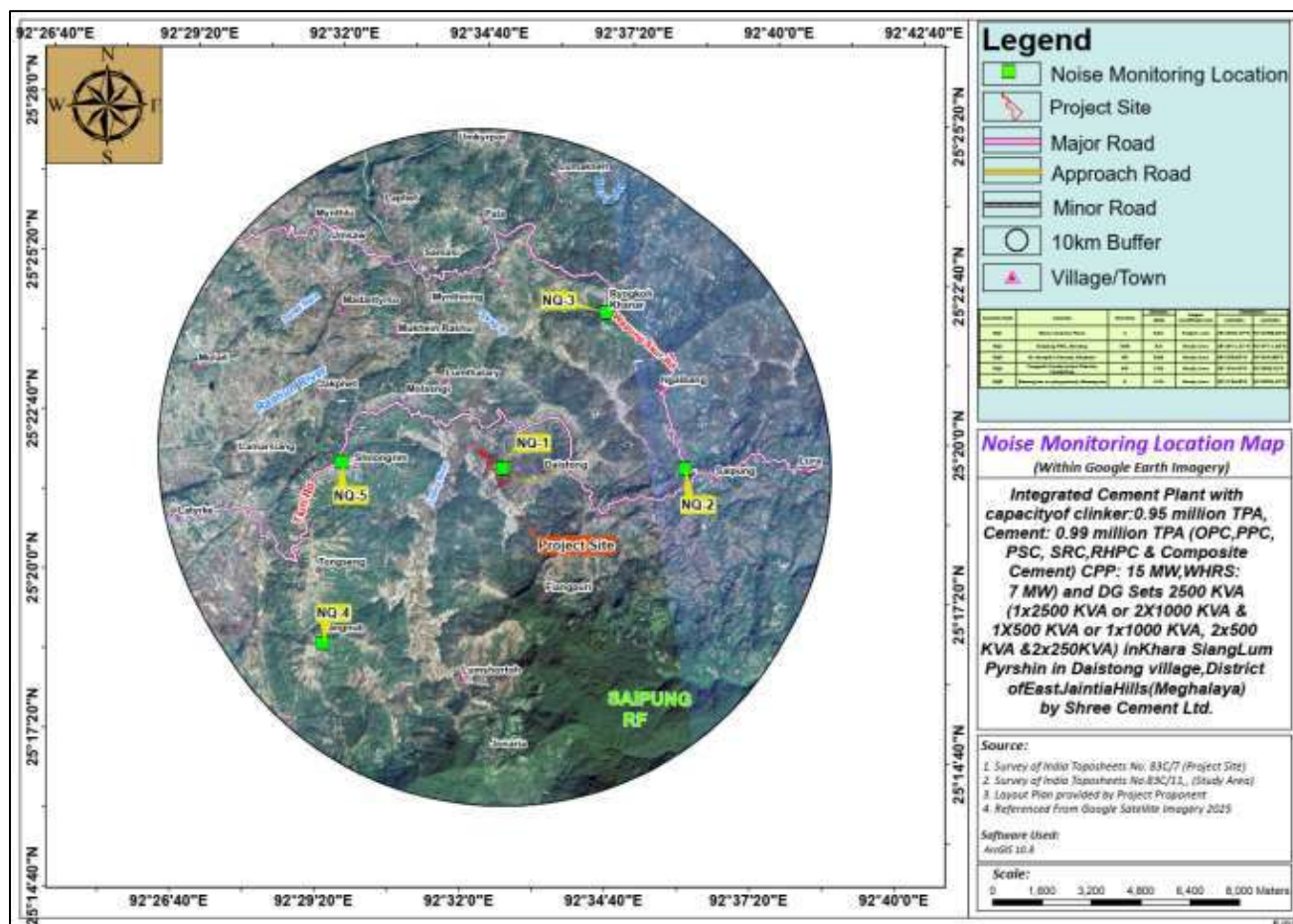


Figure: 3.11: Map showing Soil Monitoring Locations

Table :3.17(b): Soil Analysis Results

		Location	SQ1	SQ2	SQ3	SQ4	SQ5
S. No.	Parameters	Units	Results	Results	Results	Results	Results
1	pH	-	7.31	7.4	7.11	7.2	7.15
2	Conductivity	µmhos/cm	358.4	326.7	270.8	321.7	294.6
3	Sodium (as Na)	mg/kg	220.5	251.12	298.12	305.62	282.1
4	Water holding capacity	%	33.73	35.31	30.51	29.52	31.5
5	Potassium (as K)	mg/kg	215.58	170.54	198.28	162.9	183.5
6	Sand	%	44.26	35.21	47.65	48.34	41.67
7	Clay	%	34.17	37.68	32.62	30.32	36.33
8	Silt	%	18.42	27.28	13.48	21.08	20.86
9	Calcium (as Ca)	mg/kg	3564.71	3952.7	3828.68	3703.86	3508.9
10	Magnesium (as Mg)	mg/kg	689.6	809.51	712.48	472.33	525.2
11	SAR	-	0.72	0.94	1.10	1.20	1.11
12	CEC	meq/100gm	2.15	2.19	2.92	2.22	2.9
13	Phosphorus (as P)	mg/kg	60.3	59.4	66.1	54.32	58.5
14	Organic carbon	%	0.86	1.2	1.10	0.9	0.97
15	Porosity	%	40.8	38.1	39.2	39.5	37.82

Soil Quality Results

Analysis of soil samples collected from the study area revealed consistent physical characteristics across all sampled villages, exhibiting colors such as light yellow, dull brown, and brownish-grey. The soil texture was identified as predominantly silty clay or sandy loam.

The chemical analysis indicates favourable conditions for plant growth:

- **pH Range:** The soil samples were slightly to strongly alkaline, with pH values ranging from 7.11 to 7.40 which is considered optimal for a wide variety of plant species.
- **Organic carbon:** Organic carbon content was appropriate for plant growth, measuring between 0.86% and 1.20%.
- **Essential Nutrients:** All six essential nutrients (Phosphorus, Potassium, Magnesium, Sulphur, and Calcium) were present in high amounts, significantly exceeding typical levels for other micro- and macro-nutrients:
 - **Phosphorus:** 54.32 to 66.01 kg/ha
 - **Potassium:** 162.9 to 215.58 kg/ha
 - **Magnesium:** 472.33 to 809.51 mg/kg
 - **Calcium:** 3508.9 to 3952.7 mg/kg

Conclusion:

The observed higher calcium values are attributed to the inherently alkaline nature of the local soil, a condition which positively contributes to healthy plant growth. Overall, these baseline results confirm that the soil within the study area is of good quality, possessing sufficient vital macronutrients to support robust vegetation. Shree Cement Ltd. will implement adequate mitigative measures, detailed further in Chapters 4 & 10 of the EIA/EMP report, to maintain these favourable conditions.

3.5.8 BIOLOGICAL ENVIRONMENT

3.5.8.1 Introduction

Ecology, Biodiversity, delve into the intricate web of life, exploring how organisms interact with their environment, uncovering the vast spectrum of species diversity, and tracing the fascinating journey of evolution that shapes life through time. Biodiversity encompasses the immense variability of life on Earth, embracing all organisms, habitats, and the intricate ecological and evolutionary processes that sustain them. It is a dynamic, hierarchical construct expressed across three interdependent levels: genetic, species, and ecosystem diversity. Collectively, these dimensions constitute the biological foundation of the planet, ensuring ecological resilience, adaptability, and continuity through time. In this continuum, ecosystems emerge as complex, self-regulating mosaics of life, where plant and animal communities

serve as bio-indicators of environmental stability. Their responses to shifting climatic and anthropogenic pressures reveal the pulse of nature itself. Understanding these interactions through scientific inquiry is vital for ensuring ecosystem resilience, guiding sustainable management, and formulating adaptive mitigation strategies rooted in ecological integrity. Biodiversity and ecological integrity form the ecological backbone of Environmental Impact Assessment, providing critical insights into the health, stability, and resilience of natural systems. Assessing biodiversity within an EIA framework enables the identification of sensitive habitats, key species, and ecological linkages that may be affected by developmental activities. Understanding these interrelationships supports the prediction and quantification of potential impacts, guiding the formulation of effective mitigation and conservation strategies.

a) Legislative Tools of Concern

In India, a robust framework of legislative measures and policy instruments has been established to ensure the protection and sustainable management of the environment, encompassing sectors such as agriculture, forestry, and wildlife. These regulatory mechanisms collectively address the challenges associated with biodiversity conservation and ecological integrity. They serve as essential safeguards for assessing and mitigating the potential impacts of developmental activities that may threaten natural systems. For the preparation of Environmental Impact Assessment (EIA) reports and Environmental Management Plans (EMP), all relevant Acts, Rules, and Notifications are applied in accordance with their original provisions and subsequent amendments up to the present date. The key legislations and policies relevant to biodiversity conservation and management are outlined below.

- a) Indian Forest Act, 1927
- b) National Forest Policy, 1952
- c) Wildlife (Protection) Act, 1972 & subsequent amendments
- d) National Wildlife Policy, 1972
- e) Forest (Conservation) Act, 1980
- f) Environment (Protection) Act, 1986
- g) National Policy & Macro Strategy on Biological Diversity, 1999
- h) The Biological Diversity Act, 2002
- i) National Biodiversity Conservation Strategy and Action Plan
- j) Environment Policy, 2006
- k) National Biodiversity Action Plan, 2008

3.5.8.2 Objectives

Thus, integrating biodiversity and ecosystem evaluation into EIA ensures that development proceeds in harmony with ecological sustainability, maintaining the balance between human progress and environmental stewardship. Therefore, this current study centres on the project area, seeking to evaluate its influence on the surrounding biological environment. Through detailed floral and faunal surveys, it explores the richness of biodiversity and its changes over time, an integral part of modern Impact Assessment practices. By unveiling the region's floristic and faunal treasures, the research underscores the power of knowledge-driven decisions in safeguarding ecological harmony. Therefore, the objectives of this study align with the Terms of Reference (ToR), with a primary focus on developing a comprehensive inventory of floral and faunal species within the mining lease area and its surrounding 10 km influence zone. The key goals include evaluating the ecological status of existing biotic communities and their habitats, establishing a robust baseline database, and assessing the potential project-induced impacts on the biological environment are given:

a) Terrestrial and Arboreal Ecology and Biodiversity

- 1) To analyze the key characteristics of vegetation, with emphasis on the classification of natural forest types, identification of dominant and frequently occurring floral species, their leaf retention patterns, associated families, presence of anthropogenic plantations, occurrence of invasive species, and evidence of habitat degradation within the study area.
- 2) To characterize the existing habitat and land cover types in the study region, encompassing forests, wetlands, agricultural lands, settlements, and other landscape categories.
- 3) To evaluate the crop diversity of the study area and assess native plant species of commercial or economic significance.
- 4) To identify plant species of ethnomedicinal importance, highlighting their traditional uses and ecological relevance.
- 5) To determine vulnerable plant and animal species with respect to their long-term survivability, based on classifications from the IUCN Red Data List.
- 6) To identify Schedule I species as per the Wildlife (Protection) Act, 1972, along with its subsequent amendments.
- 7) To delineate ecologically sensitive zones of varying importance, such as national parks, wildlife sanctuaries, biosphere reserves, and wildlife corridors within and around the study area.

- 8) To examine the feeding ecology, taxonomic affiliations, and movement patterns of faunal and avifaunal species, thereby enhancing the understanding of ecological interactions within the designated region.

b) Aquatic Ecology and Biodiversity

- 1) To identify aquatic biodiversity, including both macrophyte communities and a range of fish species present within the study area.
- 2) To assess the conservation status of aquatic fauna, focusing on species facing potential threats, and evaluating their long-term viability in accordance with the IUCN Red Data List and the provisions of the Wildlife (Protection) Act, 1972, along with its subsequent amendments.

3.5.8.3 Project Profile, Location & Ecological Sensitivity

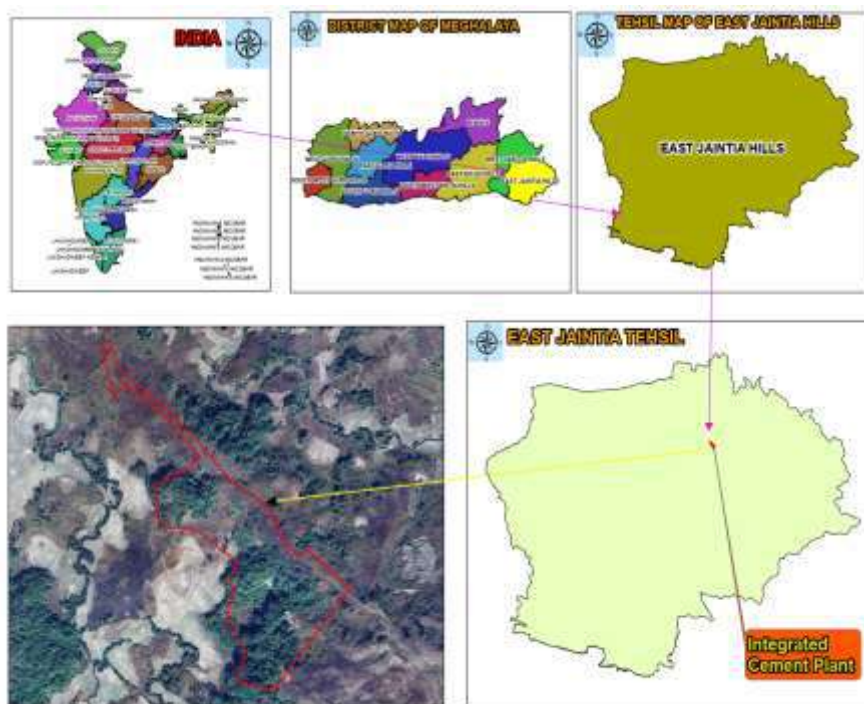
(a) Project Profile

Shree Cement Limited has proposed the establishment of a greenfield “Integrated Cement Plant and Thermal Power Plant” at Khara Siang Lum Pyrshin, Elaka Nongkhlieh Dolloiship, Village Daistong, **District East Jaintia Hills, Meghalaya, India**. The proposed project envisions a production capacity of 0.95 million TPA of clinker and 0.99 million TPA of cement, supported by a 15 MW Captive Power Plant (CPP), a 7 MW Waste Heat Recovery System (WHRS), and DG sets of 2500 kVA, all within a total plant area of 25.08 hectares (61.95 acres). The proposed facility is planned to become fully operational within the validity period of the Environmental Clearance (EC). The project falls under ‘**Schedule 3(b)**’ [Integrated Cement Plant] and ‘**Schedule 1(d)**’ [Thermal Power Plant], categorized as a ‘**Category B1**’ project in accordance with the EIA Notification, 2006, and its subsequent amendments. A fresh Terms of Reference (ToR) has been granted by the State Environment Impact Assessment Authority (SEIAA), Meghalaya, bearing **ToR Identification No. TO25B1101ML5999209N** and **File No. ML/SEAC/SEIAA/PP/EJH/126/2025**, dated **October 15, 2025** against the proposal submitted on 29/09/2025 *vide* Proposal No.: SIA/ML/IND1/552331/2025.

(b) Project Location

As per the **Toposheets** identified by **ID Nos. 83C/11 and 83C/7 (Core and Buffer Zone)** from the Geological Survey of India (GSI), the proposed project site is located at Khara Siang Lum Pyrshin, Elaka Nongkhlieh Dolloiship, Village Daistong, District East Jaintia Hills, Meghalaya, India. The geographical coordinates of the site extend from 25°21’01.823” N to 25°20’59.918” N latitude and 92°33’27.501” E to 92°33’27.104” E longitude. The elevation profile of the area ranges from a maximum of 920 meters

above mean sea level to a minimum of 862 meters, defining the general ground level of the project terrain.



(c) Ecological Sensitivity

According to the EIA Notification, 2006 (and subsequent amendments) and relevant guidelines of the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India, ecologically sensitive areas are defined as: “Geographical regions or ecosystems that require special protection because of their ecological fragility, biological richness, or environmental functions, where even minor alterations may lead to significant adverse impacts on the environment and biodiversity.” So, demarcation of ecologically sensitive areas surrounding the project site is vital, as these precincts, irrespective of their scale, major or minor, exhibit unique biological attributes requiring specialized conservation measures. Integrating ecological preservation with sustainable development and local community needs ensures the protection of these fragile ecosystems while maintaining overall environmental integrity during project implementation.

Based on Toposheet No. 83C/11 and 83C/7, the hydrological network within a 10 km buffer zone around the project site exhibits a diverse array of surface water systems, primarily composed of small to medium perennial streams that contribute to the regional drainage pattern. The Rashun River, located approximately 2.1 km to the west-northwest (WNW), represents the nearest major fluvial body, playing a key role in the area’s watershed dynamics. A tributary of the Kopili system, the locally identified as Wah

Myntang or Wah Rashiuh, flows about 3.5 km to the north-northwest (NNW), forming part of the broader Kopili River basin and supporting aquatic biodiversity. Further, the Skap River, situated around 6.0 km to the northeast (NE), and the Litang River, approximately 7.2 km to the east-northeast (ENE), contribute to the eastward drainage regime of the region. Meanwhile, the Satad Nala, flowing roughly 5.4 km to the southwest (SW), serves as a localized drainage channel, assisting in runoff regulation during monsoonal periods. Collectively, these water bodies form an interconnected hydrological network that supports riparian vegetation, groundwater recharge, and the ecological integrity (CGWB Report, 2020) of the project's surrounding environment. The 10 km buffer zone delineated for the present study does not encompass any major ecologically sensitive areas such as Wildlife Corridors, National Parks, Biosphere Reserves, Wildlife Sanctuaries, Conservation or Community Reserves, Coastal and Marine Protected Areas, or designated Biodiversity Hotspots. A single Reserved Forest *i.e.*, the Saipung Reserved Forest that has been evidenced within the regional landscape. This forest lies approximately 4.8 km from the project site, towards the south-southeast (SSE) direction, and represents the nearest significant terrestrial ecological feature of conservation importance within the study area.

Table.:3.18: Details on Project Site Specific Environmental Sensitivity

SL. NO.	ECO-SENSITIVE AREAS	DISTANCE	DIRECTION
Forestland			
1.	Saipung Reserved Forest	~ 6.35 km	SE
Wetlands			
1.	Rashun River	~2.1 km	WNW
2.	Tributary of Kopili System	~3.5 km	NNW
3.	Skap River	~6.0 km	NE
4.	Satad Nala	~5.4 km	SW
5.	Litang River	~7.2 km	ENE

Thus, the above mentioned environmental sensitive zones exert a profound influence on the ecological character of the region, governing patterns of species diversity, population dynamics, and overall ecosystem functionality (Meghalaya Biodiversity Strategy and Action Plan, 2011 – 2020). These fragile landscapes serve as critical determinants of ecological balance and biodiversity distribution within the study area. A comprehensive inventory of these ecologically sensitive and fragile zones as presented in Table No. 3.1 and Figure No.3.2.

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

CHAPTER-3
DESCRIPTION OF THE ENVIRONMENT

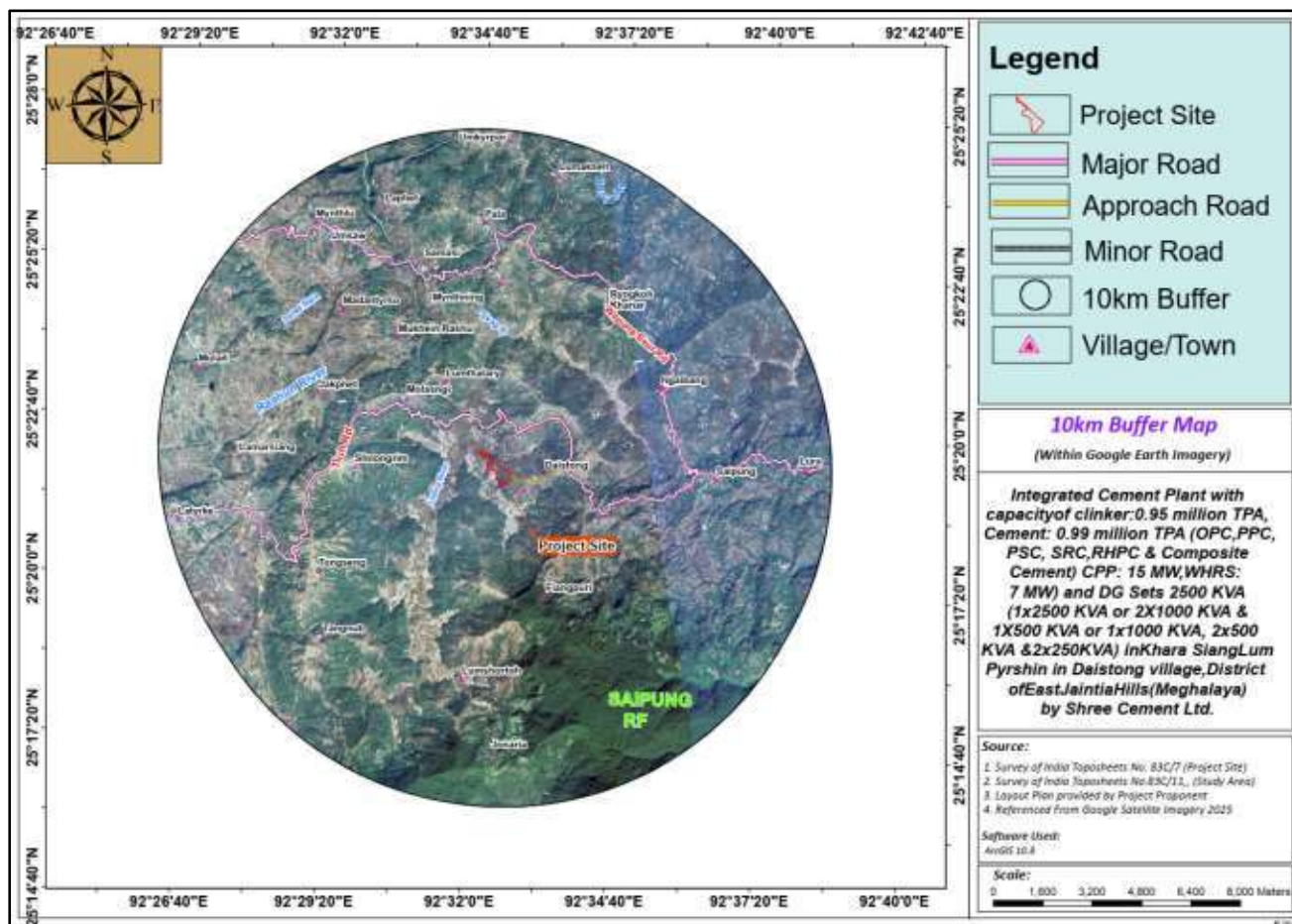


Figure:3.12: The Map Displaying the Ecological Settings of the Study Area within a 10 km radius from Proposed Integrated Cement Plant (Google earth)

3.5.8.4 Considerable Fundamentals for EB on the basis of ToR

Table: 3.19: Considerable Fundamental Points for EB on the basis of ToR

Point. No.	Terms of Reference	Remarks
Specific Terms of Reference s for (Cement Plants)		
1. Specific Additional Conditions		
I. Baseline Data Requirements		
1.1	6. Ecology / Biodiversity	
	- Flora and fauna survey of the site and its surroundings (within a radius, e.g., 10 km), with special attention to protected/endemic species. - Assessment of forest patches, wildlife corridors.	Complied accordingly as specified. <i>Vide</i> Chapter No. 3, Subsection 3.7.2 (c).
Standard Terms of Reference for Industrial Projects - 1		
1. Preliminary Requirements		

Point. No.	Terms of Reference	Remarks
1.2	Besides, following points shall be compiled as per QCI/NABET norms: a. Disclaimer by the EIA consultant. b. Declaration by the Functional Area Experts contributed to the EIA study and declaration by the head of the accredited consultant organization/authorized person. c. Undertaking by the project proponent owning the contents (information and data) of the EIA/EMP report. d. Undertaking by the EIA consultant regarding compliance of ToR issued by MoEF&CC. e. Consultant shall submit the Plagiarism Certificate for the EIA/EMP Report.	Complied accordingly as specified.
2. Executive Summary		
2.3 Baseline Environment Studies		
2.3.7	Biological Environment.	Complied accordingly as specified. <i>Vide</i> Chapter No. 3, Subsection 3.7.
2.4 Anticipated Impacts		
2.4.6	Impact on terrestrial and aquatic habitat.	Complied. <i>Vide</i> Chapter No. 3, Subsection 3.7.7 (a).
2.6 Environmental Monitoring Program		
2.6.4	Greenbelt	Will be complied accordingly as specified. $\approx 33\%$ of the total area has been delineated for Green Belt.
2.9 Environment Management Plan		
2.9.7	Greenbelt development plan	32.99% of the total area <i>i.e.</i> , 8.27 hectare (20.44 acre) will be covered by green area with native species.
2.9.9	Project cost and EMP implementation budget.	Will be complied accordingly

Point. No.	Terms of Reference	Remarks
		as specified.
4. Project Description		
4.1.3	A digital toposheet in pdf or shape file compatible to google earth of the study area of radius of 10 km and site location preferably on 1:50,000 scale (including all eco sensitive areas and environmentally sensitive places).	Complied accordingly as specified. <i>Vide</i> Chapter No. 3, Subsection 3.7.2 (c).
4.1.5	Environment settings of the site and it's surrounding along with map.	Complied accordingly as specified. <i>Vide</i> Chapter No. 3, Subsection 3.7.2 (c).
4.1.7	In case if the project site is in vicinity of the water body, 50 meters from the edge of the water body towards the site shall be treated as no development/construction zone. If it's near the wetland, Guidelines for implementing Wetlands (Conservation and Management) Rules, 2017 may be followed.	Not Applicable. No water body, within 50 meters towards the project site is located.
4.1.8	In case if the project site is in vicinity of the river, the industry shall not be located within the river flood plain corresponding to one in 25 years flood, as certified by concerned District Magistrate/Executive Engineer from State Water Resources Department (or) any other officer authorized by the State Government for this purpose as per the provisions contained in the MoEF&CC Office Memorandum dated 14/02/2022.	Not Applicable.
4.1.9	In case of canal/ nala/ seasonal drain and any other water body passing through project site, the PP shall submit the suitable steps /conservation plan/mitigation measures along with contouring, Run - off calculations, disposal etc. A robust and full proof Drainage Conservation scheme to protect the natural drainage/water bodies and its flow parameters; along with Soil conservation scheme and multiple Erosion control measures shall be provided in the report.	Not Applicable. No canal/ nala/ seasonal drain and any other water body passing through project site.
4.2 Forest and Wildlife Related Issues (If Applicable)		
4.2.1	Status of Forest Clearance for the use of forest land shall be submitted.	Not Applicable. No forestland will be

Point. No.	Terms of Reference	Remarks
		encroached for the current project.
4.2.2	Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife if the project site located within notified Eco-Sensitive Zone, 10 km radius of national park/sanctuary wherein final ESZ notification is not in place as per MoEF&CC Office Memorandum dated 8/8/2019.	Not Applicable. the project site is not located within notified Eco Sensitive Zone, and within a 10 km radius no national park/sanctuary are situated.
4.2.3	The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, Eco-sensitive Zone and Eco-sensitive areas, the project proponent shall submit the map duly authenticated by Divisional Forest Officer showing the distance between the project site and the said areas.	Not Applicable. the project site is not located within notified Eco Sensitive Zone, and within a 10 km radius no national park/sanctuary are situated.
4.2.4	Wildlife Conservation Plan duly authenticated by the Competent Authority of the State Government for conservation of Schedule I fauna along with budget and action plan, if any exists in the study area.	The area holds 29 Schedule I fauna therefore, Wildlife Conservation Plan along with budget and action plan, will be prepared accordingly.
5. Description of the Environment		
5.1	Study Period	The baseline ecological survey was conducted from 01 March, 2025 to 31 May, 2025, covering a complete three-month of pre-monsoon summer season.
5.2	Biological Environment	
	1. Aquatic - Primary productivity - Aquatic weeds - Enumeration of phytoplankton, zooplankton	Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to
		Complied accordingly as specified.

Point. No.	Terms of Reference	Remarks
	and benthos. - Fisheries - Diversity indices - Trophic levels - Rare, and endangered species. - Marine Parks/ Sanctuaries/ closed areas /coastal regulation zone (CRZ). 2. Terrestrial - Vegetation-species list, economic importance, forest produce, medicinal value. - Importance value index (IVI) of trees. - Fauna - Avifauna - Rare and endangered species. - Sanctuaries / National Park / Biosphere Reserve. - Migratory routes.	rare, endemic and endangered species. Indicator species which indicate ecological and environment degradation should be identified and included to clearly state whether the proposed project would result in to any adverse effect on any species. - Samples to collect from upstream and downstream of discharge point, nearby tributaries at downstream, and also from dug wells close to activity site. - For forest studies, direction of wind should be considered while selecting forests. - Secondary data to collect from Government offices, NGOs, published literature.
5.3	Interpretation of each environment attribute shall be enumerated and summarized as given for Biological Environment.	Complied accordingly as specified. <i>Vide</i> Chapter No. 3, Subsection 3.7.6 (c).
6. Anticipated Environment Impacts and Mitigation Measures (In Case of Expansion, Cumulative Impact Assessment Shall Be Carried Out)		
6.9	Impact on terrestrial and aquatic habitat (Sources; Embedded control measures; Assessment; Mitigation measures; Residual	Complied. <i>Vide</i> Chapter No. 3, Subsection 3.7.7 (a) & (b).

Point. No.	Terms of Reference	Remarks
	impact) a. Construction phase b. Operation phase	
12. Environment Management Plan (Construction and Operation Phase)		
12.13	Green belt development plan: An action plan for Green Belt development consisting of 3 tiers of plantations of native species all along the periphery of the project of adequate width shall be raised in 33% of total area with a tree density shall not less than 2500 per ha within a time frame of one year shall be submitted. Survival rate of green belt shall be monitored on periodic basis to ensure that survival rate not be less than 80 %.	Will be conformed consequently.

3.5.9 Methodology

(a) Baseline survey Period

01 arch, 2025 to 31 May, 2025, complete 3 months of summer season (pre-monsoon period).

3.5.8.5 Expanse of Study Area

≈ 314.16 square kilometre ($\pi r^2 = \pi \cdot 10^2 \approx 314.16$).

02 Selection of Location of Sampling Sites

In Environmental Impact Assessments (EIAs), the scientific selection of sampling sites is critical to ensuring reliable and representative ecological data. Sampling locations were strategically identified to capture the diversity of habitats and land-use types within the study area, including human settlements, agricultural fields, open scrublands, forest fringes, and aquatic ecosystems. The fundament target was to minimize sampling bias and achieve an accurate reflection of ecological gradients and biodiversity patterns. All selected sites fall within a 10 km radial distance from the project boundary. A concise summary of the sampling locations is presented in Table No. 3.3, which provides spatial and ecological characteristics of the selected sites relevant to biodiversity assessment.

03 Sampling Sites for Ecology and Biodiversity Study

Table: 3.20: Location of Sampling Sites for Ecology and Biodiversity Study

Sampling Code	Location	Study Zone	Distance	Direction
Terrestrial and Arboreal				
EB-1	Shree Cement Plant	Core Zone	0.01 km	-NA-
EB-2	Daistong Village Area	Buffer Zone	1.20 km	E
EB-3	Moolasngi New	Buffer Zone	2.13 km	NNW
EB-4	Shongrim	Buffer Zone	3.81 km	W

Sampling Code	Location	Study Zone	Distance	Direction
EB-5	Saipung RF (Fringe Area)	Buffer Zone	4.80 km	SSE
EB-6	Lamyrsiang	Buffer Zone	5.88 km	WSW
Aquatic				
EB-7	Rashun River	Buffer Zone	2.1 km	WNW
EB-8	Tributary of Kopili System	Buffer Zone	3.5 km	NNW

04 Survey Process

The assessment of biological diversity involved both primary field investigations and secondary data compilation within the core and buffer zones. The methodology integrated observations of natural vegetation, terrestrial habitats, and aquatic environments, corroborated with secondary data from government departments and scientific literature.

A comprehensive inventory of floral and faunal elements was developed based on:

- 1) The prevailing structure, composition, and abundance of species in different habitat types.
- 2) Documentation of dominant, rare, and economically important flora, including their leaf-retention patterns, commercial, and medicinal values.
- 3) Assessment of faunal diversity, feeding behaviour, vulnerability status, migration patterns, and ecological roles.

05 Primary or Field Survey for Flora

The primary ecological survey emphasized direct observation and systematic recording of vegetation and wildlife diversity. For flora, both terrestrial and aquatic vegetation were examined, focusing on species frequency, density, and dominance. Faunal assessments targeted mammals, birds, reptiles, and fishes, using multiple detection methods including visual sightings, vocalizations, footprints, droppings, and olfactory cues. Information from local inhabitants and fishermen was also utilized to validate the occurrence of species, particularly for elusive wildlife and aquatic taxa. Photographic documentation supported species identification. Data collected were verified through forest and wildlife departments to ensure accuracy.

06 Parameters Considered in the Primary EB Study

The following aspects formed the core of the primary ecological and biodiversity assessment:

- i. Species composition of flora and fauna, with emphasis on endemic, indigenous, rare, endangered, threatened (RET) and bioindicator species.

- ii. Forest type classification (as per Champion & Seth, 1968), floristic diversity, phytosociology of tree species, crop diversity, and the presence of exotic or invasive species.
- iii. Faunal distribution, abundance, migratory and resident species, habitat preferences, resilience, and economic importance.
- iv. Assessment of migratory species and species of commercial or recreational significance.

07 Phytosociological Assessment

Vegetation characterization and quantitative analysis were performed using two complementary methods:

- i. **Visual Encounter Method:** This involved systematic visual scanning of different habitats to record plant species presence, dominance, and frequency. Observations were made during fixed time intervals at each sampling site.
- ii. **Plot Quadrat Method:** Tree species were analyzed using 10 m × 10 m quadrats to estimate density, frequency, and abundance. The Importance Value Index (IVI) and diversity indices, such as Shannon–Wiener Diversity Index (H') and Simpson's Diversity Index (D), were computed to quantify community structure and ecosystem health. Lower values of Simpson's Index indicate a stable, undisturbed ecosystem, whereas higher values suggest ecological stress or anthropogenic disturbance.

08 Primary or Field Survey for Fauna

The survey of animal species was primarily conducted using the Visual Encounter Survey (VES) technique, encompassing both terrestrial and aquatic habitats. Species identification and inventory were undertaken in collaboration with local community members, ensuring a comprehensive understanding of the region's biodiversity. Standard transect walks and visual encounter surveys were executed during various times of the day and night to enhance detection efficiency across taxa. The avifaunal assessment was carried out during early mornings (7:00 - 9:00 am) and late afternoons (3:30 - 5:00 pm), while reptiles, amphibians, mammals, and floral species were recorded during daylight hours. At each sampling station, bird species were meticulously observed, counted, and documented to prepare an exhaustive species checklist. Identification accuracy was ensured through the use of binoculars and standard ornithological field guides. For aquatic fauna, data collection was supplemented through inputs from local fishermen, fish markets, and other community-based information sources, providing valuable insights into species composition and habitat utilization.

09 Desktop Study or Secondary Survey

The datasets and insights gathered from the ground survey were further substantiated through a range of secondary information sources, including academic publications, books, and scientific research studies. Moreover, the authenticated list of floral and faunal species, particularly those categorized under Schedule I of the Wildlife (Protection) Act, 1972 and its subsequent amendments, as provided by the Divisional Forest Officer (DFO) for the project, served as a vital source of secondary validation and reference.

i. Species Inventorization:

The biological diversity inventory for the study area pertaining to the current project has been successfully compiled and finalized through the integration of primary field data with insights derived from secondary (desktop) research.

ii. Survey Constraint

The hindrances and limitations encountered during the precise assessment of biological diversity within the study area primarily stemmed from factors such as difficulties in accurate species identification, restricted site accessibility, seasonal variability, and potential biases in community-reported data. These challenges collectively constrained the ability to attain a fully comprehensive understanding of the region's biodiversity. The key limitations observed during the field survey for the current project included:

- i. **Habitat Fragmentation:** The combined influence of agricultural expansion and anthropogenic interventions has led to the fragmentation of natural landscapes, thereby impeding a holistic assessment of ecological composition and species distribution patterns.
- ii. **Low Vegetation Density:** The sparse foliage cover across the study area restricted the selection of representative sampling sites, consequently limiting species detectability and the collection of comprehensive ecological data.
- iii. **Temporal Survey Limitation:** Field investigations were conducted exclusively during daylight hours, thereby confining observations to diurnal avifaunal activity and precluding assessments of nocturnal species.
- iv. **Temporal Constraints:** The rapid survey schedule undertaken within a limited duration hindered the inclusion of seasonal variations, restricting the temporal scope of biodiversity assessment.

- v. **Inconclusive Community Inputs:** Although interviews and consultations were conducted with local community members, the information obtained was ambiguous and lacked definitive ecological insights, thereby limiting its applicability for scientific interpretation.

3.5.8.6 Observations

Baseline Biodiversity Assessment represents the foundational dataset describing the pre-project ecological status of a given area. It encompasses information on species composition, habitat characteristics, and ecosystem functionality, serving as a scientific benchmark for Environmental Impact Assessment (EIA) studies and for guiding long-term ecological monitoring and conservation planning. For the present study, the baseline survey was scheduled during the winter season, extending from **1st March 2025 to 31st May 2025**, as previously outlined. The data collection framework integrates both primary field observations and secondary literature-based sources. Primary ecological data were gathered from field investigations conducted within the Core Zone (CZ) and Buffer Zone (BZ), with a particular emphasis on ecological and biological diversity parameters. The process was facilitated through the cooperation of State Forest Department officials and local community participants. It is noteworthy that the floral and faunal composition observed within the study area reflects the representative biodiversity of both major and minor ecosystems present in the buffer region. These include agricultural landscapes (~5.94%), around 49.78% of forest zones along with the areas adjoining reserved forests, scrub forests (~8.00%) and other natural or managed ecosystems as waterbodies (~0.44%) and rural built-up area (~1.56%). Accordingly, the potential species assemblages within these ecosystems have been consolidated within this report.

For the current project, comprehensive species inventories detailing the plant and animal biodiversity are presented. The symbols ‘+’ and ‘–’ are used to denote the presence and absence of species in the respective zones, namely the Core Zone (CZ) and Buffer Zone (BZ). The International Union for Conservation of Nature (IUCN) Red List framework has been adopted to categorize species based on their global conservation status. The report employs the following standard abbreviations: CR (Critically Endangered), EN (Endangered), VU (Vulnerable), NT (Near Threatened), LC (Least Concern), DD (Data Deficient), and NE (Not Evaluated), in accordance with the latest IUCN guidelines (source: <https://www.iucnredlist.org/>).

a) Terrestrial and Arboreal Ecology & Biodiversity

Vegetation serves as a key determinant in site evaluation and ecological classification, being strongly influenced by both macro- and microclimatic conditions. Its structure and health result from the dynamic

interplay between disturbance regimes, biotic succession, and abiotic factors such as climate, soil, and topography. Variations in distribution, abundance, biomass, and stratification of vegetation, shaped by natural and anthropogenic influences, play a crucial role in defining habitat quality, thereby directly influencing animal ecology and wildlife management.

i. Forest Types and Virgin Vegetation of the Study Area

Forest Type: The forests of the study area, situated within the East Jaintia Hills District of Meghalaya, represent a mosaic of North Indian Tropical Moist Deciduous Forests (East Himalayan Moist Deciduous Forests, Type 3C/C3b), along with patches of Tropical Evergreen, Temperate, and Subtropical Pine Forests (Champion & Seth, 1968; Tiwari *et al.*, 2008; Tiwari & Barik, 2019; Lyngdoh *et al.*, 2023). The region experiences a humid subtropical monsoon climate, characterized by intense rainfall from mid-May to September and a cooler, drier period from October to November, followed by a comparatively dry spell between December and March. The high precipitation regime, influenced by the orographic effect of the Meghalaya Plateau, supports rich vegetation diversity and complex forest structure. Around 42.66% of the total study area is occupied by the 3C/C3b type of forest.

Virgin Vegetation: The dominant tree species of the study area include *Castanopsis* spp., *Engelhardia spicata*, *Syzygium* spp., *Quercus* spp., *Schima* spp., *Myrica* sp., *Ficus* spp., *Rhododendron arboreum* etc. These forests are exceptionally rich in epiphytic flora comprising Ferns, Lichens, Mosses, Orchids as well. The sacred groves largely hold the species form Temperate Forest category. In Subtropical Pine Forests, *Pinus kesiya* is the principal species, form pure stands. In certain places the pines are associated with a few broad-leaved species like *Schima wallichii*. Saipung Reserved Forest represents a complex forest ecosystem, combining elements of tropical moist deciduous, semi-evergreen/evergreen, and subtropical pine forests, with significant patches of secondary vegetation (bamboo/cane, grasslands) arising from disturbance. This diversity of forest types is shaped by factors such as rainfall, elevation, soil conditions and anthropogenic influence.

ii. Cropping Pattern and Crop Diversity of the Study Area

The region lies under agro-climatic zone ML3 (East Jaintia Hills) which is characterised by hilly, undulating terrain, with the dominance of upper and middle plateau landforms. The climate is humid subtropical with high rainfall, and soils are generally shallow, acidic and often of low fertility. In such agro-ecological settings, farming is predominantly rain-fed, with limited irrigation infrastructure (**Agriculture Contingency Plan for District: East Jaintia Hills State: Meghalaya**). The agro-climatic constraints include slope instability, erosion risk, shallow soils and nutrient depletion. In the ML3 zone

and hence applicable to Daistong and typically in study area, the cropping pattern commonly includes (Field Survey and Department of Agriculture Meghalaya, ICAR, 2015):

- Paddy (rice) in the low-lying valley bottoms (upland and terrace paddy) taking advantage of the monsoon rainfall.
- Maize in upland portions where paddy cannot be grown.
- Potato, ginger, turmeric and assorted vegetables (tomato, beans, *etc.*) in the mid-slopes or upland fields as seasonal/rotational crops.
- The system is dominantly rain-fed mono-cropping or sequential cropping, rather than fully mechanised multiple cropping.

So, crop diversity in this zone tends to be moderate. The primary staple is paddy, alongside maize as secondary staple. There is diversification into tubers (potato), root & rhizome crops (ginger, turmeric) and vegetable crops (tomato, beans). As well as possibly local seasonal crops/horticulture such as leafy greens and pulses (Agriculture Contingency Plan for District: East Jaintia Hills State: Meghalaya). Cropping in Daistong likely follows a mixed pattern of paddy in the flatter lands plus upland crops and horticultural vegetables on slopes, inter-cropped or rotated where feasible (Field Survey and Department of Agriculture Meghalaya, ICAR, 2015).

iii. Medicinal Plant Species

The East Jaintia Hills District of Meghalaya harbors a rich ethnomedicinal tradition among its tribal communities. A Research documented 40 medicinal plants from 24 botanical families, with Asteraceae, Euphorbiaceae, and Zingiberaceae being the most represented (Bamon *et al.*, 2022). Herbaceous species constituted 55 % of these plants, followed by shrubs and trees, indicating the prominence of easily accessible herbs in traditional therapeutic practices. A subsequent study focusing on antidiabetic ethnomedicinal plants reported 51 species spanning 34 families and 45 genera, with herbs again predominating with 23 species and among these, *Rhus semialata* was notably utilized for blood sugar management, reflecting its ethnomedicinal significance (Bamon & Lalnundanga, 2023). Collectively, these findings underscore the ethnomedicinal knowledge, the central role of herbaceous species and leaves in remedy formulations, and the critical need for conservation of both plant resources, indigenous knowledge amid pressures from modernization, habitat loss, and demographic change.

The list of ethnomedicinal plant species is provided below, regarding which the local population has confirmed their frequent and/or daily uses (Table No. 3.4).

Table: 3.21: Ethnobotanical Plant Species Used as Traditional Medicines of the Study Area

Sl. No.	Botanical Name	Common Name	Family	Uses
1.	<i>Achyranthes aspera</i>	Prickly Chaff Flower	Amaranthaceae	Boils, Skin Application.
2.	<i>Acmella paniculata</i>	Spilanthes	Asteraceae	Toothache Relief.
3.	<i>Acorus calamus</i>	Sweet Flag	Acoraceae	Stomach Ache, Cough, Toothache.
4.	<i>Adhatoda vasica</i>	Malabar Nut	Acanthaceae	Nose-Bleed, Dysentery.
5.	<i>Aegle marmelos</i>	Bael	Rutaceae	Digestive, Diabetic Aid.
6.	<i>Ageratum conyzoides</i>	Billygoat Weed	Asteraceae	Cuts & Wounds.
7.	<i>Ageratum tuberosum</i>	Chinese Ageratum	Asteraceae	Medicinal Salad, Cough, Cold.
8.	<i>Allium cepa</i>	Onion	Amaryllidaceae	Cold, Cough, Digestive Aid.
9.	<i>Allium conyzoides</i>	Onion Weed	Amaryllidaceae	On Wounds.
10.	<i>Allium sativum</i>	Garlic	Liliaceae	New-Born Massage, Stuffy Nose.
11.	<i>Alpinia bracteata</i>	False Cardamom	Zingiberaceae	Rhizome Toothache.
12.	<i>Alpinia calangal</i>	Greater Galangal	Zingiberaceae	Skin Disease Poultice.
13.	<i>Alstonia scholaris</i>	Blackboard Tree	Apocynaceae	Asthma Bark Decoction, BP Control.
14.	<i>Anemone rivularis</i>	River Anemone	Ranunculaceae	Sinusitis Inhalation.
15.	<i>Apium graveolens</i>	Celery	Apiaceae	Blood Sugar Control.
16.	<i>Aristolochia catcartii</i>	Dutchman's Pipe	Aristolochiaceae	Antidote For Poisoning.
17.	<i>Aristolochia saccata</i>	Snake Root	Aristolochiaceae	Stomach-Ache Tuber Remedy.
18.	<i>Aristolochia tagala</i>	Indian Birthwort	Aristolochiaceae	Tonic From Roots.
19.	<i>Azadirachta indica</i>	Neem	Meliaceae	Diabetes Management.
20.	<i>Begonia urphylla</i>	Begonia	Begoniaceae	Stomachache Remedy.
21.	<i>Carica papaya</i>	Papaya	Caricaceae	Blood Sugar Control.
22.	<i>Catharanthus roseus</i>	Madagascar Periwinkle	Apocynaceae	Diabetes, Hypertension.
23.	<i>Centella asiatica</i>	Gotu Kola	Apiaceae	Indigestion, Brain Tonic, Diabetes.
24.	<i>Cinnamomum tamala</i>	Indian Bay Leaf	Lauraceae	Blood Sugar Regulation.
25.	<i>Citrus maxima</i>	Pomelo	Rutaceae	Diabetes Control.
26.	<i>Coriandrum sativum</i>	Coriander	Apiaceae	Stomach-Ache Fruit Powder.
27.	<i>Emblica officinalis</i>	Amla	Phyllanthaceae	Blood Sugar Lowering.
28.	<i>Momordica charantia</i>	Bitter Gourd	Cucurbitaceae	Diabetes Control.
29.	<i>Rhus semialata</i>	Nutgall Tree	Anacardiaceae	Glycaemic Regulation.
30.	<i>Syzygium cumini</i>	Indian Blackberry	Myrtaceae	Blood Sugar Control.
31.	<i>Terminalia chebula</i>	Haritaki	Combretaceae	Diabetes Management.
32.	<i>Tinospora cordifolia</i>	Giloy	Menispermaceae	Anti-Diabetic, Immune Support.
33.	<i>Zingiber officinale</i>	Ginger	Zingiberaceae	Nausea, Indigestion, Anti-Inflammatory.
34.	<i>Ziziphus jujuba</i>	Red Date	Rhamnaceae	Blood Sugar Regulation.

Source: Field Survey; Bamon *et al.*, 2022; Bamon & Lalnundanga, 2023.

iv. Prevalent Terrestrial Flora in the Study Area

Table: 3.22 Tree Species of the Study Area

Sl. No.	Botanical Name	English Name	Family	Foliage Type	Origin	CZ	BZ	IUCN Status
HABIT: TREE								
1.	<i>Abrus precatorius</i>	Rosary Pea	Fabaceae	D	Native	-	+	LC
2.	<i>Acacia auriculiformis</i>	Australian Acacia	Fabaceae	E	Non-Native	-	+	LC
3.	<i>Acacia catechu</i>	Black Cutch	Fabaceae	D	Native	-	+	LC
4.	<i>Aegle marmelos</i>	Bael	Rutaceae	D	Native	-	+	NT
5.	<i>Aesculus assamica</i>	Buck Eye	Sapindaceae	D	Native	-	+	DD
6.	<i>Agave americana</i>	Century Plant	Asparagaceae	E	Non-Native	-	+	LC
7.	<i>Albizia lebbeck</i>	East Indian Walnut	Fabaceae	D	Native	-	+	LC

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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Sl. No.	Botanical Name	English Name	Family	Foliage Type	Origin	CZ	BZ	IUCN Status
8.	<i>Albizia odoratissima</i>	Ceylon Rosewood	Fabaceae	D	Native	-	+	LC
9.	<i>Albizia saman</i>	Rain Tree	Fabaceae	D	Non-Native	-	+	LC
10.	<i>Alstonia scholaris</i>	Devil's Tree	Apocynaceae	E	Native	-	+	LC
11.	<i>Anacardium occidentale</i>	Cashew Nut Tree	Anacardiaceae	D	Non-Native	-	+	LC
12.	<i>Antidesma</i> sp.	Tassel Berry	Phyllanthaceae	D	Non-Native	-	+	LC
13.	<i>Areca catechu</i>	Areca Palm	Arecaceae	E	Native	-	+	LC
14.	<i>Artocarpus chaplasi</i>	Monkey Jack Tree	Moraceae	E	Native	-	+	LC
15.	<i>Artocarpus heterophyllus</i>	Jackfruit	Moraceae	E	Native	-	+	LC
16.	<i>Azadirachta indica</i>	Indian Lilac	Meliaceae	SD	Native	-	+	LC
17.	<i>Bauhinia variegata</i>	Mountain Ebony	Fabaceae	D	Native	-	+	LC
18.	<i>Betula alnoides</i>	Himalayan Birch	Betulaceae	D	Native	-	+	LC
19.	<i>Bombax ceiba</i>	Red Silk-Cotton Tree	Malvaceae	D	Native	-	+	LC
20.	<i>Callicarpa arborea</i>	Beautyberry Tree	Lamiaceae	D	Native	-	+	LC
21.	<i>Careya arborea</i>	Wild Guava	Lecythidaceae	D	Native	-	+	LC
22.	<i>Carica papaya</i>	Papaya	Caricaceae	E	Non-Native	-	+	LC
23.	<i>Cassia auriculata</i>	Matura Tea Tree	Fabaceae	D	Native	-	+	LC
24.	<i>Cassia fistula</i>	Golden Shower	Fabaceae	D	Native	-	+	LC
25.	<i>Cassia siamea</i>	Kassod Tree	Fabaceae	D	Native	-	+	LC
26.	<i>Castanopsis indica</i>	Indian Chest Nut	Fagaceae	E	Native	-	+	LC
27.	<i>Castanopsis purpurella</i>	Phongrong	Fagaceae	E	Native	-	+	LC
28.	<i>Castanopsis tributoides</i>	Chinquapin	Fagaceae	E	Native	-	+	LC
29.	<i>Casuarina equisetifolia</i>	Whistling Pine	Casuarinaceae	E	Native	-	+	LC
30.	<i>Catsetum</i> sp.	Sweet Flag	Acoraceae	E	Native	-	+	LC
31.	<i>Cedrela toona</i>	Red Cedar	Meliaceae	D	Native	-	+	LC
32.	<i>Chukrasia tabularis</i>	Chittagong Wood	Meliaceae	D	Native	-	+	LC
33.	<i>Cinnamomum verum</i>	Ceylon Cinnamon	Lauraceae	E	Non-Native	-	+	LC
34.	<i>Cinnamomum tamala</i>	Indian Bay Leaf	Lauraceae	E	Native	-	+	LC
35.	<i>Citrus maxima</i>	Pomelo	Rutaceae	E	Non-Native	-	+	LC
36.	<i>Clerodendron</i> sp.	Glory Bower	Lamiaceae	D	Native	-	+	LC
37.	<i>Cocos nucifera</i>	Coconut	Arecaceae	E	Native	-	+	LC
38.	<i>Coffea</i> sp.	Coffee	Rubiaceae	E	Non-Native	-	+	LC
39.	<i>Conocarpus erectus</i>	Button Wood	Combretaceae	E	Non-Native	-	+	LC
40.	<i>Cordia dichotoma</i>	Indian Cherry	Boraginaceae	D	Native	-	+	LC
41.	<i>Cordia sebestena</i>	Geiger Tree	Boraginaceae	E	Non-Native	-	+	LC
42.	<i>Cordia sinensis</i>	Grey-Leaved Saucer	Boraginaceae	D	Native	-	+	LC
43.	<i>Dalbergia sissoo</i>	North Indian Rosewood	Fabaceae	D	Native	-	+	LC
44.	<i>Delonix elata</i>	Creamy Peacock	Fabaceae	D	Native	-	+	LC
45.	<i>Delonix regia</i>	Royal Poinciana	Fabaceae	D	Non-Native	-	+	LC
46.	<i>Dracaena</i> sp.	Female Dragon	Asparagaceae	E	Native	-	+	LC
47.	<i>Duabanga grandiflora</i>	Crape Myrtle	Lythraceae	D	Native	-	+	LC
48.	<i>Elaeocarpus</i> sp.	Ceylon Olives	Elacocarpaceae	E	Native	-	+	LC
49.	<i>Emblica officinalis</i>	Indian Gooseberry	Phyllanthaceae	D	Native	-	+	LC
50.	<i>Engelhardia spicata</i>	Great Malay Bean	Juglandaceae	D	Native	-	+	LC
51.	<i>Erythrina</i> spp.	Coral Tree	Fabaceae	D	Native	-	+	LC
52.	<i>Eucalyptus globulus</i>	Blue Gum	Myrtaceae	E	Non-Native	-	+	LC
53.	<i>Euphorbia nivulia</i>	Dog's Tongue	Euphorbiaceae	D	Native	-	+	LC
54.	<i>Euphorbia tirucalli</i>	Indian Tree Spurge	Euphorbiaceae	D	Native	-	+	LC
55.	<i>Feronia elephantum</i>	Wood Apple	Rutaceae	D	Native	-	+	LC
56.	<i>Ficus benghalensis</i>	Banyan Tree	Moraceae	E	Native	-	+	LC

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Sl. No.	Botanical Name	English Name	Family	Foliage Type	Origin	CZ	BZ	IUCN Status
57.	<i>Ficus glomerata</i>	Cluster Fig	Moraceae	E	Native	-	+	LC
58.	<i>Ficus religiosa</i>	Sacred Fig	Moraceae	D	Native	-	+	LC
59.	<i>Ficus virens</i>	White Fig	Moraceae	D	Native	-	+	LC
60.	<i>Fissistigma verrucosum</i>	Indian Zig-Zag Vine	Annonaceae	E	Native	-	+	LC
61.	<i>Gmelina arborea</i>	White Teak	Lamiaceae	D	Native	-	+	LC
62.	<i>Grewia disperma</i>	Serrulate Leaved Grewia	Malvaceae	D	Native	-	+	LC
63.	<i>Lagerstroemia</i> sp.	Queen's Flower	Lythraceae	D	Native	-	+	LC
64.	<i>Litsea citrata</i>	Litsea Citrate	Lauraceae	E	Native	-	+	LC
65.	<i>Macaranga denticulata</i>	Blistery Macaranga	Euphorbiaceae	E	Native	-	+	LC
66.	<i>Macropanax disperma</i>	Blume Aralia	Araliaceae	E	Native	-	+	LC
67.	<i>Mallotus</i> sp.	Kumkum Tree	Euphorbiaceae	D	Native	-	+	LC
68.	<i>Mangifera indica</i>	Mango	Anacardiaceae	D	Native	-	+	LC
69.	<i>Mesua ferrea</i>	Ceylon Ironwood	Calophyllaceae	E	Native	-	+	LC
70.	<i>Metrosideros robusta</i>	Heartwood Tree	Myrtaceae	E	Non-Native	-	+	LC
71.	<i>Michelia champaca</i>	Orange Champaka	Magnoliaceae	E	Native	-	+	LC
72.	<i>Musa paradisiaca</i>	Banana	Musaceae	E	Native	-	+	LC
73.	<i>Myrica esculenta</i>	Box Myrtle	Myricaceae	E	Native	-	+	LC
74.	<i>Neolamarckia cadamba</i>	Burr Flower Tree	Rubiaceae	D	Native	-	+	LC
75.	<i>Olea europaea</i>	Olive	Oleaceae	E	Non-Native	-	+	LC
76.	<i>Pandanus</i> sp.	Screw Palm	Pandanaceae	E	Non-Native	-	+	LC
77.	<i>Persea odoratissima</i>	Machilus	Lauraceae	E	Native	-	+	LC
78.	<i>Pinus kesiya</i>	Khasi Pine	Pinaceae	E	Native	-	+	LC
79.	<i>Pinus roxburghii</i>	Chir Pine	Pinaceae	E	Native	-	+	LC
80.	<i>Pithecellobium dulce</i>	Manila Tamarind	Fabaceae	D	Non-Native	-	+	LC
81.	<i>Plumeria rubra</i>	Red Jasmine	Apocynaceae	D	Non-Native	-	+	LC
82.	<i>Polyalthia longifolia</i>	Indian Mast Tree	Annonaceae	E	Native	-	+	LC
83.	<i>Pongamia pinnata</i>	Indian Beech	Faboideae	D	Native	-	+	LC
84.	<i>Prunus cerasoides</i>	Wild Himalayan Cherry	Rosaceae	D	Native	-	+	LC
85.	<i>Psidium guajava</i>	Guava	Myrtaceae	E	Non-Native	-	+	LC
86.	<i>Punica granatum</i>	Pomegranate	Lythraceae	D	Native	-	+	LC
87.	<i>Quercus</i> sp.	Oak	Fagaceae	D	Native	-	+	LC
88.	<i>Rhododendron arboreum</i>	Rhododendron	Ericaceae	E	Native	-	+	LC
89.	<i>Rhus semialata</i>	Chinese Sumac	Anacardiaceae	D	Native	-	+	LC
90.	<i>Saraca asoca</i>	Sorrowless Tree	Fabaceae	E	Native	-	+	EN
91.	<i>Saurauia napaulensis</i>	Dillenia	Actinidiaceae	E	Native	-	+	LC
92.	<i>Schima wallichii</i>	Needle Wood Tree	Theaceae	E	Native	-	+	LC
93.	<i>Sesbania bispinosa</i>	Prickly Sesban	Fabaceae	D	Native	-	+	LC
94.	<i>Shorea robusta</i>	Sal	Dipterocarpaceae	D	Native	-	+	LC
95.	<i>Spondias mombin</i>	Yellow Mombin	Anacardiaceae	D	Non-Native	-	+	LC
96.	<i>Symphler</i> sp.	Comfrey	Boraginaceae	P	Native	-	+	LC
97.	<i>Syzygium cumini</i>	Indian Blackberry	Myrtaceae	E	Non-Native	-	+	LC
98.	<i>Syzygium jambos</i>	Rose Apple	Myrtaceae	E	Native	-	+	LC
99.	<i>Tamarindus indica</i>	Tamarind	Fabaceae	D	Non-Native	-	+	LC
100.	<i>Tectona grandis</i>	Teak	Lamiaceae	D	Native	-	+	VU
101.	<i>Terminalia catappa</i>	Indian Almond	Combretaceae	D	Native	-	+	LC
102.	<i>Terminalia chebula</i>	Myrobalan	Combretaceae	D	Native	-	+	LC
103.	<i>Terminalia myriocarpa</i>	Hollock	Combretaceae	D	Native	-	+	LC
104.	<i>Tetrameles nudiflora</i>	False Hemp Tree	Tetramelaceae	D	Native	-	+	LC
105.	<i>Toona ciliata</i>	Poma	Meliaceae	D	Native	-	+	LC

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106.	<i>Traversia palmate</i>	Snowflake Aralia	Araliaceae	E	Non-Native	-	+	LC
107.	<i>Tupidanthus calyptratus</i>	Mallet Flower	Araliaceae	E	Non-Native	-	+	LC
108.	<i>Xylia xylocarpa</i>	Burma Ironwood	Fabaceae	D	Non-Native	-	+	LC
109.	<i>Ziziphus jujuba</i>	Red Date	Rhamnaceae	D	Native	+	+	LC

Source: Field Survey; Upadhaya *et al.*, 2003; Bamon *et al.*, 2022; Bamon & Lalnundanga, 2023, and other Secondary Sources.

Table: 3.23: Floral Species of the Study Area other than Trees

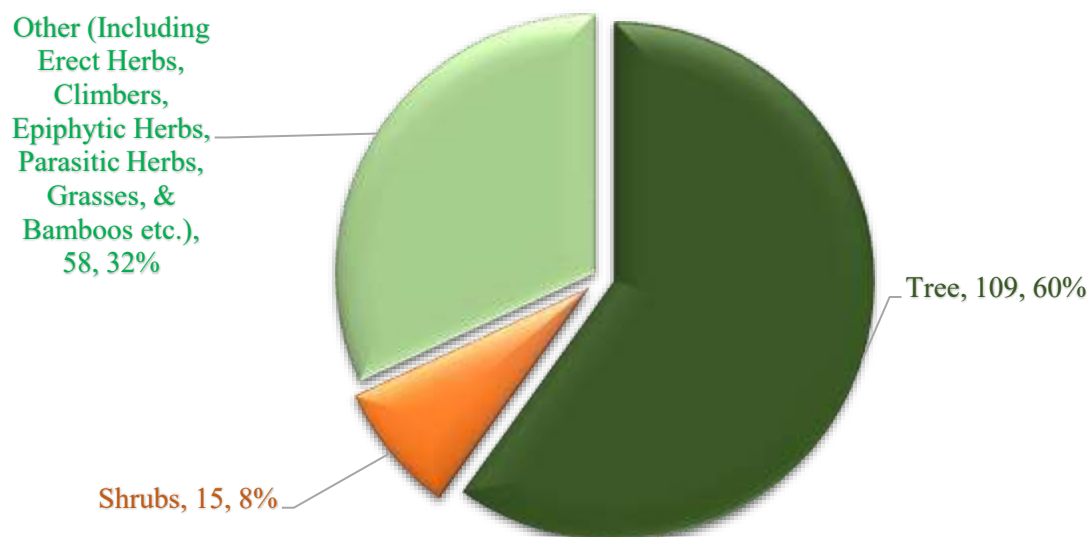
Sl. No.	Botanical Name	English Name	Family	Origin	CZ	BZ	IUCN Status
HABIT: SHRUB/ SMALL TREE							
1.	<i>Adhatoda vasica</i>	Malabar Nut / Shrub	Acanthaceae	Native	-	+	LC
2.	<i>Agapetes</i> sp.	Ornamental Heath	Ericaceae	Native	-	+	LC
3.	<i>Ardisia elliptica</i>	Duck's Eye	Myrsinaceae	Native	+	+	LC
4.	<i>Baliospermum montana</i>	Wild Castor	Euphorbiaceae	Native	-	+	LC
5.	<i>Clerodendron cootebrookianum</i>	East Indian Glory Bower	Lamiaceae	Native	+	+	LC
6.	<i>Clerodendrum viscosum</i>	Hill Glory Bower	Lamiaceae	Native	+	+	LC
7.	<i>Eupatorium odoratum</i>	Christmas Bush	Asteraceae	Non-Native	+	+	LC
8.	<i>Ficus hispida</i>	Hairy Fig	Moraceae	Native	-	+	LC
9.	<i>Gonionthalamus sesquipetalis</i>	Lai-Kham	Annonaceae	Native	-	+	LC
10.	<i>Lantana camara</i>	Shrub Verbena	Verbenaceae	Non-Native	+	+	LC
11.	<i>Leea indica</i>	Bandicoot Berry	Vitaceae	Native	-	+	LC
12.	<i>Mimosa himalayana</i>	Touch Me Not	Fabaceae	Native	+	+	LC
13.	<i>Morinda angustifolia</i>	Madder	Rubiaceae	Native	-	+	LC
14.	<i>Triumfetta tomentosa</i>	Pussy Ears	Malvaceae	Native	+	+	LC
15.	<i>Urena lobata</i>	Caesar Weed	Malvaceae	Native	+	+	LC
HABIT: ERECT HERB							
1.	<i>Achyranthes aspera</i>	Prickly Chaff Flower	Amaranthaceae	Native	-	+	NE
2.	<i>Acmella paniculata</i>	Toothache Plant	Asteraceae	Native	-	+	LC
3.	<i>Acorus calamus</i>	Sweet Flag	Acoraceae	Native	-	+	NE
4.	<i>Ageratum conyzoides</i>	Billygoat Weed	Asteraceae	Non-Native	-	+	NE
5.	<i>Ageratum tuberosum</i>	Floss Flower	Asteraceae	Non-Native	-	+	NE
6.	<i>Allium cepa</i>	Onion	Amaryllidaceae	Non-Native	-	+	NE
7.	<i>Allium sativum</i>	Garlic	Amaryllidaceae	Non-Native	-	+	NE
8.	<i>Alpinia bracteata</i>	Red Ginger	Zingiberaceae	Native	-	+	NE
9.	<i>Alpinia calcarata</i>	Snap Ginger,	Zingiberaceae	Native	-	+	NE
10.	<i>Anemone rivularis</i>	Riverside Windflower	Ranunculaceae	Native	-	+	NE
11.	<i>Apium graveolens</i>	Celery	Apiaceae	Non-Native	-	+	LC
12.	<i>Arundina graminifolia</i>	Bamboo Orchid	Orchidaceae	Native	-	+	NE
13.	<i>Begonia urphylla</i>	Begonia	Begoniaceae	Non-Native	-	+	NE
14.	<i>Bidens biternata</i>	Spanish Needles	Asteraceae	Native	-	+	NE
15.	<i>Bidens pilosa</i>	Beggar's Tick	Asteraceae	Native	-	+	NE
16.	<i>Boehmeria</i> sp.	Nettle	Urticaceae	Native	-	+	LC
17.	<i>Catharanthus roseus</i>	Madagascar Periwinkle	Apocynaceae	Non-Native	-	+	NE
18.	<i>Centella asiatica</i>	Gotu Kola	Apiaceae	Native	-	+	LC
19.	<i>Coriandrum sativum</i>	Coriander	Apiaceae	Non-Native	-	+	NE
20.	<i>Globba spathulata</i>	Yellow-Tail Swan	Zingiberaceae	Native	-	+	VU
21.	<i>Hedychium coronarium</i>	Butterfly Lily	Zingiberaceae	Native	-	+	DD
22.	<i>Lysionotus serratus</i>	Lysionotus	Gesneriaceae	Native	-	+	NE
23.	<i>Phrynium pubigerum</i>	Packing Leaf	Marantaceae	Native	-	+	NE

Sl. No.	Botanical Name	English Name	Family	Origin	CZ	BZ	IUCN Status
24.	<i>Zingiber officinale</i>	Ginger	Zingiberaceae	Native	-	+	NE
HABIT: EPIPHYTIC HERB							
1.	<i>Bulbophyllum cherrapunjeensis</i>	Common Orchid	Orchidaceae	Native	+	+	NE
2.	<i>Dendrobium chrysotoxum</i>	Fried-Egg Orchid	Orchidaceae	Native	-	+	NE
3.	<i>Pholidota imbricata</i>	Rattlesnake Orchids	Orchidaceae	Native	-	+	NE
4.	<i>Pleione maculata</i>	Maculatus	Orchidaceae	Native	-	+	NE
HABIT: CLIMBER							
1.	<i>Acacia pennata</i>	Climbing Acacia	Fabaceae	Native	-	+	LC
2.	<i>Aeschynanthes sikkimensis</i>	Lipstick Plant	Gesneriaceae	Native	-	+	NE
3.	<i>Aristolochia cathcartii</i>	Dutchman's Pipe	Aristolochiaceae	Native	-	+	NE
4.	<i>Aristolochia saccata</i>	Pouch Birthwort	Aristolochiaceae	Native	-	+	NE
5.	<i>Aristolochia tagala</i>	Indian Birthwort	Aristolochiaceae	Native	-	+	NE
6.	<i>Aroides</i> sp.	Aroids	Araceae	Native	-	+	NE
7.	<i>Calamus</i> sp.	Sweet Flag	Arecaceae	Native	-	+	NE
8.	<i>Hoya fusca</i>	Yellow Wax Flower	Apocynaceae	Native	-	+	NE
9.	<i>Momordica charantia</i>	Bitter Gourd	Cucurbitaceae	Native	+	+	NE
10.	<i>Piper sarmentosum</i>	Wild Betel	Piperaceae	Native	+	+	NE
11.	<i>Pothos scandens</i>	Climbing Aroid	Araceae	Native	-	+	NE
12.	<i>Raphidophora calophyllum</i>	Mastwood	Araceae	Native	-	+	NE
13.	<i>Tinospora cordifolia</i>	Guduchi / Heartleaf	Menispermaceae	Native	+	+	NE
GROUP: GRASS							
1.	<i>Arundinella</i> spp.	Reed grass	Poaceae	Native	+	+	NE
2.	<i>Chrysopogon zizanioides</i>	Vetiver	Poaceae	Native	+	+	NE
3.	<i>Imperata cylindrica</i>	Cogon Grass	Poaceae	Native	-	+	LC
4.	<i>Ischaemum rugosum</i>	Himalayan Millet	Poaceae	Native	+	+	LC
5.	<i>Panicum</i> sp.	Torpedo Grass	Poaceae	Native	+	+	LC
6.	<i>Phragmites karka</i>	Common Reed	Poaceae	Native	-	+	LC
7.	<i>Saccharum arundinaceum</i>	Reedy Sugarcane	Poaceae	Native	+	+	NE
8.	<i>Saccharum spontaneum</i>	Wild Sugarcane	Poaceae	Native	+	+	LC
9.	<i>Themeda quadrivalvis</i>	Kangaroo Grass	Poaceae	Native	+	+	NE
10.	<i>Thysanolaena maxima</i>	Broom Grass	Poaceae	Native	+	+	NE
GROUP: BAMBOOS							
1.	<i>Bambusa balcooa</i>	Balcoo Bamboo	Bambusoideae	Native	-	+	NE
2.	<i>Bambusa tulda</i>	Indian Timber Bamboo	Bambusoideae	Native	-	+	NE
3.	<i>Dendrocalamus hamiltonii</i>	Giant Bamboo	Bambusoideae	Native	-	+	NE
4.	<i>Dendrocalamus strictus</i>	Male Bamboo	Bambusoideae	Native	+	+	NE
5.	<i>Melocanna baccifera</i>	Muli Bamboo	Bambusoideae	Native	-	+	NE
6.	<i>Schizostachyum dullooa</i>	Hill Bamboo	Bambusoideae	Native	-	+	NE
GROUP: PARASITIC HERB							
1.	<i>Cuscuta reflexa</i>	Giant Dodder	Convolvulaceae	Native	+	+	LC

Source: Field Survey; Upadhya *et al.*, 2003; Bamon *et al.*, 2022; Bamon & Lalnundanga, 2023, and other Secondary Sources.

A total of 109 tree and 15 shrub species belong to 104 and 13 families, respectively, were identified in the study area. Plant species other than trees and shrubs, including erect herbs, climbers and epiphytic herbs, parasitic herbs, grasses, and bamboos, were collectively identified in a total of 58 instances (Graph No. 3.1)

Graph No. 3.1 Graphical Representation on the Comparative Statistics of Tree, Shrubs and Other Terrestrial Plant Species in Terms of their Species Variability in the Study Area.



v. Phytosociological analysis on the Basis of Quadrat Study of Floral (Trees) Species

Species Richness (S):	6
Total Count:	43
Total Number of Quadrats Studied:	10

Table: 3.24 Phytosociological Analysis of Tree Species Observed

Sl. No.	Scientific Name	Count	RD	RF	RA	IVI
1.	<i>Castanopsis indica</i>	3	6.98	8.0	7.0	21.95
2.	<i>Erythrina</i> sp.	2	4.65	8.0	4.7	17.30
3.	<i>Pinus kesiya</i>	17	39.53	28.0	39.5	107.07
4.	<i>Quercus</i> spp.	8	18.60	16.0	18.6	53.21
5.	<i>Schima wallichii</i>	10	23.26	28.0	23.3	74.51
6.	<i>Toona ciliata</i>	3	6.98	12.0	7.0	25.95
TOTAL		100	100	100	100	300

Graph No. 3.2 Graphical Depiction of Phytosociological Analysis of Trees Species Observed

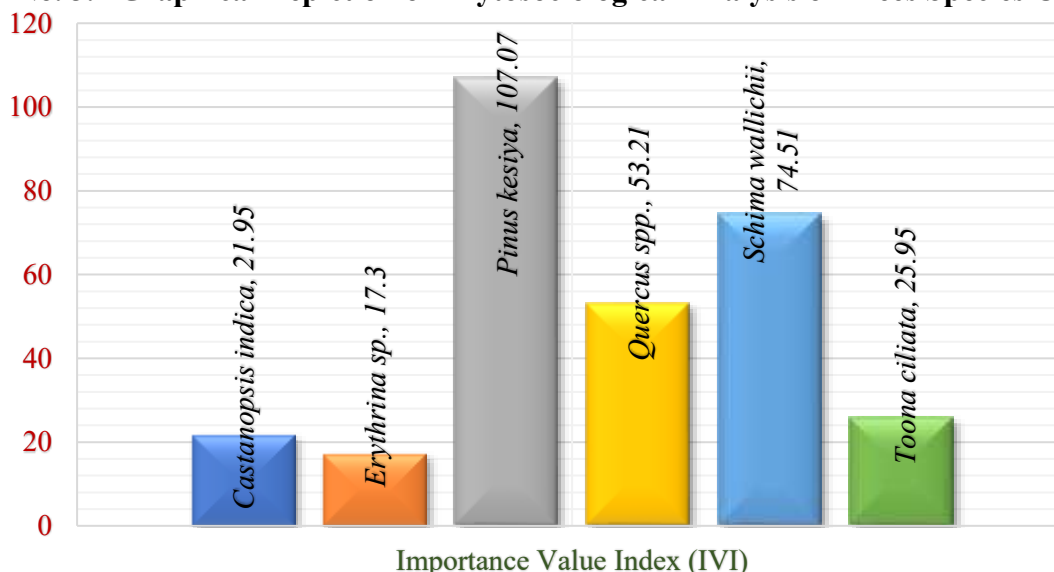


Table: 3.25: Analysis of Phytosociological Study

Sl. No.	Category	Count	P_i	P_i^2	$P_i \ln[P_i]$	Measure	Value
1.	<i>Castanopsis indica</i>	3	0.070	0.005	-00.186	D	00.257
2.	<i>Erythrina sp.</i>	2	0.070	0.005	-00.186	1 - D	00.743
3.	<i>Pinus kesiya</i>	17	0.186	0.035	-00.313	E	00.856
4.	<i>Quercus spp.</i>	8	0.047	0.002	-00.143	1/D	3.891
5.	<i>Schima wallichii</i>	10	0.395	0.156	-00.367	H	1.533
6.	<i>Toona ciliata</i>	3	0.233	0.054	-00.339	S	6
TOTAL		43	1.001	-	-		

vi. Prevalent Terrestrial and Arboreal Fauna of the Study Area

Table: 3.26 List of Mammalian Species of the Study Area

Sl. No.	Zoological Name	Common Name	Family	FH	CZ	BZ	Sch*	IUCN Status
1.	<i>Atherurus macrourus</i>	Asiatic Brush-tailed Porcupine	Hystricidae	I	-	+	I	LC
2.	<i>Barbastella leucomelas</i>	Eastern Barbastelle	Vespertilionidae	H	-	+	-	LC
3.	<i>Bos indicus</i>	Domestic Cow	Bovidae	H	+	+	-	NE
4.	<i>Callosciurus erythraeus</i>	Pallas's Squirrel	Sciuridae	H	-	+	-	LC
5.	<i>Callosciurus pygerythrus</i>	Hoary-bellied Squirrel	Sciuridae	H	-	+	-	LC
6.	<i>Canis aureus</i>	Golden Jackal	Canidae	C	-	+	I	LC
7.	<i>Canis lupus familiaris</i>	Domestic Dog	Canidae	C	+	+	-	NE
8.	<i>Cannomys badius</i>	Lesser Bamboo Rat	Muridae	H	+	+	-	LC
9.	<i>Capra aegagrus hiscus</i>	Domestic Goat	Bovidae	H	-	+	-	NE
10.	<i>Crocidura attenuata</i>	Asian Grey Shrew	Soricidae	I	-	+	-	LC
11.	<i>Cynopterus sphinx</i>	Greater Short Nosed Fruit Bat	Pteropodidae	F	-	+	-	LC
12.	<i>Felis catus</i>	Domestic Cat	Felidae	P	-	+	-	LC
13.	<i>Funambulus pennanti</i>	Five-striped Palm Squirrel	Sciuridae	C	+	+	-	LC
14.	<i>Ia io</i>	Great Evening Bat	Vespertilionidae	C	-	+	-	NT
15.	<i>Kerivoula kachinensis</i>	Kachin Woolly Bat	Vespertilionidae	I	-	+	-	LC
16.	<i>Lepus nigricollis</i>	Indian Hare	Leporidae	H	-	+	II	LC
17.	<i>Macaca mulatta</i>	Rhesus Macaque	Cercopithecidae	O	-	+	-	LC
18.	<i>Megaderma lyra</i>	Greater False Vampire Bat	Megadermatidae	I	-	+	-	VU
19.	<i>Megaerops niphanae</i>	Niphane's Fruit Bat	Pteropodidae	F	-	+	-	LC
20.	<i>Miniopterus magnater</i>	Large Bent-winged Bat	Miniopteridae	F	-	+	-	LC

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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Sl. No.	Zoological Name	Common Name	Family	FH	CZ	BZ	Sch*	IUCN Status
21.	<i>Miniopterus pusillus</i>	Lesser Bent-winged Bat	Miniopteridae	I	-	+	-	LC
22.	<i>Muntiacus vaginalis</i>	Northern Red Muntjac	Cervidae	H	-	+	I	LC
23.	<i>Murina huttoni</i>	Hutton's Tube-nosed Bat	Vespertilionidae	I	-	+	-	LC
24.	<i>Murina jaintiana</i>	Jaintia Tube-nosed Bat	Vespertilionidae	I	-	+	-	DD
25.	<i>Murina pluvialis</i>	Rainforest Tube-nosed Bat	Vespertilionidae	I	-	+	II	DD
26.	<i>Mus booduga</i>	Little Indian Field Mouse	Muridae	O	+	+	-	LC
27.	<i>Mus musculus</i>	House Mouse	Muridae	O	-	+	-	LC
28.	<i>Myotis horsfieldii</i>	Horsfield's Myotis	Vespertilionidae	I	-	+	-	LC
29.	<i>Myotis longipes</i>	Kashmir Cave Bat	Vespertilionidae	I	-	+	-	LC
30.	<i>Myotis siligorensis</i>	Himalayan Whiskered Bat	Vespertilionidae	I	-	+	-	LC
31.	<i>Ovis aries</i>	Domestic Sheep	Bovidae	H	+	+	-	NE
32.	<i>Paradoxurus hermaphroditus</i>	Asian Palm Civet	Viverridae	O	-	+	I	LC
33.	<i>Pipistrellus paterculus</i>	Mount Popa Pipistrelle	Vespertilionidae	I	-	+	-	LC
34.	<i>Prionailurus bengalensis</i>	Leopard Cat	Felidae	C	-	+	I	LC
35.	<i>Rattus rattus</i>	Black Rat / House Rat	Muridae	O	-	+	-	LC
36.	<i>Ratufa bicolor</i>	Black Giant Squirrel	Sciuridae	F	-	+	I	LC
37.	<i>Rhinolophus spp.</i>	Horseshoe Bats	Rhinolophidae	I	-	+	-	LC
38.	<i>Suncus murinus</i>	Asian House Shrew	Soricidae	I	-	+	-	LC
39.	<i>Sus scrofa</i>	Wild Boar / Pig	Suidae	O	-	+	II	LC
40.	<i>Trachypitecus pileatus</i>	Capped Langur	Cercopithecidae	O	-	+	I	VU
41.	<i>Tylonycteris malayana</i>	Greater Bamboo Bat	Vespertilionidae	I	-	+	-	LC
42.	<i>Urva edwardsii</i>	Indian Grey Mongoose	Herpestidae	O	+	+	I	LC
FH: Food Habit, H: Herbivore, F: Frugivore, C: Carnivore, P: Piscivore, I: Insectivore, O: Omnivore.								
Sch*: WLP, 1972 and amendments thereof								
Source: Field Survey; Lyngdoh <i>et al.</i> , 2019; and other Secondary Sources.								

Table: 3.27 List of Avifauna Species of the Study Area

Sl. No.	Zoological Name	Common Name	Family	FH	MP	Sch*	CZ	BZ	IUCN Status
1.	<i>Acridotheres fuscus</i>	Jungle Myna	Sturnidae	O	R	II	-	+	LC
2.	<i>Acridotheres tristis</i>	Common Myna	Sturnidae	O	R	II	-	+	LC
3.	<i>Alcedo atthis</i>	Common Kingfisher	Alcedinidae	C	R	II	-	+	LC
4.	<i>Arachnothera longirostra</i>	Little Spiderhunter	Nectariniidae	N, I	R	II	-	+	LC
5.	<i>Ardea alba</i>	Great White Egret	Ardeidae	C	LM	II	-	+	LC
6.	<i>Ardeola grayii</i>	Pond Heron	Ardeidae	C	R	II	-	+	LC
7.	<i>Bubo flavipes</i>	Tawny Fish Owl	Strigidae	C	R	I	-	+	LC
8.	<i>Bubulcus ibis</i>	Cattle Egret	Ardeidae	C	R	II	-	+	LC
9.	<i>Buceros bicornis</i>	Great Pied Hornbill	Bucerotidae	F	R	I	-	+	VU
10.	<i>Centropus sinensis</i>	Greater Coucal	Cuculidae	O	R	II	-	+	LC
11.	<i>Cinnyris asiaticus</i>	Purple Sunbird	Nectariniidae	N, I	R	II	-	+	LC
12.	<i>Columba livia</i>	Blue Rock Pigeon	Columbidae	G	R	-	-	+	LC
13.	<i>Copsychus saularis</i>	Magpie Robin	Muscicapidae	I	R	II	-	+	LC
14.	<i>Corvus corax</i>	Common Raven	Corvidae	O	R	II	-	+	LC
15.	<i>Corvus splendens</i>	Common Crow	Corvidae	O	R	-	-	+	LC
16.	<i>Dendrocitta formosae</i>	Grey Treepie	Corvidae	O	R	II	-	+	LC
17.	<i>Dicrurus macrocercus</i>	Black Drongo	Dicruridae	I	LM	II	-	+	LC
18.	<i>Egretta garzetta</i>	Little Egret	Ardeidae	C	R	II	-	+	LC
19.	<i>Eudynamis scolopaceus</i>	Asian Koel	Cuculidae	O	R	II	-	+	LC
20.	<i>Francolinus gularis</i>	Swamp Francolin	Phasianidae	O	R	II	-	+	NT
21.	<i>Gallus gallus</i>	Red Junglefowl	Phasianidae	O	R	II	-	+	LC
22.	<i>Gracula religiosa</i>	Hill Myna	Sturnidae	F	R	II	-	+	LC
23.	<i>Gyps himalayensis</i>	Himalayan Vulture	Accipitridae	SCV	R	I	-	+	NT
24.	<i>Hirundo rustica</i>	Barn Swallow	Hirundinidae	I	LDM	II	-	+	LC
25.	<i>Hypsipetes leucocephalus</i>	Black Bulbul	Pycnonotidae	F, I	R	II	-	+	LC
26.	<i>Milvus migrans</i>	Black Kite	Accipitridae	C	SDM	II	-	+	LC
27.	<i>Myophonus caeruleus</i>	Blue Whistling Thrush	Muscicapidae	I	R	II	-	+	LC
28.	<i>Nyctornis athertoni</i>	Blue-Bearded Bee-Eater	Meropidae	I	R	II	-	+	LC

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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DESCRIPTION OF THE ENVIRONMENT

Sl. No.	Zoological Name	Common Name	Family	FH	MP	Sch*	CZ	BZ	IUCN Status
29.	<i>Passer domesticus</i>	House Sparrow	Passeridae	O	R	II	-	+	LC
30.	<i>Pellorneum palustre</i>	Marsh Babbler	Pellorneidae	I	R	-	-	+	VU
31.	<i>Pericrocotus speciosus</i>	Scarlet Minivet	Campephagidae	I	R	II	-	+	NE
32.	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	Phalacrocoracidae	P	R	-	-	+	LC
33.	<i>Psarisomus dalhousiae</i>	Long-Tailed Broadbill	Eurylaimidae	I	R	II	-	+	LC
34.	<i>Psittacula krameri</i>	Rose Ringed Parakeet	Psittaculidae	F	R	II	-	+	LC
35.	<i>Pycnonotus cafer</i>	Red-Vented Bulbul	Pycnonotidae	F, I	R	II	-	+	LC
36.	<i>Pycnonotus jocosus</i>	Red-Whiskered Bulbul	Pycnonotidae	F, I	R	II	-	+	LC
37.	<i>Scolopax rusticola</i>	Wood Cock	Scolopacidae	I	WM	II	-	+	LC
38.	<i>Sitta formosa</i>	Beautiful Nuthatch	Sittidae	I	R	I	-	+	VU
39.	<i>Spelaornis longicaudatus</i>	Tawny-Breasted Wren-Babbler	Timaliidae	I	R	I	-	+	NT
40.	<i>Streptopelia decaocto</i>	Collared Dove	Columbidae	H	NM, R	II	-	+	LC
41.	<i>Turdoides striata</i>	Jungle Babbler	Leiotherichidae	I	R	II	-	+	LC
42.	<i>Upupa epops</i>	Common Hoopoe	Upupidae	I	LM	II	-	+	LC
43.	<i>Vanellus malabaricus</i>	Yellow Wattled Lapwing	Charadriidae	I	R	II	-	+	LC
FH: Food Habit, H: Herbivore, F: Frugivore, G: Granivore, N, I: Nectarivore & Insectivore, F, I: Frugivore & Insectivore, C: Carnivore, P: Piscivore, I: Insectivore, O: Omnivore.									
MP: Movement Pattern, R: Resident, LM: Local Migrant, WM: Winter Migrant.									
Sch*: WLPA, 1972 and amendments thereof									
Source: Field Survey; and Several Secondary Sources.									

Table:3.28 List of Herpetofauna Species of the Study Area

Sl. No.	Zoological Name	Common Name	Family	FH	Sch*	CZ	BZ	IUCN Status
CLASS: REPTILIAN								
1.	<i>Amphiesma stolatum</i>	Buff Striped Keelback	Natricidae	C	-	-	+	LC
2.	<i>Argyrophis diardii</i>	Diard's Blindsnake	Typhlopidae	C	-	-	+	LC
3.	<i>Boiga gocool</i>	Arrowback Tree Snake	Colubridae	C	-	-	+	LC
4.	<i>Calotes versicolor</i>	Garden Lizard	Agamidae	C	-	+	+	LC
5.	<i>Hemidactylus spp.</i>	Common Geckos	Gekkonidae	C	-	-	+	NE
6.	<i>Ophiophagus hannah</i>	King Cobra	Elapidae	C	I	-	+	VU
7.	<i>Ovophis monticola</i>	Chinese Mountain Pit Viper	Viperidae	C	-	-	+	LC
8.	<i>Pareas monticola</i>	Common Slug Snake	Pareidae	C	-	-	+	LC
9.	<i>Rhabdophis himalayanus</i>	Orange-Collared Keelback	Natricidae	C	-	-	+	LC
10.	<i>Sphenomorphus maculatus</i>	Spotted Forest Skink	Scincidae	C	-	+	+	LC
11.	<i>Varanus bengalensis</i>	Bengal Monitor	Varanidae	C	I	-	+	NT
Source: Field Survey; Chandramouli, 2021, and Several Secondary Sources.								
CLASS: AMPHIBIAN								
1.	<i>Amolops formosus</i>	Assam Sucker Frog	Ranidae	C	-	-	+	LC
2.	<i>Bufo himalayanus</i>	Himalayan Toad	Bufonidae	C	-	+	+	LC
3.	<i>Duttaphrynus melanostictus</i>	Common Indian Toad	Bufonidae	C	-	+	+	LC
4.	<i>Euphlyctis cyanophlyctis</i>	Indian Skipping Frog	Dicroglossidae	C	-	-	+	LC
5.	<i>Fejervarya limnocharis</i>	Crick Frog	Dicroglossidae	C	-	-	+	LC
6.	<i>Zhangixalus smaragdinus</i>	White Lipped Treefrog	Rhacophoridae	C	-	-	+	LC
Source: Field Survey; Saikia <i>et al.</i> , 2024, IUCN, 2024, and Several Secondary Sources.								
FH: Food Habit, C: Carnivore, Sch*: WLPA, 1972 and amendments thereof								

A total of 42 mammals and 43 avifauna species, were evidenced in the study area. The herpetofauna species, were collectively identified in a total of 17 occurrences in which 11 are reptilians and 6 are amphibians and exhibit remarkable family richness recorded as 18 for mammals, 26 for birds, 10 for reptiles, and 4 for amphibians (Graph No. 3.3).

b) Aquatic Ecology & Biodiversity

The aquatic ecology and biodiversity of the study area is principally influenced by the fresh waterbodies furnished in the Table No.3.3.

i. Prevalent Aquatic Flora of the Study Area

Table: 3.29 Common Aquatic Macrophytes and the Floral Species of Marshy Areas

Sl. No.	Botanical Name	Common Name	Family	CZ	BZ	IUCN Status	Type
1.	<i>Cyanodon dactylon</i>	Bermuda Grass	Poaceae	-	-	NE	Amphibious
2.	<i>Ceratophyllum demersum</i>	Hornwort	Ceratophyllaceae	-	-	LC	Free-floating
3.	<i>Eichhornia crassipes</i>	Water Hyacinth	Pontederiaceae	-	-	NE	Free-floating
4.	<i>Lemna minor</i>	Common Duckweed	Araceae	-	-	LC	Free-floating
5.	<i>Enhydra fluctuans</i>	Water Cress	Asteraceae	-	-	NE	Amphibious
6.	<i>Nymphaea stellata</i>	Blue Water Lily	Nymphaeaceae	-	-	EN	Free-floating
7.	<i>Neptunia oleracea</i>	Water Mimosa	Fabaceae	-	-	LC	Emergent
8.	<i>Rotala rotundifolia</i>	Roundleaf Rotala	Lythraceae	-	-	LC	Amphibious
9.	<i>Polygonum roylanum</i>	Knotweed	Polygonaceae	-	-	NE	Emergent
10.	<i>Trapa natans</i>	Water Chestnut	Lythraceae	-	-	LC	Free-floating

Sources: Field Survey, Zhang *et al.*, 2011; Sarma *et al.*, 2014; Bharthi *et al.*, 2015; Lee *et al.*, 2019; Gaur *et al.*, 2021.

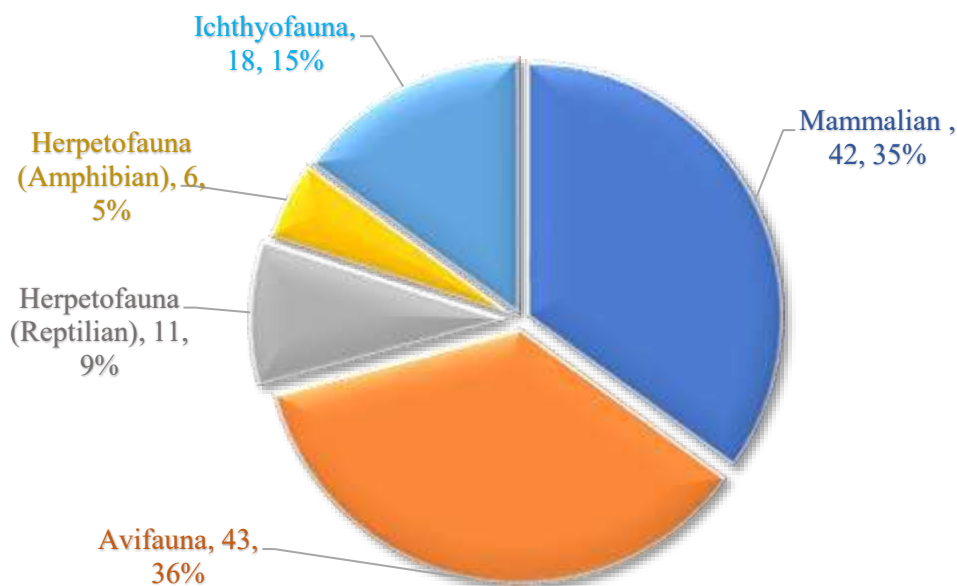
ii. Prevalent Aquatic Fauna of the Study Area

Table:3.30 Common Ichthyofauna of the Study Area

Sl. No.	Zoological Name	Common Name	Family	Sch*	CZ	BZ	IUCN Status
1.	<i>Ailia coila</i>	Gangetic Ailia	Siluridae	-	-	+	NT
2.	<i>Amblypharyngodon mola</i>	Mola Carplet	Cyprinidae	-	-	+	LC
3.	<i>Chanda nama</i>	Elongate Glassy Perchlet	Ambassidae	-	-	+	LC
4.	<i>Channa punctatus</i>	Spotted Snakehead	Channidae	-	-	+	LC
5.	<i>Cirrhinus cirrhosus</i>	White Carp	Cyprinidae	-	-	+	VU
6.	<i>Cirrhinus reba</i>	Reba Carp	Cyprinidae	-	-	+	LC
7.	<i>Clarias magur</i>	Magur / Walking Catfish	Clariidae	-	-	+	EN
8.	<i>Gagata cenia</i>	River Catfish	Sisoridae	-	-	+	LC
9.	<i>Glyptothorax telchitta</i>	Sisorid Catfish	Sisoridae	-	-	+	LC
10.	<i>Gudusia chapra</i>	Indian River Shad	Clupeidae	-	-	+	LC
11.	<i>Labeo bata</i>	Bata	Cyprinidae	-	-	+	LC
12.	<i>Labeo gonius</i>	Kuria Labeo	Cyprinidae	-	-	+	LC
13.	<i>Labeo rohita</i>	Rohu	Cyprinidae	-	-	+	LC
14.	<i>Macrogynathus pancalus</i>	Pancalus Spiny Eel	Mastacembelidae	-	-	+	LC
15.	<i>Pachypterus atherinoides</i>	Indian Anchovy Catfish	Schilbeidae	-	-	+	LC
16.	<i>Puntius sophore</i>	Freshwater Barb	Cyprinidae	-	-	+	LC
17.	<i>Schistura larketensis</i>	Larket Stone Loach	Nemacheilidae	-	-	+	NE
18.	<i>Semiplotus semiplotus</i>	Half-Bodied Carp	Cyprinidae	-	-	+	VU

Sources: Field Survey; Vaiphei and Gupta, 2017; Snaitang *et al.*, 2023; Kar, 2024; other Secondary Sources
Sch*: Schedule as per WLPA, 2023

Graph No. 3.3 Graphical Illustration on the Comparative Statistics of Five Classes of Animal Species in Terms of their Species Variability in the Study Area.



iii. Plankton Diversity of the Study Area

The planktonic communities of the East Jaintia Hills District, Meghalaya, exhibit remarkable taxonomic diversity, reflecting the ecological health and productivity of the region's aquatic ecosystems. Among the phytoplankton, members of the Chlorophyta (green algae) constitute the most dominant group, followed by representatives of Bacillariophyta (diatoms) and Cyanophyta (blue-green algae), while Dinophyta and Euglenophyta occur in comparatively lower densities. Characteristic genera frequently observed include *Microcystis* sp., *Staurastrum* sp., *Cosmarium* sp., *Scenedesmus* sp., *Spirogyra* sp., *Navicula* sp., and *Pediastrum* sp., each contributing uniquely to the trophic dynamics and primary productivity of local water bodies. Dominant taxa comprise Rotifera, Cladocera, and Copepoda, while Rhizopoda and Ostracoda are represented with relatively low densities. Within these communities, Rotifera often account for the highest species richness, with notable taxa such as *Keratella* sp., *Asplanchna* sp., *Mesocyclops* sp., *Conochilus* sp., *Bosmina* sp., *Daphnia* sp., and various species of *Brachionus* (Das and Das, 2022; Kharbyngar *et al.*, 2024). Collectively, these planktonic assemblages highlight the ecological complexity and nutrient-rich nature of the freshwater habitats in East Jaintia Hills.

3.5.8.7 Summary and Interpretation on Ecology and Biodiversity of the Study Area

The forest vegetation of the East Jaintia Hills District, Meghalaya, encompasses several recognized categories ranging from tropical evergreen and moist deciduous forests to subtropical pine forests, reflecting the region's altitudinal and climatic gradients. Within the Reserved Forest Areas (RFAs), the

vegetation is predominantly characterized by species such as *Anacardium occidentale*, *Schima wallichii*, *Pinus kesiya*, *Areca catechu*, *Macaranga* spp., *Callicarpa arborea*, *Pinus roxburghii*, and *Castanopsis* spp. In the adjoining rural landscapes, the dominant arboreal components include *Pinus kesiya*, *Schima wallichii*, *Areca catechu*, *Castanopsis* spp., and *Erythrina* spp., indicating a mixed assemblage of subtropical and tropical forest elements.

The field survey, public consultation and secondary survey revealed principal non-timber forest product (NTFP) yielding species of the region comprise *Terminalia bellirica*, *Careya arborea*, *Bauhinia variegata*, *Emblica officinalis*, *Cinnamomum tamala*, *Areca catechu*, and *Anacardium occidentale*, accompanied by understorey vegetation such as *Piper sarmentosum*, *Ficus hispida*, and thatch-forming grasses. However, the native vegetation is increasingly threatened by invasive alien species (IAS) including *Chromolaena odorata*, *Mikania micrantha*, *Lantana camara*, *Microcystis aeruginosa*, *Ageratina adenophora*, and *Saccharum spontaneum*, which adversely affect forest regeneration and native biodiversity.

Among the grassland and edge communities, *Saccharum spontaneum* is very common along riverbanks, wastelands, and fallow fields, while *Saccharum arundinaceum* thrives in moist open areas and hedgerows. *Chrysopogon zizanioides* occurs in cultivated patches, *Panicum* species along roadsides and disturbed sites, and *Arundinella* spp. are frequent at forest edges and open grasslands. Within the arboreal strata, *Castanopsis tribuloides* is present but less dominant than *C. indica*. *Pinus roxburghii* occurs mostly in drier, lower elevations of central Meghalaya and is rare in East Jaintia Hills, whereas *Pinus kesiya* is abundant above approximately 900 m elevation. *Schima wallichii* often co-dominates with *Castanopsis* and *Quercus* species, forming a characteristic feature of the district's mid-elevation forest structure.

The recorded vegetation of the study area includes several tree and herb species of notable conservation significance. Among the arboreal species, *Tectona grandis* (Teak) is categorized as Vulnerable (VU), *Aegle marmelos* (Bael) as Near Threatened (NT), and *Saraca asoca* (Ashoka tree) as Endangered (EN) according to the IUCN Red List, indicating varying degrees of population decline and habitat threat. In addition to these trees, the herbaceous species *Globba spathulata*, also listed as Vulnerable (VU), contributes to the floristic diversity of the area. The presence of these species highlights the ecological importance of the habitat and underscores the need for conservation measures to safeguard both threatened tree and herb taxa from further decline due to anthropogenic and environmental pressures.

The Simpson's Dominance Index (D) indicates a low probability that two randomly selected individuals belong to the same species, suggesting low dominance and the absence of an overwhelmingly dominant species within the plant community. Correspondingly, Simpson's Diversity Index ($1 - D$) reflects a relatively high species diversity, while the Simpson's Reciprocal Index indicates moderate evenness, with a few species exhibiting higher abundance. The Shannon–Wiener Index ($H = 1.533$) further supports moderate species diversity, implying that the ecosystem is neither monodominant nor highly complex. Overall, the calculated Pielou's Evenness ($E = 0.856$) indicates a stable and well-balanced community structure in the study area.

The aquatic macrophyte diversity of the study area comprises a balanced assemblage of amphibious, emergent, and free-floating species, representing multiple botanical families such as *Poaceae*, *Ceratophyllaceae*, *Pontederiaceae*, *Lythraceae*, and *Nymphaeaceae*. These macrophytes contribute significantly to nutrient cycling, water purification, and habitat structure within the wetland ecosystem. *Nymphaea stellata* is of particular conservation concern, listed as Endangered (EN), while most of others are Least Concern (LC).

Meghalaya, forming part of the Indo-Burma Biodiversity Hotspot and harbouring a diverse array of Indo-Malayan species, represents a critical landscape for the conservation of numerous mammalian species of the Indian subcontinent. Approximately 38% of India's mammalian fauna are found in the state (Lyngdoh *et al.*, 2019), highlighting the urgent need for targeted conservation strategies. Habitat analyses of the avian assemblages indicate that the study area encompasses a mosaic of mixed forests, edge habitats, and wetlands, characteristic of subtropical broadleaf forests, riverine corridors, and agro-rural landscapes typical of the East Jaintia Hills. The survey documented 42 mammal species and 43 bird species, alongside herpetofauna comprising 17 occurrences (11 reptiles and 6 amphibians) and 18 ichthyofauna. The study area exhibits notable family-level richness, recorded as 18 for mammals, 26 for birds, 10 for reptiles, 4 for amphibians and 10 for fish species, reflecting the high taxonomic diversity and ecological significance of the region.

The faunal composition of the study area, encompassing 15 species protected under Schedule I of the Wildlife (Protection) Act, 1972, and its subsequent amendments, highlights the region's remarkable biodiversity and ecological significance. The assemblage spans three major vertebrate classes—Mammalia, Aves, and Reptilia—alongside a diverse ichthyofaunal community, reflecting a well-structured and functionally dynamic ecosystem. A total of 07 mammalian species were recorded, distributed across families such as *Cercopithecidae*, *Bovidae*, *Felidae*, and *Herpestidae*. Several taxa, and

Trachypithecus pileatus (Capped Langur), is of significant conservation concern, being categorized as Vulnerable (VU) under the IUCN Red List. The avifaunal component, comprising six species, further accentuates the ecological richness of the landscape. *Buceros bicornis* (Great Pied Hornbill) and *Sitta formosa* (Beautiful Nuthatch) are listed as Vulnerable, while *Gyps himalayensis* (Himalayan Vulture) and *Spelaornis longicaudatus* (Tawny-breasted Wren-Babbler) are Near Threatened (NT). These forest-dependent species act as *bioindicators* of habitat integrity and high-altitude ecosystem health. Among the reptilian fauna, *Ophiophagus hannah* (King Cobra) holds a Vulnerable status, and *Varanus bengalensis* (Bengal Monitor) is Near Threatened. Their occurrence underscores the area's role in maintaining critical herpetofaunal habitats and trophic balance. The ichthyofaunal diversity is equally notable, dominated by families such as *Cyprinidae*, *Siluridae*, *Clariidae*, *Sisoridae*, and *Clupeidae*. Most species, including *Amblypharyngodon mola* (Mola Carplet), *Chanda nama* (Elongate Glassy Perchlet), and *Labeo rohita* (Rohu), are Least Concern, suggesting stable populations. However, *Ailia coila* (Gangetic Ailia, NT), *Cirrhinus cirrhosus* (White Carp, VU), *Semiplotus semiplotus* (Half-Bodied Carp, VU), and *Clarias magur* (Walking Catfish, EN) indicate localized declines linked to overfishing, pollution, and habitat loss. Particularly, *Schistura larketensis*, an endemic loach from Meghalaya, remains Not Evaluated (NE), warranting urgent ecological study.

Collectively, this faunal inventory underscores the exceptional conservation value of the region, harbouring both widespread and threatened taxa across trophic levels and habitat types. The coexistence of Vulnerable, Endangered, and endemic species reflects the area's ecological sensitivity, emphasizing the imperative for habitat preservation, sustainable resource use, and long-term biodiversity monitoring to ensure the resilience of its terrestrial and aquatic ecosystems.

3.5.8.8 Impact of Integrated Cement Plant and Thermal Power Plant on Ecology & Biological Diversity and Mitigation Measures.

An integrated cement facility combined with a thermal power plant places various stresses on the biological environment through land alteration, emissions, noise pollution, and waste production. These stresses can change the structure of ecosystems, the composition of species, and the overall ecological equilibrium. It is crucial to comprehend the biological effects and to apply focused, science-driven mitigation strategies for the conservation of biodiversity and the sustainability of ecosystems.

(a) Potential Impacts

The establishment of an integrated cement and thermal power plant can greatly influence biological diversity through several mechanisms. The acquisition of land and mining operations lead to the loss and

fragmentation of habitats, which displaces both flora and fauna and disrupts ecological corridors. Air emissions, including particulate matter, SO₂, and NO_x, settle on vegetation, impairing photosynthesis and lowering plant productivity. Additionally, water discharges that contain suspended solids or heavy metals modify aquatic chemistry, leading to a reduction in biodiversity within aquatic ecosystems. Industrial noise and vibrations disturb wildlife behaviour and reproduction, while constant illumination affects nocturnal species. Furthermore, the deposition of cement dust and fly ash pollutes the soil, alters its pH and microbial balance, and harms vegetation health, collectively resulting in ecological imbalance and a decrease in species diversity.

(b) Mitigation Measures

The scientific approach to mitigating biodiversity impacts from integrated cement and thermal power plants encompasses a thorough array of ecological management strategies. A Wildlife Conservation Plan (WLCP) should direct habitat conservation through restricted site clearance, the rescue of endangered species, and the restoration of degraded areas via afforestation and ecological corridors. Implementing a multi-tier greenbelt that covers at least 33% of the project area with native, pollution-tolerant species aids in dust absorption and noise buffering. State-of-the-art pollution control systems, including ESPs, bag filters, and FGD units, combined with Zero Liquid Discharge (ZLD) and rainwater harvesting, protect air and water quality. Strategies such as noise barriers, wildlife crossings, and controlled blasting help reduce disturbances to fauna, while effective fly ash utilization, lined disposal areas, and soil monitoring mitigate contamination. Raising conservation awareness among workers and communities, along with engaging in participatory eco-restoration programs, enhances biodiversity stewardship. Ongoing biodiversity monitoring, emphasizing indicator species, and annual reporting to authorities facilitate adaptive management and ensure long-term ecological sustainability.

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3.5.9 SOCIO-ECONOMIC ENVIRONMENT

In this section of the report an attempt has been made to measure socio-economic impact of the proposed Integrated Cement Plant. The various attributes that have been taken into account are population composition, employment generation, occupational shift, house hold income, consumption pattern, ethnic issue and law & order problem. The key objective of the study is to assess possible impact of the project on socio-economic life of the people in the neighborhood known as study area.

The objectives of the socio-economic impact assessment are as follows:

- a) To collect baseline data of the study area.
- b) To know the socio-economic status of the people living in the study area of the proposed mining project.
- c) To assess the possible impact of the project on socio-economic aspects in the study area.

d) To measure the impact of the project on Quality of life of the people in the study area.

3.5.9.1 APPROACH & METHODOLOGY

a) A mixture of both quantitative and qualitative approach has been adopted in the current socio-economic study.

b) The study has been conducted based on primary and secondary data. While primary data has been collected through a sample survey of selected households in the study area, the secondary data has been collected from the administrative records of the Government of Meghalaya, Census 2011, district hand books and from the Meghalaya Government portal.

c) The details regarding population composition, number of literates, workers, etc have been collected from secondary sources and analyzed. Also, village/city/town wise details regarding amenities available in the study area have been collected from secondary sources like Census 2011, and analyzed.

d) Two stage sampling design has been adopted to select the sampling units. The first stage units are census villages in the rural areas and towns/cities in urban areas. The ultimate stage units are households in the selected villages and towns/cities. Probability sampling has been adopted to select the sampling units.

e) Estimation of various parameters has been made based on sample data and bottom top approach has been adopted.

f) On the basis of a preliminary reconnaissance survey, two questionnaires were developed to make it suitable to fulfill the objectives of the study. The questionnaires contained both open ended and close ended questions

g) The data collected during the above survey was analyzed to evaluate the prevailing socio-economic profile of the area.

h) Based on the above data, impacts due to mining operation on the community have been assessed and recommendations for improvement have been made.

3.5.9.2 CONCEPT & DEFINITION OF TERMS USED

a) **Study Area:** The study area, also known as impact area has been defined as the sum total of core area and buffer area with a radius of 10 Kilometers from the periphery of the project site. The study area includes all the land marks both natural and manmade, falling therein.

b) **QoL:** The Quality of Life (QoL) refers to degree to which a person enjoys the important possibilities of his/her life. The 'Possibilities' result from the opportunities and limitations, each person has in his/her

life and reflect the interaction of personal and environmental factors. Enjoyment has two components: the experience of satisfaction and the possession or achievement of some characteristic.

c) **Household:** A group of persons who normally live together and take their meals from a common kitchen are called a household. Persons living in a household may be related or unrelated or a mix of both. However, if a group of related or unrelated persons live in a house but do not take their meals from the common kitchen, then they are not part of a common household. Each such person is treated as a separate household. There may be one member households, two member households or multi-member households.

d) **Sex Ratio:** Sex ratio is the ratio of females to males in a given population. It is expressed as 'number of females per 1000 males'.

e) **Literates:** All persons aged 7 years and above who can both read and write with understanding in any language are taken as literate. It is not necessary for a person to have received any formal education or passed any minimum educational standard for being treated as literate. People who are blind but can read in Braille are also treated as literates.

f) **Literacy Rate:** Literacy rate of population is defined as the percentage of literates to the total population aged 7 years and above.

g) **Labour Force:** The labour force is the number of people employed and unemployed in a geographical entity. The size of the labour force is the sum total of persons employed and unemployed. An unemployed person is defined as a person not employed but actively seeking work. Normally, the labour force of a country consists of everyone of working age (commencing from 14 to 16 years) and below retirement (around 65 years) that are participating workers, that is people actively employed or seeking employment. People not counted under labour force are students, retired persons, stay-at home people, people in prisons, permanently disabled persons and discouraged workers.

h) **Work:** Work is defined as participation in any economically productive activity with or without compensation, wages or profit. Such participation may be physical and/or mental in nature. Work involves not only actual work but also includes effective supervision and direction of work. The work may be part time or full time or unpaid work in a farm, family enterprise or in any other economic activity.

i) **Worker:** All persons engaged in 'work' are defined as workers. Persons who are engaged in cultivation of land or milk production even solely for domestic consumption are also treated as workers.

j) **Main Workers:** Those workers who had worked for the major part of the reference period (i.e. 6 months or more in the case of a year) are termed as Main Workers.

k) **Marginal Workers:** Those workers who did not work for the major part of the reference period (i.e. less than 6 months) are termed as Marginal Workers.

l) **Work participation rate:** The work participation rate is the ratio between the labour force and the overall size of their cohort (national population of the same age range). In the present study the work participation rate is defined as the percentage of total workers (main and marginal) to total population.

3.5.9.3 POSSIBLE IMPACT ASSESSMENT

Impact on population composition

The impact of the proposed Integrated Cement Plant project on population composition will be marginal as only few skilled and managerial staff will be recruited from outside and the rest will be recruited locally. The impact will be significant if a large number of people from outside get employed in the proposed project.

In that case not only the population of the study area will go up but also the skewed sex ratio may make permanent social effects like rise in exploitation of women, higher crime rate, increase in sexual diseases and depression among youth.

Impact on employment generation

The proposed Integrated Cement Plant project located at Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills, Meghalaya is expected to provide employment opportunities to nearby villagers. It is understood that all the persons to be deployed for various Skill/Unskilled activities will be recruited locally and there is very little scope for migration of people from outside the study area. The employment potentiality of the project is expected to ameliorate the economic condition of the families of those persons who will get employed in the proposed Integrated Cement Plant project. However, the Integrated Cement Plant project will provide permanent employment.

Impact on Health

Integrated cement plant projects pose potential health risks to both local communities and plant workers, primarily through the emission of air pollutants, notably fine particulate matter PM₁₀, PM_{2.5} & Sulfur dioxide (SO₂), nitrogen oxides (NO₂), and trace heavy metals. The most significant health impacts are generally respiratory, as chronic exposure to high levels of cement dust can lead to the development or exacerbation of conditions such as asthma, bronchitis, chronic obstructive pulmonary disease (COPD), and potentially lung cancer. Beyond respiratory concerns, particulate exposure is linked to cardiovascular

issues like hypertension and increased risk of heart attacks. Direct contact with the alkaline cement dust can also cause severe skin irritation, chemical burns, and allergic dermatitis due to the hexavalent chromium content, as well as eye irritation or injury. Furthermore, the release of heavy metals into the environment through emissions and wastewater can lead to long-term contamination of soil and water sources, potentially causing systemic toxic effects, including kidney damage and neurological disorders, through ingestion via the food chain.

Impact on income

An Integrated Cement Plant project in Daistong village, East Jaintia Hills, presents a complex economic scenario with both potential income opportunities and significant threats to traditional livelihoods. On the positive side, the project can generate direct employment within the plant itself, as well as indirect jobs in transportation, contract services, and local supply chains. Local entrepreneurs might find new business avenues catering to the needs of the workforce. However, these benefits are often overshadowed by potential negative impacts on the region's predominantly agrarian economy. Emissions of cement dust and associated mining activities can degrade soil and water quality, significantly reducing crop yields and negatively impacting allied activities like livestock rearing and fishing, on which many villagers depend. Furthermore, the necessary land acquisition can displace families and permanently remove vital agricultural and forest resources that provide long-term income streams. The overall impact on household income in Daistong will ultimately be determined by the company's ability to implement robust environmental mitigation measures, prioritize local hiring, and successfully execute community development plans that genuinely support sustainable local livelihoods alongside industrial operations.

Impact on consumption pattern

The field survey has revealed that people in the study are poverty ridden. Increased household income may change the consumption pattern of few families due to increased purchasing power but majority of the people will continue to be burdened with poverty.

Impact on road development

An Integrated Cement Plant project in Daistong village would have a dual impact on road development, acting as both a catalyst for infrastructure upgrades and a source of significant maintenance challenges. The necessity of transporting large volumes of raw materials like limestone and coal, as well as the finished cement product, typically drives investment in new approach roads to the plant site and the upgrading or widening of existing critical roads connecting to National Highway 6 (NH-6). These improvements often include blacktopping and better surfacing, enhancing general connectivity for the

region. However, these positive developments are accompanied by severe drawbacks. The substantial increase in heavy vehicle traffic leads to rapid wear and tear of the road surface, necessitating constant maintenance to manage potholes and general deterioration. Furthermore, the high volume of industrial trucks creates significant traffic congestion within the village and surrounding areas, posing safety hazards for pedestrians and local light vehicle users. Ultimately, while the plant prompts essential road infrastructure development, it also introduces chronic maintenance burdens and safety concerns that must be actively managed.

Impact on law & Order

As local people will be employed to run the quarry, no law & order problem is envisaged. It is expected that the workers will attend to their duties from their residence and return to their homes after the day's work is over. There would have been law & order problem if the workers were migrants and lived in shanties closed to the industry area. However, to meet any untoward incident one police post may be set up closed to the project area.

Findings of the Study

3.5.9.4 DEMOGRAPHIC COMPOSITION

Table :3.31 Existing Nearby villages in Buffer area

S. No.	Villages	Distance (Km)	Direction
1	Daistong	1.20	E
2	Mutong	5.59	ESE
3	Lumthari	1.23	NE
4	Moolasngi Old	2.58	NE
5	Moolasngi New	2.13	NNW
6	Shongrim	3.81	W
7	Tuituk	8.86	E
8	Lamyrsiang	5.88	WSW
9	Lumpdeng	7.39	WSW
10	Lelad	7.25	WSW
11	Mukhain	4.09	NNW
12	Samsai	5.77	N
13	Kremmyrsiang	7.97	NNW
14	Mynthlu	8.68	NNW
15	Jaalaphet Sumer	7.89	WNW
16	Jalaphet Sutnga	9.67	WNW
17	Paaslur	6.67	NNE
18	Moolamyliang	9.16	W
19	Tluh	9.77	W
20	Charwang	5.00	NNE

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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21	Mynthning	5.74	NE

3.5.9.5 OCCUPATIONAL PATTERN

The overall percentage of working in the area is 38.36 %.

Table: 3.32 Occupational pattern of People in Buffer Zone

S. No.	Village Name	Total Population Person	Total Worker Population Person	Total Worker Population Male	Total Worker Population Female
1	Daistong	596	261	138	123
2	Mutong	82	34	19	15
3	Lumthari	331	141	67	74
4	Moolamyliang	733	300	160	140
5	Moolasngi Old	0	0	0	0
6	Moolasngi New	385	109	56	53
7	Shnongrim	966	414	221	193
8	Tuituk	186	82	43	39
9	Lamyrsiang	846	339	168	171
10	Lumpdeng	0	0	0	0
11	Lelad	552	255	134	121
12	Samasi	513	194	98	96
13	Mynthlu	843	308	203	105
14	Kremmysiang	458	130	97	33
15	Jalaphet Sutnga	2945	1088	477	611
16	Jalaphet Sumer	2292	885	447	438
17	Tluh	953	333	184	149
18	Mynthning	367	133	76	57

S. No.	Village Name	Total Population Person	Total Non-working Population Person	Total Non-working Population Male	Total Non-working Population Female
1	Daistong	596	335	173	162
2	Mutong	82	48	21	27

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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3	Lumthari	331	190	95	95
4	Moolamyliang	733	433	212	221
5	Moolasngi Old	0	0	0	0
6	Moolasngi New	385	276	141	135
7	Shnongrim	966	552	273	279
8	Tuituk	186	104	53	51
9	Lamyrsiang	846	507	262	245
10	Lumpdeng	0	0	0	0
11	Lelad	552	297	140	157
12	Samasi	513	319	136	183
13	Mynthlu	843	535	224	311
14	Kremmyrsiang	458	328	133	195
15	Jalaphet Sutnga	2945	1857	907	950
16	Jalaphet Sumer	2292	1407	714	693
17	Tluh	953	620	282	338
18	Mynthning	367	234	113	121

Source: Census 2011, data.govt.in

3.5.9.5.1 LITERACY PATTERN

The overall percentage of literacy in the area is 42.68 %. Total literate population is 5569. The literacy rate of male is 20.48 %. While literacy rate in Female is 22.19 %.

Table :3.33 Literacy pattern of People in Buffer Zone

S. No	Village Name	Total Population Person	Literate	Literate	Literate	Illiterate	Illiterate	Illiterate
			Total	Male	Female	Total	Male	Female
1	Daistong	596	167	66	101	429	245	184
2	Mutong	82	3	3	0	79	37	42
3	Lumthari	331	221	108	113	110	54	56
4	Moolamyliang	733	371	163	208	362	209	153
5	Moolasngi Old	0	0	0	0	0	0	0
6	Moolasngi New	385	285	147	138	100	50	50
7	Shnongrim	966	650	327	323	316	167	149
8	Tuituk	186	59	31	28	127	65	62
9	Lamyrsiang	846	554	274	280	292	156	136

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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10	Lumpdeng	0	0	0	0	0	0	0
11	Lelad	552	328	164	164	224	110	114
12	Samasi	513	263	111	152	250	123	127
13	Mynthlu	843	363	161	202	480	266	214
14	Kremmysiang	458	193	92	101	265	138	127
15	Jalaphet Sutnga	2945	962	447	515	1983	937	1046
16	Jalaphet Sumer	2292	600	325	275	1692	836	856
17	Tluh	953	526	241	285	427	225	202
18	Mynthning	367	24	13	11	343	176	167

Source: Census 2011, data.govt.in

3.5.9.5.2 SOCIAL STRUCTURE

Out of total population, SC population is 0.09 % and 98.79 % is ST Population.

Table :3.34 Social Structure pattern of People in Buffer Zone

S. No	Village Name	Total Population	Schedule Cast Population			Schedule Tribe Population		
			Total	Male	Female	Total	Male	Female
1	Daistong	596	0	0	0	588	309	279
2	Mutong	82	0	0	0	82	40	42
3	Lumthari	331	0	0	0	328	160	168
4	Moolamyliang	733	0	0	0	728	369	359
5	Moolasngi Old	0	0	0	0	0	0	0
6	Moolasngi New	385	0	0	0	356	182	174
7	Shnongrim	966	0	0	0	965	493	472
8	Tuituk	186	6	4	2	180	92	88
9	Lamysiang	846	0	0	0	842	429	413
10	Lumpdeng	0	0	0	0	0	0	0
11	Lelad	552	0	0	0	542	268	274
12	Samasi	513	0	0	0	509	233	276
13	Mynthlu	843	0	0	0	824	416	408
14	Kremmysiang	458	0	0	0	450	224	226
15	Jalaphet Sutnga	2945	5	5	0	2932	1373	1559
16	Jalaphet Sumer	2292	1	0	1	2254	1145	1109
17	Tluh	953	0	0	0	944	463	481
18	Mynthning	367	0	0	0	367	189	178

Source: Census 2011, data.govt.in

3.5.9.5.3 SEX RATIO

Sex ratio is a number of females per 1000 males. As per the Census 2011. The male population is 49.56 %. While female population is 50.43 % of the total population.

Table :3.35 Sex Ratio pattern of People in Buffer Zone

S. No	Village Name	Total Population	No. of Household	Male	Female	Sex Ratio
						(Female/Male) *1000
1	Daistong	596	85	311	285	916.40
2	Mutong	82	13	40	42	1050.00
3	Lumthari	331	59	162	169	1043.21
4	Moolamyliang	733	127	372	361	970.43
5	Moolasngi Old	0	0	0	0	0.00
6	Moolasngi New	385	67	197	188	954.31
7	Shnongrim	966	145	494	472	955.47
8	Tuituk	186	33	96	90	937.50
9	Lamyrsiang	846	128	430	416	967.44
10	Lumpdeng	0	0	0	0	0.00
11	Lelad	552	93	274	278	1014.60
12	Samasi	513	89	234	279	1192.31
13	Mynthlu	843	144	427	416	974.24
14	Kremmyrsiang	458	74	230	228	991.30
15	Jalaphet Sutnga	2945	492	1384	1561	1127.89
16	Jalaphet Sumer	2292	371	1161	1131	974.16
17	Tluh	953	132	466	487	1045.06
18	Mynthning	367	67	189	178	941.80

Source: Census 2011, data.govt.in

3.5.10 SUMMARY & CONCLUSION

The successful integration of the Integrated Cement Plant into the East Jaintia Hills requires a delicate balance. While the project brings modern economic benefits and infrastructure improvements, its real-world impact hinges entirely on the effective implementation of robust environmental management plans and corporate social

responsibility (CSR) initiatives that genuinely protect the existing ecosystem and support the traditional livelihoods of villages like Daistong.

3.15 BASIC INFRASTRUCTURE FACILITIES AVAILABILITY *(as per the census records of 2011)*

A review of basic infrastructure facilities (*Amenities*) available in the study area has been done on the basis of the field survey and Census records, 2011 for the study area inhabited revenue Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya). The study area has moderate level of basic infrastructure facilities like educational, medical, potable water and power supply and transport & communication network.

As per the Census Records 2011, the study area has a total of 18 villages/towns of mainly Daistong & Mutong of East Jaintia Hills of Meghalaya state. Overall study area villages/towns are falling mainly under 1 tehsils of East Jaintia Hills of Meghalaya state.

Educational Facilities

There are 8 (Eight) Primary schools existing in the 10km radius study area. About Two (2) no's of Middle schools are found in the study area. 1 (One) Higher Secondary School (SS) and No Senior Secondary School (SSS) facility is available in the study area. The educational facilities have been further strengthening now and a number of private public schools and colleges are also functioning in the surroundings of the study area. Besides, there are Engineering and Medical colleges available in Towns and District headquarters only. Higher education facilities are available in Towns of the district. There is a considerable improvement in educational facility. The villages of the study area have no such facilities can reach within 5 to 10km range. Entire study area is predominantly rural as no town was observed in the study area.

Availability of University Education in East Jaintia Hills District

No full-fledged universities are located in the East Jaintia Hills district itself, but there are several colleges that are affiliated with North-Eastern Hill University (NEHU) in nearby Shillong.

Medical Facilities

The medical facilities are provided by different agencies like Govt. & Private individuals and voluntary organizations in the study area. As per the census 2011, only one primary health center exists in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills in Meghalaya state lying in the study area; most of the study area villages depend upon the towns & district HQ concerned with the study area having such facility. No Primary Health Sub-Center exists in the villages of the study area. No Mother & Child Welfare Center was found in the study area. There was no allopathic No Hospitals and medical

dispensaries were found in the study area. No Family Welfare Center was found in the study area. Specialized medical facilities are available only in towns and District Headquarter (HQ) only.

Potable Water Facilities

Potable water facility is available in most of the villages/towns of the study area. The entire study area has average level of potable water facilities. Hand Pump (HP) facility is commonly observed in the study area as potable water facility. Out of the total 13 villages, all villages except Village Lumpdeng & Moolasngi Old (93.33%) are served with River/Canal water in the study area. As per the census records of 2011, about 12 villages (93.33%) being served with Tank/Pond/Lake in the study area.

Communication, Road & Transport Facilities

Apart from Post & Telegraph (P&T) services, transport is the main communication linkage in the study area. Compiled census 2011, data shows that the study area has poor postal facilities in the 10km radius zone. About 12 villages (93.33%) were found serving with Post Office facilities in the study area, remaining villages are depending upon towns of the study area. The study area has average rail and road network, passes from the area.

Nearest town Mutong situated at about 5.51 km in ESE direction from the coal mine lease area. Nearest railway station is situated at Ditokcherra Railway station, Meghalaya which is about 36.90 km in SE direction from the mine lease area. Nearest airport is Guwahati Airport in Meghalaya state is located at a distance of Approx. 128.21 km in North West direction from the mine lease area site.

Project Site Area

The area is approachable by road only. Tarajak Village Daistong having few Katcha tracks are present on the mostly barren block catering to the block itself.

Banking Facility

The study area has almost all the schedule commercial banks with ATM facility at urban areas and the district HQ.

Power Supply

It is revealed from the compiled information on amenities availability as per the census record of 2011; most of the villages and towns are observed not electrified for Domestic, Agriculture, and Commercial & for all purposes, as electrification is very poor in the study zone. About Fourteen (12) villages (93.33%) and towns of the study area are electrified for domestic purpose, only 12 villages (93.33%) for agricultural and 12 villages (93.33%) for commercial purpose and only 12 villages (93.33%) were

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recorded electrified for all purposes in the study area. Out of 13 villages/towns in the study area, 14 villages (93.33%) are electrified for any purpose in the study area.

Village/town wise Basic Infrastructure and Amenities availabilities data for the entire study area is compiled and presented in **Table 3.18** as follows;

Sub District Name	Name of the Village/Town	Educational				Medical							Drinking Water				Communication & Transport				Approach to Village				Power Supply				Nearest Town Name	Nearest Town Distance from Village (in Km.)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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Saipung	Daistong	1	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

4.1 ENVIRONMENTAL IMPACT STUDY

The construction and operational phases of the Proposed Project are expected to be the primary drivers of environmental change, influencing physical, social, economic, agricultural, and aesthetic factors. Recognizing that industrial operations inherently alter local air quality, noise levels, water resources, and soil composition, this assessment seeks to balance necessary economic upliftment with the imperative for environmental sustainability. Therefore, a detailed evaluation of the project's likely effects on various environmental and socio-economic parameters is essential. This proactive impact assessment allows for the advance planning of comprehensive abatement measures—spanning prevention, minimization, mitigation, offset, or compensation for adverse impacts—while simultaneously maximizing positive project outcomes where feasible. The following sections elaborate on these anticipated impacts.

4.2 METHODOLOGY OF IMPACT ASSESSMENT

A structured approach was used to assess the project's impact on the environment and community. This systematic process identifies the effects on physical, biological, and socio-economic aspects, with a focus on implementing measures to avoid harm and enhance benefits. The assessment process comprises the following steps:

- ✓ **Identification:** Locating potential environmental impacts.
- ✓ **Prediction:** Forecasting the consequences of project activities on resources.
- ✓ **Evaluation:** Assessing the significance of impacts based on severity and resource sensitivity.
- ✓ **Mitigation:** Recommending justifiable measures to reduce harm and boost positive outcomes.

4.3 BASIS OF IMPACT ASSESSMENT

The assessment of the proposed project's impacts will be determined by analysing their characteristics - specifically their nature, type, extent, duration, intensity, and frequency—to establish their overall significance.

Table: 4.1: Impact Characteristics

Characteristic	Classification	Description
Nature	Positive	Impact represents improvement or introduces a new positive factor/change.
	Negative	Impact represents adverse change or introduces a new undesirable factor/change.
	Neutral	No change from baseline; no new factor/change introduced.
Type	Direct	Results from direct interaction between project activity and the

		environment/receptors.
	Indirect	Results from other activities that occur as a consequence of the project.
	Cumulative	Impacts that work together with other impacts (including future third-party operations) to influence the same resources/receptors.
Extent	Project Area	Impact restricted within the plant area (core zone).
	Local	Impact restricted within immediate surroundings (up to 3 km radius).
	Zonal	Impact restricted within the study area (up to 10 km radius).
	Regional	Impact extends within and beyond 10 km radius.
Duration	Short-term	Temporary impact or lasts for a short time; effect is in the near future.
	Long-term	Impact occurs during project development and lasts a long time or causes a permanent change.
Intensity	Low	Slight changes in baseline conditions; good physical environment quality; ecological and human receptors unlikely to be affected.
	Medium	Changes within benchmark norms; physical environment shows some stress; ecological and human receptors sensitive but can adapt.
	High	Changes exceeding benchmark norms; physical environment already under stress; ecological and human receptors significantly impacted with undermined ability to adapt.
Frequency	Remote (R)	When resulting in remote or one-off chance of an event due to an activity on a receptor/ resource.
	Occasional (O)	When an impact due to an activity is occurring intermittently from time to time on a receptor/resource.
	Periodic (P)	When an impact due to an activity is resulting on a periodic basis for a week or a month on a resource/receptor.
	Continuous (C)	When an impact due to an activity is continuously resulting on a resource/receptor.

4.4 INTERACTION MATRIX

A systematic identification of potential interactions between project activities and various resources/receptors within the Area of Influence is achieved using an interaction matrix. This matrix (presented in Table 4.4) covers all potential interactions, irrespective of their probability of occurrence. It lists potential receptors against a comprehensive list of project activities.

Entries within the matrix cells utilize a simple coding system:

- **Blank cells** indicate that an interaction is not reasonably expected.
- **Tick-marked cells (✓)** denote that an interaction is reasonably possible and may lead to a potential impact.

Table: 4.2: Interaction Matrix

S. No.	Project Activity Likely Impacted Resources / Receptors	Pre-construction Phase			Construction Phase						Operation Phase								Miscellaneous	
		Land Acquisition	Site Clearing	Site preparation / Change in Topography	Civil works such as earth moving and building structures including temporary	Heavy Equipment operations	Disposal of construction waste	Generation of Sewerage	Influx of construction workers	Transportation of construction material	Raw Material transportation, storage and handling	Crushing of coal, storage, and handling of construction materials	Kiln operation	Grinding process	Operation of power source	Abstraction of water	Co-processing of Hazardous Waste / AFR	Waste management	Development activities carried out by company	Greenbelt Development
A.	Physical																			
1.	Air		☐	☐	☐	☐	☐			☐	☐	☐	☐	☐	☐		☐		☐	☐
2.	Noise & / Vibration		☐		☐	☐				☐	☐	☐	☐	☐	☐					☐
3.	Land Use	☐			☐															
4.	Topography			☐																

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5.	Geology																		
6.	Drainage Pattern			☐	☐														
7.	Surface Water													☐					
8.	Ground Water			☐	☐				☐					☐					
9.	Soil	☐	☐	☐	☐	☐	☐		☐	☐								☐	
B. Biological																			
1.	Flora																		
2.	Fauna																		
3.	NP/WLS/BR/reserves/Forests etc.																		
C. Social 5 Socio-Economic																			
1.	Demography								☐										
2.	Physical Displacement																		
3.	Land Use (w.r.t. Population influx)								☐										
4.	Habitation								☐										
5.	Economy & Livelihood	☐							☐	☐	☐							☐	

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6.	Social & Cultural Structure								☐										☐	
7.	Infrastructure & Public Services				☐													☐	☐	
8.	Public Health							☐	☐							☐	☐	☐	☐	
9.	Education								☐									☐		
10.	Agriculture																			
11.	Transport Infrastructure				☐	☐			☐	☐	☐									
D.	Occupational Health																			
1.	Injury		☐	☐	☐	☐	☐			☐	☐	☐	☐	☐						
2.	Health						☐	☐		☐	☐	☐	☐	☐		☐				
3.	Non - routine risk					☐				☐	☐	☐	☐	☐		☐	☐			
	Legends		Show no interactions is reasonably								☐					Show interactions reasonably possible with one of the outcomes may lead to potential impact				

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According to the interactions identified between project activities and resource/receptors as described in the above table, it is evident that the following aspects are likely to have impact due to the proposed project (Table: 4.3) and therefore, to be considered for Impact Assessment:

Table: 4.3: Likely Impacted Resources / Receptors

S. No.	Likely Impacted Resources / Receptors	
A.	Physical	Air Quality
		Noise Level
		Surface Water
		Soil Environment
		Topography
		Drainage Pattern
B.	Biological environment	Flora
		Fauna
C.	Socio economic environment	Demography
		Land use (w.r.t. population influx)
		Economy & Livelihood
		Social & Cultural Structure
		Infrastructure & Public Services
		Public Health
		Education
		Agriculture
		Transport Infrastructure
D.	Occupation Health & Safety	Injury
		Health
		Non-Routine Risk

Source: Interaction Matrix

The impact of Proposed project related activities on various environmental parameters were assessed and are given below:

4.5 ANTICIPATED IMPACT ON TOPOGRAPHY & LAND USE PATTERN AND MITIGATION MEASURES

The project will result in the following impacts regarding land use and physical environment:

- **Topography:** The site exhibits a largely flat gradient (an 8-meter elevation difference between the lowest and highest points). Therefore, extensive reshaping of the natural land surface is not required or anticipated.
- **Land Use:** A fundamental shift from agricultural activity to industrial operations is planned. This change carries indirect implications for the current agricultural workforce but will concurrently create alternative job prospects for residents.
- **Pollution:** An uptick in airborne dust is expected temporarily due to the mobilization and operation of heavy construction machinery.

• Impact Evaluation

Impact Evaluation is given in table below:

Table: 4.4: Impact Evaluation for Change in Land Use Pattern

Impact Evaluation Element	Land use of the area will be changed from existing agriculture land to industrial land.			
Potential Effect/ Concern	Land use of the proposed project area is agriculture land which will be used for industrial purpose after its conversion into Industrial land use.			
<i>Characteristics of Impacts</i>				
Nature	Positive		Negative	<i>Neutral</i>
	✓			
Type	<i>Direct</i>	Indirect	Cumulative	
	✓			
Extent	<i>Project Area</i>	Local	Zonal	Regional
	✓			
Duration	Short – term		<i>Long- term</i>	
			✓	

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Intensity	Low		<i>Medium</i>	High
			✓	
Frequency	Remote (R)	Occasional (O)	Periodic (P)	<i>Continuous (C)</i>
				✓
<i>Significance of Impact</i>				
Significance	<i>Insignificant</i>	Minor	Moderate	Major
	✓			

Mitigation efforts are planned as follows:

- **Topographical Integrity:** The natural slope and contour of the area will be maintained throughout the site preparation and clearing stages.
- **Material Management:** All generated soil will be utilized internally for site levelling work, minimizing off-site disposal.
- **Hydrological Conservation:** The water body to the South west is designated as a protected area and will not be impacted by project activities; robust measures are in place to ensure its preservation.
- **Air Quality Management:** Frequent application of water spray will be used as a dust suppressant to control fugitive dust emissions resulting from ground-disturbing work.

4.6 ANTICIPATED IMPACT ON AMBIENT AIR QUALITY AND MITIGATION MEASURES

4.6.1 Construction Phase

• Anticipated Impacts

The construction phase will introduce several sources of air pollution:

- **Vehicle & Activity Emissions:** Levelling work and heavy vehicle traffic will increase dust (Particulate Matter) and NOx concentrations.
- **Key Dust Generators:** Earthwork, grading, and foundation work are the main sources of site-specific dust.
- **Vehicle Exhaust:** Construction equipment exhaust will marginally increase levels of SO₂, NO₂, PM, CO, and hydrocarbons.
- **Health and Environmental Concerns:** These pollutants pose a risk to air quality and human health (e.g., respiratory issues) and contribute slightly to broader air pollution and climate change.
- **Waste Handling:** The movement of construction waste and debris will negatively impact ambient air quality.

- **Stockpile Dust:** Wind and vehicle movement around aggregates and sand stockpiles may release airborne dust.
- **Overall Impact Assessment:** Impacts are short-duration, reversible, marginal, and primarily localized within the project boundary.

The overall impact on air quality will be temporary and marginal. Effects are strictly confined within the project boundary, are fully reversible, and are expected to be negligible outside of the immediate project site.

- **Mitigation strategies for air quality control include:**
 - Regular water sprinkling on site and unpaved roads.
 - Planting adequate vegetation around the site perimeter.
 - Deploying only construction equipment with valid PUC certification.
 - Ensuring consistent upkeep and maintenance of all vehicles.
 - Implementing proper waste management (covered loads, covered vehicles, proper disposal) to control waste-related pollution.
 - Stabilizing stockpile slopes and maintaining controlled heights to minimize dust release.

4.6.2 Operation Phase

- **Anticipated Impacts**

The operation of the facility will lead to an increase in concentrations of fugitive emissions and stack emissions (SO₂, NO_x, PM, and CO). These impacts stem from two main categories:

(A) Fugitive Emissions

Fugitive emissions arise from both process-related and non-process-related activities within the cement plant:

Process-related activities:

- **Material Handling and Transfer:** Emissions occur during:
 - Loading and unloading of raw materials and finished products.
 - Material transfer points.
 - Venting from silos.
- **Milling Operations:** Emissions are generated during:
 - Primary and secondary crushing of limestone, coal, and/or Petcoke.
 - Clinker grinding processes.
 - Packing plant operations.

Non-process-related activities:

- **Vehicular Traffic:** Emissions result from:
 - Movement of trucks/trailers transporting raw materials and finished products within the plant premises.
 - Movement of personnel vehicles.
- **Material Storage:** Emissions occur from materials (e.g., limestone) stored in covered sheds.

(B) Stack Emissions

Major emissions discharged via stacks originate primarily from the integrated cement plant processes:

- **Particulate Matter (PM):** PM emissions are the main pollutant anticipated from the stacks.
- **Gaseous Pollutants:** The kiln operation is expected to release gaseous pollutants, including SO₂, NO_x, and CO.
- **Co-processing Pollutants:** If hazardous waste is co-processed, Dioxins & Furans concentrations will also be present in the ambient air.

4.6.3 METEOROLOGICAL PARAMETERS

Surface meteorological data at project site was collected for Summer Season March to May-2025-26. The hourly meteorological data considered during this period were:

- Wind speed;
- Wind direction;
- Ambient atmospheric temperature;
- Cloud cover;
- Relative Humidity

4.6.4 MODEL OPTIONS USED FOR COMPUTATIONS

The options used for short-term computations are:

- The plume rise is estimated by Briggs formulae, but the final rise is always limited to that of the mixing layer;
- Stack tip down-wash is not considered;
- Buoyancy Induced Dispersion is used to describe the increase in plume dispersion during the ascension phase;
- Calms processing routine is used by default;

- It is assumed that the pollutants do not undergo any physio-chemical transformation and that there is no pollutant removal by dry deposition;
- Washout by rain is not considered;
- Flat terrain is assumed / used for computations;
- Cartesian co-ordinate system has been used for computations; and
- The model computations have been done for 10 km with 100 m grid interval.

4.6.5 EMISSION OF PM10

Major sources of PM10 emission in case of limestone project are the loading activity at mine site (loading of material over trucks / trucks by excavators) and the movement of vehicles on unpaved haul roads, blasting and crushing activity. The emission rates for these sources are given in latest USEPA's AP-42 guidelines.

4.6.6 LOADING OF MATERIAL

The material will be loaded on dumpers using excavators. JCB will be used for loading of material during the 3 working shift 18 Hours/day. Emission factor for PM 2.5 is 0.98 gm/sec (Nevada Division of Environmental Protection Bureau of Air Pollution Control (BAPC) Permitting Branch) The PM10 emission rate due to loading activity is calculated using below equation.

$$E = k \times 0.0016 \times \left(\frac{\left(\frac{u}{2.2} \right)^{1.3}}{\left(\frac{M}{2} \right)^{1.4}} \right) \quad (\text{USEPA's AP42, (Nov 2006)})$$

Where,

E = Emission Factor, kg/ton

k = Particle size multiplier, 0.35 for PM10

M = Moisture Content, %

u = Mean wind speed, m/s

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Table: 4.5: Project Specific Details for Air Modeling

Parameters	Block
Production (TPA)	Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA
Working hour	8
working days	300
total working hour	2400
Moisture Content (%)	0.17
Emission rate PM ₁₀ (g/sec)	0.8
Emission rate PM _{2.5} (g/sec)	0.6

4.6.7 ACTIVITIES

Table: 4.6: Project Activities Details for Air Modeling

Activities / Operations	Emission Factor Equations	Emission Factors	Units (g/s)
Crushing	$E_{10} = 0.52 \times 0.00022 \times A_{1.5} \text{ (kg/min)}$	0.153	g/sec
Emission from material handling	$E_{10} = k \ 0.0016 \ (U/2.2))0.8 \ (M/2)1.4 \text{ (kg/tonne)}$	0.74	g/sec
Transportation from Haul road	$E_{10} \text{ (kg/VKT)} = 0.423 \text{ (s/12)} \ 0.9 \text{ (W/2.7)}$ 0.45	1.0125	g/sec

4.6.8 EMISSION OF PM₁₀ DUE TO HAUL ROAD

Vehicular movement was calculated for the transportation activities proposed through the locals roads. Transportation of raw materials from plant site to main road will be trucks / trolleys (Considered Truck numbers). The approach roads will be provided up to the project to nearest road.

Total Pollution load (Et) of the vehicles was determined using equation below. The total number of vehicles for each category was used to estimate emission as daily average.

$$E_i = \sum_i (Veh_j D_j) e_{ijk}$$

where, Et is the total estimated emission of each pollutant (expressed as g/day or tons/day), Vehj is the number of vehicles of type j, Dj is the distance travelled by vehicle type j and ei is the emission factor of vehicle type i (expressed as g/km).

4.6.9 INCREMENTAL GROUND LEVEL CONCENTRATION (GLC) DUE TO TRANSPORTATION.

For the purpose of the impact assessment, the more relevant determination for anticipated pollutants is the incremental Concentration in the background concentration rather than the determination of maximum GLC values. In the present study, an attempt has been made to determine the increase in the concentration of PM for locations where ambient air quality stations were established. The resultant GLC concentration thus obtained along with the background levels is present in table below:

Table: 4.7: RESULTANT GLC CONCENTRATION VALUE OF PM₁₀

Location Code	Receptor	Background Maximum Concentration (µg/m ³) PM ₁₀	Total* Incremental Concentration (µg/m ³) PM ₁₀	Resultant Concentration (µg/m ³)
A1	Shree Cement Plant	62.41	1.13	63.54
A2	Daistong Presbyterian Church, Daistong	63.21	0.98	64.19
A3	Saipung PHC, Mutong	62.43	0.2	62.63
A4	St Joseph's Church, Khahnar	61.97	0.24	62.21
A5	Tangnub Presbyterian Church, Lumpdeng	62.47	0.13	62.6

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A6	Samasi Presbyterian Church, Samasi	61.45	0.11	61.56
A7	Jongria Old L.P School, Jongria Old	61.21	0.06	61.27
A8	Shnongrim sc playground, Shnongrim	60.88	0.05	60.93

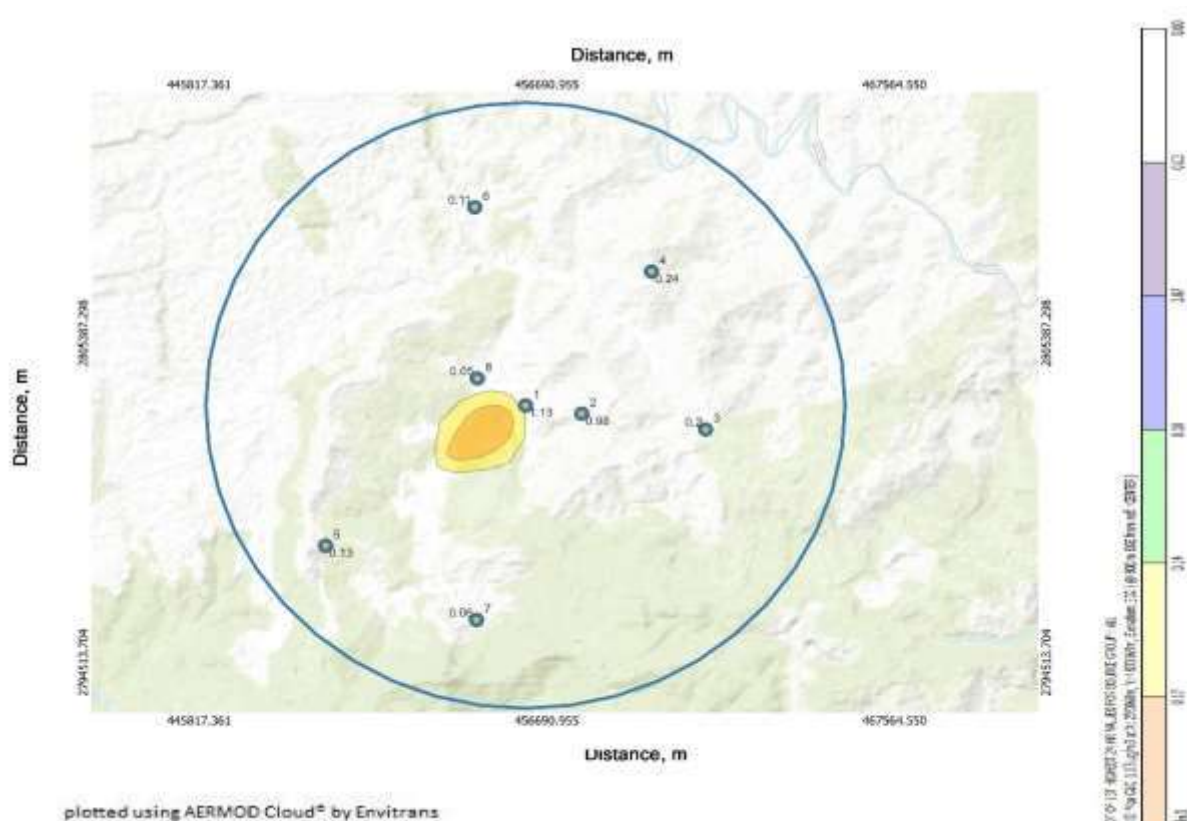


FIGURE:4.1 ISOPLETHS FOR INCREMENTAL GLC OF PM₁₀ FOR MINING, BLASTING AND TRANSPORTATION.

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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Table: 4.8: RESULTANT GLC CONCENTRATION VALUE OF PM_{2.5}

Location Code	Receptor	Background Maximum Concentration (µg/m ³) PM _{2.5}	Incremental Concentration (µg/m ³) PM _{2.5}	Resultant Concentration (µg/m ³)
A1	Shree Cement Plant	32.89	0.96	33.85
A2	Daistong Presbyterian Church, Daistong	34.56	0.66	35.22
A3	Saipung PHC, Mutong	33.78	0.51	34.29
A4	St Joseph's Church, Khahnar	33.45	0.38	33.83
A5	Tangnub Presbyterian Church, Lumpdeng	32.45	0.5	32.95
A6	Samasi Presbyterian Church, Samasi	32.45	0.36	32.81
A7	Jongria Old L.P School, Jongria Old	31.76	0.38	32.14
A8	Shnongrim sc playground, Shnongrim	30.47	0.32	30.79

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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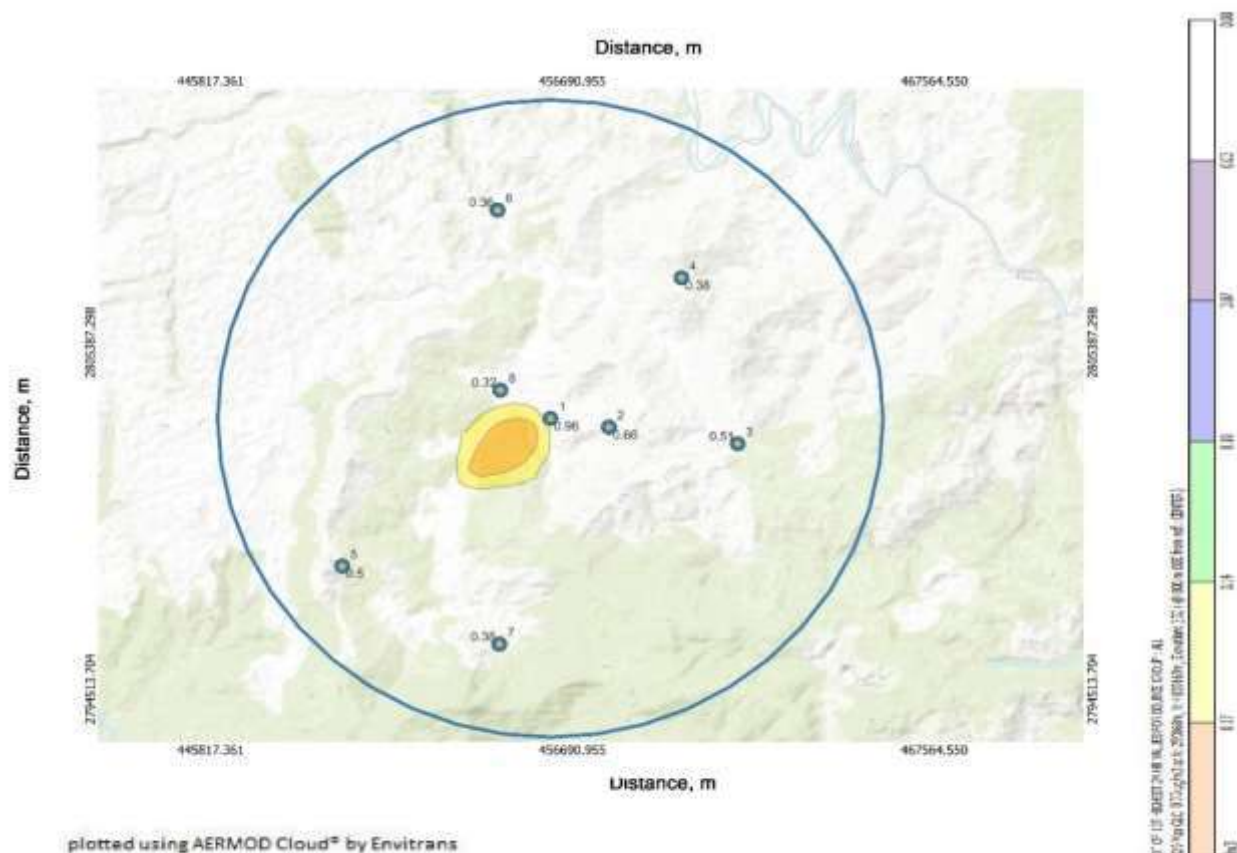


FIGURE:4.2 ISOPLETHS FOR INCREMENTAL GLC OF PM_{2.5} FOR MINING, BLASTING AND TRANSPORTATION

Table:4.9: RESULTANT GLC CONCENTRATION VALUE OF SO_x

Location Code	Receptor	Background Maximum Concentration (µg/m ³) SO _x	Incremental Concentration (µg/m ³) SO _x	Resultant Concentration (µg/m ³)
A1	Shree Cement Plant	3.77	0.6	4.37
A2	Daistong Presbyterian Church, Daistong	4.89	0.45	5.34
A3	Saipung PHC, Mutong	4.92	0.09	5.01
A4	St Joseph's Church,	4.78	0.03	4.81

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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	Khahnar			
A5	Tangnub Presbyterian Church, Lumpdeng	4.86	0.02	4.88
A6	Samasi Presbyterian Church, Samasi	4.75	0.02	4.77
A7	Jongria Old L.P School, Jongria Old	3.97	0.02	3.99
A8	Shnongrim sc playground, Shnongrim	3.9	0.02	3.92

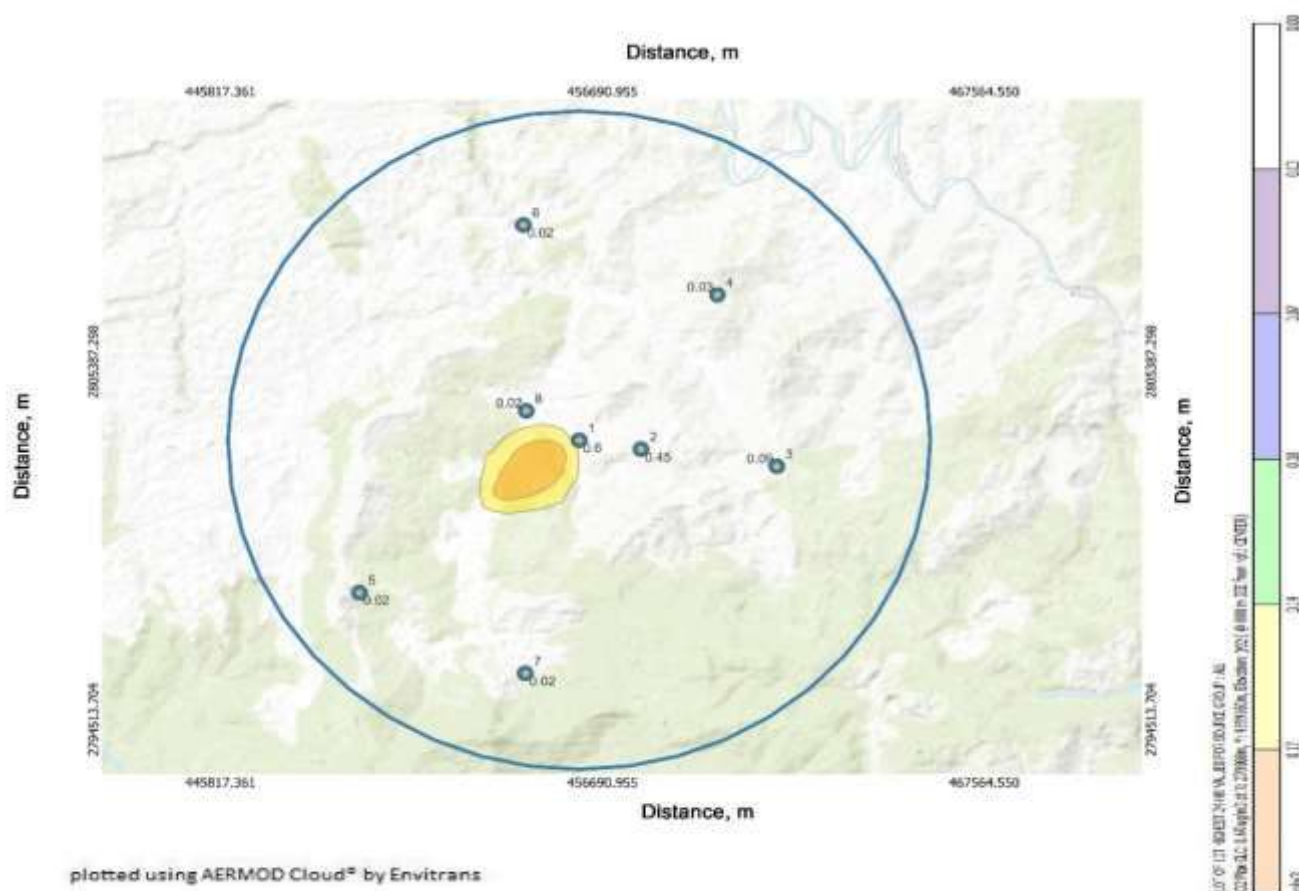


FIGURE:4.3 ISOPLETHS FOR INCREMENTAL GLC OF SO_x FOR MINING, BLASTING AND TRANSPORTATION

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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Table:4.10: RESULTANT GLC CONCENTRATION VALUE OF NO_x

Location Code	Receptor	Background Maximum Concentration (µg/m ³) NO _x	Incremental Concentration (µg/m ³) NO _x	Resultant Concentration (µg/m ³)
A1	Shree Cement Plant	5.89	0.62	6.51
A2	Daistong Presbyterian Church, Daistong	5.92	0.57	6.49
A3	Saipung PHC, Mutong	5.90	0.14	6.04
A4	St Joseph's Church, Khahnar	5.46	0.03	5.49
A5	Tangnub Presbyterian Church, Lumpdeng	5.52	0.03	5.55
A6	Samasi Presbyterian Church, Samasi	5.62	0.03	5.65
A7	Jongria Old L.P School, Jongria Old	5.98	0.02	6.00
A8	Shnongrim sc playground, Shnongrim	5.75	0.02	5.77

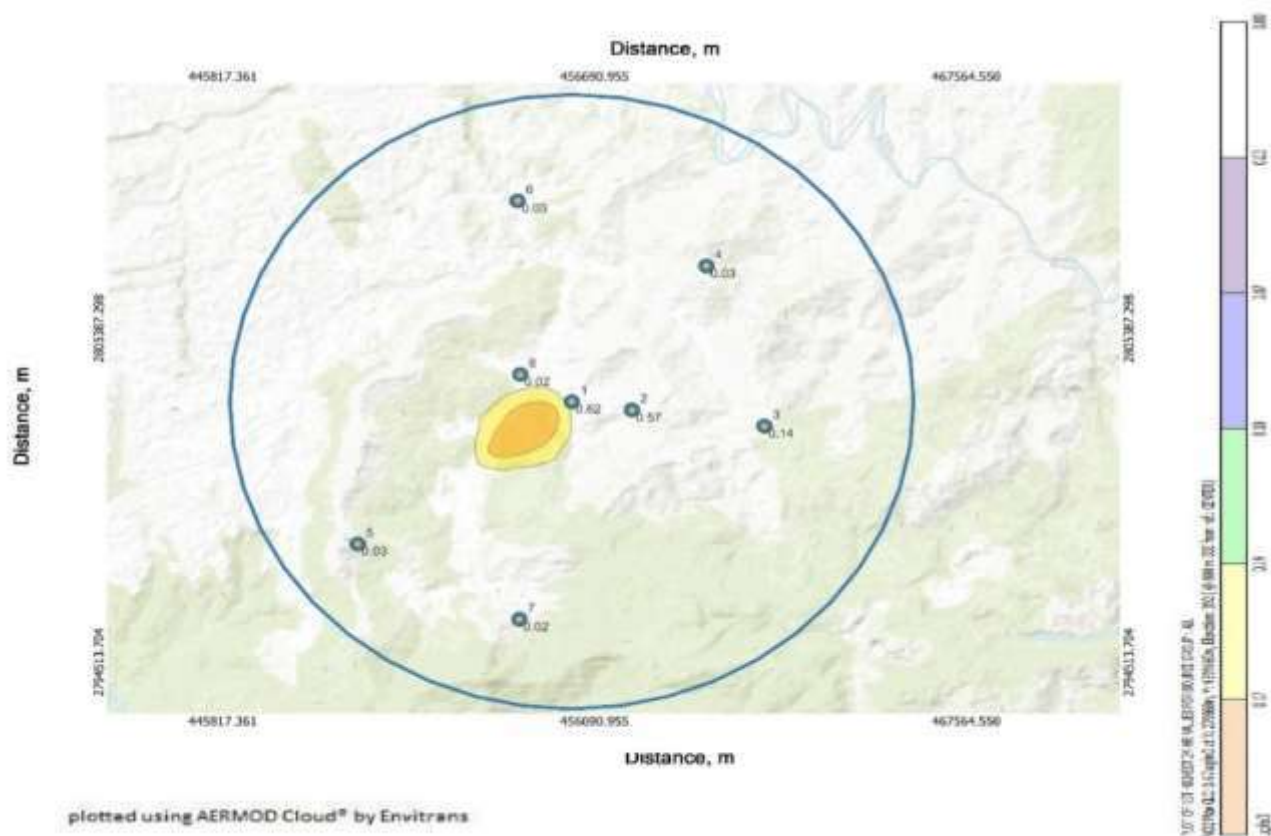


FIGURE:4.4 ISOPLETHS FOR INCREMENTAL GLC OF NO_x FOR MINING, BLASTING AND TRANSPORTATION

4.7 ANTICIPATED IMPACT ON NOISE AND VIBRATION ENVIRONMENT AND MITIGATION MEASURES

• Construction Phase

Anticipated Impacts

- **Noise Sources:** Noise will primarily be generated by the movement and operation of transport and construction vehicles/equipment. Other key sources include excavation, earthmoving, compaction, concrete mixing, crane operation, steel erection, and foundation/piling work.
- **Impact Scope:** Noise generation during this phase will be temporary and confined to the plant site boundaries.

Mitigation Measures

- **Equipment Upkeep:** All equipment will be kept in good condition to maintain noise levels within prescribed norms.
- **Work Timing:** Construction work will only be conducted during daytime hours.
- **Worker Protection:** Workers exposed to high noise levels will be provided with necessary personal protective equipment (PPE), such as earplugs and earmuffs.

• **Operation Phase**

Anticipated Impacts

- **Noise Sources:** An increase in noise levels within the plant area is expected from machinery such as raw and clinker grinding mills, turbines, fans, compressors, motors, D.G. sets, and transportation activities.
- **Health and Safety Risks:** Exceeding permissible noise levels continuously can lead to reduced productivity, loss of concentration, increased accident risk, and potential hearing damage for workers.
- **Noise Levels Forecast:**
 - Plant boundary levels will be maintained below 50 dB(A) (daytime) and 45 dB(A) (night-time).
 - Noise levels near heavy machinery (mills, compressors, turbines) might reach 65 to 85 dB(A), posing a direct risk to workers' hearing.

Impact Evaluation for Ambient Noise Level

Impact Evaluation Element	Change in Noise Level due to operation phase of the proposed project			
Potential Effect/Concern	Impact on health of humans and biological factors/receptors due to noise generated due to the proposed project during day and night time and also on occupational health of the workers exposed to noise.			
<i>Characteristics of Impacts</i>				
Nature	Positive		<i>Negative</i>	Neutral
			✓	
Type	<i>Direct</i>	Indirect	Cumulative	
	✓			
Extent	<i>Plant Area</i>	<i>Local</i>	Zonal	Regional

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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	✓			
Duration	<i>Short - term</i>		Long- term	
	✓			
Intensity	Low		<i>Medium</i>	High
			✓	
Frequency	Remote (R)	Occasional (O)	Periodic (P)	Continuous (C)
				✓
Significance of Impact				
Significance	Insignificant	Minor	Moderate	Major
			✓	

Mitigation Measures

To abate noise during the operation phase, the following measures will be taken:

- **Low-Noise Equipment:** Equipment and machinery will be selected based on low-noise specifications and housed within insulated ceilings.
- **Worker PPE:** Machine operators and persons working in close proximity to noisy machinery will be provided with personal protective equipment (earplugs/earmuffs).
- **Regular Maintenance:** Proper maintenance, oiling, and greasing of machines at regular intervals will be conducted to reduce noise generation.
- **Enclosed Installation:** Compressors and turbines will be installed inside closed buildings.
- **Greenbelt Development:** A greenbelt of appropriate width will be developed at the plant boundary to help attenuate noise levels.
- **Monitoring and Correction:** Regular monitoring of noise levels will be carried out, and corrective measures will be applied to the machinery concerned as needed.

4.8 ANTICIPATED IMPACT DUE TO THE TRANSPORTATION OF RAW MATERIAL AND FINISHED PRODUCT AND MITIGATION MEASURES

The logistics plan emphasizes road transport for the majority of materials, including all fuels and finished goods. In the interim phase before the belt is fully commissioned, limestone will be temporarily moved by road vehicles.

Mode of transportation is given as below:

Table: 4.11 Percentage Transportation of Raw material and Product

S. No.	Raw Material / Product	Mode of Transportation with % age

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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1.	Iron Ore	100 % by Road
2.	Bauxite	100 % by Road
3.	Biomass	100 % by Road
4.	Fly ash	100 % by Road
5.	Slag	100 % by Road
6.	Indian & Imported Coal	100 % by Road
7.	Petcoke as feed stock	100 % by Road
8.	Dolochar	100 % by Road
9.	Limestone	100 % by Road
10.	Cement	100 % by Road

• Anticipated Impacts

Transportation activities will have the following effects:

- Increased road traffic density will reduce ambient air quality.
- Heavy vehicle movement will raise noise levels.
- Noise and vibrations may slightly impact local flora and fauna.
- Higher traffic volume increases the risk of accidents.
- Insufficient safety measures during transport could affect public health.

• Impact Evaluation

Impact evaluation is given in the table below.

Impact Evaluation due to Transportation of Raw Material and Products

Impact Evaluation Element	Change in traffic density due to transportation of raw material and products by road.		
Potential Effect/ Concern	Increased load on existing transportation infrastructure and air emissions due to transportation of material.		
<i>Characteristics of Impacts</i>			
Nature	Positive	<i>Negative</i>	Neutral
		☐	

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Type	Direct	Indirect	Cumulative	
	☐			
Extent	Plant Area	Local	Zonal	Regional
				☐
Duration	Short - term		Long- term	
			☐	
Intensity	Low		Medium	High
			☐	
Frequency	Remote (R)	Occasional (O)	Periodic (P)	Continuous (C)
				☐
<i>Significance of Impact</i>				
	Insignificant	Minor	Moderate	Major
			☐	

Mitigation Measures

- **Road Network Suitability:** The existing **Tluh road** has a "Good" Level of Service (LOS) and is deemed sufficient to handle the anticipated increase in traffic load.
- **Internal Road Paving:** All internal roads within the plant premises will be concreted to eliminate dust emissions generated by vehicles on non-metallic surfaces.
- **Vehicle Requirements:** All trucks must be covered with tarpaulin and utilize only Pollution Under Control (PUC) Certified vehicles.
- **Speed Limits:** A strict speed limit of 10–20 Km/h will be enforced for heavy vehicles within the plant premises to prevent dust generation and improve safety.
- **Material Handling:** Specific materials like fly ash will be transported in closed bulkers and unloaded using pneumatic systems to prevent fugitive emissions.
- **Greenbelt & Plantation:** A greenbelt covering 32.99% (8.27 Ha.) of the total plant area has been developed along the periphery, inside the premises, and towards nearby habitations. This area will be maintained to reduce the impact of emissions, in compliance with CPCB guidelines.

4.9 ANTICIPATED IMPACT ON SOIL QUALITY AND MITIGATION MEASURES

No Eco-sensitive zone presents with in the study area. Mitigation measures for the same are given below:

- **Construction Phase**

Anticipated Impacts

Impacts on the soil during construction are primarily due to material usage and heavy machinery movement:

- **Soil Compaction:** Common problem caused by the movement of heavy machinery over the soil.
- **Soil Contamination:** Accumulation of cement on topsoil leads to a lack of oxygen, reducing soil porosity.
- **Soil Degradation:** Stockpiling of soil increases the risk of mixing topsoil with sub-soil components and construction materials, which reduces overall soil quality.

Mitigation Measures

Mitigation focuses on good site management, waste handling, and soil stabilization:

- **Waste Minimization:** Careful design, planning, and good site management will minimize material wastage (concrete, mortars, cement grouts).
- **Waste Segregation & Recycling:** Construction waste will be segregated on-site to facilitate recycling (concrete/masonry as backfill; steel as scrap).
- **Disposal Points:** Litter disposal and collection points will be established across work sites.
- **Recyclable Waste:** Empty packaging materials (drums, glass, paper, plastics, wood, etc.) will be periodically disposed of through local recyclers.
- **Soil Stockpile Management:**
 - Construction spoils will be temporarily stored at designated dumpsites within the plant premises.
 - Stockpiles will be mounded no higher than 1.3 m to control erosion.
 - Working on wet soil will be avoided to reduce compaction.
- **Soil Stabilization:**
 - Areas with loose debris/soil will be planted with Vetiver grass to maintain fertility, hold soil, reduce erosion, and produce manure.
 - Golden Shower Tree (Cassia fistula) will be planted on road partitions and slope areas to strengthen the soil layer and enhance water retention for better vegetation.
- **Operation Phase**

Anticipated Impacts

The soil quality of the area may be affected by operational activities if proper care is not taken:

- **Degradation from Airborne Dust:** The settling of airborne dust from plant operations can degrade soil quality.
- **Changes in Soil Physical Properties:**
 - Settling of airborne dust or wash-off of solid particulates via surface/ground water will alter soil texture.
 - This leads to changes in porosity, permeability, and other physical characteristics of the soil.
- **Changes in Soil Chemistry:** The addition of foreign materials (pollutants) from air and water due to unit activities will alter soil chemistry.

Impact Evaluation

Impact evaluation is given in the table below:

Impact Evaluation for Soil Environment

Impact Evaluation Element	Change in soil texture & soil chemistry			
Potential Effect/ Concern	Impact on soil quality of nearby areas due to generation & settling of air borne dust due to the proposed project.			
<i>Characteristics of Impacts</i>				
Nature	Positive		<i>Negative</i>	Neutral
			☐	
Type	<i>Direct</i>	Indirect	Cumulative	
	☐			
Extent	Project Area	<i>Local</i>	Zonal	Regional
		☐		
Duration	Short - term		<i>Long- term</i>	
			☐	
Intensity	Low		<i>Medium</i>	High
			☐	
Frequency	Remote (R)	Occasional (O)	Periodic (P)	Continuous (C)

				☐
Significance of Impact				
Significance	Insignificant	Minor	Moderate	Major
			☐	

Mitigation Measures

- **Air Pollution Control Equipment (APCE):** Efficient APCE, such as Bag Houses/RABH/Bag Filters/ESPs, will be installed at all major stacks of the cement plant to maintain emissions within permissible statutory limits.
- **Effective Pollutant Dispersion:** Stacks will be built to adequate heights, as per statutory guidelines, to ensure effective dispersion of pollutants.
- **Fugitive Emission Control:** Efficient Bag Filters will be installed at all material handling and transfer points to control fugitive dust emissions.
- **Wastewater Management:** No wastewater will be discharged outside the plant premises.
- **Soil Quality Management:**
 - A professional horticulturist will be engaged to ensure soil quality improvement within the plant area through adequate manuring and fertilizing.
 - Soil samples from nearby areas will be collected and tested at regular intervals to monitor and mitigate any potential harmful impacts.
- **Soil Erosion Prevention:**
 - Watershed development practices will be adopted, including maintaining permanent grass cover on rangelands.
- **Revegetation and Topsoil Management:**
 - Topsoil will be evenly spread in proposed plantation areas. The area will be made self-sustaining by initially planting grass, shrubs, and herbs, followed by tree saplings to support lush green vegetation.

4.10 ANTICIPATED IMPACT ON WATER QUALITY AND MITIGATION MEASURES

• Construction Phase

Anticipated Impacts

- **Groundwater Extraction:** The project will require water for construction, canteen use, and domestic purposes, sourced from groundwater/Surface Water. This extraction may decrease the local groundwater table/availability of surface water.
- **Water Contamination:** Wastewater generated during construction could potentially deteriorate groundwater quality if not managed properly.
- **Increased Suspended Solids:** Heavy rain and loose soil at the site may lead to soil run-off, increasing suspended solids in surface water.

Mitigation Measures

Mitigation focuses on managing run-off, preventing erosion, and conserving water:

- **Stormwater Drainage:** Stormwater drains will be constructed immediately, aligned with the site's natural drainage pattern to minimize alteration, prevent flooding, and control soil erosion.
- **Sedimentation Control:** Sedimentation pits will be provided at appropriate locations to trap silt-laden run-off water and prevent excessive silt from leaving the site.
- **Water Recycling/Reuse:** Run-off collected in storm drains will be diverted to a water reservoir, where the stored water will be reused for civil construction purposes.
- **Groundwater Recharge:** Rainwater harvesting will be practiced to help recharge the groundwater table.

• Operation Phase

Anticipated Impacts

- **Water Requirement:** The operation phase requires 600 KLD of water in total (515 KLD fresh water, 85 KLD recycled water), sourced from groundwater and/or mine pit water (based on availability).
- **Water Quality Degradation:** If not managed properly, wastewater generated during operations could impact the quality of nearby groundwater and surface water sources.
- **Wastewater Generation:** 16 KLD of wastewater will specifically be generated from drinking and domestic utilities within the plant.

Impact Evaluation

Impact evaluation is given in table below:

Impact Evaluation for Surface Water Environment

Impact Evaluation Element	Change in water Level due to abstraction of ground water and surface water for the proposed project.			
Potential Effect/ Concern	Impact on ground water level due to ground water abstraction; No change in quality of water as no water will be discharged outside the proposed cement plant.			
<i>Characteristics of Impacts</i>				
Nature	Positive		<i>Negative</i>	Neutral
			✓	
Type	<i>Direct</i>	Indirect	Cumulative	
	✓			
Extent	Plant Area	<i>Local</i>	Zonal	Regional
		✓		
Duration	Short - term		Long- term	
			✓	
Intensity	Low		<i>Medium</i>	High
			✓	
Frequency	Remote (R)	Occasional (O)	Periodic (P)	Continuous (C)
				✓
<i>Significance of Impact</i>				
Significance	Insignificant	Minor	Moderate	Major
			✓	

Mitigation Measures

- **Zero Liquid Discharge (ZLD):** The project is committed to a ZLD concept, ensuring that no wastewater is discharged outside the plant premises.
- **Industrial Wastewater Reuse:** Reverse Osmosis (RO) reject water from the Captive Power Plant (CPP) or Waste Heat Recovery System (WHRS), approximately 75 KLD, will be repurposed for cooling mill sprays.
- **Domestic Wastewater Treatment and Reuse:**

- The 16 KLD of domestic wastewater from the plant and canteen will be treated in a dedicated 20 KLD Sewage Treatment Plant (STP).
- The resulting treated water (15 KLD) will be fully utilized for greenbelt development and plantation activities.
- **Water Resource Management:** Rainwater harvesting will be actively practiced within the plant premises to recharge groundwater.
- **Monitoring:** Regular monitoring of water quality and water levels will be carried out to ensure compliance and identify any potential issues.
- **Community Awareness:** Training and awareness programs regarding water conservation measures will be organized for the local population.
- **Conclusion of Impact:** Due to the adherence to the zero liquid discharge concept, the project's operation is not anticipated to have any adverse impact on the groundwater quality of the area.

4.11 ANTICIPATED IMPACT ON BIOLOGICAL ENVIRONMENT AND MITIGATION MEASURES

There is no National Park & Elephant/ Tiger Reserve exist in the 10 km radius area of Project Boundary. However, Saipung Reserved Forest is present at a distance of ~6.35 km in SE direction from Project boundary. A letter showing non-Forest land has been obtained from Chief Forest Office, Jaintia Hill Autonomous District Council, Jowai vide Memo no. JHADC/FOR/29/25/1426-27 dated 5th August 2025. Copy of the authenticated letter and map is enclosed as along with this EIA/EMP Report.

The Khara Siang Lum Pyrshin forest in Daistong village is a community-managed sacred grove within the broader **Meghalaya subtropical forest** ecosystem. This region is a significant biodiversity hotspot. Specific species lists for this particular grove are limited in publicly available data, but based on the general East Jaintia Hills region and similar sacred groves, the following wildlife is likely present:

Forest Type

The forest is classified as a **Subtropical Broad-leaved Humid Forest**, characterized by a dense canopy, diverse tree species (including those from families like Lauraceae, Fagaceae, and Rubiaceae), and significant undergrowth. It acts as a biodiversity refuge within a landscape affected by shifting cultivation and mining.

Mammals

The general East Jaintia Hills region is home to a variety of mammals, including several cat species and primates. Likely inhabitants or visitors to such a dense forest patch may include:

- **Primates:** Hoolock Gibbon (*Hoolock hoolock*) (endangered), Assamese Macaque, Rhesus Macaque, Capped Langur.
- **Felids:** Leopard (*Panthera pardus*), Marbled Cat, Asian Golden Cat, Jungle Cat, Leopard Cat.
- **Other Mammals:** Himalayan Black Bear, Wild Boar, Indian Muntjac (Barking Deer), Red Serow, various species of squirrels and rodents, and potentially small Indian civets and other mustelids.

Reptiles

The warm, humid environment supports a diverse herpetofauna. Common types of reptiles in the region include:

- Various species of **snakes**, including venomous types like the King Cobra, spectacled cobra, and pit vipers, as well as non-venomous ones like rat snakes and pythons.
- A wide array of **lizards**, including geckos (such as the Tokay Gecko) and various skinks.

Birds

The area is a crucial habitat for numerous bird species, benefiting from the intact forest cover. The region's avifauna includes:

- **Hornbills:** Great Hornbill, Oriental Pied Hornbill, and Rufous-necked Hornbill.
- **Pheasants and Partridges:** Grey Peacock-Pheasant, Kalij Pheasant, Red Junglefowl.
- **Other notable species:** Oriental White-eye, various Laughingthrushes, flycatchers, warblers, babblers, and birds of prey like the Mountain Hawk-Eagle and different types of owls.

Key characteristics of this habitat type include:

- **Dense Canopy:** The forest has a very dense upper layer of tree cover.
- **High Humidity and Rainfall:** The region receives significant precipitation, contributing to a lush environment.
- **Biodiversity Hotspot:** The habitat supports a rich variety of plant and animal species due to its intact nature, often functioning as a traditional "sacred grove".
- **Dominant Flora:** Common tree families include Lauraceae, Rubiaceae, and Fagaceae.
- **Elevation:** It is typically found in high-altitude areas, usually above 1000 meters.
- **Ecosystem Role:** This habitat type acts as a vital refuge for wildlife amidst surrounding areas impacted by human activities like shifting cultivation (jhum) and mining.

Wildlife Conservation plan for Schedule - I species have been prepared with the budget of 60 lakhs.

Copy of forwarding letter along with Wildlife Conservation Plan has been enclosed along with this EIA/EMP Report.

• Construction Phase

Anticipated Impacts

- **Soil Degradation & Biodiversity Loss:** Particulate matter emissions from transportation and material handling may lower the soil quality in the surrounding environment, negatively affecting local biodiversity.
- **Impact on Terrestrial Flora (Dust):**
 - Fugitive dust generated during construction may settle on plant leaf surfaces.
 - This dust settlement can impede photosynthesis (photo-transduction efficiency).
 - It may also block stomata, leading to reduced transpiration and plant productivity.
- **Fauna Displacement (Noise):** Increased noise levels from construction machinery may frighten wild animals, potentially forcing them to migrate to quieter areas.

Mitigation Measures

- **Dust Suppression:** Water sprinkling will be regularly used on haul roads and internal roads to control fugitive dust emissions.
- **Emission Attenuation:** Greenbelt development and plantation activities will be implemented to help reduce fugitive emissions.
- **Noise Control:** Transport vehicles and machinery will undergo proper maintenance and lubrication to minimize noise levels in the surrounding environment.

• Operation Phase

Anticipated Impacts

- **Soil Degradation & Biodiversity Loss:** Particulate matter emissions from the stack and fugitive emissions from transportation and material handling may degrade soil quality and affect the surrounding biodiversity.
- **Fauna Displacement (Air & Noise):**
 - Particulate matter emissions may cause migration of animals and birds.
 - Increased noise levels due to running machinery may scare wild fauna and force them to migrate.
- **Impact on Terrestrial Flora (Dust):** Fugitive dust emissions may impact plant life by settling on leaves, which impedes photosynthesis and transpiration efficiency.

Impact Evaluation

Impact evaluation is given in the table below.

Impact Evaluation for Biological Resources

Impact Evaluation Element	Change in the biological resources of the area due to the proposed project operation and generation of emissions			
Potential Effect/ Concern	Loss of habitat, Impact on health of biological receptors due to area and line sources of air emissions including fugitive dust emissions during operation activities.			
<i>Characteristics of Impacts</i>				
Nature	Positive		<i>Negative</i>	Neutral
			✓	
Type	<i>Direct</i>	Indirect	Cumulative	
	✓			
Extent	Project Area	<i>Local</i>	Zonal	Regional
		✓		
Duration	Short - term		<i>Long- term</i>	
			✓	
Intensity	<i>Low</i>		Medium	High
	✓			
Frequency	Remote (R)	Occasional (O)	Periodic (P)	Continuous (C)
				✓
Significance of Impact				
Significance	Insignificant	Minor	Moderate	Major
	✓			

Mitigation Measures

- **Enhanced Greenbelt Development:** Scale up greenbelt development and tree plantation efforts both within and surrounding the plant site to control the dispersion of particulate emissions and noise.
- **Installation of Air Pollution Control Equipment (APCE):** Install efficient APCE to ensure that all emissions remain within permissible regulatory limits.

- **Regular Water Sprinkling:** Continuously use water sprinklers on haul roads to manage and control fugitive emissions in the vicinity.
- **Paved Transportation Roads:** Utilize paved roads for all transportation activities to minimize the generation of fugitive emissions.
- **Covered Material Transport and Storage:** Transport all materials in closed trucks and store them under tarpaulin covers to prevent dust escape.
- **Vehicle and Machinery Maintenance:** Ensure proper maintenance and periodic pollution level checks for all transport vehicles and machinery to reduce both noise and gaseous emissions in the surrounding environment.

4.12 ANTICIPATED IMPACT ON SOCIO - ECONOMIC ENVIRONMENT AND MITIGATION MEASURES

Project potential impacts on the social - economic environment are summarized below and categorized either as positive / beneficial or negative / adverse impacts.

- **Construction Phase**

Anticipated Impacts

- **Positive Employment:** 1050 jobs created (unskilled/semi-skilled labour sourced locally where possible).
- **Indirect Economic Growth:** Development of local markets, shops, and transportation services due to worker influx.
- **Public Health Risks:** Potential spread of water/vector-borne diseases due to population influx straining existing sanitation.
- **Health Issues (Dust):** Short-term exposure to construction dust may cause eye irritation, nausea, and headaches in nearby villagers.
- **Social Conflicts:** Risk of worker-community conflicts, theft, violence, and increased substance abuse due to rapid influx of diverse populations.

Mitigation Measures

- **Sanitation:** Deployment of mobile or temporary toilets with adequate water supply near the site.
- **Disease Prevention:**
 - Awareness programs conducted before monsoon seasons regarding disease spread.
 - Provision of mosquito repellents in villages and at construction sites.
- **Behavioural Management & Safety:**

- Proper site supervision by site in charge.
- Formation of an emergency cell with equipped medical, safety, and communication systems to manage incidents.
- **Dust Control:** Covering the site boundary with curtains to minimize dust emissions.
- **CSR & Community Development:** Shree Cement Ltd. commits to local development initiatives (education, health, infrastructure, etc.) and capacity building training.
- **Operation Phase**

Anticipated Impacts

- **Long-Term Health Risks (Negative):** Potential health impacts (respiratory/cardiovascular disease, eye irritation, bronchitis, etc.) from long-term exposure to pollutants (PM, SO₂, NO₂, cement dust).
- **Employment & Economic Growth (Positive):**
 - Approximately 600 contractual jobs will be created.
 - Overall positive development of local infrastructure, education, and health facilities via CSR activities.
- **Labour Availability Shift (Negative):** Potential minor labour shortage in other local economic sectors (agriculture, shops) as people shift to project work. The impact magnitude is high due to high household dependency on local labour availability.

Impact Evaluation

Impact evaluation is given in the table below.

Impact Evaluation for Socio-economic Environment

Impact Evaluation Element	Impact on socio economics due to the proposed project.			
Potential Effect/ Concern	The proposed project will provide direct & indirect employment opportunities to the local residents, which will help to increase their earning and better living standard as well as further up-liftment of socio-economic status of the area.			
<i>Characteristics of Impacts</i>				
Nature	Positive		Negative	Neutral
	✓			
Type	<i>Direct</i>	Indirect	Cumulative	

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	✓			
Extent	Project Area	Local	<i>Zonal</i>	Regional
			✓	
Duration	Short - term		<i>Long- term</i>	
			✓	
Intensity	Low		<i>Medium</i>	High
			✓	
Frequency	Remote (R)	Occasional (O)	Periodic (P)	<i>Continuous (C)</i>
				✓
Significance of Impact				
Significance	Insignificant	Minor	Moderate	Major
			✓	

Mitigation Measures

- **Emission Control:** Advanced Air Pollution Control Equipment (APCE), including Bag Houses, RABH, Bag Filters, and ESP systems, will be installed on all major stacks to keep emissions within permissible limits.
- **Gaseous Pollutant Reduction:** Gaseous emissions will be minimized through the use of low-NOx burners with calciner for reduced nitrogen oxide formation and leveraging the inherent SO2 scrubbing capability of the pyro-process itself.
- **Fugitive Emissions Management:** A regimen of regular maintenance for all vehicles and machinery will be enforced to reduce fugitive dust and other emissions.
- **Continuous Monitoring:** Continuous monitoring systems (CEMS and CAAQMS) will be installed at all major stacks and various ambient locations to provide real-time tracking of emissions and local air quality.
- **Health and Medical Provisions:** Shree Cement Ltd. will establish an occupational health center for staff and extend medical services to residents of nearby villages.

4.13 ANTICIPATED IMPACT ON OCCUPATIONAL HEALTH AND MITIGATION MEASURES

• **Construction Phase**

Anticipated Impacts:

- **Air Quality:** Generation of dust from stone masonry, rubble removal, cement handling, and vehicle movement.
- **Safety Hazards:** Risk of injuries from falls from heights and into excavated areas.
- **Physical Strain:** Ergonomic issues and injuries related to manual material handling tasks (lifting, pushing, pulling).

Mitigation Measures:

- **Personal Protection:** Proper selection and provision of Personal Protective Equipment (PPE) such as respirators and helmets, along with appropriate training, to prevent inhalation of dust, asbestos, and fibers.
- **Chemical Protection:** Providing workers with PPE and washing facilities to ensure protection from wet concrete.
- **Noise Control:** Implementation of suitable acoustic insulation to reduce noise levels.
- **Fall Prevention:** Equipping scaffolding with guardrails, toe boards, and brick guards. Using personal prevention devices like podium steps for work at height.

• Operation Phase

Associated Hazards:

Hazards during the operation phase primarily affect workers within the industry, but some health hazards can also impact local communities. These include:

- Exposure to fine particulate dust
- Exposure to high temperatures
- Noise exposure
- Physical hazards
- Chemical hazards and other industrial hygiene issues

Specific Concern: Exposure to Dust

- **Source:** Dust exposure is most significant during raw material handling, clinker production, and cement grinding stages.
- **Health Risk:** Long-term exposure to fine particulate dust puts workers at risk of developing respiratory disorders.

Exposure Levels as per Norms will be maintained

Description	Personal Exposure, time weighted average 8 hr. RSPM in $\mu\text{g}/\text{m}^3$
	Norms

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Coal and Petcoke Dust	2000
Limestone Dust	10000
Cement Dust	10000

Source: CPCB guidelines

Methods to Prevent and Control Dust Exposure

- Implementation of good housekeeping and maintenance practices.
- Use of air-conditioned, closed cabins for machinery operators.
- Utilization of dust extraction and recycling systems to remove dust from work areas (e.g., grinding mills).
- Use of appropriate Personal Protective Equipment (PPE), such as masks and respirators, to manage residual exposure after engineering controls are in place.

Prevention and Control of High-Temperature Exposure

Principal Exposure Areas: Handling hot raw meals, hot clinker, and operation/maintenance of kilns and other hot equipment.

Prevention and Control Techniques:

- Shielding surfaces where workers are near or in contact with hot equipment.
- Using appropriate PPE as needed (e.g., insulated gloves and shoes).
- Minimizing work duration in high-temperature areas by implementing shorter shifts.

Noise Exposure

Main Sources of Noise/Vibration: Exhaust fans, grinding mills, kilns, compressors, and motors.

Involved Risks (Impacts on Health):

- Hearing impairment
- Hypertension
- Increased pulse rate
- Annoyance
- Tinnitus
- Sleep disturbances

Exposure Levels as per Norms

Organization	Standard/Recommendation	Exposure Limit	Exchange Rate

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OSHA (USA)	Permissible Exposure Limit (PEL)	90 dB(A) for an 8-hour Time-Weighted Average (TWA)	5 dB
	Action Level	85 dB(A) TWA (requires a hearing conservation program)	
NIOSH (USA)	Recommended Exposure Limit (REL)	85 dB(A) for an 8-hour TWA	3 dB (more stringent)
India (Factories Act)	Maximum Permissible Exposure	90 dB(A) for an 8-hour exposure	

DGFASLI Official Source: <https://dgfasli.gov.in/en/model-rules-part-ii/operations-involving-high-noise-and-vibration-levels>

Management Measures for Physical Hazards

Physical hazards during project operations include slips, trips, falls, contact with moving objects/machinery (dump trucks, front loaders, conveyors, etc.), lifting injuries, and burns from hot surfaces.

The following management measures will be ensured to prevent these physical hazards:

- **Lockout/Tagout Procedures:** Any person working on equipment with moving parts must personally ensure the equipment is de-energized, isolated, and locked/tagged out before work begins.
- **Fall Protection:** Any person working from a height or a position with a potential risk for a fall must use appropriate fall protection equipment.
- **Personal Protective Equipment (PPE):** Prescribed PPE will be provided to all workers exposed to open processes or systems.
- **Emergency Response:** Immediate and proper medical care will be provided at the project site in case of any accident.

High Risk Categories	Prevention:
Contractors	Contractor Safety Management
Young/Temporary Employees	Special Safety Induction
Direct Causes	
Traffic and Mobile Plant	Driver Training

Falls from Heights, Objects falling from Heights	Safety Procedures for Work at Heights, Overhead Protection
Caught in Starting/Moving Equipment	Plant Isolation Procedures

The scientific approach to mitigating biodiversity impacts from integrated cement and thermal power plants encompasses a thorough array of ecological management strategies. A Wildlife Conservation Plan (WLCP) should direct habitat conservation through restricted site clearance, the rescue of endangered species, and the restoration of degraded areas via afforestation and ecological corridors. Implementing a multi-tier greenbelt that covers at least 33% of the project area with native, pollution-tolerant species aids in dust absorption and noise buffering. State-of-the-art pollution control systems, including ESPs, bag filters, and FGD units, combined with Zero Liquid Discharge (ZLD) and rainwater harvesting, protect air and water quality. Strategies such as noise barriers, wildlife crossings, and controlled blasting help reduce disturbances to fauna, while effective fly ash utilization, lined disposal areas, and soil monitoring mitigate contamination. Raising conservation awareness among workers and communities, along with engaging in participatory eco-restoration programs, enhances biodiversity stewardship. Ongoing biodiversity monitoring, emphasizing indicator species, and annual reporting to authorities facilitate adaptive management and ensure long-term ecological sustainability.

4.14 ASPECT IMPACT ANALYSIS WITH MITIGATION MEASURES

Aspect Impact analysis and mitigation measures are given in Table - 4.5

Table - 4.5: Aspect Impact Analysis and Mitigation Measures

S. No.	Project Activity	Aspect/Hazard	Potential Impact	Key Mitigation Measures
1.	Transportation of raw materials (by road)	Fugitive Dust Emission	Increased dust concentration in ambient air; affects biotic environment.	- Use PUC certified vehicles; cover with tarpaulin & avoid overloading. - Maintain speed limit (10-20 km/hr) inside premises. - Use paved roads & vacuum sweeping machines

				regularly.
2.	Raw Material & Finished Product - Storage & Handling	Fugitive Dust Emission	Increased dust concentration; risk of respiratory diseases for workers.	- Use covered yards for storing gypsum, coal, and petcoke. - Provide Personal Protective Equipment (PPE) to all workers.
3.	Raw Mix Preparation	Particulate Matter Emission	Increase in particulate matter concentration in ambient air.	- Transport materials via covered belt conveyors. - Install Bag Filters at all material handling and transfer points.
4.	Clinkerization (Calcination)	PM, Gaseous Emission (SO ₂ , NO ₂) & Fugitive Dust	Increase in pollutants concentration in the air environment.	- Install adequate APCEs (Bag House & ESP). - Install Low NO_x burners; add De-NO_x system if required. - Develop/maintain greenbelt/plantation. - Provide comprehensive PPE (Goggles, Mask, Helmet, Boots, Gloves, Earmuffs, etc.).
5.	Clinker Grinding / Cement Mill (incl. Fly ash handling)	PM, Fugitive Dust Emission	Increase in particulate matter and dust in air environment.	- Install Efficient Bag House. - Receive fly ash via closed bulkers & pneumatic systems. - Develop/maintain greenbelt/plantation.
6.	Clinker Grinding / Cement Mill	Noise generation (Fans, Grinding)	Increased noise levels; hearing	- Provide Earmuffs/Earplugs in high noise zones.

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	(including Fly ash handling)		impairments; health effects.	- Ensure proper lubrication & maintenance of machinery. - Develop/maintain greenbelt/plantation. - Conduct periodic Occupational Health Surveillance.
7.	Cement Packing & Dispatch	Fugitive Dust Emission	Increased dust concentration (area source); respiratory diseases risk.	- Implement dust extraction arrangements. - Collect and recycle spilled cement. - Install Bag Filters at transfer points. - Provide PPE & conduct periodic health surveillance. - Develop/maintain greenbelt/plantation.
8.	Coal handling & Grinding	Fugitive Dust Emission	Increase in fugitive dust concentration in air environment.	- Implement dust extraction arrangements. - Install Bag Filters at all material handling & transfer points. - Develop/maintain greenbelt/plantation.
9.	CPP Boiler (Captive Power Plant)	PM, Gaseous Emission (SO ₂ , NO ₂) & Fugitive Dust	Increase in pollutants concentration in the air environment.	- Install ESP for CFBC boiler for PM control. - Install Bag Filters at all material transfer points. - Use lime dosing in CFBC boiler for SO₂ control.

				- Install Low NOx burners for NOx control. - Develop/maintain greenbelt/plantation.

4.15 SUMMARY AND CONCLUSION

The environmental impact evaluation concluded that the potential effects from the cement plant's site activities and operation on various environmental parameters would be minimal. This conclusion is based on a careful study of the plant's unit operations, as well as the surrounding environment. To manage and mitigate any potential adverse impacts, effective "Control Technology" has been incorporated into the project plan. Considering all proposed impacts and the comprehensive mitigative measures, it has been observed that the activities during both the construction and operation phases of the proposed project will generate only negligible environmental impacts, allowing the facility to operate in an eco-friendly manner by Shree Cement Ltd.

5.0 ANALYSIS OF ALTERNATIVES

As per EIA Notification dated 14th Sept., 2006, as amended thereof; the Chapter on “Analysis of Alternatives (Technology & Site)” is applicable only, if the same is recommended at the Scoping stage.

5.1 NO PROJECT SCENARIO

To manage the fast-growing demand for cement in India and support essential infrastructure development, establishing cement manufacturing units at strategic locations is crucial. A "no-project" scenario for this specific site would not be feasible, as the resulting demand gap, which is necessary for cost-effective supply, cannot simply be filled by projects in other limited locations. Economically, rejecting the project would mean an annual revenue loss at a national level, impacting overall economic progress. Consequently, to supply the vital demand for cement driven by the region's increasing infrastructure development—including the construction of roads, flyovers, apartments, and townships—Shree Cement Limited is proposing the development of the Integrated Cement Plant at Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya).

5.2 DESCRIPTION OF ALTERNATIVES WITH RESPECT TO TECHNOLOGY FOR PROPOSED INTEGRATED CEMENT PLANT

In accordance with the Terms of Reference (ToR) issued by the SEIAA, Meghalaya having File No. File No. ML/SEAC/SEIAA/PP/EJH/126/2025 and TOR Identification No. TO25B1101ML5999209N dated 15th Oct.2025, a detailed analysis of alternative technologies for the proposed project is required. The project has selected as per detailed Study as well as required availability, proven technologies for clinker and cement manufacturing. Specifically, it will adopt a 6-Stage Preheater for clinkerization and Vertical Roller Mills (VRM) for the cement mill. These choices are based on achieving lower specific energy consumption, ease of operation, reduced maintenance needs, and a compact layout. Furthermore, a Waste Heat Recovery System (WHRs) will be installed for energy conservation. While these modern technologies are detailed in EIA/EMP Report, the implementation phase remains open to any further technological advancements that promise improved energy efficiency or reduced emissions.

5.3 DESCRIPTION OF ALTERNATIVES WITH RESPECT TO SITE FOR PROPOSED INTEGRATED CEMENT PLANT

The proposed site for the Integrated Cement Plant in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) was selected based on a comparison of three alternative sites and the following key criteria designed to ensure minimum environmental impact and logistical efficiency:

Strategic and Logistical Advantages:

- **Proximity to Raw Material:** The site is situated just 1.2 km from the captive limestone mine, streamlining the primary raw material supply.
- **Road Connectivity:** Excellent access to the road network via Tluh Road that road connected to the National Highway 6 (NH-6) minimizes lead distance, time, and transportation- related impacts.
- **Land Availability:** Adequate land is available for the plant's current and future needs.
- **Power Access:** Proximity to and availability of power sources.
- **Water Access:** Availability of mine pit water in the vicinity of the proposed site.
- **Social Infrastructure:** Access to existing social infrastructure such as, markets, and community centres.

Environmental and Topographical Considerations:

- **Absence of Sensitive Features:** The area is free of any recognized environmental sensitive features or forest land involvement.
- **Favourable Terrain:** The site features ideally flat to slightly undulating land, suitable for development and the establishment of greenbelts and plantations.
- **Comparative Advantage:** The selected site was determined to be the best option among three alternatives after studying their respective environmental considerations.

Comparison of the alternative sites for the Proposed Project is given in Table - 5.1

Table: 5.1 Analysis of Options for Proposed Integrated Cement Plant

Techno-commercial parameters	Weightage	Site -1 (Village Daistong) Score	Justification	Site - 2 (Village Lumthari) Score	Justification	Site - 3 (Village Saipung) Score	Justification
LAND	25						
Land area availability	8	8	25.08 ha (Sufficient to set up proposed plant)	4	21.0 ha	6	15 ha
Land Type	8	8	100 % Pvt. Land	3	Pvt. Land	8	100 % Pvt. Land
Forest land	6	6	No Forest Land involved	6	No Forest Land involved	6	No Forest Land involved
Terrain (flat, undulating, presence of	3	3	Undulating	3	Undulating	3	Undulating

CHAPTER-5
ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

Techno-commercial parameters	Weightage	Site -1 (Village Daistong) Score	Justification	Site - 2 (Village Lumthari) Score	Justification	Site - 3 (Village Saipung) Score	Justification
hillocks, marshy land)							
Proximity to road network	15						
Connectivity to existing road	15	14	NH- 6 is at a distance of ~18.97 km in W direction	13	NH- 6 is at a distance of ~19.98 km in SW direction	7	NH- 6 is at a distance of ~23.06 km in W direction
Proximity to rail network	15						
Nearest Railway Station and railway siding	15	13	Nearest Railway Station is Ditokcherra Railway station which is at distance of ~36.56 km in SE direction	14	Nearest Railway Station is Ditokcherra Railway station which is at distance of ~39.22 km in SE direction	9	Nearest Railway Station is Ditokcherra Railway station which is at distance of ~33.50 km in SSE direction
Proximity to Raw Material	15						
Proximity to Limestone Source for manufacturing of Clinker	15	11	Limestone Mine is present at a distance of ~ 1.2 km in South West direction	12	Limestone Mine is present at a distance of ~6.0 km in South direction	14	Limestone Block is present at a distance of ~1.5 km in South direction
Environmental Sensitivity of the Location	30						
National Park, Wildlife Sanctuary, Biosphere Reserve etc.	7	7	Nurpuh Wildlife Sanctuary is present at ~28.13 km in SSW direction	7	Nurpuh Wildlife Sanctuary is present at ~31.72 km in SSW direction	7	Nurpuh Wildlife Sanctuary is present at ~29.55 km in SW direction

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CHAPTER-5
ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

Techno-commercial parameters	Weightage	Site -1 (Village Daistong) Score	Justification	Site - 2 (Village Lumthari) Score	Justification	Site - 3 (Village Saipung) Score	Justification
Archaeological site	3	3	No Archaeological Site within 10 km radius	3	No Archaeological Site within 10 km radius	3	No Archaeological Site within 10 km radius
Wetlands, watercourses or other water bodies	4	4	No Wetland Reserve within 10 km radius of the project site	4	No Wetland Reserve within 10 km radius of the project site	4	No Wetland Reserve within 10 km radius of the project site
International Border	4	4	~37 kms from the project site	4	~39.88 kms from the project site	4	~38.32 kms from the project site
Human Settlement (within site / nearby)	6	5	Village Daistong is present at ~0.82 km in ESE direction	5	Village Lumthari is present at ~0.34 km in SW direction	4	Village Saipung is present at ~1.16 km in SE direction
Any Sensitive areas i.e., School	6	5	Raidong L.P Government School at ~2.90 km in W direction	5	Larket Govt. L.P School at ~2.07 km in N direction	6	Tuinar U.P. School in village Saipung ~ 1.46 km in South direction
Total	100	91		83		81	

The Site-1 (Project Site) has been recommended to select for proposed Integrated Cement Plant in close proximity with the limestone mines, road connectivity with nearest state highway and based on the environmental considerations and other aspects.

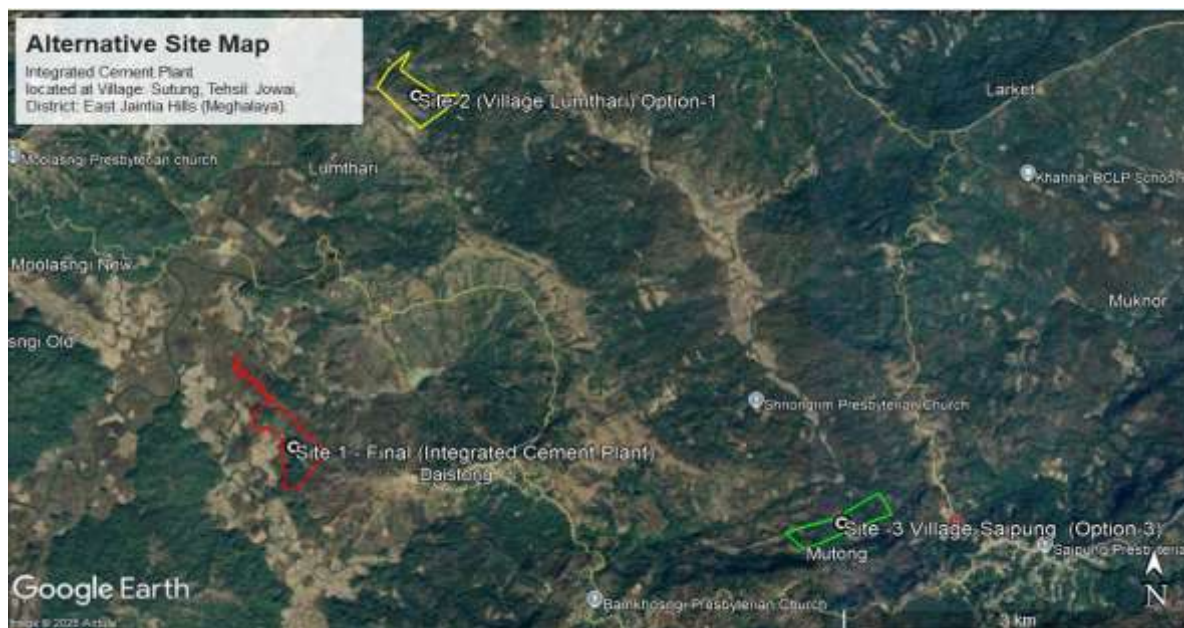


Figure: 5.1 Location map showing all alternative sites and captive limestone mine is provided below:

5.4 SOCIAL CONCERN

The proposed site was selected based on criteria that minimize social and environmental impacts. Key considerations included its close proximity Thuh Rd about 1.68 km and State Highway 6 (SH-6) about 19.09 Km in West direction, which mitigates traffic on local village roads. Furthermore, the location is free from habitation and sensitive environmental features—such as water bodies or forest areas—and requires minimal vegetation clearance. The availability of reliable power was another deciding factor. The Environmental Impact Assessment (EIA) report identified major local social concerns, specifically unemployment, industrial growth needs, and health-related issues.

5.5 CONCLUSION

Shree Cement Limited conducted extensive analysis of alternative technologies and potential sites, considering both environmental and social implications, and concluded that the chosen approach for the Integrated Cement Project is optimal. The selected technology is expected to provide a cost-effective solution while minimizing social concerns, as the company prioritized a rigorous analysis of all environmental aspects during the selection of the suitable and efficient technology and location.

6.1 INTRODUCTION

Post-project environmental monitoring is a critical activity carried out on a regular basis to verify the impact of project operations and ensure environmental protection. The core objectives of this program are to evaluate the performance of the mitigation measures proposed in the Environmental Management Plan (EMP), assess the overall adequacy of the initial Environmental Impact Assessment (EIA), and suggest necessary improvements to enhance environmental quality. This process also serves to manage the implementation of defined mitigative measures and undertake compliance monitoring of the project's ongoing operations. Detailed monitoring of emissions and effluents for various environmental parameters is conducted at the site, adhering strictly to the norms and standards established by the Meghalaya State Pollution Control Board (MSPCB) and the Ministry of Environment, Forest, and Climate Change (MoEF&CC). The environmental monitoring program specifically targets key components and pollution sources, including stack emissions, fugitive emissions, ambient air quality, water quality, and noise levels.

6.2 MEASUREMENT METHODOLOGIES

6.2.1 Proposed Monitoring Programme

Post-project monitoring will be conducted to assess any significant or minor environmental impacts within both the core and buffer zones. This comprehensive monitoring program will focus on the following key parameters:

- **Micro-meteorological data:** Collection of data related to local weather conditions.
- **Ambient air quality:** Measuring the quality of the air in the surrounding environment.
- **Fugitive emissions:** Monitoring non-point source emissions that escape from industrial processes.
- **Stack emissions:** Measuring the pollutants released from industrial stacks.
- **Noise levels:** Assessing noise pollution in and around the project site.
- **Groundwater quality and levels:** Regular checks on the quality and depth of groundwater.
- **Wastewater:** Monitoring the quality of both inlet and outlet wastewater.
- **Employee medical check-ups:** Conducting health assessments for project employees.

6.2.2 Instruments to be used

To monitor the environmental parameters mentioned previously, a variety of specialized instruments and systems will be deployed. The specific equipment to be utilized includes:

- **Weather Monitoring Station (WMS):** For collecting micro-meteorological data.
- **Respirable Dust Sampler (RDS):** Used for ambient air quality monitoring of larger particulate matter.

- **Fine Particulate Sampler (FPS):** For monitoring fine particulate matter as part of air quality assessments.
- **Stack Monitoring Kit / Online Continuous Emission Monitoring Systems (OCEMS):** For measuring pollutants released from industrial stacks.
- **Sound Level Meter:** Essential for monitoring noise levels.
- **Water Level Indicator:** For assessing groundwater levels.
- **Continuous Ambient Air Quality Monitoring Stations (CAAQMS):** For ongoing, real-time measurement of various air quality parameters.

6.2.3 POST-PROJECT MONITORING MEASUREMENT METHOD & TEST PROCEDURE

Post-project monitoring will be carried out strictly according to the conditions stipulated in the Environmental Clearance Letter issued by the SEIAA/SEAC, Meghalaya, the Consent issued by the MPCB, and the prevailing guidelines from the CPCB. The project area is divided into two distinct zones for assessment: the proposed project site will be designated as the core zone, while the area lying within a 10 km radius from the site will be considered the buffer zone. Within this buffer zone, only slight and occasional impacts on the physical and biological environment are anticipated in close proximity to the project.

Details of Post Project Monitoring Programme are given in **Table - 6.1**.

Table : 6.1 Parameters for Post - Project Monitoring

Attributes	Measurement Method	Test Procedure
A. Meteorological data monitoring		
• Wind speed • Wind direction • Dry bulb temperature • Wet bulb temperature • Relative humidity • Rainfall	Mechanical/ automatic weather station	-
B. Ambient Air Quality Monitoring		
Pollutant Monitoring		
PM10	Gravimetric method	-
PM2.5		-

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CHAPTER-6
ENVIRONMENTAL MONITORING PROGRAMME

SO ₂	EPA Modified West & Geake method	Absorption in Potassium Tetra Chloromercurate followed by Colorimetric estimation using P-Rosaniline hydrochloride and Formaldehyde (IS: 5182 Part-II)
NO ₂	Arsenite modified Jacob & Hochheiser	Absorption in dil. NaOH and then estimated calorimetrically with sulphanilamide and N (I-Nepthyle) Ethylene diamine Dihydrochloride and Hydrogen Peroxide (CPCB Method).

C. Stack Pollutant Monitoring

Pollutant PM	As per CPCB guidelines	Gravimetric method/ CEMS
SO _x	As per IS-11255-part (2) 1985 (Absorbing Solution of H ₂ O ₂ , isopropanol Reagent)	Absorption in H ₂ O ₂ , Isopropanol followed by Colorimetric estimation using Sulphuric acid and Barium Chloride as Per IS-11255-part (2) 1985 / CEMS
NO _x	As per IS-11255-part (7) 2005 with NO _x flask assembly	Absorption of Sample in NO _x flask assembly Followed by Colorimetric estimation using Phenol-di-sulphonic acid and other reagent as Per IS-11255-part (7) 2005 / CEMS
Dioxin & Furan during co- processing		

D. Groundwater Level and Quality Monitoring

pH, Turbidity, Colour, Odour, Taste, TDS, Total Hardness, Calcium hardness, Magnesium hardness, Chloride, Fluoride, Sulphate, Nitrates, Alkalinity, Iron, Copper, Manganese etc.	As per IS 10500: 2012	Samples for water quality should be collected and analyzed as per: IS: 2488 (Part 1-5) methods for sampling and testing of Industrial effluents. Standard methods for examination of water and wastewater analysis published by American Public Health Association.

E. Waste Water Monitoring

Waste Water (PH, BOD, COD, Oil & Grease, Faecal coliforms etc.)	As per IS 3025	Standard methods for examination of water and waste water analysis published by American Public Health Association.

D. Noise Level Monitoring

Noise levels at Day & night time - Leq dB (A)	As per CPCB procedure	As per CPCB norms

Integrated Cement Plant with capacity of Clinker: 0.95 Million TPA, Cement: 0.99 Million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

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E. Medical Check-up

Spirometry, Audiometry, Biochemical Parameter (Sugar, Blood, Circulatory and Vision test etc.)	As per Factory act-1984	-
H. Performance evaluation of APCEs/ Adequacy study	-	-

6.3 ACTION PLAN FOR POST PROJECT ENVIRONMENT MONITORING MATRIX

The Environmental Management Matrix is given below –

Table: 6.2 Action Plan for Post Project Environment Monitoring Matrix

S. No	Attributes / Aspects	Monitoring Parameter	Location	Frequency	Responsibility
Construction Phase					
1.	Ambient Airquality Monitoring	PM10, PM2.5, SO2, NO2 and CO as per NAAQS, 2009	01 location in downwind direction of dominant Wind direction and 01 locations on Project boundary	As per EC/CTE/CTO conditions	Environment engineer
2.	Water Quality	pH, Turbidity, Colour, Odour, Taste, TDS, Total Hardness, Calcium hardness, Magnesium hardness, Chloride, Fluoride, Sulphate, Nitrates, Alkalinity, Iron, Copper, Manganese	Set of grab samples during pre and post - monsoon for ground and surface water for 10km distance	As per EC/CTE/CTO conditions	Environment engineer
3.	Water level	Water Table Depth, Hydraulic Head, Piezometric Level, Groundwater Flow Direction and Gradient	Nearby Ground water sources and as per CTO conditions	Every season / As per NOC from Central Ground Water Authority (CGWA)	Environment engineer
4.	Noise Level	Day & Night dB (A)	Plant and near boundary construction activities	As per EC/CTE/CTO conditions	Environment engineer
5.	Medical Checkup	Spirometry, Audiometry, Biochemical Parameter (Sugar, Blood), ECG, Vision Test and Chest X-ray	Pre-placement Medical Checkup	Yearly as per Factories Act	Environment engineer, Plant Unit Head and HR Department
			Periodical Examination		
Operation Phase					
1.	Meteorological monitoring	Wind speed, Wind direction, Dry bulb temperature, Wet bulb temperature, Relative humidity, Rainfall, Solar	Minimum 1 site in the plant impact area.	Regular by Weather Monitoring Station	Environment engineer and team

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		Radiation, Cloud Cover, Environmental Lapse Rate			
2.	Ambient Air quality Monitoring	PM10, PM2.5, SO2, NO2 and CO as per NAAQS, 2009	Near to the entrance Gate of Plant Site and towards the Villages in upwind & downwind direction from the plant site, as per the max. GLC obtained and as per EC / CTO conditions.	As per CTO & Revised National Ambient Air Quality Standards (NAAQS) vide MoEF&CC circular, dated 16.11.2009	Environment engineer and team
3.	Fugitive Emission Monitoring	SPM	Cement Mill, Packing Plant, Raw Materials Handling Area & Coal Yard	As per conditions	EC/CTE/CTO
4	Stack Monitoring	PM, SO2, NOx, Dioxin & Furans during co - processing	Stacks of Raw Mill/ Kiln, Clinker Cooler, Coal Mill and Cement Mill.	As per EC/CTE/CTO conditions Continuous Online Monitoring	Environment engineer and team
.	Water Quality	pH, Turbidity, Colour, Odour, Taste, TDS, Total Hardness, Calcium hardness, Magnesium hardness, Chloride, Fluoride, Sulphate, Nitrates, Alkalinity, Iron, Copper, Manganese	Set of grab samples during pre and post - monsoon for ground and surface water for 10km distance	As per conditions	EC/CTE/CTO
5.	Water level	Water Table Depth, Hydraulic Head, Piezometric Level, Groundwater Flow Direction and Gradient	Nearby Ground water sources and as per CTO conditions	Every season / As per NOC from Central Ground Water Authority (CGWA)	Environment engineer
6.	Waste water	pH, BOD, COD, Oil & Grease, fecal coliforms, TSS, TDS	Inlet & Outlet of Sewage Treatment Plant	As per conditions	EC/CTE/CTO
7.	Noise Level Monitoring	Day & Night dB (A)	Plant boundary	As per conditions	EC/CTE/CTO
8.	Medical Checkup	Spirometry, Audiometry, Biochemical Parameter (Sugar, Blood), ECG, Vision Test and Chest X-ray	Pre-placement Medical Checkup Periodical Examination	Yearly as per Factories Act	Environment engineer, Plant Unit Head and HR Department
9.	Performance evaluation of APCE's / Adequacy Study	Inlet & outlet dust of APCE's	Raw Mill / Kiln Bag house, Coal Mill Bag House, Cement Mill Bag House,	Six Monthly	Environment engineer and team

			Clinker Cooler ESP and CPP ESP		

6.4 DATA ANALYSIS

Monitoring data analysis will be done by NABL/MoEF&CC approved laboratory as per CPCB guidelines will be timely submitted to concerned authority (specified in Environment Clearance Letter issued by SEAC/SEIAA, Meghalaya and Consent issued by MPCB) on regular basis.

6.5 REPORTING SCHEDULE

Environmental Monitoring Programme will be conducted for various environmental components as per the conditions stipulated in Environmental Clearance Letter issued by SEAC/SEIAA, Meghalaya and Consent to Operate issued by MPCB.

Six Monthly Compliance Status Report will be submitted on regular basis to IRO, MoEF&CC, Meghalaya by 1st of June and 1st of December and also will be upload to Parivesh web portal of MoEF&CC, New Delhi Quarterly Compliance Status Report for conditions stipulated in CTO/CTE will be submitted to MPCB on regular basis. Monthly compliance Report for conditions stipulated in CTO will be submitted to Meghalaya Pollution Control Board (MPCB) on regular basis.

6.6 EMERGENCY PROCEDURES

Company will adopt emergency procedures for Environmental Monitoring as mentioned below:

Planned Preventive Maintenance

Maintenance programmes will be established at the facility for the following equipment systems:

- Process equipment
- Environmental process equipment
- Continuous monitors
- Laboratory equipment
- Sampling equipment

Procedure

- Routine round the clock maintenance programme for plant equipment.
- Annual maintenance or half yearly shutdown.

Emissions to Atmosphere

In the event of an emission of dust form from any of the potential emission points the following action will be taken. Emergency Response Team Leader on duty should be notified immediately, by telephone or by use of the internal communication system. The leader will decide on what action to be taken:

- Identifying the source of the emission.
- Shutting down Production, if necessary
- Contacting relevant members of staff and management
- Contacting the local authority.
- Deciding in consultation with management what corrective action is deemed necessary.

Revision of Emergency Procedure

The emergency procedure will be reviewed and updated as necessary to reflect legislative changes or changes to the company's operation. These changes will be communicated to all employees through directors, managers, supervisors or environmental communications.

6.7 DETAILED BUDGET

The budget for Environment Monitoring and Management is as below:

- Capital Cost: Rs. 3.08 Crores
- Recurring Cost: Rs. 0.29 Crores/annum

7.0 INTRODUCTION

As per EIA Notification 14th Sept., 2006, as amended thereof; Application for Environmental Clearance (for ToR approval) was submitted to SEIAA/SEAC, Meghalaya on 20th Sep, 2025. Thereafter, the (Terms of Reference) ToR letter was issued by SEIAA/SEAC, Meghalaya vide TOR Identification No. TO25B1101ML5999209N, dated 15th October 2025 for Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2x1000 KVA & 1x500 KVA or 1x1000 KVA, 2x500 KVA & 2x250 KVA) in Khara Siang Lum Pyrshin in Daistong village, Elaka: Nongkhlieh Dolloiship, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

The following Additional Studies were undertaken in order to comply with the conditions of the ToR obtained for the Integrated Cement Project:

1. Public Consultation
2. Risk Assessment and Disaster Management Plan

7.1 PUBLIC CONSULTATION

This is Draft EIA Report, Public Hearing details shall be incorporated in respective Chapter once it is conducted.

7.2 RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

7.2.1 Risk Assessment & Damage Control

Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized threat.

Accidental risk involves the occurrence or potential occurrence of some accident consisting of an event or sequence of events resulting into fire, explosion or toxic hazards to human health and environment.

Activities requiring assessment of risk due to occurrence of most probable instances of hazard and incident are both onsite and off-site.

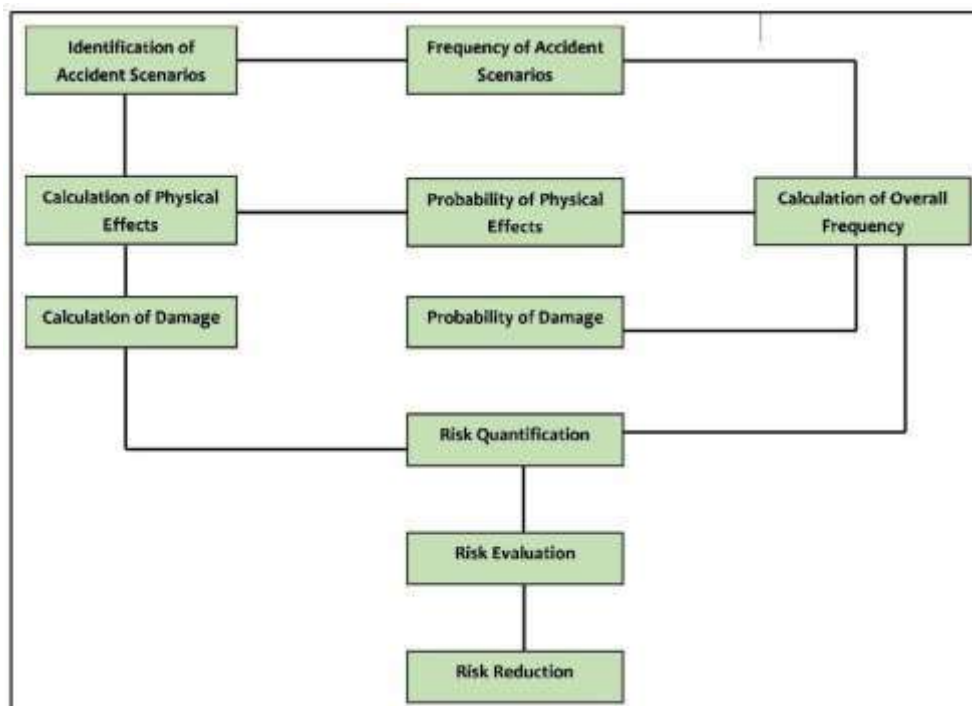


Figure: 7.1: Risk Analysis Strategy

7.2.2 Hazard Identification & Risk Assessment (HIRA) for Integrated Cement Project

Hazard Identification and Risk Analysis (HIRA) is the collective methodology encompassing all efforts to pinpoint potential hazards and evaluate associated risks within industrial facilities, spanning their entire operational lifecycle. The core purpose of these activities is to confirm that risks posed to employees, the public, or the environment remain consistently managed within an organization's predefined tolerance levels. These studies typically investigate three fundamental risk questions, tailoring the depth of the analysis to align with specific objectives, the facility's current life stage, and available resources. A rigorous HIRA process is the foundational element of the Risk-Based Process Safety (RBPS) pillar dedicated to thoroughly understanding hazards and risk profiles. This framework is particularly vital in the context of the cement manufacturing industry, which is inherently labor-intensive and experiences specific hazards integral to the production process itself. The possible area, places, type of likely hazards identified are as under in Table- 7.1

Table :7.1: The possible area, places, type of likely hazards identified

Department Location	Activity	Hazards Impact
Reclaimer & stacker	Stacker & reclaimer engulfment in pile	Fire

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Raw Mill	Storage of Raw Mill in silo & operation of ESP	Fire, Collapse, Material spillage and explosion
Pre-heater & Kiln	Cleaning of jamming in preheater /kiln inlet	Backfire result in burnt/injuries to working people
Kiln girth gear	Use of oil & grease	Fire
Coal Mill	Coal grinding and storage of fine coal in coal bins	Fire & explosion in bag filter and material spillage
Coal Handling	Stacking of coal in open yard	Fire
Belt conveyer	Coal Handling	Fire
Clinker Silo	Storage of Clinker	Collapse and Material spillage
Compressor house	Operation of compressor	Fire & explosion
Pressure Vessels	Storage of Compressor air	Explosion
Store & scrap yard	Storage of oil drum, waste oil drums and DA Cylinders	Fire & explosion
Electrical	Transformer, MCC / Sub station	Fire & explosion
Store	Storage of lubricating oil	Fire
Packing plant	Storage of packing bags, Storage of cement in Silos	Fire, Collapse, Material spillage and explosion
CPP Boiler	Boiler	Fire and explosion
CPP turbine	Turbine Room	Fire and explosion
WHRs	WHRs Boiler	Fire and explosion
	Turbine	Fire and explosion

Table :7.2: Hazard Identification and Risk Assessment (HIRA) and Safety measures to be adopted at Integrated Cement Plant

S. No.	Possible Hazard	Cause of Hazard	Safety Measures
1.	Exposure to High Temperature - Handling of hot raw meal (Powdered limestone, laterite additives etc. heated in a pre-heater cyclone). - Handling of hot clinker. - Operation & maintenance of kiln or other hot equipment	Carelessness during working hours, Damage of equipment/tools	- Shielding surfaces where worker's proximity and close contact with hot equipment is expected, - Using personal protective equipment (PPE), as needed (e.g., insulated gloves and safety helmet & safety shoes); - Water arrangement at site; - Minimizing the work time required in high temperature environments by implementing shorter shifts at these locations.

2.	Physical Hazards • Falling / impact with objects. • Hot Surface burns • Transportation • Contact with allergic substances	• Slips, Trips and fall. • Contact with falling / moving objects and lifting/over exertion. • Contact with, or capture in, moving machinery. Maintenance of equipment, including mills, mill separators, fans, coolers, and belt conveyors.	• It will be personally ensured that the equipment's with moving parts are de- energized, isolated and locked/tagged out. • Work permit for work at height • Fall protection system will be used by workers working at an elevation more than or equal to 6 feet. • PPEs will be provided to the person dealing with flame welding, cutting or brazing. • Safety helmets will be provided to workers for protection from any falling accidents. • Barriers will be provided to prevent slipping or being knocked off the edge of a structure. • Danger areas will be marked clearly with suitable warning signs to avoid any accident. • Proper medical care will be provided at the project site in case of any accidental issues.
3.	Events Pertaining to Manufacturing Process		
i.	Handling of Coal	• Flammable, ignitable and reactive property of fuel.	• The coal will be received and stored in Stockpile. • Stockpile will be made in a way so that the wind strikes the width of the stockpile and not the length. • Stacking - layer by layer (each of 1 to 1.5 m height) with compaction of each layer will be done. • Stacking in small heaps will be done and compacted in trapezoidal shape. • Effective sprinkling systems will be provided all-round the coal storage yards.
ii.	Handling of Alternative fuel & Raw Materials (AFR)	• Material Spillage. • Flammable, ignitable and reactive property of fuel.	• Storage area will be designed to withstand the load of material stocked and any damage from the material spillage. • Adequate fire - fighting systems will be provided for the storage area, along with the areas in the facility.
iii.	Handling of Fine dust	Maintenance process in the pre - heater cyclone and other areas	• The relevant PPEs will be provided during cleaning to the workers with sufficient care • during the maintenance operations
iv.	Handling of Hot Clinker	Spill out of hot clinker during transportation to the top of the silo or closed stock pile for storage	• Proper care for the conveying system and the bund wall for the clinker stock pile will be the part of design criteria
v.	Handling of Cement	• During material transfer	• Cement will be conveyed in a closed circuit (mechanical and/or pneumatic or combination of both) to avoid any health and environment risk.
4.	Fire	• Fuel Spillage, Electrical	• Installation of Fire detection alarm and control

		rooms, Transformer area, AFR Storage area, Empty bag go-down, Diesel Storage tank and Flammable gas cylinder storage area.	system for early detection • Suitable fire extinguishers, fire hydrant system and fire buckets etc. will be provided for fighting the fire during emergency. • Employees working in such areas will be imparted training for first aid firefighting to prevent/extinguish the fire at initial stage.
5.	Explosion	• Heat and Pressure load due to damage in equipment/ tool	• Proper isolation of system. • All cylinders to be secured. • Hoses in good condition. • Proper PPE. • Correct Fire extinguisher to be available at site. • Deployment of Experienced personnel. • Inspect the cylinders & hoses before starting the job.
6.	Electrocution	• Carelessness during working hours, Damage of equipment/tools	• Proper care will be taken while working on such equipment's. • Proper earthing of panel must be checked. • Correct Fire Extinguisher to be available at site.

Frequency and Consequences analysis/ Hazard Identification & Risk Assessment (HIRA) Cement Manufacturing process –

Activity/Products /Services	Hazards	Risk	Location	Severity (5)	Probability of Occurrence (5)	Risk Rating	Control & Influence
All Hopper Cleaning	Asphyxiation	Occupational illness needing hospitalized treatment	Raw Mill & Coal Mill	2	2	4	Isolate inlet chute and Use of PPE
	Spillage of dust & material	Eye and body injury and requiring Hospitalization.		3	3	9	Use appropriate PPE's
	Huge spillage of material / Silo	Fatal Injury		5	1	5	Allot trained workmen, Toolbox talk before job, Use of PPE and Follow as per work permit
	Injury to hand	Injury Requiring Hospitalization.		2	4	8	Allot trained workers, Use of PPE and Follow as per work permit
	Collapse of material leading to entrap	Fatal Injury		5	1	5	Allot trained workers, Use of PPE and Follow as per work permit
	Sudden Inflow of material	Fatal Injury		4	1	4	Allot trained workmen, Toolbox talk before job, Use of PPE and Follow as per work permit

Cyclone jam	Spillage of Hot meal outside cyclone and puffing of hot air	Injury leading to Permanent disability, Loss of body parts, Burns	Preheater	4	3	12	- While opening the pocking hole person shall not stand in front of the pocking hole, SOP to be followed and appropriate PPEs to be used. - Person should not be in front of hole and no body stand bottom of that area, SOP to be followed and appropriate PPEs to be used. - Combustible & flammable materials to be removed/protected and firefighting equipment to be available at site.
	Hot material falling on persons	Fatal		5	2	10	- Area below jam cyclone floors to be cordoned. - Experienced people only allowed for jam removal and SOP to be followed
Kiln inlet & Raiser duct Cleaning	Splash of hot material	Injury leading to Permanent disability, Loss of body parts, Burns		4	2	8	Draught & temperature of system & Process Controls and use of appropriate PPE's
	Rebound of hot coating pieces	Injury leading to Burns		3	2	6	Draught & temperature of system & Process Controls and use appropriate PPE's
Cooler Snow man removal	Burn injury	Injury leading to burn & partial disability	Cooler	4	3	12	1) Maintain the kiln hood draft higher side. 2) Blaster to be switch off & empty out. Use appropriate PPE's.
	Water hose hit to the person	Injury leading to Permanent disability, Loss of body parts, Burns		5	2	10	- Keep one person nearer to UT Pump for emergency. 2) All pipe joints to be checked on routine basis. 3) Pressure to be maintained for safe job execution.
	Hot material bounce	Injury leading to burn & partial disability		4	3	12	Use appropriate PPE's. 2) Workmen should not stand in front of poking hole & maintain safe distance.

UT pump operation	Damaged or bursting the hoses	Injury leading to Permanent disability, Loss of body parts.	-	5	2	10	Keep one person nearer to UT Pump for emergency. 2) All pipe joints to be checked on routine basis. 3) Pressure to be maintained for safe job execution/ under the capacity.
	Water hose hit to the person	Injury leading to Permanent disability, Loss of body parts.	-	4	2	8	Keep one person nearer to UT Pump for emergency. 2) All pipe joints to be checked on routine basis. 3) Pressure to be maintained for safe job execution/ under the capacity.
Removal of hot dust material from kiln inlet hot dust area	Flush / Emission of hot material	Injury leading to Permanent disability, Loss of body parts, Burns	-	5	3	15	1) Inlet slope area coating to be removed. 2) Kiln inlet seal to be checked. 3) Kiln inlet draft to be maintained to higher side. 4) Water Spray to be done on splied hot material from a safe distance and then remove. 5) Use appropriate PPEs.
Scaffolding for process activities (PH Kiln inlet, outlet, kiln hood, cooler)	Dust emission	Injury leading to burn & partial disability	PH, Kiln inlet, outlet, kiln hood & cooler	4	3	12	Inspect all cyclones before entering into kiln/cyclone, if there is any coating then remove the coating. Provide the dummy above the working area. Close Supervision and Monitoring with safety personal. Scaffolding material changed from wood & rope to MS pipe & clamps for avoiding slippage.
	Body Injury	Injury leading to permanent disability, Loss of body parts,		5	3	15	Close all air blasters, vent out the residual air if any. Keep the vent valve open.
	Person may fall, material may fall	Injury leading to permanent disability, Loss of body parts,		5	2	10	Ensure all coating, accumulations removed from the cyclones. Trained workmen to be deployed. Use appropriate PPEs (Full Body Harness,)

	Material may flush from cyclones	Injury leading to permanent disability, Loss of body parts,		5	2	10	Clear the coating or accumulation before entering in to the cyclone and provide dummy in cyclone feed chute.
	Scaffolding may collapse. Scaffolding pipe may slip	Injury leading to permanent disability, Loss of body parts,		5	2	10	Cross check the scaffolding as per the standard. Hazards to be explain to the workers through tool box talk before starting the job.
	Coating may collapse inside the kiln	Injury leading to permanent disability, Loss of body parts,		5	2	10	Check the coating thickness, how strong it is. if it is weak, remove the coating and check the kiln.
	Ignition of flammables	Injury requiring First Aid.		2	2	4	Use of PPE (Hand Gloves & Googles), Deploy trained person and space made free of flammable
Removal of Old Damaged Lining and Castable (Preheater)	Fall of person	Injury requiring hospitalization, Eye injury & Scald.	-	5	2	10	Restrict person movement by barricading. Use of safety nets,
	Fall of debris	Injury requiring hospitalization, Eye injury & Scald.	-	5	2	10	Tool box talk for material handling,
	Slip/fall of material or man.	Injury requiring hospitalization, Eye injury & Scald.	-	5	2	10	Allot trained workers, Conduct TBT before stating the job. Restrict person movement by barricading. Use of safety nets,
	Inhalation of dust	Injury requiring hospitalization, Eye injury & Scald.	-	3	3	9	Ensure PPE usage& ensure dust free environment.
Refractory material& Scaffolding pipes	Caught between, snake bite	Injury requiring hospitalization, Eye injury & Scald.	-	5	2	10	Inspect the area, Hazards to be explained to the workers through PEP talk.
shifting from yard to work place	Fall of material, hoist failure	Injury requiring hospitalization, Eye injury & Scald.	-	5	2	10	Use only load tested lifting equipment. Cross check the rope, cage condition with check lists. Hoist operator is to be authorized.
	Rope may failure or improper position of rope	Injury requiring hospitalization, Eye injury & Scald.	-	5	2	10	Change the rope timely as per the suppliers guarantee. Use skilled man power for shifting the pallets.

	Scaffolding pipe, clamp, grit may slip	Injury requiring hospitalization, Eye injury & Scald.	-	4	2	8	Hazards to be explain to the workers through PEP talk (Nylon rope failure, pipe may slip if it is improper tightening)
Brick lining in Kiln	Slip/fall of material or man.	Injury requiring hospitalization, Eye injury & Scald.	-	5	3	15	Allot trained workers, SOP to be followed.
	Brick fall down may hit the person who is standing nearby.	Injury requiring hospitalization, Eye injury & Scald.	-	5	3	15	Walkway should not be block while brick transporting happens. Avoid working below the walkway/ net to be provided. Skilled person to be deployed on job.
Fine Coal bin Cleaning	Splash /spills of materials	Injury requiring hospitalization, Eye injury & Scald.	-	4	3	12	Use appropriate PPE's. Person should stand away in front of the door.
Coal Grinding	Fire	Injury leading to permanent disability, Loss of body parts, Burns.	-	5	2	10	CO ₂ purging interlock with high Temperature /CO-o.15%. Monitoring from CCR along with explosion vents. Avoid the entering of excess O ₂ by false air.
Coal Grinding	Explosion	Injury leading to permanent disability, Loss of body parts, Burns.	-	5	2	10	CO ₂ purging interlock with high Temperature /CO- o.15%. Monitoring from CCR along with explosion vents. Avoid the entering of excess O ₂ by false air.
Lifting of refractory & other materials to the heights by hydra	Falling of Material / Cage	Injury requiring hospitalization, Eye injury & Scald.	-	4	2	8	Use only load tested lifting equipment. Cross check the rope, cage condition with check lists. Hydra operator is to be authorized.
Kiln Firing with Diesel	Fire or explosion (Diesel may leak)	Injury leading to Permanent disability, Loss of body parts, Burns	-	5	2	10	Thorough inspection of the diesel line before starting the pump.
	Body Injury (Diesel pipe may burst)	Injury leading to Permanent disability, Loss of body parts, Burns	-	5	2	10	Check the diesel pipe condition periodically as per supplier recommendation.
	Splash /spills of diesel in system	Injury leading to Permanent disability, Loss of body parts,	-	5	2	10	Close all air blasters vent out the residual air if any. System (kiln) air to be vent by fresh air damper.

		Burns					
	Back Fire	Injury leading to Permanent disability, Loss of body parts, Burns	-	5	2	10	Use fire proof glass and fire proof face shield. Maintain appropriate draft in system.
	Fire	Injury leading to Permanent disability, Loss of body parts, Burns	-	5	2	10	Control on coal feed. Maintain appropriate draught in system.
	Splash of gases	Injury leading to Permanent disability, Loss of body parts, Burns	-	4	2	8	Online gas analyzers (Kiln inlet, PC inlet & PH outlet) & draught control
Refractory Mixer machine Cleaning & Operation	Hand trap between blade & table	Injury requiring First Aid.	-	4	2	8	Use appropriate PPE (Hand Gloves & Googles), Deploy trained person.
	Electrocution	Injury requiring First Aid.	-	4	2	8	Use appropriate PPE (Hand Gloves & Googles), Deploy trained person
	Castable bag may slip	Injury requiring First Aid.	-	2	2	4	Use appropriate PPE (Hand Gloves & Googles), Deploy trained Person
Flow Measurement	Slip/fall of socket, bolt Or spanners.	Injury requiring hospitalization, Eye injury	-	3	2	6	Conduct Tool box talks before performing the job. Allot the trained workmen with appropriate PPEs.
	Slip/fall of measuring equipment's	Injury requiring hospitalization, Eye injury	-	3	2	6	Conduct Tool box talks before performing the job. Allot the trained workmen with appropriate PPEs.
	May be touch the thermometer needle	Injury requiring hospitalization, Eye injury	-	4	2	8	Conduct Tool box talks before performing the job. Allot the trained workmen with appropriate PPEs.
	Sudden release of Gas & materials	Injury requiring hospitalization, Eye injury	-	5	2	10	Conduct Tool box talks before performing the job. Allot the trained workmen with appropriate PPEs. Inform to CCR to maintain the draught.
	Slip/fall of socket, bolt Or spanners.	Injury requiring hospitalization, Eye injury	-	5	2	10	Conduct Tool box talks before performing the job. Allot the trained workmen with appropriate PPEs.

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CHAPTER-7
ADDITIONAL STUDIES

Degree of calcination sample collection	Splash of Hot material	Injury leading to Permanent disability, Loss of body parts, Burns	-	3	2	6	Use appropriate PPE's & trained person to be deployed.
Inspection of Kiln Flame condition	Splash of Hot material	Injury leading to Permanent disability, Loss of body parts, Burns	-	3	2	6	Fire proof glass to be used., Use appropriate PPE's & maintain proper hood draught.
Removal of coating at kiln inlet & burner pipe	Flush / Emission of hot material	Injury leading to Permanent disability, Loss of body parts, Burns	-	3	2	6	Use appropriate PPE's (Face shield & fire proximity suit). Maintain proper draught.
False air arresting	Material may be puffing back side	Injury requiring First Aid.	-	2	2	4	Conduct Tool box talks before performing the job. Allot the trained workmen with appropriate PPEs.
	Hand irritation	Injury requiring First Aid.	-	2	2	4	Conduct Tool box talks before performing the job. Allot the trained workmen with appropriate PPEs.
	Puffing of hot air or material, May material or hot gasses splash on body	Injury requiring First Aid.	-	2	2	4	Conduct Tool box talks before performing the job. Allot the trained workmen with appropriate PPEs.
Lining of Refractory in PH	Fall of person	Injury requiring hospitalization, Eye injury & Scald.	-	5	2	10	Restrict person movement by barricading, Use of safety nets, Ensure PPE usage& ensure dust free environment, SOP/PRO/011
	Fall of Refractory material	Injury requiring First Aid.	-	5	2	10	Tool box talk for material handling,
	Slip/fall of debris	Injury requiring hospitalization, Eye injury & Scald.	-	5	2	10	Tool box talk for material handling
	Slip/fall of material.	Injury requiring hospitalization, Eye injury & Scald.	-	5	2	10	Tool box talk for material handling, Dummy to made and Safety net should be use on top of the work place, Jallies also to be use on top of work place.

	Slip/fall of material or man.	Injury requiring hospitalization, Eye injury & Scald.	-	5	2	10	Ensure PPE usage & ensure dust free environment. Allot trained workers

Sr. No.	Probability/likelihood of occurrence:	Impact severity ratings:	Consideration during the review:
1.	UNLIKELY may not occur	1- Insignificant; Negligible	N - Normal Condition
2.	SELDOM, unlikely but possible to occur (yearly)	2- Minor, Minimal health & safety effect (minor effect on human health/first- aid needed)	A - Abnormal Condition
3.	OCCASIONAL, likely to occur sometimes (monthly)	3- Moderate, minor health & safety effect	E - Emergency Condition
4.	LIKELY, will occur several times (weekly)	4- Critical, minor health & safety effect	-
5.	FREQUENTLY, likely to occur always (Daily)	5- Catastrophic, major health & safety effect that cannot be controlled. (likely to result in severe injury or ill health & fatality).	-

7.2.3 Disaster Management Plan

Definition

A major emergency in a work is one, which has the potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption both inside and outside the work. It would require the assistance of emergency services to handle it in effective manner.

Scope

The aim of hazard control and disaster management is concerned with preventing accidents through good design, operation, maintenance and inspection, by which it is possible to reduce the risk of an accident, but it is not possible to eliminate it. Since, absolute safety is not achievable; an essential part of major hazard control must also include mitigating the effects of a major accident. An important aspect of mitigation is emergency planning, i.e., identifying accidents as soon as possible, evaluating the consequences of such accidents and deciding on the emergency procedures, both on-site and off-site, that would need to be adapted in the event of an emergency.

Objective

The objectives of the emergency plan will be:

- To protect plant personnel and general public.
- To prevent and minimize damage to property and to the environment.
- To help persons at site in a systematic manner meeting a disaster situation.
- To restore the affected areas back to normal as soon as possible.

e) To review accident after it has occurred and to evaluate company's efforts in order to improve emergency management response in the future.

To deal with the below emergencies, the Emergency Plan is prepared.

S. No.	Area	Possible Emergency	Hazard	Preventive Measures to be adopted
a)	Stores	Possibility of catching fire in stores materials	Fire	- Suitable fire extinguishers, fire hydrant system and fire buckets will be provided for fighting the fire during emergency. - Stores staff will be imparted the training for first aid firefighting to prevent/extinguish the fire at initial stage.
b)	Oil Storage Tank	Possibility of catching fire at the oil storage tanks and fuel oil handling system and Oil spillage from storage tanks	Fire and Explosion	- Fire hazard area will be declared as "No Smoking and No Naked Flame Zone" and regular check- up and maintenance of the fire prone area will be done. - Suitable fire extinguishers and fire hydrant system will be provided at the tank enclosure and inside the pump room. - Unloading of petroleum in bulk will not be allowed between sunset and sunrise. Tanker engine will be switched off before unloading and the tanker will be earthed. - Regular scheduled inspections of storage tank and the enclosed area will be carried out by the custodian with regard to proper earthing, presence of any combustible material or growth of wild vegetation, no breaches in the wire fencing, damage in the dyke wall etc.
c)	Packing Plant	Possibility of catching fire in the bag godown	Fire	- The packing plant will be declared as "No Smoking of Fire" area. - Suitable fire extinguishers and fire hydrant systems will be provided for fire- fighting in emergency situation. - Permission will be taken for working with welding/gas cutting in that area. - Adequate drainage to immediately drain out the water used in fire- fighting will be provided to avoid water damage and the sheds will be properly ventilated. - The sheds will be properly ventilated.
d)	Silos	Collapse of silos resulting in dust emission, material spillage & injury to person & damage to other property.	Physical	- Structural Soundness of silos will be ensured and filling up of Silos will be avoided. - Avoid over filing of silos - Lighting arrestor at top of silos bucket elevator will be installed.

e)	Storage of Coal	Catching fire due to material spillage leading to damage to property	Fire	- Flammable, ignitable, reactive and non-compatible wastes will be stored separately and will never be stored in the same storage shed - Adequate storage capacity will be provided in the premises. - Storage area will be designed to withstand the load of material stocked and any damage from the material spillage. - Automatic smoke, heat detection system will be provided in the sheds. - Adequate fire-fighting systems will be provided for the storage area, along with the areas in the facility. - Coal will be stored in covered shed.
f)	Electrical Transformer	Catching fire in transformers	Fire and Explosion	- Predictive interlocks will be provided which will automatically give an alarm/trip the system. - In case oil pressure inside the transformer tank increases, buchholtz relay provided will sound an alarm and if necessary, will trip the transformer and thus avoid oil explosion. - A diaphragm will be provided at the bottom of - explosion vent to vent out high oil pressure whenever pressure is increased beyond limit.
g)	Transformer Yard and HT/LT Sub-Station	Possibility of fire and explosion	Fire and Explosion	- Transformers will be separated by brick wall up to height of transformer. - Soak pits of suitable capacity will be provided to collect the leaked transformer oil in case of fire and explosion. - Periodic maintenance of all electrical machinery apparatus will be done. - In case of fire in HT transformer, first of all switch off 33/132 kV Incomer breaker - In case of LT transformer fire/explosion, switch off the transformer feeder from HT line - Emergency control room will be informed for fire brigade and other actions
h)	Electrical Cable Tunnels	Catching fire in electrical cables inside the tunnels	Fire	- Suitable fire extinguishers will be provided for fire-fighting. - Good housekeeping will be ensured to avoid any fire rise. - Exhaust fans will be provided to avoid suffocation.
i)	Conveyor Belts	Catching of fire in conveyors due to Gas cutting / welding and Frictional heat	Fire	- Suitable Fire extinguishers will be provided for each transfer towers for firefighting during emergency - Suitable fire equipment will be kept at hand during gas cutting / welding. - Full cord system will be provided throughout its length to stop it in any emergency - Preventive checks on frictional parts like drum and lagging of drum will be done.

j)	Failure of Lifting Tools and Tackles and Pressure Vessels	Injury to person and damage to equipment	Physical	- All lifting tools and tackles and pressure vessels will be tested/examined by competent person authorized by chief inspector of factories, Govt. of Gujarat as per statutory requirement and at defined frequency - Safe working pressure range will be maintained in the Air receiver tank/pressure vessels Safe Working Load will not be violated while using cranes, hoists, ropes, chains and other lifting tools and tackles, only authorized personnel will be allowed to handle the same - Regular and periodic maintenance will be done.
k)	Oil Tankers	Toppling of Oil Tankers	Physical	- Speed limit signboards will be displayed; no vehicle will be allowed to move beyond 20 km/hr - In case oil is toppled, Plant Inventory department will be informed - Sand will be sprayed on the oil to prevent further spread of oil and oil-soaked sand will be collected to fill in the land and cover with soil
l)	Working at Height	Fall from Height resulting in injury to person	Physical	- Information will be given immediately to Emergency Control Room/ OHC and to the Job Execution In- charge - Rescue team member will rush at site with rescue kit - Emergency team will be allotted to act as per Emergency organization structure - Rescuers to access the probable risk for rescuing the victim
m)	Stockpiles	Engulfment in Stockpile	Physical	- Take permission before climbing on stock pile - Pedestrian to maintain a safe distance from stock pile - Person to work under close supervision <i>In case of Emergency</i>, inform immediately to Emergency Control Room/OHC and to the Job Execution In-charge
n)	ESP	Release of Particulate matter in case of failure of chambers of ESP or tripping of ESP	Events Pertaining to Manufacturing Process	- All the stack will be equipped with Continuous Online Monitoring Systems and connected with Central Control Room in the plant for monitoring the emissions. - All the arrangements will be done to avoid tripping in the ESP along with interlocking system. - Proper maintenance of Air Pollution Control Equipment will be done periodically.

7.2.3.1 Onsite Emergency Plan

The Onsite Emergency Management Plan serves as a master document that outlines a structured approach to handling major incidents within a facility's premises. This comprehensive plan details the emergency organization structure, clearly defines the responsibilities of key personnel, establishes effective communication protocols, and specifies the necessary emergency response strategies required to control and mitigate a variety of potential major incidents effectively.

❖ Emergency Organization and its Responsibilities

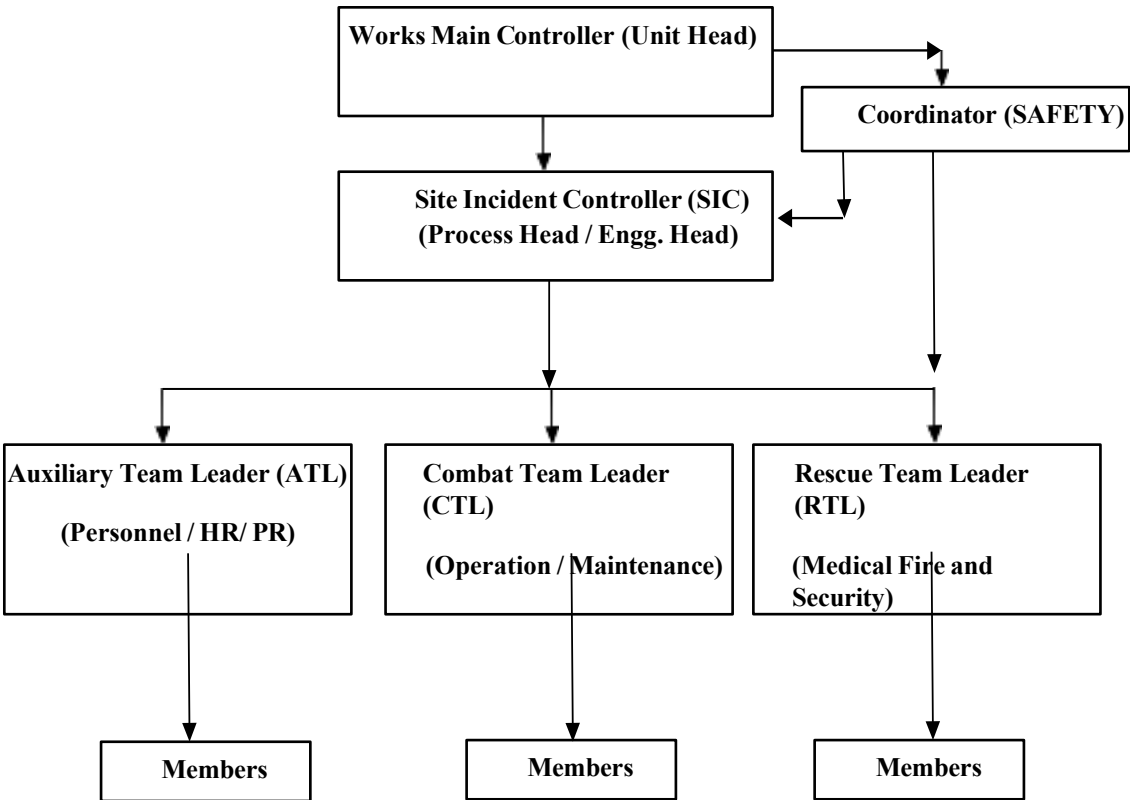


Figure: 7.1: Emergency Command Structure

Responsibilities and Duties of Personnel

S. No.	Designated roles of Emergency Command Structure	Responsibilities

1.	Works Main Controller	• Relieve the site incident controller of responsibility for overall control. • Ensure that the outside emergency services are called in. • Ensure that key personnel are called in. • Exercise direct operational control of those parts of the work outside the affected area. • Maintain a speculative continuous review of possible developments and assess these to determine most probable course of events. • Direct the shutting down of equipment and evacuation of areas in consultation with the site incident controller and key personnel. • Ensure the casualties and receiving adequate attention. Arrange for additional help, if required. Ensure that relatives are advised. • Liaise with Chief Officers of the fire and police services and with the experts on fire, safety, health etc. provide advice on possible effects on areas outside works. • Where the emergency is prolonged, arrange for the relief of personnel and the provisions of catering facilities. • Ensure the proper consideration is given to the preservation of evidences for investigations • Ensure with site incident controller about instructions of “ALL CLEAR” communication. • Ensure and control rehabilitation of affected areas. • Communication to Shree Cement Limited (Unit: Bhuj Cement Plant) • followed by a written report about the accident, including mitigation action taken.
2.	Site Incident Controller (SIC)	• Assess the scale of emergency and decide if a major emergency situation exists or is likely. On this decision, he will activate the subsequent major emergency procedure. • Direct all operations within the affected area with the following priorities: • Secure the safety of personnel • Minimize damage to equipment, property and the environment • Minimize loss of material • Direct rescue and firefighting operations • Ensure that the affected area is searched for unattended casualties. • Ensure that all non-essential workers in the affected area evacuate to the appropriate assembly point. • Direct the outside emergency services if called for emergency. • Report all significant development to the site main controller. Provide advice and information, as required, to the senior officer of the Fire Brigade. • Ensure the head counting for personnel. • Control traffic movement within the works. • Ensure that chronological record of the emergency to be maintained. • Have regard to the need to preserve evidence that would facilitate any subsequent esquire into the cause and circumstances of the emergency. • Direct the instructions about the “ALL CLEAR” communication • through mobile phones & walkie-talkie

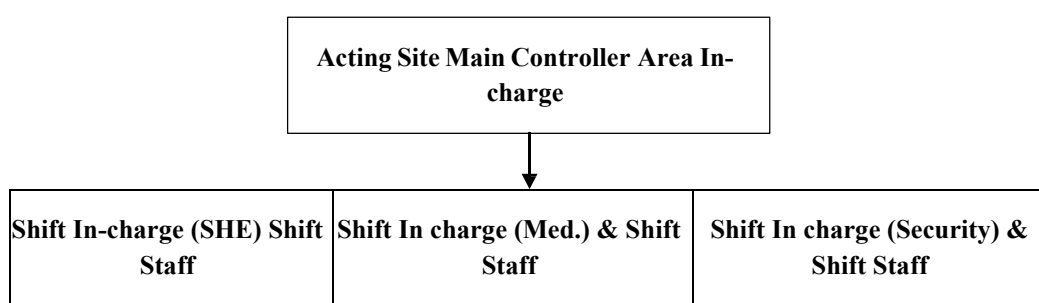
3.	HR & ADMIN – Head	• He handles the evacuation of the personnel from the emergency situation to the Assembly point. • He takes the head count of the Evacuated personnel. • He will assist the site controller in liaison with the local emergency authorities. • Manage traffic movement towards the incident area and clears way to the Emergency vehicles.
4.	Electrical – Head	• He will be heading the Shutdown. • After receiving the communication from the Incident controller, he will arrange to stop the power supply to the site and shutdown of the other equipment at site as per requirement. • After receiving the “All Clear” communication from the incident controller, he will resume the power supply to site.
5.	Mechanical – Head	• He will be heading the heavy equipment • After receiving the communication from the Incident controller, he will arrange to properly access at site. • After receiving the “All Clear” communication from the incident controller, he will resume the tool tackles (welding machine, cutting machine, grinding machine etc.) to site.
6.	Fire Fighting Team	• After receiving the emergency communication, they will immediately report to the Incident controller. • As per his instruction they will mobilize the Fire Fighting equipment’s and Leak control kits etc. • They will control the fire & Gas leakages. • In emergency situation other than Fire & Gas leakages, they will help the first aid team.
7.	First Aid Team	• After receiving the emergency communication First aid team will immediately reports to the Incident controller • First aid team will remove the casualties from the incident area to the safe place. • They will provide the immediate first aid to the casualties. • Help them to transport to the medical aid if warrants.

8.	Area in-charge of Emergency Affected Area	• He will immediately proceed to the scene of incident to confirm and assess the situation. • He will notify the nature of emergency to the fire station and security office to inform SIC / SMC and the concerned persons. • Area In-charge should clearly indicate to fire station and security office about I) Nature of emergency II) Location of emergency • He will ensure that all hot jobs including welding, cutting, grinding, chipping, open fire heating, etc. are stopped in the area. • He will coordinate the actions of site emergency services, maintenance services and other services for quick control of the situation, he will also perform emergency control measures as per directions from SIC / SMC. • He will furnish the full details about the incident to the Senior Management and Safety Officer, SMC / SIC, and other emergency services at site. • He will set up an emergency control post on site for team leaders of assistance groups from where the control and direction of the emergency operation is safe and he will arrange some communication media e.g., telephone at the emergency control post. • He will keep himself in constant touch with the emergency post and continue to pass on information / receive direction from emergency post to the concerned personnel. • He will ask for spare manpower from the other area in-charges of the unaffected area.

Emergency organization during non-working hours

The help of most of the personnel listed earlier will not be available and hence a separate working procedure has to be followed:

- ✓ All applicable duties for silent hours / enumerated earlier will apply.
- ✓ In-charge of the affected area will handle the situation with the available manpower and services, till the designated authorities of emergency organization reach the emergency site.



- **Emergency Control Post:** This command center, established by the area in-charge during a major emergency, provides a safe and secure location for assistance team leaders to direct and control emergency operations. It is equipped with essential communication tools, such as telephones.
- **Assembly Points:** Strategically located throughout the site, these designated safe areas are chosen considering factors like prevailing wind direction, proximity to paging systems, and accessibility via multiple routes to ensure efficient and safe evacuation.

- **Alarm System:** The type and complexity of the alarm system depend on the plant's size. An adequate number of audible warning points are necessary to alert all personnel. There must also be a reliable system in place to immediately inform external emergency services once an internal alarm is raised.
- **Communication System:** Effective communication is paramount during an emergency. Best practices often allow any employee to raise an immediate alarm to initiate the quickest possible response. Various communication methods are utilized, including telephones, shouting, messengers, and walkie-talkies. Concerned SHE In-charge will inform the Fire Station through the quickest way possible for quick response and Security Office for passing of the information to the concerned persons and services. The following persons and services inside the work place will be informed in case of major emergencies like – major fire, major accident, major spillage, gas leak, cyclone, etc. These authorities and services will be notified by Security Officer as per the direction by the Head - SHE of the Site. Fire Station, Medical Centre / Medical In-charge, Plant head, SHE Staff and Security Staff.

➤ **First Aid**

A fully equipped, 24/7 first-aid center will be maintained on-site, staffed continuously by a compounder (pharmacist/dresser) and a doctor. To augment these primary services during an emergency, an auxiliary first aid squad, consisting of members spread across different shifts and departments, will be established. An ambulance stationed at the plant will be used for on-site transport of affected individuals and for carrying them to external hospitals when necessary.

➤ **Safety**

The safety department, headed by a dedicated Safety Officer, will ensure continuous coverage during emergencies. Necessary safety appliances will be strategically distributed throughout the plant to address potential eventualities. Furthermore, safety awareness will be promoted continuously through posters and placards placed in various plant locations.

➤ **Emergency Drills**

The effectiveness and readiness of emergency response plans will be routinely tested using three types of drills:

- **Table-top exercises (TTE):** Initial testing of plan elements and procedures in a discussion-based format. The plan is refined and updated based on these findings.
- **Functional exercises (FE):** Practical drills focused on ensuring the proper functioning and readiness of specific equipment, such as fire-fighting apparatus and the fire hydrant system.

- **Full-scale exercises (FSE):** Comprehensive drills designed to assess the overall preparedness level and coordination of all emergency response teams.

TTE and FE will be conducted periodically initially, along with specific recurrent drills targeting:

- Plant-wide fire emergencies.
- Fire drills within office and administrative buildings.
- Plant emergency drills that specifically involve evacuation scenarios.

➤ **Personal Protective Equipment (PPEs)**

Personal protective equipment plays a vital role in overcoming major disastrous situation saving life during onsite emergency. List of recommended Personal Protective equipment (PPE) is given below in Table - 7.4.

Table:7.3 Summary of Recommended Personal Protective Equipment according to hazard onsite

Objective (Body Part)	Workplace Hazards	Suggested PPE
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation	Safety glasses with side-shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, overhead power cords	Plastic helmets with top and side impact protection
Hearing protection	Noise, ultra-sound	Hearing protectors (ear plugs or ear muffs)
Foot protection	Falling/rolling objects, points objects, corrosive/hot liquids	Safety shoes and boots
Hand protection	Hazardous materials, vibrations, cuts/lacerations, extreme temperatures	Gloves (rubber/synthetic/leather/steel/insulation)
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors, Oxygen deficiency	Facemasks with filters, single/multi-gas monitors, supplied air
Body / leg protection	Extreme temps, hazardous materials, biological agents, cutting/laceration	Insulating clothing, body suits, aprons

Fly Ash	Fly ash handling and storage	Dust-proof goggles, rubber/PVC gloves, coveralls

In addition to the specific safety gear mentioned previously, standard practice dictates that all employees throughout the facility will be issued fundamental Personal Protective Equipment (PPE), specifically safety helmets and safety shoes. The company enforces a strict statutory requirement that all employees must wear the appropriate safety gear provided to them at all times while attending duty within the factory premises.

7.2.3.2 Off-Site Emergency Planning

The user provided extensive text describing the Off-Site Emergency Plan. They want me to process this information. The previous requests were either to write the content "in a different way" or summarize them "in paragraph." The user did not specify an output format for *this* text block. I should default to a structured summary or a rephrased presentation of the information provided, as that has been the user's pattern. A structured summary using bullet points and clear headings would be the most effective way to handle this large block of information clearly.

The text covers the purpose of the off-site plan, the coordinating officer's role, evacuation factors, and the roles of various external organizations (police, fire brigade, health authorities, media, NGOs, etc.).

I will structure the summary logically:

1. Introduction to the Off-Site Plan
2. Key Considerations (Evacuation, Organization, Communication, etc.)
3. Roles of External Agencies
4. Specific Organizational Roles (Police, Fire, Health, Media)

This should effectively capture all the user's points in a clear, different format from the dense text provided.

The off-site emergency plan is a crucial component of any hazard control system, designed to manage accidents that extend beyond the facility's boundaries and affect the surrounding community or environment. It logically complements the on-site plan and is typically managed by either the works management or the local authority, with an appointed emergency coordinating officer taking overall command of external activities.

Key considerations and operational details of the plan include:

Organizational Structure and Logistics

- **Command Structure:** Defines organizational details, warning systems, implementation procedures, and identifies key personnel like the incident controller, site main controller, and their deputies.
- **Communications:** Identifies personnel involved, communication centers, networks, call signs, and a comprehensive list of emergency telephone numbers.
- **Special Equipment:** Details the availability and location of specific resources, such as heavy lifting gear, specialized fire-fighting equipment, or fireboats.
- **Humanitarian Arrangements:** Outlines logistics for transport, evacuation centers, emergency feeding, treatment of the injured, first aid provision, ambulances, and temporary mortuaries.
- **Information Management:** Requires Material Safety Data Sheets (MSDS) and summaries of risks for hazardous substances to be available, along with arrangements for obtaining real-time meteorological information and forecasts.

Evacuation and Rehabilitation

Evacuation protocols are based on factors such as the nature of the incident (e.g., fire without explosion risk vs. rapidly escalating fire) and immediate safety advice (e.g., evacuate nearby houses or advise people to stay indoors and shield themselves). The plan also covers arrangements at rallying posts and parking yards, and the eventual rehabilitation of evacuated persons.

Role of External Authorities and Organizations

Various external bodies play vital roles in implementing the off-site plan:

- **Local Authority (Panchayat, Sabha, Samiti, Municipalities):** Assists in combating the emergency and rescue phase after assessing the impact scenario.
- **Police:** Controls traffic and crowds at the accident site, organizes evacuation, transports injured people to hospitals, coordinates with civil defense, home guards, and other state services, and handles post-mortem arrangements for fatalities.
- **Fire Brigade:** Primarily responsible for extinguishing fires and providing general assistance during the emergency.
- **Health Care Authorities:** Ensures hospitals and doctors are ready to treat injuries, coordinates availability of drugs and equipment at various health centers, secures assistance from nearby medical institutions, and manages temporary mortuaries and body identification.
- **Voluntary Organizations and NGOs:** Provide valuable expertise, resources (e.g., hospitals, helplines), and personnel to assist response efforts and perform specific planned tasks.

Media and Public Information

Transparency and accurate communication are critical:

- The media must have continuous access to designated officials to provide the public with credible, accurate information and prevent confusion.
- Efforts are made to verify information before public release, often consulting public health authorities on health-related statements.
- The media helps facilitate the response by disseminating essential information to the public about the accident and safety measures.
- Arrangements for informing relatives are also specified.

Assessment

The plan also includes mechanisms for collecting information on the emergency's causes and reviewing the efficiency and effectiveness of all aspects of the emergency response plan once the situation is under control.

7.3 CONCLUSION

The risk analysis for the proposed Integrated Cement Plant has concluded that the potential hazards do not present a major risk profile. This conclusion rests on the implementation of appropriate risk control measures, designed to minimize identified risks to an acceptable level.

The overall safety strategy relies on several key preventative actions: regular employee training, rigorous implementation of Standard Operating Procedures (SOPs), and mandatory compliance with all relevant Personal Protective Equipment (PPE) requirements. These measures are intended to minimize health hazards and prevent workplace incidents or casualties.

8.1 INTRODUCTION

Shree Cement Ltd. (SCL) believes holistic Socio - economic development of the local community is the need of the hour. It truly believes that a company's prosperity is linked with that of its neighbouring communities. All the development related and community support activities are driven at all cement manufacturing and grinding units and have continuous on-going social interventions.

SCL's Vision

"Lead in creating prosperity and happiness for all stakeholders through innovation and sustainable practices."

It is anticipated that as a consequence of this proposed project there will be employment opportunities including skilled, semi-skilled, and unskilled wages. It will be assured alongside that the industry will bring improvement of physical infrastructure in local area like building/strengthening of existing roads, providing drinking water, drainage system, transportation facilities etc. with improved educational facilities and professional practices and by extending healthcare facilities it can be expected that the project will lead towards further development in literacy, economic status and standards of living. Thus, the basic requirement of the community needs will be strengthened by the proposed project by providing or by improving the existing facilities in the area, which will help in uplifting the quality of life of the local communities. Additionally, support in the areas of sports, recreation and environmental sanitation can also be undertaken to facilitate socioeconomic opportunities.

8.2 PROPOSED PROJECT BENEFITS

The proposed project will provide various benefits across the nearby areas, which are attributed below:

- 1) Environment
- 2) Employment
- 3) Economic
- 4) Social

1. Environmental Benefits

a. Greenbelt & Plantation Development

For Proposed Integrated Cement Plant

Total project area for the Proposed Integrated Cement Project is 25.08 ha (61.95 acres) out of which approx. 8.27 ha (i.e., 33 % of the total project area) will be developed as greenbelt development & plantation and 15 m wide greenbelt will be done along the plant boundary and 20-meter width towards the habitation of Daistong Village to attenuate the air pollution.

The greenbelt & plantation around the Cement industry will act as an effective barrier between plant and surroundings. The other benefits are mentioned as below -

2. Greenbelt aids water management (run-off, groundwater recharge) and reduces soil erosion.
3. Greenbelt captures emissions, attenuates noise, improves air/noise quality, and enhances aesthetics.
4. Unplantable open spaces will have shrubs/grasses to prevent topsoil erosion, other areas will be lawns/flowers.
5. Educational activities for local villagers regarding tree importance and care.

b. Rain water Harvesting

The plant area rainfall runoff will be managed using properly sloped drains to ensure natural flow into a large, 2741 Sq.m storage pond. After accounting for a 60% reduction due to various losses, the harvested water will be utilized for essential on-site activities like greenbelt maintenance, domestic use, and sanitation. This water harvesting system significantly aids in reducing the extent of groundwater withdrawal required for plant operations.

c. Use of Hazardous Non-hazardous waste in Cement manufacturing as AFR

The company has explored the potential to utilize various types of local industrial hazardous and non-hazardous wastes as Alternate Fuel Resources (AFR) within the cement manufacturing process. This approach provides numerous environmental and economic benefits, including the recovery of energy content from the waste, the conservation of non-renewable fossil fuels and natural resources, reduced CO₂

emissions, a decrease in production costs, and effective management of waste disposal problems to reduce contamination. The plan proposes achieving an approximate 15% Thermal Substitution Rate (TSR) by co-processing these wastes—such as MSW RDF, boiler ash, cloth waste, plastic waste, and wooden dust—in the kiln, which lessens the dependency on coal. This TSR is flexible and may be adjusted based on the availability of suitable AFR materials. More detailed information on this process is available in Chapter 2 of the EIA/EMP Report.

d. Use of Waste materials from Power Plants & Steel Plants

The integrated cement plant intends to utilize industrial waste products, specifically fly ash from nearby thermal power plants and granulated blast furnace slag (GGBFS) from iron production, as raw material inputs. The utilization of fly ash, which otherwise poses significant health and disposal problems, in the manufacture of Pozzolana Portland Cement (PPC) and Composite cement helps conserve natural

resources. The incorporation of GGBFS as a replacement for a portion of Portland cement enhances the concrete's long-term performance and durability while simultaneously reducing the overall environmental footprint of the final product. This strategy effectively transforms environmentally problematic industrial wastes into valuable resources.

2. Employment Benefits (Direct & Indirect) due to the Project

The proposed integrated cement project is expected to create significant direct and indirect employment opportunities. The operational phase of the plant will require approximately 800 employees in total: 300 regular staff members and around 500 contract laborers for operations and maintenance activities. Priority for these positions will be given to local residents and those whose land was acquired for the project, based on their skills and experience.

Beyond direct hiring, the project is anticipated to generate numerous indirect jobs across various sectors, including transportation services (truck owners, drivers), retail networks (cement stockists, shopkeepers), repair workshops, and other ancillary services (tea-stalls, lenders, petty contractors).

3. Economic benefits

The proposed SCL project is positioned to significantly contribute to both the overall economy and the growth of surrounding areas through various socio-economic development initiatives. By generating both direct and indirect employment opportunities, the project aims to improve the socio-economic condition and raise the living standards of the local population. The venture benefits from and helps meet the robust demand within the Indian cement sector, which is fueled by major government infrastructure projects such as Bharatmala, Sagarmala, the Smart Cities Mission, and PMAY. In addition to creating jobs, the plant is expected to boost state and central government revenues through taxes and royalties. The project will further enhance the local economy indirectly by providing new business avenues, including transport contracts and maintenance work, and by implementing Corporate Social Responsibility (CSR) programs that increase the economic status of people in the area.

4. Social Benefits

The company views the local community as a primary stakeholder, prioritizing both business interests and environmental responsibility. Management aims to act as a catalyst for community transformation by fostering strong partnerships with local populations, government bodies, and NGOs. Building on over seventy years of addressing social issues such as health, sanitation, education, and women empowerment, the company's Corporate Social Responsibility (CSR) policy specifically targets the systematic and sustainable social, economic, and environmental progress of communities surrounding its operations. For

the proposed project, socio-economic development activities will focus on nearby villages, complementing existing governmental programs. The company will actively promote sustainability by organizing environmental awareness camps and executing developmental activities aligned with national objectives.

8.3 PROMOTION OF SOCIO - ECONOMIC STATUS

The following Additional Studies were undertaken in order to comply with the conditions of the ToR obtained for the Integrated Cement Project:

SCL is committed to carrying out various socio-economic development activities designed to substantially contribute to the local economy and social structure. The beneficial impacts of these initiatives will be evident across numerous areas, including employment generation, services, trade, commerce, public utilities, literacy rates, social awareness campaigns, healthcare facilities, and recreational opportunities.

The socio-economic development plan will be customized based on specific issues raised during public hearings and will be implemented in nearby villages. SCL intends to supplement existing governmental programs by partnering with government agencies, NGOs, and local Panchayats. Furthermore, 'Village Development Committees' will be established to foster community engagement and facilitate the planning, monitoring, and coordination of all development activities within the area. Major focus areas of SCL's initiatives are detailed in the accompanying Figure 8.1.



Figure: 8.1: Focus areas

8.4 PROPOSED ACTION PLAN FOR SOCIO ECONOMIC DEVELOPMENT

This is draft EIA/EMP report, once the public hearing will conduct then the Action plan for the same shall be incorporated in Final EIA/EMP report. Where total cost allocated for the Socio-Economic Development activities.

8.5 CONCLUSION

In addition to offering direct employment, the Integrated Cement Plant is expected to create a substantial number of indirect job opportunities in the area for contractors, shopkeepers, agents, stockists, and individuals in transportation and workshop services. The local economy will be significantly boosted by the spending power of employees and the demand for services generated by the company. This economic growth is anticipated to increase the buying power of residents, leading to a higher standard of living, including better access to education, improved health and sanitation facilities, and housing. This is considered a major positive outcome that will contribute to the sustainable development of the entire region.

9.1 INTRODUCTION

The financial viability of the project is assessed by examining the following key areas:

- **Investment and Operational Costs:** This includes a detailed estimation of the total investment cost, which incorporates the Environment Management Plan, as well as the projected costs for operation and maintenance.
- **Cost-Benefit Analysis:** The assessment provides crucial financial statements, such as the Profit and Loss Statement, Projected Cash Flow Statement, and Balance Sheet, to analyze the project's profitability.
- **Key Financial Indicators:** The financial viability is measured through standard indicators, including the Internal Rates of Return on both investment and equity, the Break-Even Point, and the project's Payback Period.
- **Sensitivity Analysis:** The study concludes with an analysis of how the Break-Even Point would be affected by various changes or potential variables.

9.2 INVESTMENT COSTS

The total estimated investment for the proposed Integrated Cement project is approximately INR 1264 Crores. This comprehensive figure includes the capital costs for the cement plant itself, a colony for employees, and the necessary working capital. The project's cost projections are based on quotes from reputable European suppliers and are derived from the requirements for both fixed and non-fixed assets.

The total project investment is cost has been summarized in Table 9.1 as under:

Table: 9.1: Summary of Investment Cost

Sr. No.	Item	INR Crores
1.	Land and Site Development	150
2	Civil Works & Structures	225
3.	Plant & Machinery	590
4.	Captive Power Plant (15 MW)	116
5.	Waste Heat Recovery Plant (7 MW)	183
	Grand Total	1264

The fund requirements for the project are expected to be met by 100% equity and the same has been considered while analyzing cost-benefit analysis.

Assumptions and workings for Investment Cost computations of major heads have been described in the following sub-sections.

9.3 CONCLUSION

In addition to offering direct employment, the Integrated Cement Plant is expected to create a substantial number of indirect job opportunities in the area for contractors, shopkeepers, agents, stockists, and individuals in transportation and workshop services. The local economy will be significantly boosted by the spending power of employees and the demand for services generated by the company. This economic growth is anticipated to increase the buying power of residents, leading to a higher standard of living, including better access to education, improved health and sanitation facilities, and housing. This is considered a major positive outcome that will contribute to the sustainable development of the entire region.

10.1 INTRODUCTION

The Environmental Management Plan (EMP) is a comprehensive strategy for eliminating, or reducing to acceptable levels, the adverse environmental impacts that may arise during the implementation and operation of the proposed integrated cement plant. It incorporates a suite of mitigation, management, monitoring, and institutional measures.

The EMP addresses environmental components affected by the various activities involved in the plant's processes, relying on impact evaluations and baseline conditions to mitigate negative effects. The plan encompasses a continuous cycle of planning, implementation, monitoring, data analysis, and corrective action, and has been delineated in accordance with relevant Acts, Rules, Regulations, and Standards governing environmental management.

To ensure regulatory compliance, the EMP is detailed under the following specific management areas:

- Air Quality Management Plan
- Noise Level Management Plan
- Solid & Hazardous Waste Management Plan
- Energy Conservation
- Wastewater (Effluent) Management Plan
- Storm Water Management Plan
- Rainwater Harvesting Plan
- Plan for maximum usage of waste water/treated water in the unit
- Greenbelt Development & Plantation Programme
- Action plan for environment safeguard measures to minimise the impact on the habitation of the locals
- Occupational Health & Safety Management Plan
- Socio-Economic Management Plan (a brief description of which will be provided in Chapter - 8 after the Public Hearing of the EIA/EMP Report)
- Total capital cost and recurring cost/annum for environmental pollution control measures

Purpose of EMP

- Ensure emissions and waste are controlled, minimized, and disposed of properly to meet legal and technological requirements.
- Implement state-of-the-art technology to achieve and maintain environmental standards.
- Promote the careful and efficient use of natural resources, including water.

- Establish and maintain a safe, healthy, and secure working environment for all personnel.
- Maintain the effective functioning of all environmental control measures.
- Implement a system for disaster and accident prevention and preparedness.
- Conduct continuous monitoring of the project's cumulative and long-term environmental effects.
- Work to reduce all potential accident hazards.
- Allocate specific financial resources for environmental management activities.
- Support and carry out a greenbelt development and plantation program.
- Obtain and implement ISO 9001, ISO 14001, and OHSAS 4500 certifications for the project.

Elements of EMP

EMP includes four major elements: -

1. **Planning:** This stage involves identifying potential environmental impacts, defining legal obligations, and setting clear environmental, health, safety, and social objectives, commitments, and policies.
2. **Implementation:** This phase focuses on the allocation of resources for the project, assigning clear accountability to employees and contractors, and documenting all necessary actions and procedures.
3. **Checking (Measurement & Evaluation):** This step consists of regular inspections, audits, and monitoring activities to verify performance, track corrective actions, maintain accurate records.
4. **Management Review:** In this final stage, actions are defined and implemented to ensure the organization's ongoing improvement in environmental, health, safety, and social performance.

The following Policies & programs will be developed to ensure proper implementation of EMP for the Cement Plant:

- A Corporate Environmental Policy (CEP) will be established.
- An Environmental Management Cell (EMC) will be formed.
- Guidelines from the Central Pollution Control Board (CPCB) will be implemented to control fugitive emissions.
- The project will comply with CREP Guidelines.
- The concepts of waste minimization and the 3Rs (Reduce, Reuse, Recycle) will be adopted.
- Conservation of energy and natural resources will be a key focus.
- A greenbelt development and planting program will be put in place.
- Measures for occupational health and safety will be implemented.
- A dedicated budget will be set aside for environmental mitigation measures.

10.2 CORPORATE ENVIRONMENT POLICY

To successfully achieve the goals of the Environmental Management Plan (EMP), the company must establish formal Corporate Environment policies. Additionally, an Environment Management Cell (EMC) needs to be formed to ensure compliance with relevant rules and regulations.

The company has a well-defined Corporate Environmental Policy, officially adopted by the Board of Directors, which provides a clear framework aimed at becoming an Environmentally Sustainable organization. To manage environmental issues effectively and ensure adherence to all conditions stipulated in various clearances and consents, a specific hierarchical system or administrative order has been established.

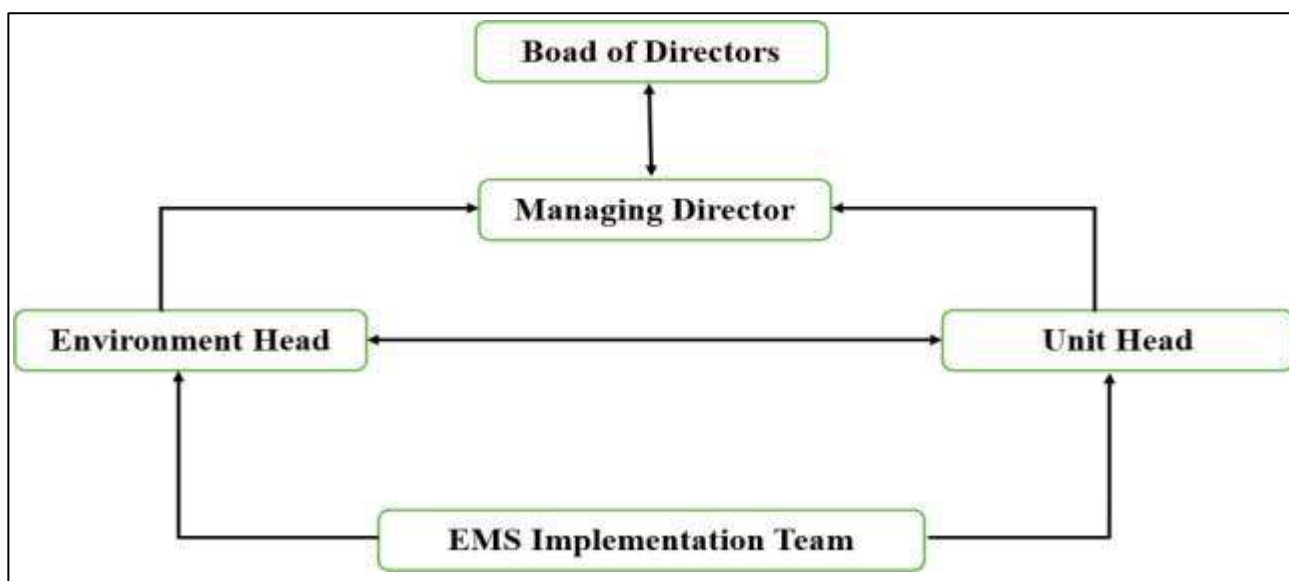
10.3 ENVIRONMENTAL MANAGEMENT CELL (EMC)

To ensure that environmental quality remains within acceptable standards, continuous and regular monitoring of various environmental components is essential. To facilitate this, the Integrated Cement Plant will establish and maintain a fully-equipped Environmental Management Cell (EMC) dedicated to environmental monitoring and management.

The EMC team's primary responsibilities will include overseeing pollution monitoring aspects and supervising the effective implementation of control measures. A dedicated group comprising qualified and efficient engineers and technicians will be specifically assigned to the maintenance, upkeep, and monitoring of all pollution control equipment, ensuring they operate at peak efficiency.

10.3.1 Structure of EMC

Structure of Environment Management Cell at Shree Cement Ltd. as per the Corporate Environment Policy is given below:



10.3.2 Responsibilities of EMC

The responsibilities of the Environmental Management Committee (EMC) can be categorized and presented as follows:

I. Equipment Management & Maintenance

- Acquisition: Procuring and commissioning necessary pollution control and monitoring equipment.
- Maintenance & Upkeep: Establishing and regulating maintenance schedules for all pollution control equipment.
- Quality Assurance: Ensuring the timely calibration of all pollution control equipment and related facilities.

II. Environmental Monitoring & Evaluation

- Monitoring Activities: Conducting environmental monitoring within the core and buffer zones.
- Data Analysis: Evaluating the results of monitoring activities.
- Record Keeping: Maintaining records to continuously track and assess the quality status of the surrounding environment.

III. Compliance & Regulatory Adherence

- Standard Adherence: Ensuring that all prescribed environmental standards are consistently met.
- Statutory Compliance: Adhering to all relevant guidelines and statutory requirements.
- Implementation of Measures: Executing the mitigation measures outlined in the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) reports.
- Waste Management: Coordinating with vendors for waste handling and disposal, ensuring all processes follow prescribed conditions.

IV. Planning & Risk Mitigation

- Proactive Studies: Conducting proactive environmental studies and implementing necessary precautions to prevent disasters and emergencies in operational and nearby areas.
- Green Initiatives: Overseeing the development, plantation, and maintenance of greenbelts.

V. Coordination & Reporting

- Internal & External Liaison: Coordinating with statutory bodies, internal functional groups, and corporate departments (Project/Environment & Engineering).
- Committee Operations: Organizing regular meetings of the Environmental Management Committee.

- **Operational Integration:** Collaborating with engineering and operation teams to implement modifications aimed at improving the efficiency of pollution control systems.
- **Auditing & Review:** Conducting internal environmental reviews and performance appraisals, and organizing third-party environmental/energy/water audits.
- **Stakeholder Communication:** Reporting compliance status (including non-compliances) to management and relevant stakeholders.

VI. Training & Development

- **Capacity Building:** Organizing regular training programs focused on environmental requirements, sustainable development, climate change, and environmental monitoring.

10.4 AIR QUALITY MANAGEMENT PLAN

The Air Quality Management for Construction and operation phase been prepared which described below:

The following points outline the construction phase measures:

- Water will be sprinkled at the construction site and on nearby unpaved roads.
- Paved roads will be swept regularly to reduce the re-suspension of dust.
- Construction equipment with a valid PUC certificate will be used to restrict exhaust emissions.
- Vehicles will be properly maintained throughout the construction phase.
- Proper handling and a controlled height for unloading construction waste will be maintained to minimize the impact on air quality.
- To prevent dust from stockpiles of construction material (aggregates and sand), they will be properly aligned with stabilized slopes, maintained at a maximum height, and covered.

The following points outline the operation phase measures:

Fugitive Emissions

Definitions

- **Fugitive Emissions:** Air pollutants that are released into the atmosphere from non-point sources (i.e., not through a confined flow stream like a chimney or stack).
- **Fugitive Dust:** Any solid particulate matter that becomes airborne due to natural occurrences or human activities, specifically excluding matter emitted from an exhaust stack.

Factors that Influence Emissions

The following factors have a direct impact on the quantity and nature of fugitive emissions:

- **Material Properties:** The moisture content of the material being managed.

- **Process Type:** The specific type of material processed during operations.
- **Equipment Used:** The type of machinery or equipment being utilized.
- **Operational Procedures:** The specific operating practices and methods employed by staff.

Measures to Control Emissions

Transportation and Emission Control Measures

Material Handling Procedures

- **Clinker Transport:** Clinker will be moved to the storage silo using a covered conveyor system, ensuring controlled movement and minimal release of dust.
- **Fly Ash Transport:** Fly ash will be transferred pneumatically (using air pressure) directly from bulkers to the fly ash silo, a method designed to contain material completely and prevent fugitive emissions.

Site Operational Controls

- **Infrastructure:** All internal roads within the plant are paved to reduce dust generation from vehicle movement.
- **Cleaning Regimen:** A vacuum sweeping machine will be used for the regular cleaning of all roads and floors.
- **Dust Suppression:** Water tankers will be used to sprinkle water on all bare lands and roads to suppress dust effectively.
- **Vehicle Speed Limit:** A strict speed limit of 10–20 km/hr will be enforced for all vehicles operating within the plant premises to further minimize dust kick-up and emissions.

10.5 DECARBONISATION PROGRAMME

Cognizant of our nation's commitment and the sectoral requirements, SCL is striving to decarbonize its operations by improving resource efficiency and by setting carbon intensive targets. SCL aims to make processes across its value chain more sustainable and is diligently working to achieve sectoral roadmap for 'Net Zero Concrete' by 2050.

SCL is meeting around 56% of power requirement through green energy sources. With the new investment in renewable energy, company aim to enhance the share of green energy in total power consumption significantly. This will facilitate in raising the green power footprint as part of sustainability goals and help meeting GHG emission reduction targets.

10.5.1 Action Plan to Reduce its Carbon Intensity

SCL aims to enhance the **Alternative Fuel Rate (AFR)** progressively within upcoming years and have imported technology from Denmark and Italy to enhance the same. By using AFR, it is envisaged that the CO₂ emission will be reduced by further 8 kg/MT Clinker.

SCL is in process to explore feasibility of another sustainable alternative to OPC i.e., **Limestone Calcined Clay Cement (LC3)**. LC3 cement can help reduce up to 40% CO₂ emission as compared to OPC and contribute towards sustainable growth.

SCL is evaluating emerging technologies in area of product chemistry, energy storage, new forms of energy and capture technologies.

10.5.2 Glasgow COP26 Climate Submit

Action Plan of SCL to achieve Five Commitments announced by Hon'ble Prime Minister of India during COP 26 Climate Change Summit at Glasgow :

Commitment-1 : By 2030, India will bring its non - fossil energy capacity to 500 GW.

Implementation Status : As a part of Renewable Energy, SCL enhanced its green power generation capacity from 263.1 MW in FY 21-22 to 581.94 MW in FY 24-25 (including Waste Heat Recovery System, Wind and Solar). Out of 581.94 MW, 56.30 MW is from Wind Energy, 283.14 MW from Solar Energy and remaining 242.50 MW energy from WHRS.

Commitment-2 : By 2030, India will fulfil 50 percent of its energy requirements with renewable energy.

Implementation status : Presently, SCL is meeting around 56% of power requirement through green energy sources. With the new investment in renewable energy, company aim to enhance the share of green energy in total power consumption significantly. This will facilitate in raising the green footprint as part of sustainability goals.

Commitment-3 : India will reduce one billion tonnes of the total projected carbon emission between now and 2030.

Commitment-4 : By 2030, India will bring its economy's carbon intensity down to 45%.

Implementation Status : SCL has GHG emission reduction targets - validated by the Science-Based Targets initiative (SBTi). Company aims to reduce **Scope-1 GHG intensity by 12.7% by 2030** from the base year 2019. Committed to reduce **Scope-2 GHG intensity by 27.1% by 2030** from the base year of 2019.

Commitment-5 : India will achieve the targets of net zero emission by 2070.

Implementation Status : SCL strives to follow sectoral roadmap to achieve net zero concrete by 2050.

Table :10.1: EMP Budget

Sr. No.	Particulars	Capital Cost (Rs. Lakhs)	Recurring Cost (Rs. Lakhs)
1	Pollution Control during construction stage (Dust suppression, Wastewater treatment and Disposal, Roads, Monitoring, Muck disposal)	50.00	5.00
2	Air Pollution Control	1840.00	218.00
3	Water Pollution Control	38.00	19.50
4	Noise Pollution Control	20.00	3.50
5	Environmental Monitoring	308.00	29.00
6	Hazardous Waste Storage & Handling	5.00	5.00
7	Occupational Health & Safety	50.00	5.00
8	Greenbelt and plantation	41.35	15.00
9	Total	2352.00	300.00

Additional Budget of 65 lakhs has also been proposed for wildlife conservation initiative, the same has been detailed out in the annexure “wildlife conservation plan” annexed along with the EIA/EMP Report.

10.6 CONCLUSION

In addition to offering direct employment, the Integrated Cement Plant is expected to create a substantial number of indirect job opportunities in the area for contractors, shopkeepers, agents, stockists, and individuals in transportation and workshop services. The local economy will be significantly boosted by the spending power of employees and the demand for services generated by the company. This economic growth is anticipated to increase the buying power of residents, leading to a higher standard of living, including better access to education, improved health and sanitation facilities, and housing. This is considered a major positive outcome that will contribute to the sustainable development of the entire region.

11.0 PROJECT DESCRIPTION

11.1 Introduction

Shree Cement Limited (SCL) is a public limited company incorporated under the provisions of the Companies Act, 1956 on 25th October 1979. The company operates cement and clinker manufacturing units located at Beawar, Ras, and Nawalgarh in Rajasthan; Balodabazar–Bhatapara in Chhattisgarh; Sedam in Karnataka; Guntur in Andhra Pradesh; and Ras Al Khaimah (RAK) in the United Arab Emirates (UAE). SCL also operates twelve split grinding units located at Khushkhera, Suratgarh, and Jobner in Rajasthan; Roorkee in Uttarakhand; Aurangabad in Bihar; Bulandshahar and Etah in Uttar Pradesh; Panipat in Haryana; Hansda in Jharkhand; Cuttack in Odisha; Patas in Maharashtra; and Purulia in West Bengal. At present, the installed cement production capacity of the SCL Group is 62.8 million tonnes per annum (MTPA). The company has a total power generation capacity of 1084.94 MW, comprising 503.0 MW thermal power, 242.50 MW waste heat recovery system (WHRS), 283.14 MW solar power, and 56.3 MW wind power.

11.1.1 Identification of the Project

The Proposed Integrated Cement Plant with production capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd.

11.2 SITE SELECTION FOR THE PROJECT

The proposed project site is located in East Jaintia Hills district, Meghalaya. The Nurpuh Wildlife Sanctuary lies at an approximate distance of 28.13 km in the south-southwest (SSW) direction from the site, indicating no direct impact on any notified eco-sensitive area.

There are no Archaeological Sites or Wetland Reserves within a 10 km radius of the project location. The international border with Bangladesh is situated at approximately 37 km from the site.

The nearest human settlement is Village Daistong, located about 0.82 km in the east-southeast (ESE) direction.

Overall, the selected site does not fall within any environmentally or archaeologically sensitive zone and is suitable for the proposed development from a locational sensitivity perspective.

11.3 BRIEF DESCRIPTION OF THE PROJECT

For the brief description of the project the below mentioned table may be referred.

Table: 11.1: Brief Description of Nature, Size and Location of the Project

S. No.	Particulars	Details	
1.	Type of Project	Greenfield Project	
2.	Name of Unit	Integrated Cement Plant (A Unit of Shree Cement Limited)	
3.	Size & Configuration of Project	✓ Clinker: 0.95 million TPA ✓ Cement: 0.99 million TPA (OPC, PPC, PSC, Composite Cement, RHPC & SRC) ✓ CPP: 15 MW ✓ WHRS: 7 MW ✓ DG Sets: 2500 KVA (1 x 2500 KVA or 2 x 1000 KVA & 1 x 500 KVA or 1 x 1000 KVA, 2 x 500 KVA & 2 x 250 KVA) ✓ Project Site Area: 25.08 ha (61.95 Acres)	
4.	Location		
	Villages	Daistong	
	Elaka	Elaka – Nongkhlieh Dolloiship	
	District	East Jaintia Hills	
	State	Meghalaya	
5.	Geographical extents of project site	Latitude	Longitude
		25°21'01.823"N to 25°20'59.918"N	92°33' 27.501"E to 92°33'27.104"E
	Toposheet No.	Core & Buffer Zone: 83C/11 & 83C/7	
6.	Project Details		
	Capital Cost of the project	Rs. 1264 Crores	
	Cost for Environmental Protection measures	• Capital Cost: Rs. 23.5 Crores • Recurring Cost: Rs. 0.30 Crores/annum	
7.	Project Basic Requirement		

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

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S. No.	Particulars	Details	
	Area	Total Plant Area	25.08 ha (61.95 Acres)
		Greenbelt Development & Plantation	Approx. 8.27 ha (20.44 Acre) (~33% of total plant area)
	Water Requirement (KLD)	600 KLD (Including Fresh Water Requirement: 515 KLD & Recycled Water from STP & RO Rejects: 85 KLD). <i>Source: Water requirement will be fulfilled by the ground water and nearby surface water bodies with prior statutory permission from the concerned State government.</i>	
	Power Requirement (MW)	Total Power Requirement: 18 MW ❖ Energy consumption per ton of Clinker: 50-55 Kwh - Energy consumption per ton for Cement Grinding: OPC, PPC, RHPC & SRC Cement: 30 to 35Kwh, - PSC Cement: 28 to 51 Kwh, - Composite Cement: 28 to 36 Kwh - Thermal Energy consumption of Clinker: 670 Kcal/Kg - Source: Proposed Captive Power Plant, WHRS and State Grid Power Supply & DG sets (for back up)	
8.	Manpower Requirement		
	Implementation (Construction) Phase	Permanent: 100 Nos.	
		Contractual: 500 Nos.	
	Operation Phase	Permanent: 150 Nos.	
Contractual: 300 Nos.			
9.	Project Site Vicinity Details		
	Nearest Village	Village Daistong (~1.43 km in ESE direction)	
	Nearest Major Town City	Mutong (~5.51 km in ESE direction)	
	Nearest National /State Highway	NH- 6 (~18.93 km in SW direction)	
	Nearest Railway Station	Ditokcherra Railway station (~36.90 km in SE direction)	
	Nearest Airport	Silchar Airport (~63.35 km in SE direction)	

S. No.	Particulars	Details
		Guwahati Airport (~128.21 km in NW direction)
	Nearby Water Bodies	River (Wah Chyrmit) about 4.48 NW Direction. Pal Lam Kankalang River about 8.50 NE Direction
	National Park, Wildlife Sanctuary, Tiger/ Elephant Reserve, Eco-Sensitive Zone etc.	No National Park, Wildlife Sanctuary, Tiger/ Elephant Reserve, exist within 10 km radius study area.
	Reserved/ Protected Forest within 10 km radius	No Reserved/ Protected Forest within 10 km Study area. Except Saipung Reserved Forest (~6.35 in SE direction)
	CPA/SPA/OPA within study area	There is no CPA/SPA within 10 km radius study area.
	Archaeological site	None within 10 km radius
	Seismic Zone	Zone - V as per IS: 1893 (Part-I): 2002

11.4 MAJOR REQUIREMENTS FOR THE PROJECT

11.4.1 Raw Material Requirement:

Major raw material required for Clinker & Cement production is Limestone, Iron Ore, Bauxite, Gypsum (Mineral, Synthetic, Chemical & Imported), Fly ash and Slag. **Details regarding quantity of raw materials required their source along with distance and mode of transportation are given in Table 11.2 (a & b):**

Table: 11.2(a)

S. No.	Name of Raw Material	Basis	Quantity (Million TPA)	Source	Mode of Transport.
1.	Limestone	1.5 T/T of Clinker	1.43	Captive Mine	~ 0.1 km; Combination of Two or three modes.
2.	Iron Ore (Laterite)	0.015 T/ T of Clinker	0.014	Nearby Area	~60 km; Combination of Two or three modes.

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

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S. No.	Name of Raw Material	Basis	Quantity (Million TPA)	Source	Mode of Transport.
3.	Bauxite	0.044 T/ T of Clinker	0.042	Nearby Area	Combination of Two or three modes.
4.	Gypsum	0.07 T / T of Cement	0.06	Bhutan Imported	~60 km; Combination of Two or three modes.
5.	Fly ash	0.35 T/T of Cement	0.34	Nearby Area	Combination of Two or three modes.
6.	Slag	0.55 T/T of Cement	0.54	Nearby Area	Combination of Two or three modes.
7.	Dolochar		0.095	Nearby Spong Iron Plant	~60 km; Combination of Two or three modes.
8.	Petcock as feed Stock		0.095	--	~60 km; Combination of Two or three modes.
9.	Biomass		0.56	Nearby Agriculture Field	~60 km; Combination of Two or three modes.

Table: 11.2 (b)

Requirement (in Million TPA) for Cement (OPC/PPC/Composite Cement/PSC/RHPC/LC3/SRC) Production						
S. No.	Raw Material	OPC / RHPC/ SRC	PPC	PSC	LC3	Composite Cement
1.	Clinker	0.92	0.57	0.38	0.50	0.38
2.	Gypsum	0.07	0.07	0.07	0.07	0.07
3.	Fly ash	0.00	0.35	0.00	-	0.35
4.	Slag	0.00	0.00	0.00	-	-
5.	Calcined Clay	-	-	-	0.33	-
6.	Limestone	-	-	-	0.10	-
	Total Capacity (MTPA)**	0.99	0.99	0.99	0.99	0.99

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

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Note:

**Clinker will also be sent to the sister grinding units, market sale and will also be received from outside (Other SCL Plants), if Clinkerization plant is not in operation or in case of shortfall of Clinker.*

*** Cement production will be 0.99 million TPA only either from various options as OPC/RHPC/SRC/LC3/PPC /PSC/Composite Cement.*

11.4.2 Fuel Requirement

Fuel / Feed stock Requirement

Details regarding quantity of Fuel/Feed Stock required, their source along with distance and mode of transportation for proposed Integrated Cement Plant is given in Table - 2.9

Table: 11.3 Fuel Requirement for Proposed Integrated Cement plant

S. No.	Name of Feed Stock	Quantity (Million TPA)	Source	Calorific Value (Kcal/kg)	Ash (in %)	Sulphur (in %)	Distance & Mode of Transportation
For Cement Plant							
1.	Indian & Imported Coal	0.36	<i>Indigenous Coal:</i> Nearby Coal Mines	4200-4800	30-35	0.4-0.5	Local Area ~20 to 200 km by Road
			<i>Imported Coal:</i> USA, South Africa, Australia and Indonesia through Calcutta Port / Calcutta or Paradeep or Vizag etc.	5000-5800	6-10	0.5-0.6	Calcutta Port / Calcutta or Paradeep or Vizag – ~650 km by Road.
2.	Petcoke as feed stock	0.24	Petcoke USA / Saudi Arabia / Turkey / Canada through Calcutta	7800 - 8300	0.5-2	6-9	Calcutta Port / Calcutta or Paradeep or Vizag – ~650 km by Road.

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

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S. No.	Name of Feed Stock	Quantity (Million TPA)	Source	Calorific Value (Kcal/kg)	Ash (in %)	Sulphur (in %)	Distance & Mode of Transportation
			Port / Calcutta or Paradeep or Vizag etc.				
3.	Dolochar	0.24	Nearby Sponge Iron Plant	2500-2700	68.18	0.32	~100 to 300 km by Road
4.	Biomass	0.30	Nearby Agriculture Fields	2300-2500	5- 29	0.15 - 0.22	~100 km by Road
For Captive Power Plant							
1	100% Indian Coal	0.225	Indigenous Coal: Nearby Coal Mines	4200-4800	30-35	0.4-0.5	Local Area ~20 to 200 km by Road
2	100% Imported Coal	0.12	USA, South Africa, Australia and Indonesia through Calcutta Port / Calcutta or Paradeep or Vizag Port etc.	5000-5800	6-10	0.5-0.6	Calcutta Port / Calcutta or Paradeep or Vizag ~650 km by Road
3	Biomass	0.26	Nearby Agriculture fields	2300-2500	5- 29	0.15 - 0.22	~100 km by Road

11.4.3 Other Basic Requirements:

Total water requirement for proposed project will be 600 KLD; which will be sourced from Water from Dihang River/ Ground water/ Mine Pit water based on the availability.

Table: 11.4: Water Requirement

Descriptions / Particulars	Total Water Requirement	Remarks

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

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S. No.		(KLD)		
		Fresh Water (KLD)	Recycled Water (RO Reject/ Domestic waste) (KLD)	
A.	Cement Plant Process Requirements			
	Cement Mill Spray	120		70 KLD
	Cooling Water	60		Cooling water blow down & RO Reject Water will be used in Mill Spray, Stackers & Recamier.
	Stackers & Reclaimer	10		
	Raw Mill Section	10		
	Coal Mill	5		
B.	WHRS	40	15	
C.	CPP	160	50	
D.	Drinking & Domestic requirement for Plant	25	05	Sewage water will be treated in STP & 15 KLD treated STP water will be used for greenbelt & plantation development
E.	Plantation & Greenbelt Requirement	85	15	
Grand Total (A + B + C + D + E)		515	85	515 KLD Raw Water + 86 KLD Recycled water (from STP Treated, Blowdown & RO Reject)

Note: Total Water Requirement 600 KLD {including Fresh requirement 515 KLD & Recycled water from STP & RO rejects 85 KLD}.

Power Requirement for the plant will be 18 MW; which will be sourced from proposed Captive Thermal Power Plant (15 MW) & Waste Heat Recovery System (7 MW), State Grid and DG Sets (for emergency backup).

11.5 PROCESS DESCRIPTION:

The manufacturing of cement will be based on dry process technology and essentially consist of the following unit operation steps:

- Crushing of limestone at the mine site.
- Pre-blending of crushed limestone by Stacker & Reclaimer.
- Grinding-cum-Drying of Raw Materials and Coal/ Petcoke/ Dolochar/ Biomass in VRM
- Homogenization of raw meal in a blending silo.
- Clinkerization of the raw meal in a rotary kiln with preheater, calciner and Cooler.
- Grinding, storage and packing of cement
- Transportation of Clinker & Cement through Road Rail Networks

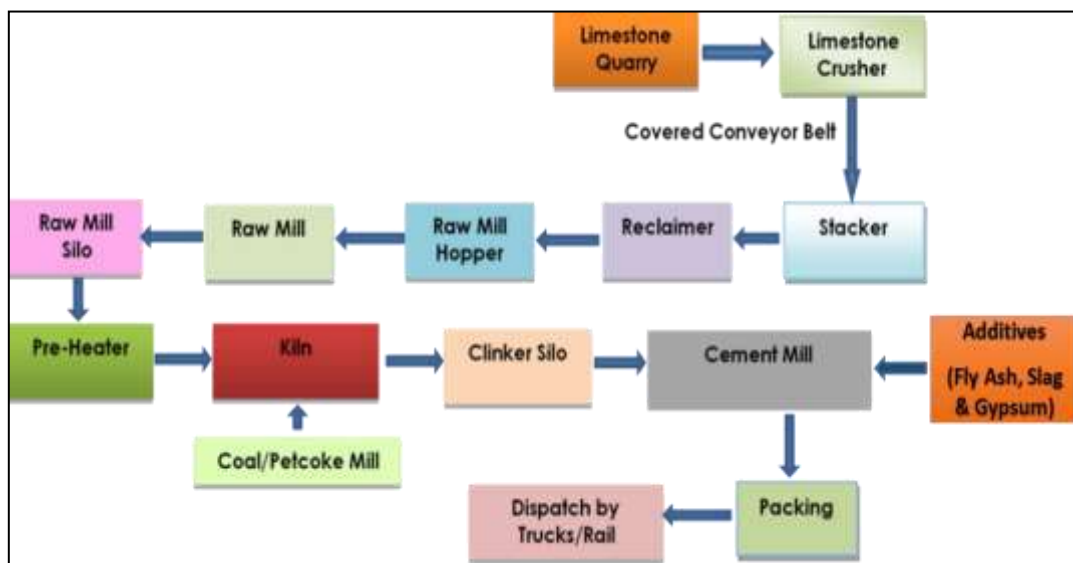


Figure :11.1

Technology Description of Cement Plant

- ✓ Limestone Crushing: ROM limestone is processed through a wobbler and crusher to achieve <90 mm size, then sent for stacking and pre-blending.
- ✓ Pre-Blending: Crushed limestone is homogenized using stacker and reclaimer systems.
- ✓ Raw Material & Fuel Grinding (VRM): Limestone with corrective materials is ground and dried in VRM using preheater hot air. Coal/petcoke is crushed in a roll crusher and ground in a ball mill/VRM. Alternative fuels such as hazardous waste, dolochar, and biomass may be used.

- ✓ Raw Meal Homogenization: Ground material is stored and blended in continuous blending silos.
- ✓ Clinkerization: Preheater and calciner ensure efficient heat transfer and partial calcination. Final clinker formation occurs in the kiln's burning zone.
- ✓ Clinker Cooling: Hot clinker (~1000°C) is cooled in a grate cooler and transported to storage silos.
- ✓ Cement Grinding & Packing: Clinker is ground in the cement mill using hot air from HAG (coal/dolochar/biomass). Final cement is stored in silos and packed via electronic rotary packers.
- ✓ Transport: Cement and clinker are dispatched mainly by road via NH-6.
- ✓ NO_x Reduction (SCR): Low-NO_x burners, calciner modifications, controlled reducing atmosphere, and combustion optimization minimize NO_x generation through in-system reactions.
- ✓ Alternative Fuel Co-Processing: Hazardous/non-hazardous waste is co-processed at ~1400°C, reducing coal dependency and eliminating residues. AFR system includes ground and feed hoppers, hoists/elevators, conveyors, double-flap valves, and safety shut gates.

11.6 Description of Environment.

The Baseline was conducted during summer season **(March to May 2025)**.

11.6.1 Air Environment

Baseline ambient air quality was monitored at eight locations within the 10 km study area during March 2025 to May 2025. PM₁₀ concentrations ranged from 32.48–63.21 µg/m³ (98th percentile: 60.31–62.81 µg/m³), while PM_{2.5} levels ranged from 14.65–34.56 µg/m³ (98th percentile: 30.38–34.42 µg/m³). Gaseous pollutants were low, with SO₂ between 2.29–4.92 µg/m³ and NO₂ between 3.11–5.98 µg/m³, all well below NAAQS limits.

Variations in particulate matter were influenced by rural traffic, domestic fuel burning, and scattered mining activity. Overall, the region maintained good air quality throughout the baseline period.

11.6.2 Water Environment

Groundwater Quality

Groundwater samples collected during March–May 2025 from Saipung PHC, St. Joseph's Church (Khahnar), Tangnub Presbyterian Church (Lumpdeng), and Shnongrim playground showed slightly acidic pH (5.32–5.90). Other parameters were within IS 10500:

- Chlorides: 34.2–38.2 mg/L
- Sulphate: 18.2–25.2 mg/L
- Nitrate: 8.1–9.8 mg/L

- Calcium: 42.5–48.2 mg/L
- Magnesium: 8.4–9.2 mg/L
- Iron: <0.05 mg/L

Groundwater is suitable for livestock use but often unsuitable for direct human consumption due to acidity. The proposed project is designed as a zero-discharge system, ensuring no impact on local water bodies. SCL will support the community by implementing desalination-based potable water supply measures under the EMP/SEDP.

11.6.3 Surface Water Quality

Surface water sampled during the baseline period showed:

- pH: 5.4–5.8
- DO: 6.8–7.6 mg/L
- BOD: 4.2–4.8 mg/L
- Chlorides: 18.12–20.30 mg/L
- Sulphates: 24.40–24.70 mg/L
- Total Coliform: 44–46 MPN/100 ml

Most parameters comply with CPCB Category A standards, indicating suitability as a drinking water source after treatment.

11.6.4 Noise Environment

Noise monitoring conducted in March–May 2025 across five stations recorded day-time levels between 48.50–52.90 dB(A) and night-time levels between 38.10–42.60 dB(A). All values comply with CPCB standards for residential and silence zones.

Background noise stems from local traffic, community activities, and natural surroundings, reflecting a calm acoustic environment.

11.6.4 Soil Environment

Soil sampling during the baseline period revealed consistent texture—sandy-loam to loamy-clay—with good nutrient content:

- pH: 7.11–7.40

- Organic Carbon: 0.86–1.20%
- Phosphorus: 54.32–66.01 kg/ha
- Potassium: 162.9–215.58 kg/ha
- Magnesium: 472.33–809.51 mg/kg
- Calcium: 3508.9–3952.7 mg/kg

Soils are nutrient-rich and suitable for vegetation. Slight alkalinity is natural to the region. SCL will implement soil conservation and greenbelt measures as part of the EMP.

11.6.5 Ecology & Biodiversity (EB)

Ecological surveys conducted during March–May 2025 show that the study area comprises agricultural land, scrub, grasslands, and forest patches. No protected areas or eco-sensitive zones exist within 10 km. Species recorded are common and non-threatened.

Ecological Impact & Mitigation

Potential biodiversity impacts from the integrated cement and thermal power project include habitat disturbance, dust deposition, and noise. Mitigation includes:

- Wildlife Conservation Plan (WLCP)
- 33% native-species greenbelt
- Advanced pollution control systems (ESP, Bag Filters, FGD, Low-NOx)
- Noise barriers and wildlife-safe infrastructure
- Fly ash management, soil protection, and ZLD
- Continuous ecological monitoring and annual reporting

11.6.6 Socio-Economic Environment

Socio-economic surveys undertaken during March–May 2025 indicate rural livelihoods supported by agriculture, small-scale trade, and labor work. The area has basic infrastructure such as schools, health centers, and road networks.

The project is expected to generate local employment, enhance skills, support community development, and improve infrastructure through CSR/SEDP initiatives.

11.7 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

11.7.1 CONSTRUCTION PHASE IMPACTS & MITIGATION

Table:11.5: Land Use & Physical Environment – Construction Phase

Aspect	Impact During Construction	Significance	Mitigation Measures
Topography	Minor disturbance due to site clearance and levelling	Low	Maintain natural contours; restrict excavation
Land Use	Temporary loss of agricultural activity within project site	Medium	Reuse topsoil; restore green areas post-construction
Soil	Soil disturbance, compaction, erosion	Low– Medium	Controlled excavation; soil reuse; temporary bunds
Hydrology	No direct impact (no water body within site boundary)	Insignificant	Protect southwest waterbody zone; maintain buffer
Dust (PM)	Significant temporary dust from earthwork, vehicle movement	Medium	Water sprinkling; covering stockpiles; speed control
Vehicle Emissions	Temporary rise in NO _x , SO ₂ , CO, PM from machinery	Low	Use PUC-certified vehicles; equipment maintenance
Noise	Noise due to construction machinery & vehicles	Low– Medium	Use silencers; restrict nighttime work; PPE for workers

Table 11.6: Air Quality – Construction Phase

Source	Impact	Duration/Extent	Mitigation
Earthwork, Excavation	High fugitive dust (PM)	Short-term, Localized	Water sprinkling; phased excavation
Material Movement	Dust release from loading/unloading	Short-term	Covered trucks; avoid overloading
Vehicle Exhaust	Increase in NO _x , SO ₂ , CO, HC	Short-term	PUC vehicles; regular servicing
Stockpiles	Wind-blown dust	Local	Cover stockpiles; stabilize heights

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

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Source	Impact	Duration/Extent	Mitigation
Construction Debris Handling	Dust and particulate release	Local	Covered disposal; designated waste areas

11.7.2 OPERATION PHASE IMPACTS & MITIGATION

Table:11.6: Land Use & Physical Environment – Operation Phase

Aspect	Impact During Operation	Significance	Mitigation Measures
Land Use	Permanent shift from agriculture to industrial use	Minor–Moderate	Job creation; CSR livelihood support
Topography	No further alteration expected	Insignificant	Maintain contour integrity
Hydrology	No discharge—Zero Liquid Discharge (ZLD) system	Insignificant	Continuous monitoring; stormwater management
Traffic	Increased raw material & product transportation	Moderate	Road safety plan; speed limits; paved roads
Noise	Increased noise from mills, fans, transport	Low–Medium	Acoustic enclosures; greenbelt; PPE
Air Pollution (Fugitive)	Dust from material handling, storage, transfer	Moderate	Bag filters; enclosed conveyors; paved roads
Air Pollution (Stack)	PM, SO ₂ , NO _x , CO emissions from kiln/CPP	Moderate	ESP, Bag House, Low-NO _x burners, lime dosing

Table: 11.7: Air Quality – Operation Phase

Fugitive Emissions

Source	Impact	Extent/Duration	Mitigation
Raw Material Handling	PM dispersion	Local, Continuous	Bag filters; enclosed conveyors
Crushing (Limestone/Coal)	Dust and PM	Local, Continuous	Dust extraction system; APC equipment

Integrated Cement Plant with capacity of clinker: 0.95 million TPA, Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, LC3, RHPC & Composite Cement) CPP: 15 MW, WHRS: 7 MW) and DG Sets 2500 KVA (1x2500 KVA or 2X1000 KVA & 1X500 KVA or 1x1000 KVA, 2x500 KVA & 2x250KVA) in Khara Siang Lum Pyrshin in Daistong village, District of East Jaintia Hills (Meghalaya) by Shree Cement Ltd

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Source	Impact	Extent/Duration	Mitigation
Clinker & Cement Grinding	Process dust	Local	High-efficiency Bag House
Packing & Dispatch	Fugitive PM	Local	Dust collectors; spill recovery
Vehicular Movement	Dust + NO _x , SO ₂	Plant premises	Paved roads; speed control (10–20 km/h)

Table: 11.8: Stack Emissions

Source	Pollutants	Impact	Mitigation
Kiln/Calcliner	PM, SO ₂ , NO _x , CO	Increase in regional air load	ESP/Bag House; Low-NO _x burners; De-NO _x system
Cement Mill	PM	Local air deterioration	Bag House; enclosed systems
CPP Boiler	PM, SO ₂ , NO _x	Air quality deterioration	ESP; lime dosing; Low-NO _x burners
Co-processing	Dioxins & Furans	Minor trace-level emissions	High-temp combustion; strict emission monitoring

11.7.3 SUMMARY OF IMPACT DIFFERENTIATION

Table: 11.9: Construction Phase vs. Operation Phase – Comparison

Environmental Component	Construction Phase	Operation Phase
Land Use	Temporary disturbance	Permanent agricultural-to-industrial conversion
Topography	Minor contour modification	No further change
Air Quality	Short-term dust (PM) and vehicle exhaust	Continuous stack emissions + fugitive dust
Water Environment	No discharge; risk only from spills	ZLD; no outside impact
Noise	Machinery and vehicle noise	Industrial noise from mills, fans, transport

Environmental Component	Construction Phase	Operation Phase
Soil Quality	Limited disturbance	Possible deposition of dust; controlled by greenbelt
Ecology	Temporary disturbance from construction	Long-term habitat alteration; greenbelt mitigation
Socio-economic	Temporary jobs	Long-term employment; CSR/SEDP benefits

The financial viability of the project is assessed by examining the following key areas:

- **Investment and Operational Costs:** This includes a detailed estimation of the total investment cost, which incorporates the Environment Management Plan, as well as the projected costs for operation and maintenance.
- **Cost-Benefit Analysis:** The assessment provides crucial financial statements, such as the Profit and Loss Statement, Projected Cash Flow Statement, and Balance Sheet, to analyze the project's profitability.
- **Key Financial Indicators:** The financial viability is measured through standard indicators, including the Internal Rates of Return on both investment and equity, the Break-Even Point, and the project's Payback Period.
- **Sensitivity Analysis:** The study concludes with an analysis of how the Break-Even Point would be affected by various changes or potential variables.

11.8 ENVIRONMENTAL MONITORING PROGRAMME

Details of the environmental monitoring schedule / frequency, which will be undertaken for various environmental components, as per conditions EC/CTE/CTO are given in the Table – 11.11

Table: 11.10 Post Project Monitoring

S. No.	Description	Frequency of Monitoring	Location
1.	Meteorological Data	Continuous	Plant Site

2.	Ambient Air Quality	Twice a Week & Continuous Online Monitoring	Near to the entrance Gate of Plant Site and towards the Villages in upwind & downwind direction from the plant site, as per the max. GLC obtained and as per EC / CTO conditions.
3.	Fugitive Emission	Quarterly or as per EC/CTO	Cement Mill, Packing Plant, Raw Materials Handling Area & Coal Yard
4.	Stack Emission Monitoring	Continuous Online Monitoring	Raw Mill & Kiln, Coal/Petcoke Mill, Clinker Cooler, Cement Mill and CPP Boiler
5.	Water Quality	Twice in a year / As per NOC from GWCA	Nearby Ground water sources and as per CTO conditions.
6.	Waste Water Monitoring (STP Outlet)	Monthly & as per CTO	Sewage Treatment Plant as per CTO.
7.	Water Level	Every Season/ As per NOC from CGWA	Nearby Ground water sources and as per CTO Conditions
8.	Noise Level Monitoring		
(i)	Ambient Noise Monitoring	Monthly & as per EC / CTO	Near to the entrance Gate of Plant Site, Health Centre
9.	Medical Checkup of Employee	Yearly or as per Factories Act	Health Centre /Dispensary
10.	Performance evaluation of APCE's / Adequacy Study	Six Monthly	Raw Mill / Kiln Bag house, Coal Mill Bag House, Cement Mill Bag House, Clinker Cooler ESP and CPP ESP.

11.9 ADDITIONAL STUDIES:

Additional Studies conducted in relation to Risk Assessment and Disaster Management Plan as per ToR points issued by SEIAA, Meghalaya vide File No. ML/SEAC/SEIAA/PP/EJH/126/2025 and ToR identification No. TO25B1101ML5999209N, dated 15th Oct 2025.

11.10 PROJECT BENEFITS

The proposed project will play a significant role in meeting the rising demand for cement and will contribute positively to the economic growth of the region as well as the country. Shree Cement Ltd. is committed to actively supporting

socio-economic development in the villages surrounding the plant site. Key focus areas will include improvement of physical infrastructure, promotion of education, enhancement of health and family welfare services, development of community facilities, and support for cultural and social initiatives.

A comprehensive Social and Economic Development Plan (SEDP) has been prepared to address local needs, including the issues, concerns, and suggestions raised during the Public Hearing and the requirements identified in the Social Impact Assessment (SIA). The implementation of these measures will contribute significantly to improving the quality of life and ensuring sustainable development of the surrounding communities.

11.11 ENVIRONMENTAL MANAGEMENT PLAN

11.11.1 Environmental Management Plan (Executive Summary – Concise Version)

The Environmental Management Plan (EMP) outlines the key measures to prevent, minimize, and manage environmental impacts during construction and operation of the proposed Integrated Cement Plant. The plan complies with all applicable environmental laws, CPCB guidelines, and industry best practices.

Key Focus Areas of EMP

- Air quality management
- Noise control
- Wastewater & stormwater management
- Solid & hazardous waste management
- Energy and resource conservation
- Rainwater harvesting & maximum reuse of treated water

- Greenbelt development
- Occupational health & safety
- Socio-economic development
- Budget allocation for all environmental safeguards

11.11.2 EMP Objectives

- Keep emissions and waste within statutory limits
- Ensure efficient use of water and energy
- Maintain safe working and environmental conditions
- Strengthen disaster preparedness and risk reduction
- Monitor environmental performance for continual improvement
- Enhance ecological buffer through plantation and greenbelt

11.11.3 EMP Budgetary Provisions

The EMP ensures that environmental impacts from construction and operation are effectively controlled through strong mitigation, monitoring, and institutional mechanisms. The project will also generate substantial direct and indirect employment, improve local infrastructure, and support socio-economic development—enhancing overall sustainability in the region.

Table: 11.11 EMP Details.

Sr. No.	Particulars	Capital Cost (Rs. Lakhs)	Recurring Cost (Rs. Lakhs/Year)
1	Pollution Control during Construction Stage (Dust suppression, wastewater treatment & disposal, roads, monitoring, muck disposal)	50.00	5.00
2	Air Pollution Control	1840.00	218.00
3	Water Pollution Control	38.00	19.50
4	Noise Pollution Control	20.00	3.50
5	Environmental Monitoring	308.00	29.00
6	Hazardous Waste Storage & Handling	5.00	5.00
7	Occupational Health & Safety	50.00	5.00

Sr. No.	Particulars	Capital Cost (Rs. Lakhs)	Recurring Cost (Rs. Lakhs/Year)
8	Greenbelt Development & Plantation	41.35	15.00
Total	—	2352.00	300.00

Additional Budget of 65 lakhs has also been proposed for wildlife conservation initiative, the same has been detailed out in the annexure “wildlife conservation plan” annexed along with the EIA/EMP Report.

11.12 OCCUPATIONAL HEALTH HAZARD:

Shree Cement Ltd. will implement a comprehensive Safety, Health and Environment (SHE) Policy to control and minimize workplace risks. The key objectives are to prevent hazards, ensure a safe working environment, and safeguard the health of all employees. A dedicated budget of Rs. 50 Lakhs (capital) and Rs. 5 Lakhs (annual recurring) has been allocated for the first three years to establish and maintain robust occupational health and safety systems.

11.13 CONCLUSION

The proposed project will generate significant socio-economic benefits for the surrounding communities through improved infrastructure, enhanced education and healthcare services, and increased employment opportunities. It will also contribute to government revenue through taxes and duties.

Environmental impacts are expected to remain within permissible limits due to the adoption of effective pollution control measures and continuous monitoring. Extensive greenbelt development around and within the plant will further mitigate emissions and enhance the local environment. Overall, the project is anticipated to support sustainable regional development while maintaining strong environmental safeguards.

12.0 DISCLOSURE OF CONSULTANT ENGAGED:

This Environmental Impact Assessment (EIA) study and supporting documents have been prepared by P&M Solutions, an experienced and accredited environmental consultancy organization with demonstrated expertise in environmental impact assessment, regulatory compliance, and sustainability advisory services. The consultant has been engaged by Shree Cement Limited for conducting the EIA/EMP study for the proposed:

“Integrated Cement Plant with capacity of Clinker: 0.95 million TPA; Cement: 0.99 million TPA (OPC, PPC, PSC, SRC, RHPC & Composite Cement); Captive Power Plant (CPP): 15 MW; Waste Heat Recovery System (WHRS): 7 MW; and DG Sets of 2500 KVA (1×2500 KVA or 2×1000 KVA & 1×500 KVA OR 1×1000 KVA, 2×500 KVA & 2×250 KVA), located at Khara Siang Lum Pyrshin, Daistong Village, East Jaintia Hills District, Meghalaya.”

The consultancy team has executed the study with complete professional independence and technical impartiality. All assessments—including baseline environmental monitoring, impact prediction, and formulation of the Environmental Management Plan (EMP)—have been carried out in accordance with prescribed regulatory guidelines, standard scientific methodologies, and authenticated data sources.

The consultant has no commercial interest in the project other than the professional services rendered and has prepared this report objectively to facilitate informed decision-making by regulatory authorities, stakeholders, and the project proponent.

12.1 Declaration by the EIA Coordinator (EC) and FAE involved contributing to the preparation of EIA.

12.1.1 Declaration by the EIA Coordinator:

I, the EIA Coordinator for this project, hereby declare that I have supervised, reviewed, and coordinated the overall preparation of this Environmental Impact Assessment (EIA) report. The compilation, analysis, and integration of inputs from all Functional Area Experts (FAEs) have been carried out under my direct guidance in accordance with applicable environmental regulations, prescribed procedures, and accredited methodologies.

I further confirm that:

- The information, assessments, and conclusions presented in the EIA report are accurate to the best of my knowledge and based on verified data.

- The report has been prepared objectively, with professional integrity, and without any conflict of interest with the project proponent.
- All functional area contributions have been checked for consistency, correctness, and compliance with relevant guidelines.

This declaration is made in fulfilment of my responsibilities as an accredited EIA Coordinator for ensuring the quality, completeness, and scientific validity of the EIA report.

Name of EIA Coordinator Concerned	Mr. Mohan Bhagwat
Signature of the EIA Coordinator	
Period of Involvement	1st February 2025 till date
Name of ACO	P&M Solutions Add. C-88, Sector-65, Noida 201301, Uttar Pradesh.
Mobile No.	+91 9953843815

12.1.2 DECLARATION BY THE FAE'S INVOLVED:

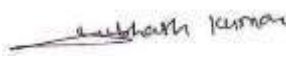
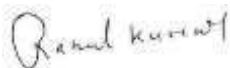
We, the Functional Area Experts (FAEs) duly approved/recognized for our respective environmental disciplines, hereby declare that we have independently contributed to the preparation of this Environmental Impact Assessment (EIA) report. Our inputs—including data interpretation, field assessment, impact evaluation, and preparation of the respective functional area sections—are based on our professional expertise, accredited qualifications, and adherence to standard scientific and regulatory methodologies.

We further affirm that:

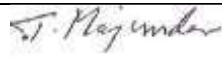
- Our assessments are accurate and true to the best of our professional knowledge.
- The work has been carried out objectively, without bias, and in compliance with relevant guidelines and procedures.
- We have no conflict of interest with the project proponent and have maintained full professional integrity throughout the study.

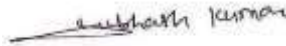
This declaration is made in accordance with the responsibilities and ethical standards expected of FAEs contributing to the EIA process.

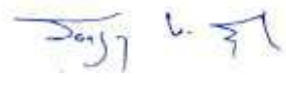
Functional Area Expert

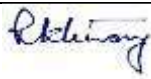
S. No.	Functional Areas	Name of the Experts	Contribution Made	Signature & Date
1	Air pollution Monitoring, prevention and control-AP	Mr Subhash Kumar	• Identification of Air Quality Monitoring Network • Supervision of ambient air quality monitoring • Review of primary air quality monitoring report and analysis • Addressing air quality issues in EIA Report and suggesting mitigation measures for impacts due to air pollution and review. • Review and analysis of primary meteorological data	
2	Water pollution Monitoring, prevention and control-WP	Rahul Kumar	• Identification of water sampling locations, their time and frequency pertaining to site conditions • Counter checking of analysis of data by literature study and consultation with local people and concerned departments • Identification of water quality by analysis report study and detection of potential	

			hazards due to developmental activity • Checking of water availability by literature study and by interacting concerned Govt. Officials like GWB and irrigation dept.	
3	Solid and Hazardous waste-SHW	Hussain Ziauddin	• Estimated the waste generation quantity due to various construction activity • Devising measures to minimize wastes; recycle and disposal • Identification methods of recycling and reuse Ensured incorporation of the same into the EIA report.	<i>Hussain Ziauddin</i>
4	Socio-Economic-SE	Mr. Abhay Nath Mishra	• Design and develop format/ questionnaire for baseline survey, social changes arising out of development projects and assessment of data so collected • Evaluation of socio-economic status of tribal/ non-tribal areas • Assessment of social impact • Collection of secondary information Survey tool design	<i>Amishrq</i>

			• Reconnaissance study, transect walk • Community participation, Mitigation plan • Stakeholder consultation	
5	Ecology and Biodiversity-EB	Manoj Kumar Pandey	• Visited site to identify the ecological condition of project area by direct field study and identification of major floral and faunal species • Identification of potential impact due to the project interventions and developing mitigation measures by direct field study and consulting the stakeholders like forest and wildlife officials, local people etc.	
6	Hydrology, Ground water and water conservation-HG	Mr. Tapan Majumdar	• Identification of the water sources and drainage pattern • Analyze them to identify the likely impacts • Devise mitigation measures and assisted in preparation of the EIA report.	
7	Geology GEO		• Identification of nature of geology of the project area	

			• Identification of areas likely to be affected by soil erosion • Devised protection measures for embankment slope and water bodies	
8	Soil Conservations-SC	Subhash Kumar	• Identification of soil quality and soil type for establishing the baseline conditions • Assessing the impact on soil due to various activities of the project • Suggest mitigation measures to control the adverse impact • Preparation of report for incorporation in the EIA	
9	Meteorology, Air quality and modelling and prediction-AQ	Mr. Rahul Kumar	• Analysis of air quality data, meteorological data, traffic data etc. as per the requirements of Pollution Dispersion model (Caline 3) • Assessment of secondary data requirements for modeling, collection of secondary data like mixing height, stability class etc.	

			- Predict air quality using pollution dispersion model (Calaine 3) - Interpretation, analysis and presentation of predicted results of pollution dispersion modeling - Review and finalization of report	
10	Noise and Vibration-NV	Sanjay Kumar Singh	- Identification of Noise Quality Monitoring Network and noise sensitive location along the project stretch - Supervision of ambient noise quality monitoring - Review of noise quality monitoring report - Addressing noise related issues in EIA report and suggesting measures for impacts due to noise pollution - Analysis of noise quality data, traffic data etc. as per the requirement of mathematical model of Dhawani pro. Interpretation, analysis and presentation of predicted results.	
11	Land Use-LU	Mrs. Poonam Kumari Mangalam	Identification and collection of satellite images	

			and other associated maps for the project area • Creation of GIS data base and processing of satellite imageries • Devised measure to save sensitive and productive land uses by suggesting option of realignment, bypass and eccentric widening • Analysis of land use map and incorporation of land use details into EIA	
12	Risk & Hazard -RH*	Mr. R.K.Tiwary	• Identification of the potentially hazardous material and events that might occur during various phases of the project • Devising contingency plan for each type of hazard • Incorporation of the same in the EIA report	

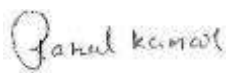
12.2 DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANISATION

I, as the Head of the Accredited Consultancy Organization (ACO), hereby declare that this Environmental Impact Assessment (EIA) report has been prepared by our team of qualified and accredited professionals in accordance with the applicable regulatory requirements, NABET/QCI accreditation norms, and approved methodologies.

I confirm that:

- The EIA Coordinator and all Functional Area Experts (FAEs) involved in the study are duly accredited and competent in their respective domains.
- The consultancy organization has exercised due diligence, oversight, and quality control throughout the preparation of this report.
- The findings, analyses, and recommendations presented in the EIA report are based on verified data, scientific assessment, and independent professional judgement.
- The ACO has no conflict of interest with the project proponent, and the report has been prepared with full objectivity, transparency, and ethical integrity.
- Lab engaged in this project is Noida Testing laboratories which is already empanelled with us. The laboratory is NABL accredited and MoEF&CC recognised.

This declaration is made to affirm the authenticity, quality, and compliance of the EIA report as per the standards expected of an accredited consultancy organization.



Name: Rahul Kumar

Designation: CMD

Name of the EIA Consultant Organization: P and M Solution, C-88, Sector-65, Noida 201301, Uttar Pradesh

NABET Certificate No. & Issue Date: Certificate No. NABET/EIA/2326/RA 0298_Rev.01, at sr. no 164 list of Accredited EIA consultant in category A, valid till 07/05/2026

12.3 NABET CERTIFICATE OF THE ACO ENGAGED:


**QUALITY COUNCIL
OF INDIA**
Creating an Ecosystem for Quality



**National Accreditation Board
for Education and Training**



Certificate of Accreditation

P and M Solution, Noida
 C-88, Sector-65, Noida, Uttar Pradesh- 201301

*The organization is accredited to upgraded as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –*

S.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including opencast/underground	1	1 (a) (i)	A
2	River Valley projects	3	1 (c)	A
3	Coal washeries	6	2 (a)	B
4	Metallurgical industries (ferrous & non-ferrous)	8	3 (a)	A
5	Cement plants	9	3 (b)	A
6	Highways	34	7 (f)	A
7	Building and construction projects	38	8 (a)	B
8	Townships and Area development projects	39	8 (b)	B

***Note:** Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated July 18, 2023, and Supplementary Assessment minutes dated May 17, 2024, posted on QCI-NABET website.*

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/23/2846 dated August 09, 2023 and QCI/NABET/ENV/ACO/24/3300 dated July 5, 2024. The accreditation needs to be renewed before the expiry date by P and M Solution, Noida following due process of assessment.


Sr. Director, NABET
Dated: July 5, 2024

Certificate No.
NABET/EIA/2326/RA 0298_Rev.01

Valid up to
May 07, 2026

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to the QCI-NABET website

LIST OF ANNEXURES:

AGREEMENT TO SELL

NON-FOREST LAND CERTIFICATE

MONITORING PHOTOGRAPHS

WILDLIFE CONSERVATION PLAN

500 AND 2.5 KM Sensitivity Map



सत्यमेव जयते

INDIA NON JUDICIAL

Government of Meghalaya

e-Stamp

Certificate No. : IN-ML10742928751265X
Certificate Issued Date : 06-Oct-2025 04:48 PM
Account Reference : SHCIL (FI)/ mlshcil01/ SHILLONG/ ML-EKH
Unique Doc. Reference : SUBIN-MLMLSHCIL0118936775451345X
Purchased by : SHRI SYRPAIBHA SUKHLAIN
Description of Document : Article 5 Agreement or Memorandum of an Agreement
Property Description : AGREEMENT FOR SALE
Consideration Price (Rs.) : 0
(Zero)
First Party : SHRI SYRPAIBHA SUKHLAIN
Second Party : SHREE CEMENT LIMITED
Stamp Duty Paid By : SHRI SYRPAIBHA SUKHLAIN
Stamp Duty Amount(Rs.) : 100
(One Hundred only)



Please write or type below this line

IN-ML10742928751265X

SL / Instrument No 93

Date 06-10-2025



GG 0019758924

Statutory Alert:

1. The authenticity of this Stamp certificate should be verified at 'www.shcilestamp.com' or using e-Stamp Mobile App of Stock Holding. Any discrepancy in the details on this Certificate and as available on the website / Mobile App renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy, please inform the Competent Authority.

AGREEMENT FOR SALE

KNOW ALL MEN this Agreement for sale is executed on this the 6th day of October, 2025 at Khliehriat, East Jaintia Hills District.

-BETWEEN-

Shri. Syrpaibha Sukhlain, S/o Drol Rupon, aged about 45 years, R/o H. No. 3, Shnongthymme Village, East Jaintia Hills District and bearing EPIC number DWN0705004, as the rightful owner of the land known as Khara Siang Lum Pyrshim, located in village Daistong, Elaka Nongkhlieh, East Jaintia Hills, (coordinates in Annexure A) hereinafter called the **FIRST PARTY/SELLER** which term and expression shall unless repugnant to the context mean and include her legal heirs, successors, administrators, executors, representatives, agents and assigns of the **ONE PART**.

-AND-

SHREE CEMENT LIMITED, through its authorized signatory Mr. Bharat Sharma, having its registered office address at Bangur Nagar, Beawar District, Rajasthan-305901, hereinafter called the **SECOND PARTY/ PURCHASER** which term and expression shall unless repugnant to the context mean and include the legal heirs, successors, administrators, executors, representatives, agents and assignees of the **OTHER PART**.

WHEREAS, the First Party is the absolute owner over a plot of land measuring an Area of **25.08 Hectare (61.97 Acres)** more or less, situated at Khara Siang Lum Pyrshim, located in village Daistong, Elaka Nongkhlieh, East Jaintia Hills, here-in-after referred to as Scheduled Property.

AND WHEREAS the First Party is desirous to sell the said Scheduled property and with this intention has approached the Second Party who has agreed to purchase the same.

AND WHEREAS the said First Party has agreed to sell the said Scheduled property measuring about **25.08 Hectare (61.97 Acres)** more or less (as per schedule



hereafter) for a consideration price of **Rs. 400,000/- (Rupees Four Lacs) only per Acre** and the purchaser is agreeable to purchase the same and accordingly both the parties are willingly entering into this instant **Agreement to Sale**.

AND WHEREAS on the fulfillments of the conditions mentioned in the aforesaid both the parties shall enter into a Sale Deed on terms and conditions stipulated herein below.

NOW THIS DEED WITNESSETH AS FOLLOWS:-

1. That the First Party is the absolute owner over a plot of land measuring an Area of **25.08 Hectare (61.97 Acres)** more or less situated at Lum Pyrshin, Nongkhleih Elaka, East Jaintia Hills District, Meghalaya vide Land Holding Certificate issued by the competent authority namely The Jaintia Autonomous Hills District Council.

(Copy of the Land Holding Certificate is enclosed.)

2. That the First Party being with a conscious and sound mind wishes to transfer the aforesaid Scheduled property to the Second Party free from all encumbrances.
3. That the Second Party herein on being approached by the First Party has agreed to purchase the said Scheduled property and the First Party has agreed to sell the said Scheduled property to the Second Party for a consideration price of **Rs. 400,000/- (Rupees Four Lacs) only per Acre** and accordingly both the parties entered into this instant Sale deed.
4. That the Second Party shall have the right to erect and operate a Cement/ Clinker Plants and ancillary function on the property, which is more fully and specifically described in the Schedule below.
5. That the First Party hereby sells and transfers the said Scheduled Property, which is free from all encumbrances and the Second Party hereby takes into possession of the said Scheduled property from the Seller.
6. That the Second Party shall pay the said consideration of **Rs. 400,000/- (Rupees Four Lacs) only per Acre upon which the Parties shall enter into a Sale Deed.**



7. That upon receipt of the consideration, the First Party hereby hands over unto the Second Party the absolute possession of the said Scheduled Property.
8. That the First Party shall no longer have any claims whatsoever from the date of execution of this Sale Deed against the Purchaser.
9. That the First Party hereby assures upon the Second Party that the said Scheduled Property is free from any liability, charges and claims and the First Party shall take all the responsibilities to any disputes of title or other claims arising out of the said Scheduled Property.
10. That the First Party has no objection to the Second Party establishing a cement plant in this area, and no claims related to setting up of plant and loss of agricultural land shall be raised at any point in future.

IN WITNESSESS WHEREOF we set and subscribed our hands hereunto on the day, month and year first above mentioned.

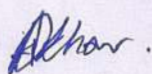


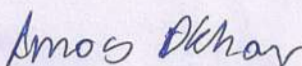
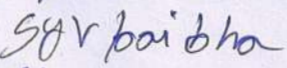
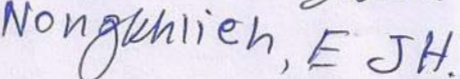
(SHRI. SYRPAIBHA SUKHLAIN)
SELLER

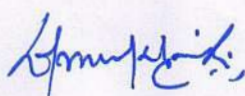


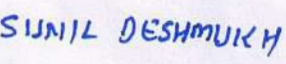
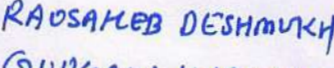
SHREE CEMENT LIMITED
PURCHASER
(BHARAT SHARMA)

WITNESSES:-

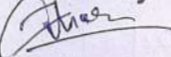
Signature: 

Name: 
S/o: 
R/o: 

Signature: 

Name: 
S/o: 
R/o: 

Identified by:-


Mr. T. Dkhar
(Advocate)



GOVERNMENT OF MEGHALAYA
DEPARTMENT OF FORESTS AND ENVIRONMENT
OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS (HoFF),
MEGHALAYA



No.MFG.39/NFLC/MINING/MMMCR/2016/JH/ 10,358 Dated Shillong, the 10th October, 2025.

To,

✓ M/s Shree Cement Limited,
Shnongthymme Village,
Elaka Nongkhlieh,
East Jaintia Hills District - 793200.

Sub: Application for Non-Forest Land Certificate for setting up of Integrated Cement Plant located at Khara Siang Lum Pyrshin, Daistong Village, Elaka Nongkhlieh, East Jaintia Hills District.

On careful consideration of the report of the Conservator of Forests (T), Khasi & Jaintia Hills, Shillong, Meghalaya vide his letter No. MFG/CF/NFLC/MMMCR/JH/Pl.III/10313, dated 10.10.2025, communication of the Divisional Forest Officer, Jaintia Khasi Hills (T) Division, Jowai vide letter No. JH/Shree Cement/56.49 ha/2025-26/A/523, dated 24.09.2025 and your application No.SCL/MEG/015, dated 03.10.2025 in the matter of issuance of Non-Forest Land Certificate for setting up of Integrated Cement Plant located at Khara Siang Lum Pyrshin, Daistong Village, Elaka Nongkhlieh, East Jaintia Hills District, the undersigned is directed to convey approval of the Principal Chief Conservator of Forests & HoFF, Meghalaya, Shillong for certifying the aforesaid plot of land measuring 56.49 ha as Non-Forest Land as per definition of forest in Section 3 (10) of Meghalaya Forest Regulation, 1973 as amended vide Meghalaya Forest Regulation (Amendment) Act, 2012.

The Non-Forest Land Certificate for the aforesaid plot is strictly confined to the boundary of the plot as contained in the GPS surveyed map enclosed herewith duly countersigned by the Divisional Forest Officer.

If any tree felling is involved, prior permission of the Competent Authority should be obtained under the Meghalaya Tree Felling (Non-Forest Areas) Rules, 2006 failing which the company could be liable for offence under the provisions of the Meghalaya Forest Regulation, 1973.

Further, all other conditions as applicable under other statutory provisions shall be complied with failing which this certificate shall be deemed to be cancelled.

Encl: GPS surveyed map.

Chief Conservator of Forests (T)
Meghalaya, Shillong.

Dated Shillong, the October, 2025.

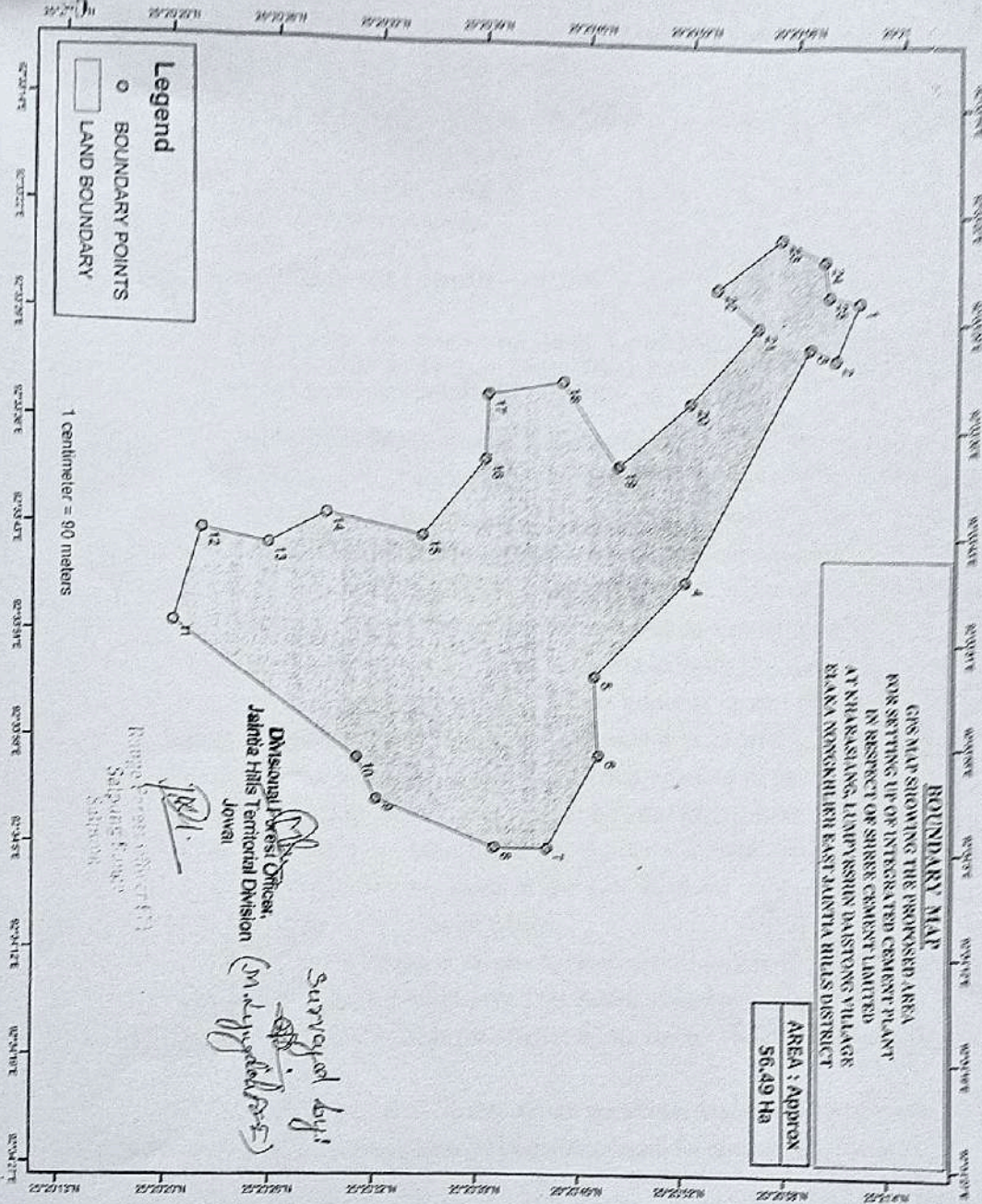
Memo No.MFG.39/NFLC/MINING/MMMCR/2016/JH/
Copy to:-

1. The Conservator of Forests (T), Khasi & Jaintia Hills, Shillong, Meghalaya for information with reference to his letter stated above.
2. The Divisional Forest Officer, Jaintia Hills (T) Division, Jowai for information and necessary action with reference to his letter stated above.

Chief Conservator of Forests (T)
Meghalaya, Shillong

MK/-
Sylvan House, Lower Lachumiere
Shillong 793001

Phone: 91 364 2220414
Fax: 91 364 2504068



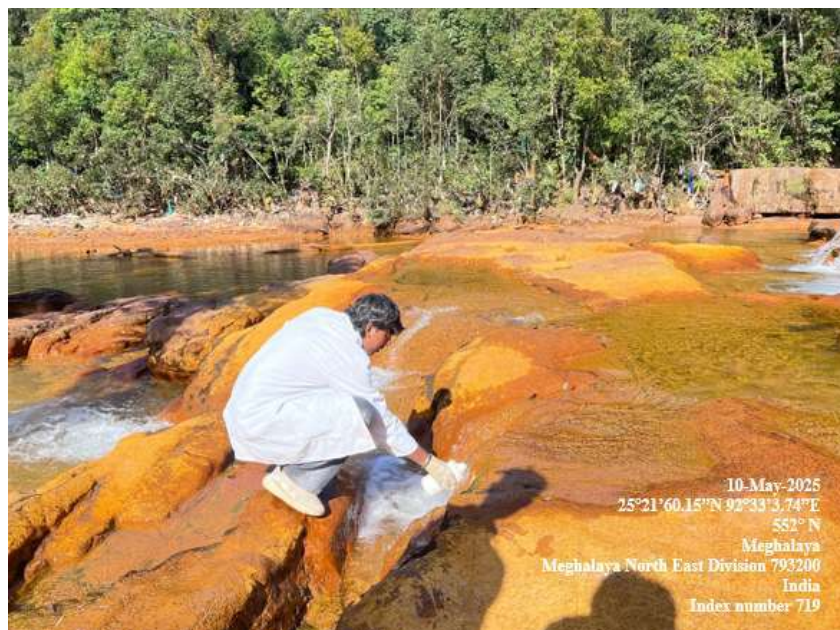
POINT	BOUNDARY POINT COORDINATES	
	LATITUDE	LONGITUDE
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2	25° 21' 00.89"	92° 33' 21.85"
3	25° 20' 58.78"	92° 33' 20.56"
4	25° 20' 51.38"	92° 33' 46.45"
5	25° 20' 45.77"	92° 33' 53.04"
6	25° 20' 46.07"	92° 33' 58.48"
7	25° 20' 42.82"	92° 34' 04.82"
8	25° 20' 39.60"	92° 34' 04.89"
9	25° 20' 24.21"	92° 34' 01.89"
10	25° 20' 30.63"	92° 33' 58.67"
11	25° 20' 19.68"	92° 33' 49.73"
12	25° 20' 21.33"	92° 33' 41.35"
13	25° 20' 28.34"	92° 33' 44.23"
14	25° 20' 28.51"	92° 33' 42.07"
15	25° 20' 34.80"	92° 33' 41.46"
16	25° 20' 38.77"	92° 33' 38.21"
17	25° 20' 38.89"	92° 33' 33.77"
18	25° 20' 41.82"	92° 33' 32.00"
19	25° 20' 47.09"	92° 33' 36.59"
20	25° 20' 41.54"	92° 33' 34.25"
21	25° 20' 58.64"	92° 33' 29.19"
22	25° 20' 52.08"	92° 33' 26.59"
23	25° 20' 57.00"	92° 33' 23.24"
24	25° 20' 58.62"	92° 33' 24.75"
25	25° 20' 58.91"	92° 33' 22.10"



EDNVIRONMENTALONITORING PHOTOGRAPHS FOR SHREE CEMENT PLANT



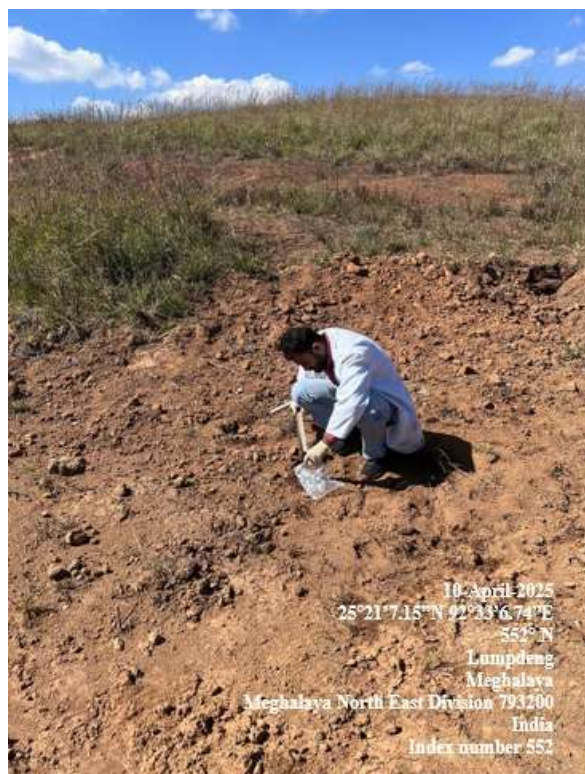
EDNVIRONMENTALONITORING PHOTOGRAPHS FOR SHREE CEMENT PLANT



EDNVIRONMENTALONITORING PHOTOGRAPHS FOR SHREE CEMENT PLANT



EDNVIRONMENTALONITORING PHOTOGRAPHS FOR SHREE CEMENT PLANT



Wildlife Conservation Plan (WLCP)

for

The Project of the Project of Integrated Cement Plant

[Schedule: 3(b) Category: B1]

Production Capacity:

Clinker: 0.95 million TPA, Cement: 0.99 million TPA,

CPP: 15 MW, WHRS: 7 MW, DG Sets 2500 kVA

Total Plant Area: 25.08 ha (61.95 Acres)

by

M/s. Shree Cement Limited

[Bangur Nagar, Beawar, Rajasthan, India, PIN – 305 901]

at

Khara Siang Lum Pyrshin,

Elaka: Nongkhlieh Dolloiship, Village: Daistong,

District: East Jaintia Hills, State: Meghalaya, India.

Environment Consultant



M/s. P & M SOLUTIONS

**QCI Certificate No. NABET/EIA/2326/RA 0298 (Accredited by QCI/ NABET,
Approved by MoEF & CC) C - 88, Sector 65, Noida, Uttar Pradesh - 201301**

JANUARY 2025

Mobile No. +91 9953843815, +91 8377871554

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1. CHAPTER: 1: INTRODUCTION

1.1 Project Profile

Shree Cement Limited proposes to establish a Greenfield Integrated Cement at Khara Siang Lum Pyrshin, Elaka Nongkhlieh Dolloiship, Village Daistong, in the East Jaintia Hills District of Meghalaya, India. The proposed undertaking embodies the Company's strategic vision to augment its production base through the deployment of advanced, resource-efficient, and environmentally sustainable manufacturing systems. The project envisages an installed capacity of 0.95 million tonnes per annum (MTPA) of clinker and 0.99 MTPA of cement, encompassing multiple cement variants viz., Ordinary Portland Cement (OPC), Portland Pozzolana Cement (PPC), Portland Slag Cement (PSC), Sulphate Resistant Cement (SRC), Rapid Hardening Portland Cement (RHPC), and Composite Cement, thereby catering to diverse infrastructural and industrial applications. To ensure energy self-sufficiency and operational reliability, the complex integrates a 15 MW Captive Power Plant (CPP) and a 7 MW Waste Heat Recovery System (WHRS) designed to optimize energy utilization and minimize carbon intensity. Additionally, Diesel Generator (DG) sets aggregating 2500 kVA (configurable as 1×2500 kVA or 2×1000 kVA & 1×500 kVA, or alternatively 1×1000 kVA, 2×500 kVA & 2×250 kVA) will serve as auxiliary backup systems to ensure seamless plant operations under all contingencies. The entire facility will be developed within a total plant area of 25.08 hectares (61.95 acres).

Designed to become fully operational within the validity period of the Environmental Clearance (EC), the project is classified under Schedule 3(b) [Integrated Cement Plant] and Schedule 1(d) [Thermal Power Plant], and accordingly categorized as a Category B1 project as per the EIA Notification, 2006 and its subsequent amendments. A fresh Terms of Reference (ToR) was granted by the SEIAA, Meghalaya on October 15, 2025 (ToR ID: TO25B1101ML5999209N, File No. ML/SEAC/SEIAA/PP/EJH/126/2025) against the proposal submitted on September 29, 2025 (Proposal No. SIA/ML/IND1/552331/2025).

The establishment of this integrated facility will not only enhance the Company's production capabilities but also contribute significantly to the industrial diversification, employment generation, and socio-economic development of the region. The project underscores Shree Cement Limited's unwavering commitment to sustainable industrial growth, adherence to environmental stewardship, and alignment with the national agenda for low-carbon and resilient infrastructure development.

1.2 Project Location

As per the Toposheets identified by ID Nos. 83C/11 and 83C/7 (Core and Buffer Zone) from the Geological Survey of India (GSI), the proposed project site is located at Khara Siang Lum Pyrshin, Elaka Nongkhlieh Dolloiship, Village Daistong, District East Jaintia Hills, Meghalaya, India. The geographical coordinates of the site extend from 25°21'01.823" N to 25°20'59.918" N latitude and 92°33'27.501" E to 92°33'27.104" E longitude. The elevation profile of the area ranges from a maximum of 920 meters above mean sea level to a minimum of 862 meters, defining the general ground level of the project terrain.

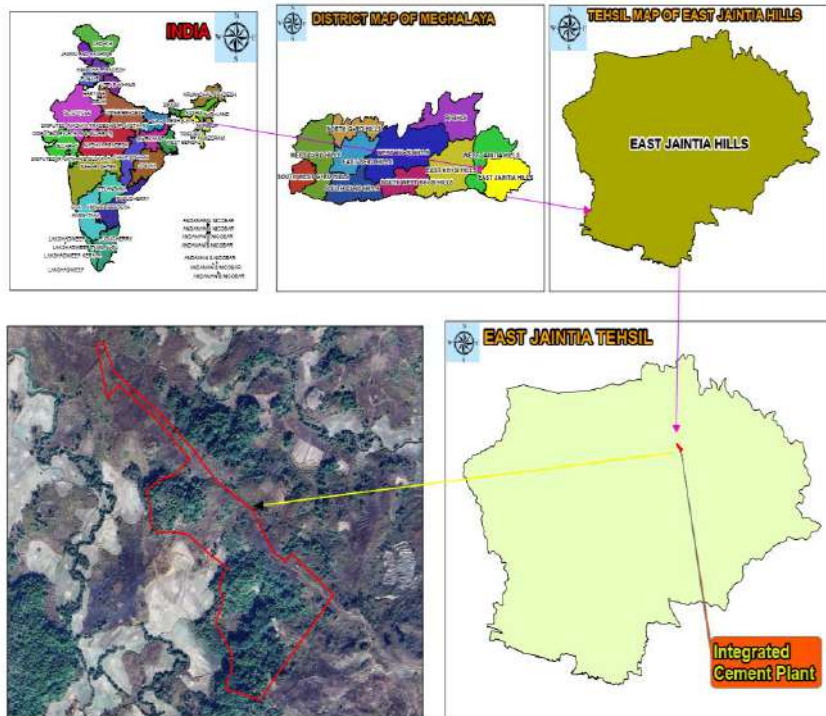


Figure No.1 Location of the Proposed Project Area.

1.3 Identification of the Project

As specified previously, the proposed project entails an installed capacity of 0.95 MTPA of clinker and 0.99 MTPA of cement, supported by a 15 MW Captive Power Plant (CPP), a 7 MW Waste Heat Recovery System (WHRS), and 2500 kVA DG sets to ensure reliable and efficient operations and falls under Schedule 3(b) and Schedule 1(d) and consequently categorized as a Category B1 project. Therefore, project was identified as per EIA Notification 2006 and amended till the date given below.

Table No. 1. Identification of the Project.

Schedule	Category	Product & Total Production Capacity	Condition if any GC/ SC	Applicability of Public Hearing
3(b) & 1 (d)	'B1'	Cement: 0.99 MTPA Clinker: 0.95 MTPA CPP Capacity: 15 MW WHRS: 7 MW	Not Applicable.	Applicable.

1.4 Geographic Coordinate Details of the Site

There are thirty-one (31) points in the project area. The details of these points are given in the table below (Table No. 2) and shown in the layout plan ahead (Figure No. 2).

Table No. 2. Coordinates of Thirty-One Corner Points.

CORNER POINT NO.	LATITUDE	LONGITUDE	CORNER POINT NO.	LATITUDE	LONGITUDE
Point 1	25° 20' 59.84" N	92° 33' 26.21"	Point 17	25° 20' 31.49" N	92° 33' 43.00"
Point 2	25° 20' 59.99" N	92° 33' 27.21"	Point 18	25° 20' 32.94" N	92° 33' 42.46"
Point 3	25° 20' 57.03" N	92° 33' 28.48"	Point 19	25° 20' 35.04" N	92° 33' 43.47"
Point 4	25° 20' 50.64" N	92° 33' 36.40"	Point 20	25° 20' 38.70" N	92° 33' 38.25"
Point 5	25° 20' 44.80" N	92° 33' 42.00"	Point 21	25° 20' 38.89" N	92° 33' 34.28"

CORNER POINT NO.	LATITUDE	LONGITUDE	CORNER POINT NO.	LATITUDE	LONGITUDE
Point 6	25° 20' 41.49" N	92° 33' 46.87"	Point 22	25° 20' 40.17" N	92° 33' 33.20"
Point 7	25° 20' 41.42" N	92° 33' 46.97"	Point 23	25° 20' 41.67" N	92° 33' 33.40"
Point 8	25° 20' 36.85" N	92° 33' 49.63"	Point 24	25° 20' 41.44" N	92° 33' 33.45"
Point 9	25° 20' 35.59" N	92° 33' 51.34"	Point 25	25° 20' 43.16" N	92° 33' 32.85"
Point 10	25° 20' 36.52" N	92° 33' 52.12"	Point 26	25° 20' 44.89" N	92° 33' 34.79"
Point 11	25° 20' 31.91" N	92° 33' 57.65"	Point 27	25° 20' 45.23" N	92° 33' 36.28"
Point 12	25° 20' 20.12" N	92° 33' 47.87"	Point 28	25° 20' 47.08" N	92° 33' 38.62"
Point 13	25° 20' 21.37" N	92° 33' 43.28"	Point 29	25° 20' 51.38" N	92° 33' 34.40"
Point 14	25° 20' 23.33" N	92° 33' 44.08"	Point 30	25° 20' 55.43" N	92° 33' 29.19"
Point 15	25° 20' 25.09" N	92° 33' 44.27"	Point 31	25° 20' 54.04" N	92° 33' 27.64"
Point 16	25° 20' 28.81" N	92° 33' 42.08"			

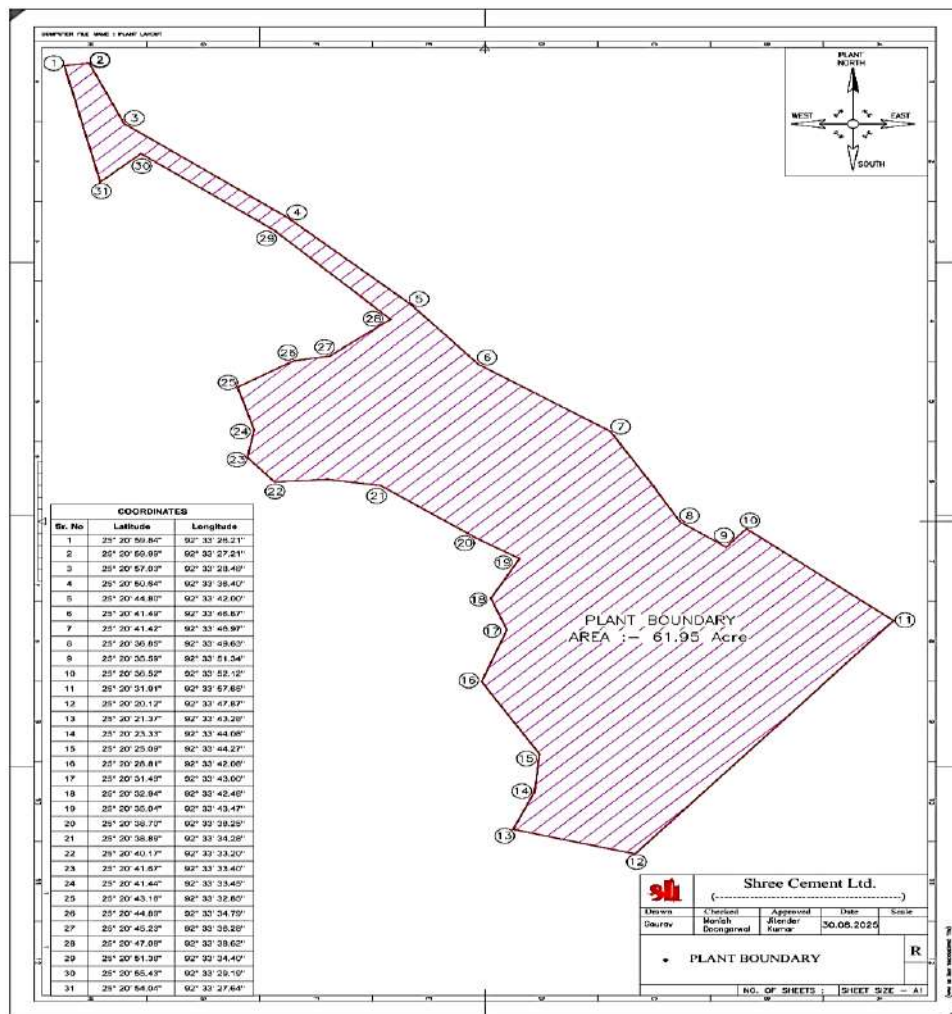


Figure No. 2 Coordinates of Thirty-One Corner Points.

1.5 Plant Area Details and Land Utilization for Proposed Project Site

The project site exhibits an undulating hilly terrain, with elevations ranging from a maximum of 920 m to a minimum of 862 m above mean sea level, resulting in a natural ground level variation across the area. The total land area earmarked for the proposed integrated plant is 25.08 hectares (61.95 acres). No forest land is involved within the proposed site. The existing land is private land, which will be converted to industrial use following due process. The application for land allotment has already been submitted to the concerned authorities. As this is a Greenfield project, there are no existing structures within the site boundary. The proposed plant layout strategically accommodates all major facilities, including the

Clinkerization Unit, Cement Mill, Captive Power Plant (CPP), Waste Heat Recovery System (WHRS), raw material and product storage areas, as well as designated greenbelt and plantation zones, ensuring an efficient and environmentally balanced industrial setup. Plant area details and land utilization for proposed project site is furnished below (Table No. 3) and in Figure No. 3.

Table No. 3. Proposed Plant Layout of Land Utilization.

Sl. No.	Particulars	Land Area			Percentage (%)
		Square metre	Acre	Hectare	
1.	Greenbelt & Plantation	82,736	20.44	8.27	32.99
2.	Raw Material Unloading	15,916	3.93	1.59	06.35
3.	Material Storage	39,978	9.87	4.00	15.94
4.	Plant: Clinkerization	9,278	2.29	0.93	03.70
5.	Plant: Cement Grinding & Packing Plant	13,864	3.43	1.39	05.53
6.	Non-Plant Building	11,141	2.75	1.11	04.44
7.	Road & Cemented Area	17,414	4.30	1.74	06.94
8.	Open Area	52,434	12.96	5.24	20.91
9.	Power Plant	10,789	2.67	1.08	04.30
10.	Rain Water Storage Pond	7,070	1.75	0.71	02.82
TOTAL		2,50,610	61.95	25.08	100.00

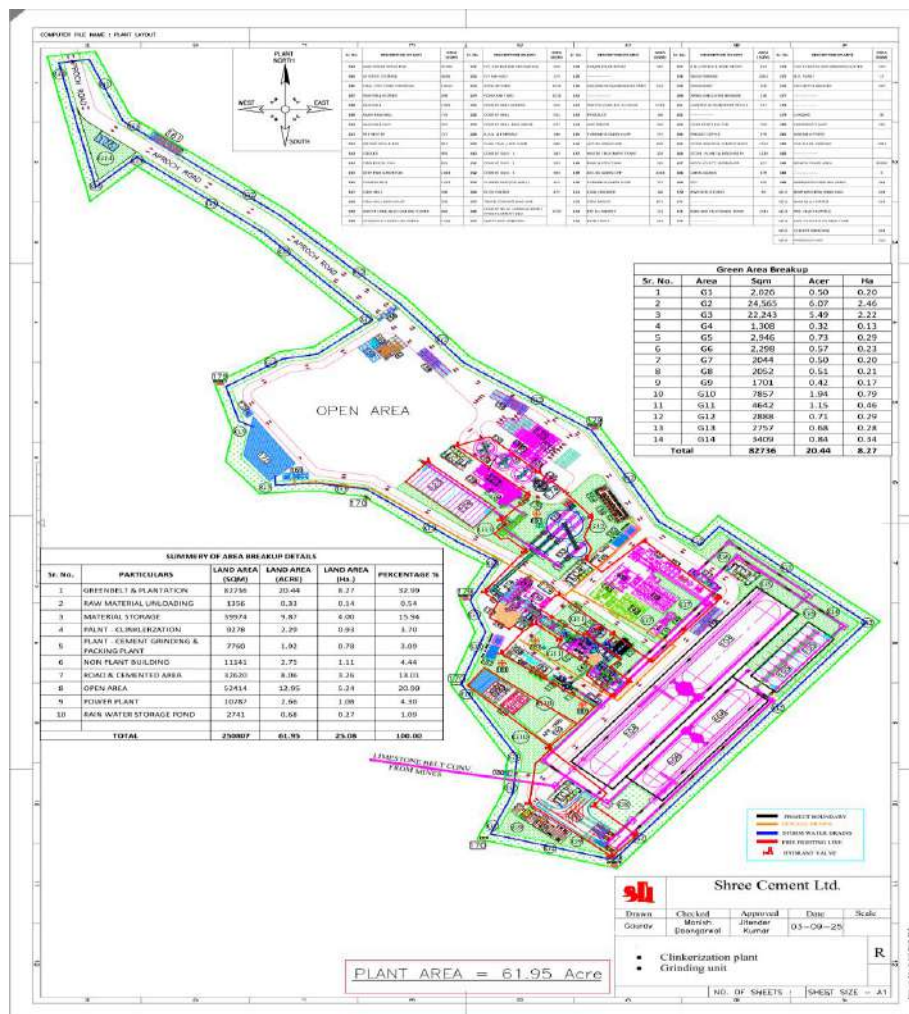


Figure No. 3. Proposed Plant Layout of Land Utilization.

1.6 Environmental Sensitivity of the Study Area

According to the EIA Notification, 2006 (and subsequent amendments) and relevant guidelines of the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India, ecologically sensitive areas are defined as: “Geographical regions or ecosystems that require special protection because of their ecological fragility, biological richness, or environmental functions, where even minor alterations may lead to significant adverse impacts on the environment and biodiversity.” So, demarcation of ecologically sensitive areas surrounding the project site is vital, as these precincts, irrespective of their scale, major or minor, exhibit unique biological attributes requiring specialized conservation measures. Integrating ecological preservation with sustainable development and local community needs ensures the protection of these fragile ecosystems while maintaining overall environmental integrity during project implementation.

Based on Toposheet No. 83C/11 and 83C/7, the hydrological network within a 10 km buffer zone around the project site exhibits a diverse array of surface water systems, primarily composed of small to medium perennial streams that contribute to the regional drainage pattern. The Rashun River, located approximately 2.1 km to the west-northwest (WNW), represents the nearest major fluvial body, playing a key role in the area’s watershed dynamics. A tributary of the Kopili system, the locally identified as Wah Myntang or Wah Rashiuh, flows about 3.5 km to the north-northwest (NNW), forming part of the broader Kopili River basin and supporting aquatic biodiversity. Further, the Skap River, situated around 6.0 km to the northeast (NE), and the Litang River, approximately 7.2 km to the east-northeast (ENE), contribute to the eastward drainage regime of the region. Meanwhile, the Satad Nala, flowing roughly 5.4 km to the southwest (SW), serves as a localized drainage channel, assisting in runoff regulation during monsoonal periods. Collectively, these water bodies form an interconnected hydrological network that supports riparian vegetation, groundwater recharge, and the ecological integrity (CGWB Report, 2020) of the project’s surrounding environment. The 10 km buffer zone delineated for the present study does not encompass any major ecologically sensitive areas such as Wildlife Corridors, National Parks, Biosphere Reserves, Wildlife Sanctuaries, Conservation or Community Reserves, Coastal and Marine Protected Areas, or designated Biodiversity Hotspots. A single Reserved Forest *i.e.*, the Saipung Reserved Forest that has been evidenced within the regional landscape. This forest lies approximately 4.8 km from the project site, towards the south-southeast (SSE) direction, and represents the nearest significant terrestrial ecological feature of conservation importance within the study area.

Table No. 4. Details on Project Site Specific Environmental Sensitivity.

Sl. No.	Eco-Sensitive Areas	Distance	Direction
Forestland			
1.	Saipung Reserved Forest	~ 4.8 km	SSE
Wetlands			
1.	Rashun River	~2.1 km	WNW
2.	Tributary of Kopili System	~3.5 km	NNW
3.	Skap River	~6.0 km	NE
4.	Satad Nala	~5.4 km	SW
5.	Litang River	~7.2 km	ENE

Thus, the above mentioned environmental sensitive zones exert a profound influence on the ecological character of the region, governing patterns of species diversity, population dynamics, and overall ecosystem functionality (Meghalaya Biodiversity Strategy and Action Plan, 2011 – 2020). These fragile landscapes serve as critical determinants of ecological balance and biodiversity distribution within the

study area. A comprehensive inventory of these ecologically sensitive and fragile zones as presented in Table No. 4 and Figure No.4.

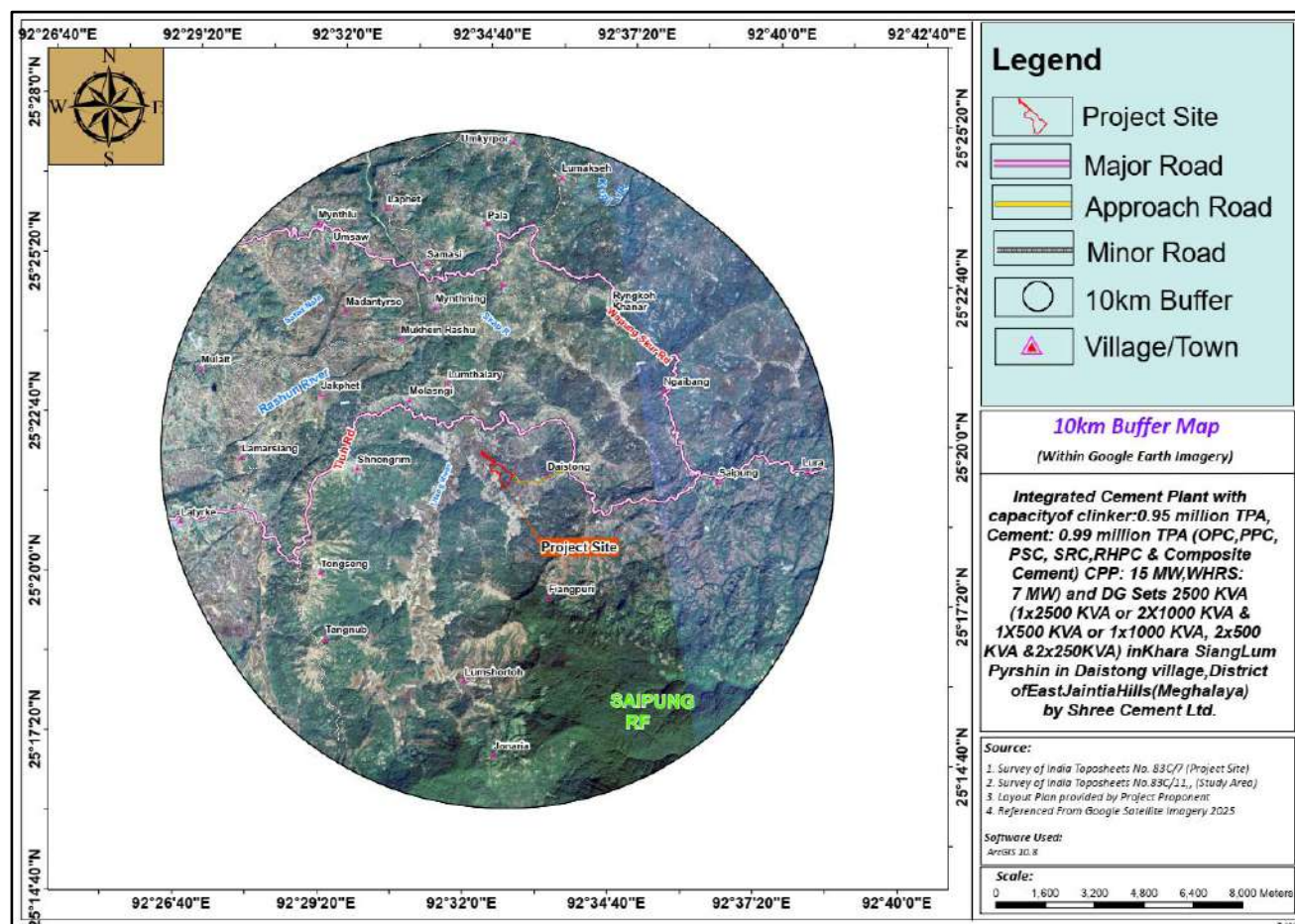


Figure No. 4 The Map Displaying the Ecological Settings of the Study Area within a 10 km radius from Proposed Integrated Cement Plant (Google earth).

1.7 Land Use Land Cover (LULC) of the Study Area

Land Use and Land Cover (LULC) constitute essential parameters in biodiversity conservation, as modifications in land utilization and surface characteristics exert significant influence on habitat integrity and the availability of ecological resources that support diverse flora and fauna. Comprehensive analysis of LULC patterns is crucial for identifying potential biodiversity threats, devising targeted conservation strategies, and promoting the sustainable management and resilience of ecological systems. Specific insights into the Land Use and Land Cover the study area within a 10 km radius, lies in East Jaintia Hills region and Daistong village can be inferred from the documented patterns. The area exhibits a mosaic of agricultural land, forested tracts, and historically mined zones, with recent transitions reflecting a shift toward sustainable land management practices.

Agriculture remains primarily traditional and rainfed, cantered on subsistence crops such as rice, maize, and vegetables. The landscape retains a substantial forest cover, although past disturbances from jhum cultivation and mining activities have contributed to localized deforestation and habitat degradation. Comprehensive land use details within the 10 km study area are presented in Table No. 5 and Figure No. 5.

Table No. 5 Land and Use and Land Cover Delineation of the Study Area within a 10 km Radius

Sl. No.	LULC Classification	Area (Ha)	%
1.	Crop Land	2088.63	05.94
2.	Deciduous Forests Area	15010.40	42.66
3.	Built-Up (Rural)	548.45	01.56
4.	Mining Area	972.15	02.76
5.	Barren Land	10779.40	30.64
6.	Scrub Forest Area	3124.98	08.88
7.	Evergreen Forests Area	2505.49	07.12
8.	Waterbodies	153.36	00.44
Total		35182.86	100.00

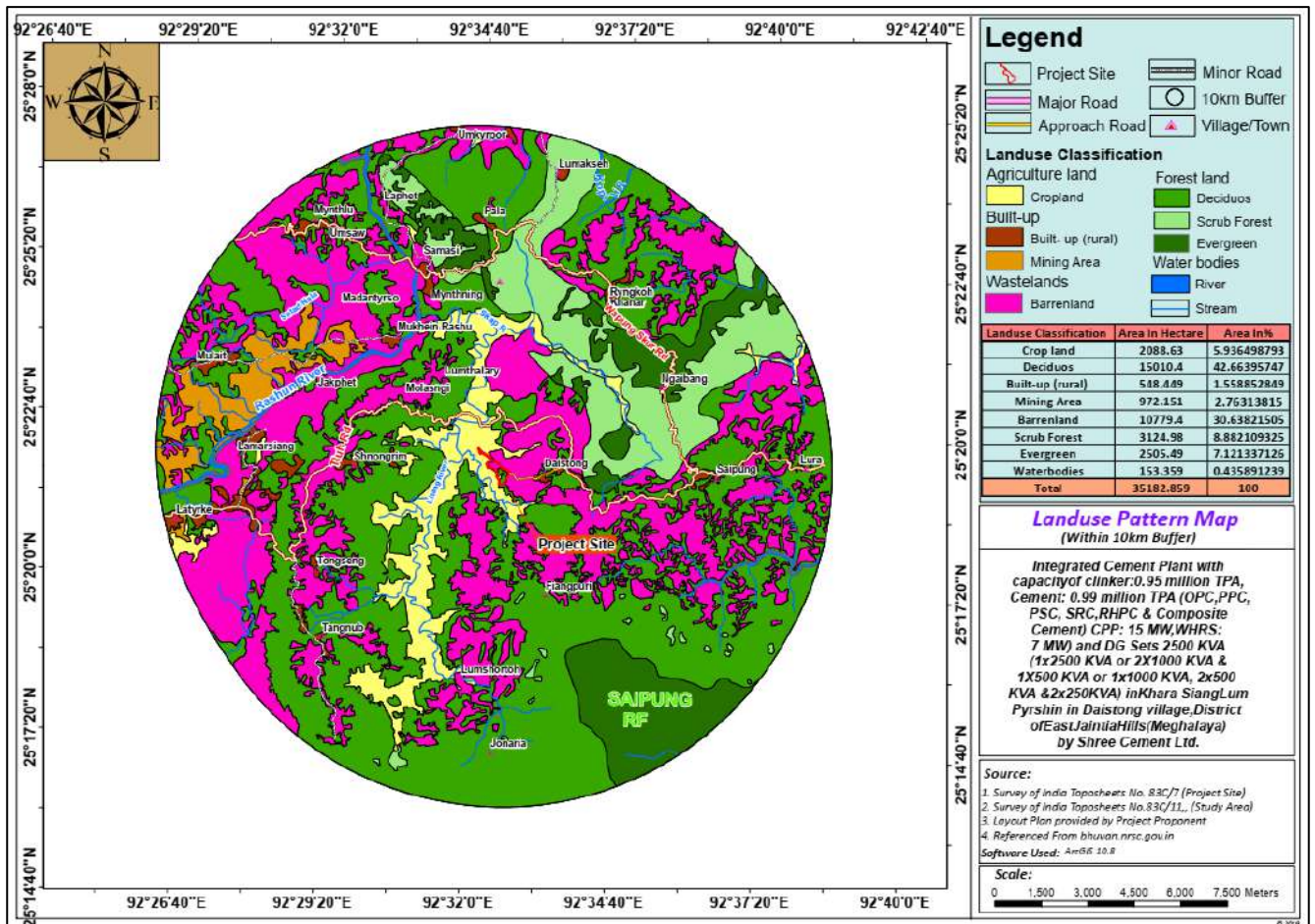


Figure No. 5 The Map Exhibiting the LULC Pattern of the Study Area within a 10 km radius from Proposed Integrated Cement Plant.

The 10 km study area exhibits a heterogeneous landscape with a predominance of forest cover ($\approx 50\%$ combined deciduous and evergreen), interspersed with barren land, agricultural fields, mining zones, and scattered rural settlements. Deciduous forests (42.66%) form the core wildlife habitat, providing connectivity, foraging grounds, and nesting sites, while evergreen forests (7.12%) act as biodiversity hotspots supporting specialized and endemic species. Scrublands (8.88%) serve as transitional habitats for semi-open area fauna, whereas croplands (5.94%) offer limited biodiversity potential depending on agro-ecological practices. Barren land (30.64%) and mining areas (2.76%) represent ecologically stressed zones, causing habitat fragmentation, soil degradation, and limited wildlife use. Rural

settlements (1.56%) form low-density human-wildlife interfaces, and waterbodies (0.44%) provide critical aquatic habitats. Overall, the landscape retains substantial natural character, supporting wildlife conservation, but restoration of degraded areas, habitat connectivity enhancement, and sustainable land-use management are essential to maintain ecological integrity and biodiversity resilience.

1.8 Convenience and Connectivity of the Study Area

Road networks are widely recognized as a double-edged factor in landscape ecology, exerting both deleterious and facilitative influences on biodiversity. On one hand, roads can disrupt ecological connectivity, fragment habitats, and increase wildlife mortality due to vehicular collisions. They can also intensify human pressures on sensitive ecosystems, elevating risks of poaching, illegal resource extraction, and habitat degradation, while contributing to noise and light pollution that alters animal behaviour. Conversely, well-planned road access and connectivity are instrumental for conservation management, enabling systematic monitoring, research interventions, anti-poaching patrols, and community-based conservation efforts, thereby supporting species protection and habitat restoration initiatives.

In the context of the present project, the study area demonstrates a strategic yet low-impact accessibility profile. The site is connected via National Highway 6, which passes approximately 18.93 km southwest of the plant boundary, complemented by a dedicated approach road ensuring controlled access. The nearest railway facility, Ditokcherra Railway Station, lies at a distance of ~ 36.90 km southeast, while the closest airports are Silchar Airport (~ 63.35 km SE) and Guwahati Airport (~ 128.21 km NW), provide regional and national connectivity.

Importantly, field observations and spatial analyses indicate that the current road infrastructure has not resulted in significant ecological disruption within the study area. There is no evidence of habitat fragmentation, elevated wildlife mortality due to vehicle collisions, or unauthorized anthropogenic pressures in sensitive zones. Noise and light pollution associated with transport corridors are negligible, and overall habitat integrity remains largely intact. This indicates that while the study area is adequately connected for conservation and management purposes, the existing road network has not yet imposed adverse effects on local biodiversity. Thus, the study area presents an example where strategically planned road accessibility and connectivity coexist with ecological stability, providing logistical advantages for conservation activities without compromising the integrity of wildlife habitats.

2. CHAPTER: 2: RATIONALE & OBJECTIVES FOR THE WLCP

The proposed study of the biological environment is a critical component of the Environmental Impact Assessment (EIA), serving as a foundation for the conservation of ecological integrity, environmental quality, and biodiversity within and surrounding the project area. Ecological systems exhibit complex, multi-tiered interactions between biotic and abiotic components, encompassing relationships of

dependence, competition, and mutualism. Biotic components, including terrestrial and aquatic flora and fauna, interact intricately among themselves and with abiotic factors such as soil, hydrology, climate, and geomorphology, collectively shaping ecosystem function and resilience. In the context of sustainable development, systematic documentation of biodiversity, habitat structure, and species distribution is essential to identify vulnerabilities, predict potential anthropogenic impacts, and formulate science-based mitigation strategies.

2.1 Key Objectives of the Proposed Wildlife Conservation Plan

- a) To conduct a comprehensive terrestrial ecological assessment of the proposed project site and surrounding landscape.
- b) To document floral and faunal assemblages across taxonomic groups, ecological guilds, and trophic levels.
- c) To identify and assess scheduled species, including those categorized as Rare, Endangered, Critically Endangered, Endemic, and Vulnerable (RECEV) under IUCN and Wildlife Protection Act (1972) criteria.
- d) To locate and characterize ecologically sensitive features and key habitats such as wetlands, riparian zones, forest fragments, and wildlife corridors.
- e) To establish baseline ecological data, including species composition, habitat types, and structural attributes of terrestrial, wetland, and aquatic vegetation.
- f) To evaluate potential operational impacts of the project on biodiversity, ecosystem connectivity, and habitat integrity.
- g) To prepare a scientifically robust report summarizing the status of wildlife and biodiversity within a 10 km radial study area, including impact assessment and evidence-based mitigation measures.

2.2 Scientific Components of the Wildlife Conservation Plan

- I. **Wildlife Survey:** Quantitative assessment of species richness, abundance, population density, and community composition using standardized survey protocols.
- II. **Habitat Assessment:** Mapping and characterization of critical habitats, including feeding grounds, breeding sites, nesting areas, and roosting locations.
- III. **Avifaunal Distribution:** Inventory of resident and migratory birds, with seasonal monitoring to identify critical flyways and stopover habitats.
- IV. **Rare and Endangered Species:** Documentation of threatened taxa, assessment of conservation status, and identification of priority conservation zones.
- V. **Floristic Survey:** Detailed inventory of plant species diversity, structure, and functional groups, emphasizing ecological significance and conservation value.
- VI. **Site-Specific Biodiversity Features:** Identification of microhabitats, keystone species, and unique ecological features contributing to landscape-level biodiversity.
- VII. **Impact Prediction and Mitigation:** Assessment of project-induced pressures, including habitat fragmentation, corridor obstruction, disturbance from mining and transportation, and cumulative impacts, with targeted mitigation measures designed to maintain ecosystem connectivity and species viability.

- VIII. Economic and Resource Allocation Plan: Development of a cost-effective and actionable financial plan, ensuring adequate resources for implementation of all WLCP activities, monitoring, and adaptive management.

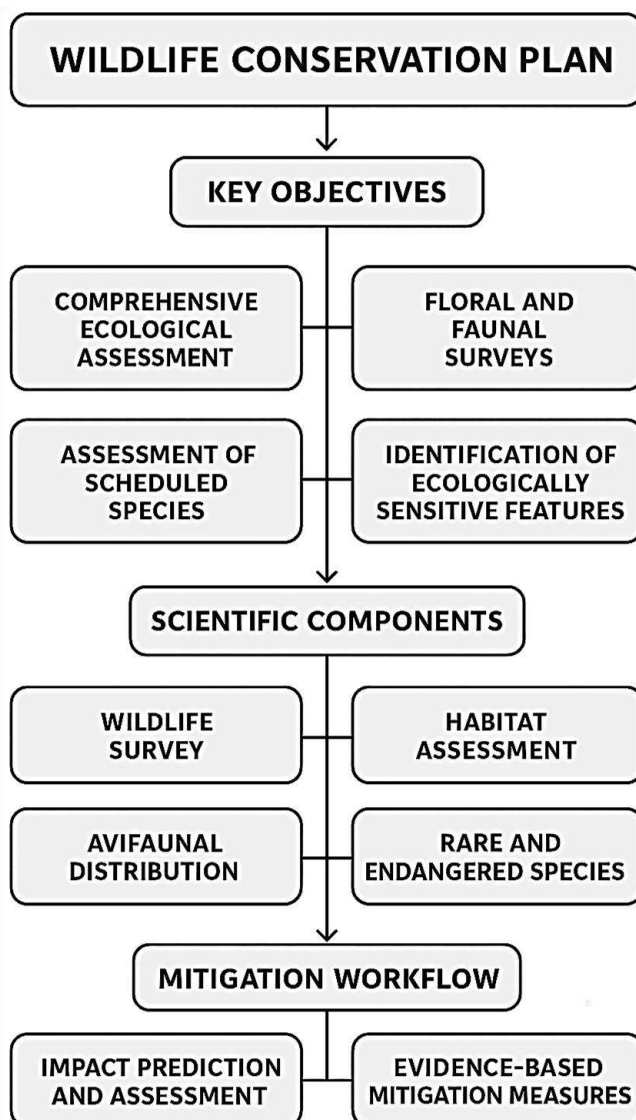


Diagram No. 1 Workflow for WLCP, Presenting Objectives, Components, & Mitigation.

2.3 Regulatory and Statutory Requirements

The Wildlife Conservation Plan (WLCP) for the proposed project has been meticulously formulated in strict accordance with national regulatory frameworks and established statutory practices governing wildlife conservation reserves. In areas where national guidelines are absent or limited, international best practices and recommendations from the Ministry of Environment, Forest and Climate Change (MoEFCC) applicable to analogous projects have been duly integrated.

The baseline survey is designed to assess the existing ecological status, human-environment interactions, and flora and fauna diversity within the study area. A 10 km radial buffer around the project site has been delineated as the study zone. Comprehensive biodiversity baseline surveys were conducted over a period of three months, including detailed documentation of flora species and systematic identification

of faunal species in alignment with MoEFCC guidelines. Faunal species have been classified following the Wildlife Protection Act, 1972 (as amended) and assigned appropriate conservation categories.

2.4 Purpose of the Report

The objectives of the Wildlife Conservation Plan are outlined as follows:

- Conservation of natural habitats through sustainable and controlled exploitation of resources.
- Protection of rare and endangered species within designated protected areas, including national parks and wildlife sanctuaries.
- Establishment of biosphere reserves to safeguard endangered flora and fauna.
- Legal protection of wildlife, including enforcement of hunting bans and anti-poaching measures.
- Regulation of trade and export of endangered species and their derivatives to prevent exploitation.
- Public awareness and environmental education, fostering the long-term preservation of biodiversity for future generations.

2.5 Need for a Conservation Plan

A fresh Terms of Reference (ToR) has been accorded by the State Environment Impact Assessment Authority (SEIAA), Meghalaya, bearing ToR Identification No. TO25B1101ML5999209N and File No. ML/SEAC/SEIAA/PP/EJH/126/2025, dated October 15, 2025, pursuant to the proposal submitted on September 29, 2025, under Proposal No. SIA/ML/IND1/552331/2025. The ToR distinctly specifies the requirements associated with the Wildlife Conservation Plan (WLCP), establishing a structured framework to steer the survey methodology, baseline assessment, and mitigation actions for wildlife and habitat conservation in the project influence zone.

The postulated ToR points related to WLCP for current project are furnished below (Table No. 6).

Table No. 6. Considerable Fundamental Points for EB on the basis of ToR.

Point. No.	Terms of Reference	Remarks
Specific Terms of Reference s for (Cement Plants)		
1. Specific Additional Conditions		
I. Baseline Data Requirements		
1.1	6. Ecology / Biodiversity	
	○ Flora and fauna survey of the site and its surroundings (within a radius, <i>e.g.</i>, 10 km), with special attention to protected/endemic species. ○ Assessment of forest patches, wildlife corridors.	Complied accordingly as specified. <i>Vide</i> Chapter No. 3, of EIA Report and Chapter No. 4 of this WLCP.
Standard Terms of Reference for Industrial Projects - 1		
1. Preliminary Requirements		
1.2	Besides, following points shall be compiled as per QCI/NABET norms: a. Disclaimer by the EIA consultant. b. Declaration by the Functional Area Experts contributed to the EIA study and declaration by the head of the accredited consultant organization/authorized person.	Complied accordingly as specified.

Point. No.	Terms of Reference	Remarks
	c. Undertaking by the project proponent owning the contents (information and data) of the EIA/EMP report. d. Undertaking by the EIA consultant regarding compliance of ToR issued by MoEF&CC. e. Consultant shall submit the Plagiarism Certificate for the EIA/EMP Report.	
2. Executive Summary		
2.3 Baseline Environment Studies		
2.3.7	Biological Environment.	Complied accordingly as specified. <i>Vide</i> Chapter No. 3, of EIA Report and Chapter No. 4 of this WLCP.
2.4 Anticipated Impacts		
2.4.6	Impact on terrestrial and aquatic habitat.	Complied.
2.6 Environmental Monitoring Program		
2.6.4	Green Belt	Will be complied accordingly as specified. $\approx 33\%$ of the total area has been delineated for Green Belt.
2.9 Environment Management Plan		
2.9.7	Green belt development plan	32.99% of the total area <i>i.e.</i> , 8.27 hectare (20.44 acre) will be covered by green area with native species.
2.9.9	Project cost and EMP implementation budget.	Will be complied accordingly as specified.
4. Project Description		
4.1.3	A digital toposheet in pdf or shape file compatible to google earth of the study area of radius of 10 km and site location preferably on 1:50,000 scale (including all eco sensitive areas and environmentally sensitive places).	Complied accordingly as specified.
4.1.5	Environment settings of the site and it's surrounding along with map.	Complied accordingly as specified.
4.1.7	In case if the project site is in vicinity of the water body, 50 meters from the edge of the water body towards the site shall be treated as no development/construction zone. If it's near the wetland, Guidelines for implementing Wetlands (Conservation and Management) Rules, 2017 may be followed.	Not Applicable. No water body, within 50 meters towards the project site is located.
4.1.8	In case if the project site is in vicinity of the river, the industry shall not be located within the river flood plain corresponding to one in 25 years flood, as certified by concerned District Magistrate/Executive Engineer from State Water Resources Department (or) any other officer authorized by the State Government for this purpose as per the provisions contained in the MoEF&CC Office Memorandum dated 14/02/2022.	Not Applicable.
4.1.9	In case of canal/ nala/ seasonal drain and any other water body passing through project site, the PP shall submit the suitable steps /conservation plan/mitigation measures along with contouring, Run - off calculations, disposal etc. A robust and full proof Drainage Conservation scheme to protect the natural drainage/water bodies and its flow	Not Applicable. No canal/ nala/ seasonal drain and any other water body passing through project site.

Point. No.	Terms of Reference	Remarks
	parameters; along with Soil conservation scheme and multiple Erosion control measures shall be provided in the report.	
4.2 Forest and Wildlife Related Issues (If Applicable)		
4.2.1	Status of Forest Clearance for the use of forest land shall be submitted.	Not Applicable. No forestland will be encroached for the current project.
4.2.2	Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife if the project site located within notified Eco-Sensitive Zone, 10 km radius of national park/sanctuary wherein final ESZ notification is not in place as per MoEF&CC Office Memorandum dated 8/8/2019.	Not Applicable. the project site is not located within notified Eco Sensitive Zone, and within a 10 km radius no national park/sanctuary are situated.
4.2.3	The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, Eco-sensitive Zone and Eco-sensitive areas, the project proponent shall submit the map duly authenticated by Divisional Forest Officer showing the distance between the project site and the said areas.	Not Applicable. the project site is not located within notified Eco Sensitive Zone, and within a 10 km radius no national park/sanctuary are situated.
4.2.4	Wildlife Conservation Plan duly authenticated by the Competent Authority of the State Government for conservation of Schedule I fauna along with budget and action plan, if any exists in the study area.	The area holds 15 Schedule I fauna therefore, Wildlife Conservation Plan along with budget and action plan, will be prepared accordingly.
5. Description of the Environment		
5.1	Study Period	The baseline ecological survey was conducted from 01 March, 2025 to 31 May, 2025, covering a complete three-month of pre-monsoon summer season.
5.2	Biological Environment	
	1. Aquatic - Primary productivity - Aquatic weeds - Enumeration of phytoplankton, zooplankton and benthos. - Fisheries - Diversity indices - Trophic levels - Rare, and endangered species. - Marine Parks/ Sanctuaries/ closed areas /coastal regulation zone (CRZ). 2. Terrestrial - Vegetation-species list, economic importance, forest produce, medicinal value.	- Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. Indicator species which indicate ecological and environment degradation should be identified and included to clearly state whether the proposed project would result in to any adverse effect on any species. - Samples to collect from upstream and downstream of
		Complied accordingly as specified.

Point. No.	Terms of Reference	Remarks
	- Importance value index (IVI) of trees. - Fauna - Avifauna - Rare and endangered species. - Sanctuaries / National Park / Biosphere Reserve. - Migratory routes.	discharge point, nearby tributaries at downstream, and also from dug wells close to activity site. - For forest studies, direction of wind should be considered while selecting forests. - Secondary data to collect from Government offices, NGOs, published literature.
5.3	Interpretation of each environment attribute shall be enumerated and summarized as given for Biological Environment.	Complied accordingly as specified.
6. Anticipated Environment Impacts and Mitigation Measures (In Case of Expansion, Cumulative Impact Assessment Shall Be Carried Out)		
6.9	Impact on terrestrial and aquatic habitat (Sources; Embedded control measures; Assessment; Mitigation measures; Residual impact) a. Construction phase b. Operation phase	Complied.
12. Environment Management Plan (Construction and Operation Phase)		
12.13	Green belt development plan: An action plan for Green Belt development consisting of 3 tiers of plantations of native species all along the periphery of the project of adequate width shall be raised in 33% of total area with a tree density shall not less than 2500 per ha within a time frame of one year shall be submitted. Survival rate of green belt shall be monitored on periodic basis to ensure that survival rate not be less than 80 %.	Will be conformed consequently.

3. CHAPTER: 3: METHODOLOGY

3.1 Baseline survey Period

01 March, 2025 to 31 May, 2025, complete 3 months of summer season (pre-monsoon period).

3.2 Expanse of Study Area

≈ 314.16 square kilometre ($\pi r^2 = \pi \cdot 10^2 \approx 314.16$).

3.3 Selection of Location of Sampling Sites

In Environmental Impact Assessments (EIAs), the scientific selection of sampling sites is critical to ensuring reliable and representative ecological data. Sampling locations were strategically identified to capture the diversity of habitats and land-use types within the study area, including human settlements, agricultural fields, open scrublands, forest fringes, and aquatic ecosystems. The fundamental target was to minimize sampling bias and achieve an accurate reflection of ecological gradients and biodiversity patterns. All selected sites fall within a 10 km radial distance from the project boundary. A concise summary of the sampling locations is presented in Table No. 7, which provides spatial and ecological characteristics of the selected sites relevant to biodiversity assessment.

(a) Sampling Sites for Ecology and Biodiversity Study

Table No. 7. Location of Sampling Sites for Ecology and Biodiversity Study.

Sampling Code	Location	Study Zone	Distance	Direction
Terrestrial and Arboreal				
EB-1	Shree Cement Plant	Core Zone	0.01 km	-NA-
EB-2	Daistong Village Area	Buffer Zone	1.20 km	E
EB-3	Moolasngi New	Buffer Zone	2.13 km	NNW
EB-4	Shongrim	Buffer Zone	3.81 km	W
EB-5	Saipung RF (Fringe Area)	Buffer Zone	4.80 km	SSE
EB-6	Lamyrsiang	Buffer Zone	5.88 km	WSW
Aquatic				
EB-7	Rashun River	Buffer Zone	2.1 km	WNW
EB-8	Tributary of Kopili System	Buffer Zone	3.5 km	NNW

3.4 Survey Process

The assessment of biological diversity involved both primary field investigations and secondary data compilation within the core and buffer zones. The methodology integrated observations of natural vegetation, terrestrial habitats, and aquatic environments, corroborated with secondary data from government departments and scientific literature. A comprehensive inventory of floral and faunal elements was developed based on:

- 1) The prevailing structure, composition, and abundance of species in different habitat types.
- 2) Documentation of dominant, rare, and economically important flora, including their leaf-retention patterns, commercial, and medicinal values.
- 3) Assessment of faunal diversity, feeding behaviour, vulnerability status, migration patterns, and ecological roles.

(a) Primary or Field Survey for Flora

The primary ecological survey emphasized direct observation and systematic recording of vegetation and wildlife diversity. For flora, both terrestrial and aquatic vegetation were examined, focusing on species frequency, density, and dominance. Faunal assessments targeted mammals, birds, reptiles, and fishes, using multiple detection methods including visual sightings, vocalizations, footprints, droppings, and olfactory cues. Information from local inhabitants and fishermen was also utilized to validate the

occurrence of species, particularly for elusive wildlife and aquatic taxa. Photographic documentation supported species identification. Data collected were verified through forest and wildlife departments to ensure accuracy.

(b) Parameters Considered in the Primary EB Study

The following aspects formed the core of the primary ecological and biodiversity assessment:

- i. Species composition of flora and fauna, with emphasis on endemic, indigenous, rare, endangered, threatened (RET) and bioindicator species.
- ii. Forest type classification (as per Champion & Seth, 1968), floristic diversity, phytosociology of tree species, crop diversity, and the presence of exotic or invasive species.
- iii. Faunal distribution, abundance, migratory and resident species, habitat preferences, resilience, and economic importance.
- iv. Assessment of migratory species and species of commercial or recreational significance.

(c) Phytosociological Assessment

- i. **Visual Encounter Method:** This involved systematic visual scanning of different habitats to record plant species presence, dominance, and frequency. Observations were made during fixed time intervals at each sampling site.
- ii. **Plot Quadrat Method:** Tree species were analyzed using 10 m × 10 m quadrats to estimate density, frequency, and abundance. The Importance Value Index (IVI) and diversity indices, such as Shannon–Wiener Diversity Index (H') and Simpson's Diversity Index (D), were computed to quantify community structure and ecosystem health. Lower values of Simpson's Index indicate a stable, undisturbed ecosystem, whereas higher values suggest ecological stress or anthropogenic disturbance.

(d) Primary or Field Survey for Fauna

The survey of animal species was primarily conducted using the Visual Encounter Survey (VES) technique, encompassing both terrestrial and aquatic habitats. Species identification and inventory were undertaken in collaboration with local community members, ensuring a comprehensive understanding of the region's biodiversity. Standard transect walks and visual encounter surveys were executed during various times of the day and night to enhance detection efficiency across taxa. The avifaunal assessment was carried out during early mornings (7:00 - 9:00 am) and late afternoons (3:30 - 5:00 pm), while reptiles, amphibians, mammals, and floral species were recorded during daylight hours. At each sampling station, bird species were meticulously observed, counted, and documented to prepare an exhaustive species checklist. Identification accuracy was ensured through the use of binoculars and standard ornithological field guides. For aquatic fauna, data collection was supplemented through inputs from local fishermen, fish markets, and other community-based information sources, providing valuable insights into species composition and habitat utilization.

(e) Desktop Study or Secondary Survey

The datasets and insights gathered from the ground survey were further substantiated through a range of secondary information sources, including academic publications, books, and scientific research studies. Moreover, the authenticated list of floral and faunal species, particularly those categorized under Schedule I of the Wildlife (Protection) Act, 1972 and its subsequent amendments, as provided by the Divisional Forest Officer (DFO) for the project, served as a vital source of secondary validation and reference.

3.5 Species Inventorization

The biological diversity inventory for the study area pertaining to the current project has been successfully compiled and finalized through the integration of primary field data with insights derived from secondary (desktop) research.

3.6 Survey Constraint

The hindrances and limitations encountered during the precise assessment of biological diversity within the study area primarily stemmed from factors such as difficulties in accurate species identification, restricted site accessibility, seasonal variability, and potential biases in community-reported data. These challenges collectively constrained the ability to attain a fully comprehensive understanding of the region's biodiversity. The key limitations observed during the field survey for the current project included:

- i. **Habitat Fragmentation:** The combined influence of agricultural expansion and anthropogenic interventions has led to the fragmentation of natural landscapes, thereby impeding a holistic assessment of ecological composition and species distribution patterns.
- ii. **Low Vegetation Density:** The sparse foliage cover across the study area restricted the selection of representative sampling sites, consequently limiting species detectability and the collection of comprehensive ecological data.
- iii. **Temporal Survey Limitation:** Field investigations were conducted exclusively during daylight hours, thereby confining observations to diurnal avifaunal activity and precluding assessments of nocturnal species.
- iv. **Temporal Constraints:** The rapid survey schedule undertaken within a limited duration hindered the inclusion of seasonal variations, restricting the temporal scope of biodiversity assessment.
- v. **Inconclusive Community Inputs:** Although interviews and consultations were conducted with local community members, the information obtained was ambiguous and lacked definitive ecological insights, thereby limiting its applicability for scientific interpretation.

4. CHAPTER: 4: BASELINE DATA

Baseline Biodiversity Assessment represents the foundational dataset describing the pre-project ecological status of a given area. It encompasses information on species composition, habitat characteristics, and ecosystem functionality, serving as a scientific benchmark for Environmental Impact Assessment (EIA) studies and for guiding long-term ecological monitoring and conservation planning. For the present study, the baseline survey was scheduled during the winter season, extending from 1st March 2025 to 31st May 2025, as previously outlined. The data collection framework integrates both primary field observations and secondary literature-based sources. Primary ecological data were gathered from field investigations conducted within the Core Zone (CZ) and Buffer Zone (BZ), with a particular emphasis on ecological and biological diversity parameters. The process was facilitated

through the cooperation of State Forest Department officials and local community participants. It is noteworthy that the floral and faunal composition observed within the study area reflects the representative biodiversity of both major and minor ecosystems present in the buffer region. These include agricultural landscapes (~5.94%), around 49.78% of forest zones along with the areas adjoining reserved forests, scrub forests (~8.00%) and other natural or managed ecosystems as waterbodies (~0.44%) and rural built-up area (~1.56%). Accordingly, the potential species assemblages within these ecosystems have been consolidated within this report. For the current project, comprehensive species inventories detailing the plant and animal biodiversity are presented. The symbols ‘+’ and ‘–’ are used to denote the presence and absence of species in the respective zones, namely the Core Zone (CZ) and Buffer Zone (BZ). The International Union for Conservation of Nature (IUCN) Red List framework has been adopted to categorize species based on their global conservation status. The report employs the following standard abbreviations: CR (Critically Endangered), EN (Endangered), VU (Vulnerable), NT (Near Threatened), LC (Least Concern), DD (Data Deficient), and NE (Not Evaluated), in accordance with the latest IUCN guidelines (source: <https://www.iucnredlist.org/>).

4.1 Terrestrial and Arboreal Ecology & Biodiversity

Vegetation serves as a key determinant in site evaluation and ecological classification, being strongly influenced by both macro- and microclimatic conditions. Its structure and health result from the dynamic interplay between disturbance regimes, biotic succession, and abiotic factors such as climate, soil, and topography. Variations in distribution, abundance, biomass, and stratification of vegetation, shaped by natural and anthropogenic influences, play a crucial role in defining habitat quality, thereby directly influencing animal ecology and wildlife management.

i. Forest Types and Virgin Vegetation of the Study Area

Forest Type: The forests of the study area, situated within the East Jaintia Hills District of Meghalaya, represent a mosaic of North Indian Tropical Moist Deciduous Forests (East Himalayan Moist Deciduous Forests, Type 3C/C3b), along with patches of Tropical Evergreen, Temperate, and Subtropical Pine Forests (Champion & Seth, 1968; Tiwari *et al.*, 2008; Tiwari & Barik, 2019; Lyngdoh *et al.*, 2023). The region experiences a humid subtropical monsoon climate, characterized by intense rainfall from mid-May to September and a cooler, drier period from October to November, followed by a comparatively dry spell between December and March. The high precipitation regime, influenced by the orographic effect of the Meghalaya Plateau, supports rich vegetation diversity and complex forest structure. Around 42.66% of the total study area is occupied by the 3C/C3b type of forest.

Virgin Vegetation: The dominant tree species of the study area include *Castanopsis* spp., *Engelhardia spicata*, *Syzygium* spp., *Quercus* spp., *Schima* spp., *Myrica* sp., *Ficus* spp., *Rhododendron arboreum* etc. These forests are exceptionally rich in epiphytic flora comprising Ferns, Lichens, Mosses, Orchids as well. The sacred groves largely hold the species form Temperate Forest category. In Subtropical Pine Forests, *Pinus kesiya* is the principal species, form pure stands. In certain places the pines are associated with a few broad-leaved species like *Schima wallichii*. Saipung Reserved Forest represents a complex forest ecosystem, combining elements of tropical moist deciduous, semi-evergreen/evergreen, and subtropical pine forests, with significant patches of secondary vegetation (bamboo/cane, grasslands) arising from disturbance. This diversity of forest types is shaped by factors such as rainfall, elevation, soil conditions and anthropogenic influence.

ii. Cropping Pattern and Crop Diversity of the Study Area

The region lies under agro-climatic zone ML3 (East Jaintia Hills) which is characterised by hilly, undulating terrain, with the dominance of upper and middle plateau landforms. The climate is humid subtropical with high rainfall, and soils are generally shallow, acidic and often of low fertility. In such agro-ecological settings, farming is predominantly rain-fed, with limited irrigation infrastructure (**Agriculture Contingency Plan for District: East Jaintia Hills State: Meghalaya**). The agro-climatic constraints include slope instability, erosion risk, shallow soils and nutrient depletion. In the ML3 zone and hence applicable to Daistong and typically in study area, the cropping pattern commonly includes (Field Survey and Department of Agriculture Meghalaya, ICAR, 2015):

- Paddy (rice) in the low-lying valley bottoms (upland and terrace paddy) taking advantage of the monsoon rainfall.
- Maize in upland portions where paddy cannot be grown.
- Potato, ginger, turmeric and assorted vegetables (tomato, beans, *etc.*) in the mid-slopes or upland fields as seasonal/rotational crops.
- The system is dominantly rain-fed mono-cropping or sequential cropping, rather than fully mechanised multiple cropping.

So, crop diversity in this zone tends to be moderate. The primary staple is paddy, alongside maize as secondary staple. There is diversification into tubers (potato), root & rhizome crops (ginger, turmeric) and vegetable crops (tomato, beans). As well as possibly local seasonal crops/horticulture such as leafy greens and pulses (**Agriculture Contingency Plan for District: East Jaintia Hills State: Meghalaya**). Cropping in Daistong likely follows a mixed pattern of paddy in the flatter lands plus upland crops and horticultural vegetables on slopes, inter-cropped or rotated where feasible (Field Survey and Department of Agriculture Meghalaya, ICAR, 2015).

iii. Medicinal Plant Species

The East Jaintia Hills District of Meghalaya harbors a rich ethnomedicinal tradition among its tribal communities. A Research documented 40 medicinal plants from 24 botanical families, with Asteraceae, Euphorbiaceae, and Zingiberaceae being the most represented (Bamon *et al.*, 2022). Herbaceous species constituted 55 % of these plants, followed by shrubs and trees, indicating the prominence of easily accessible herbs in traditional therapeutic practices. A subsequent study focusing on antidiabetic ethnomedicinal plants reported 51 species spanning 34 families and 45 genera, with herbs again predominating with 23 species and among these, *Rhus semialata* was notably utilized for blood sugar management, reflecting its ethnomedicinal significance (Bamon & Lalnundanga, 2023).

Collectively, these findings underscore the ethnomedicinal knowledge, the central role of herbaceous species and leaves in remedy formulations, and the critical need for conservation of both plant resources, indigenous knowledge amid pressures from modernization, habitat loss, and demographic change.

The list of ethnomedicinal plant species is provided below, regarding which the local population has confirmed their frequent and/or daily uses (Table No. 8).

Table No. 8. Ethnobotanical Plant Species Used as Traditional Medicines of the Study Area.

Sl. No.	Botanical Name	Common Name	Family	Uses
1.	<i>Achyranthes aspera</i>	Prickly Chaff Flower	Amaranthaceae	Boils, Skin Application.
2.	<i>Acmella paniculata</i>	Spilanthes	Asteraceae	Toothache Relief.
3.	<i>Acorus calamus</i>	Sweet Flag	Acoraceae	Stomach Ache, Cough, Toothache.
4.	<i>Adhatoda vasica</i>	Malabar Nut	Acanthaceae	Nose-Bleed, Dysentery.
5.	<i>Aegle marmelos</i>	Bael	Rutaceae	Digestive, Diabetic Aid.
6.	<i>Ageratum conyzoides</i>	Billygoat Weed	Asteraceae	Cuts & Wounds.
7.	<i>Ageratum tuberosum</i>	Chinese Ageratum	Asteraceae	Medicinal Salad, Cough, Cold.
8.	<i>Allium cepa</i>	Onion	Amaryllidaceae	Cold, Cough, Digestive Aid.
9.	<i>Allium conyzoides</i>	Onion Weed	Amaryllidaceae	On Wounds.
10.	<i>Allium sativum</i>	Garlic	Liliaceae	New-Born Massage, Stuffy Nose.
11.	<i>Alpinia bracteata</i>	False Cardamom	Zingiberaceae	Rhizome Toothache.
12.	<i>Alpinia calangal</i>	Greater Galangal	Zingiberaceae	Skin Disease Poultice.
13.	<i>Alstonia scholaris</i>	Blackboard Tree	Apocynaceae	Asthma Bark Decoction, BP Control.
14.	<i>Anemone rivularis</i>	River Anemone	Ranunculaceae	Sinusitis Inhalation.
15.	<i>Apium graveolens</i>	Celery	Apiaceae	Blood Sugar Control.
16.	<i>Aristolochia catcartii</i>	Dutchman's Pipe	Aristolochiaceae	Antidote For Poisoning.
17.	<i>Aristolochia saccata</i>	Snake Root	Aristolochiaceae	Stomach-Ache Tuber Remedy.
18.	<i>Aristolochia tagala</i>	Indian Birthwort	Aristolochiaceae	Tonic From Roots.
19.	<i>Azadirachta indica</i>	Neem	Meliaceae	Diabetes Management.
20.	<i>Begonia urphylla</i>	Begonia	Begoniaceae	Stomachache Remedy.
21.	<i>Carica papaya</i>	Papaya	Caricaceae	Blood Sugar Control.
22.	<i>Catharanthus roseus</i>	Madagascar Periwinkle	Apocynaceae	Diabetes, Hypertension.
23.	<i>Centella asiatica</i>	Gotu Kola	Apiaceae	Indigestion, Brain Tonic, Diabetes.
24.	<i>Cinnamomum tamala</i>	Indian Bay Leaf	Lauraceae	Blood Sugar Regulation.
25.	<i>Citrus maxima</i>	Pomelo	Rutaceae	Diabetes Control.
26.	<i>Coriandrum sativum</i>	Coriander	Apiaceae	Stomach-Ache Fruit Powder.
27.	<i>Emblica officinalis</i>	Amla	Phyllanthaceae	Blood Sugar Lowering.
28.	<i>Momordica charantia</i>	Bitter Gourd	Cucurbitaceae	Diabetes Control.
29.	<i>Rhus semialata</i>	Nutgall Tree	Anacardiaceae	Glycaemic Regulation.
30.	<i>Syzygium cumini</i>	Indian Blackberry	Myrtaceae	Blood Sugar Control.
31.	<i>Terminalia chebula</i>	Haritaki	Combretaceae	Diabetes Management.
32.	<i>Tinospora cordifolia</i>	Giloy	Menispermaceae	Anti-Diabetic, Immune Support.
33.	<i>Zingiber officinale</i>	Ginger	Zingiberaceae	Nausea, Indigestion, Anti-Inflammatory.
34.	<i>Ziziphus jujuba</i>	Red Date	Rhamnaceae	Blood Sugar Regulation.

Source: Field Survey; Bamon *et al.*, 2022; Bamon & Lalnundanga, 2023.

iv. Prevalent Terrestrial Flora in the Study Area

Table No. 9. Tree Species of the Study Area.

Sl. No.	Botanical Name	English Name	Family	Foliage Type	Origin	CZ	BZ	IUCN Status
HABIT: TREE								
1.	<i>Abrus precatorius</i>	Rosary Pea	Fabaceae	D	Native	-	+	LC
2.	<i>Acacia auriculiformis</i>	Australian Acacia	Fabaceae	E	Non-Native	-	+	LC
3.	<i>Acacia catechu</i>	Black Cutch	Fabaceae	D	Native	-	+	LC
4.	<i>Aegle marmelos</i>	Bael	Rutaceae	D	Native	-	+	NT
5.	<i>Aesculus assamica</i>	Buck Eye	Sapindaceae	D	Native	-	+	DD
6.	<i>Agave americana</i>	Century Plant	Asparagaceae	E	Non-Native	-	+	LC
7.	<i>Albizia lebbek</i>	East Indian Walnut	Fabaceae	D	Native	-	+	LC
8.	<i>Albizia odoratissima</i>	Ceylon Rosewood	Fabaceae	D	Native	-	+	LC
9.	<i>Albizia saman</i>	Rain Tree	Fabaceae	D	Non-Native	-	+	LC
10.	<i>Alstonia scholaris</i>	Devil's Tree	Apocynaceae	E	Native	-	+	LC
11.	<i>Anacardium occidentale</i>	Cashew Nut Tree	Anacardiaceae	D	Non-Native	-	+	LC
12.	<i>Antidesma</i> sp.	Tassel Berry	Phyllanthaceae	D	Non-Native	-	+	LC
13.	<i>Areca catechu</i>	Areca Palm	Arecaceae	E	Native	-	+	LC
14.	<i>Artocarpus chaplasi</i>	Monkey Jack Tree	Moraceae	E	Native	-	+	LC

Sl. No.	Botanical Name	English Name	Family	Foliage Type	Origin	CZ	BZ	IUCN Status
15.	<i>Artocarpus heterophyllus</i>	Jackfruit	Moraceae	E	Native	-	+	LC
16.	<i>Azadirachta indica</i>	Indian Lilac	Meliaceae	SD	Native	-	+	LC
17.	<i>Bauhinia variegata</i>	Mountain Ebony	Fabaceae	D	Native	-	+	LC
18.	<i>Betula alnoides</i>	Himalayan Birch	Betulaceae	D	Native	-	+	LC
19.	<i>Bombax ceiba</i>	Red Silk-Cotton Tree	Malvaceae	D	Native	-	+	LC
20.	<i>Callicarpa arborea</i>	Beautyberry Tree	Lamiaceae	D	Native	-	+	LC
21.	<i>Careya arborea</i>	Wild Guava	Lecythidaceae	D	Native	-	+	LC
22.	<i>Carica papaya</i>	Papaya	Caricaceae	E	Non-Native	-	+	LC
23.	<i>Cassia auriculata</i>	Matura Tea Tree	Fabaceae	D	Native	-	+	LC
24.	<i>Cassia fistula</i>	Golden Shower	Fabaceae	D	Native	-	+	LC
25.	<i>Cassia siamea</i>	Kassod Tree	Fabaceae	D	Native	-	+	LC
26.	<i>Castanopsis indica</i>	Indian Chest Nut	Fagaceae	E	Native	-	+	LC
27.	<i>Castanopsis purpurella</i>	Phongrong	Fagaceae	E	Native	-	+	LC
28.	<i>Castanopsis tributoides</i>	Chinquapin	Fagaceae	E	Native	-	+	LC
29.	<i>Casuarina equisetifolia</i>	Whistling Pine	Casuarinaceae	E	Native	-	+	LC
30.	<i>Catasetum</i> sp.	Sweet Flag	Acoraceae	E	Native	-	+	LC
31.	<i>Cedrela toona</i>	Red Cedar	Meliaceae	D	Native	-	+	LC
32.	<i>Chukrasia tabularis</i>	Chittagong Wood	Meliaceae	D	Native	-	+	LC
33.	<i>Cinnamomum verum</i>	Ceylon Cinnamon	Lauraceae	E	Non-Native	-	+	LC
34.	<i>Cinnamomum tamala</i>	Indian Bay Leaf	Lauraceae	E	Native	-	+	LC
35.	<i>Citrus maxima</i>	Pomelo	Rutaceae	E	Non-Native	-	+	LC
36.	<i>Clerodendron</i> sp.	Glory Bower	Lamiaceae	D	Native	-	+	LC
37.	<i>Cocos nucifera</i>	Coconut	Arecaceae	E	Native	-	+	LC
38.	<i>Coffea</i> sp.	Coffee	Rubiaceae	E	Non-Native	-	+	LC
39.	<i>Conocarpus erectus</i>	Button Wood	Combretaceae	E	Non-Native	-	+	LC
40.	<i>Cordia dichotoma</i>	Indian Cherry	Boraginaceae	D	Native	-	+	LC
41.	<i>Cordia sebestena</i>	Geiger Tree	Boraginaceae	E	Non-Native	-	+	LC
42.	<i>Cordia sinensis</i>	Grey-Leaved Saucer	Boraginaceae	D	Native	-	+	LC
43.	<i>Dalbergia sissoo</i>	North Indian Rosewood	Fabaceae	D	Native	-	+	LC
44.	<i>Delonix elata</i>	Creamy Peacock	Fabaceae	D	Native	-	+	LC
45.	<i>Delonix regia</i>	Royal Poinciana	Fabaceae	D	Non-Native	-	+	LC
46.	<i>Dracaena</i> sp.	Female Dragon	Asparagaceae	E	Native	-	+	LC
47.	<i>Duabanga grandiflora</i>	Crape Myrtle	Lythraceae	D	Native	-	+	LC
48.	<i>Elaeocarpus</i> sp.	Ceylon Olives	Elaeocarpaceae	E	Native	-	+	LC
49.	<i>Emblica officinalis</i>	Indian Gooseberry	Phyllanthaceae	D	Native	-	+	LC
50.	<i>Engelhardia spicata</i>	Great Malay Bean	Juglandaceae	D	Native	-	+	LC
51.	<i>Erythrina</i> spp.	Coral Tree	Fabaceae	D	Native	-	+	LC
52.	<i>Eucalyptus globulus</i>	Blue Gum	Myrtaceae	E	Non-Native	-	+	LC
53.	<i>Euphorbia nivulia</i>	Dog's Tongue	Euphorbiaceae	D	Native	-	+	LC
54.	<i>Euphorbia tirucalli</i>	Indian Tree Spurge	Euphorbiaceae	D	Native	-	+	LC
55.	<i>Feronia elephantum</i>	Wood Apple	Rutaceae	D	Native	-	+	LC
56.	<i>Ficus benghalensis</i>	Banyan Tree	Moraceae	E	Native	-	+	LC
57.	<i>Ficus glomerata</i>	Cluster Fig	Moraceae	E	Native	-	+	LC
58.	<i>Ficus religiosa</i>	Sacred Fig	Moraceae	D	Native	-	+	LC
59.	<i>Ficus virens</i>	White Fig	Moraceae	D	Native	-	+	LC
60.	<i>Fissistigma verrucosum</i>	Indian Zig-Zag Vine	Annonaceae	E	Native	-	+	LC
61.	<i>Gmelina arborea</i>	White Teak	Lamiaceae	D	Native	-	+	LC
62.	<i>Grewia disperma</i>	Serrulate Leaved Grewia	Malvaceae	D	Native	-	+	LC
63.	<i>Lagerstroemia</i> sp.	Queen's Flower	Lythraceae	D	Native	-	+	LC
64.	<i>Litsea citrata</i>	Litsea Citrate	Lauraceae	E	Native	-	+	LC
65.	<i>Macaranga denticulata</i>	Blister Macaranga	Euphorbiaceae	E	Native	-	+	LC
66.	<i>Macropanax disperma</i>	Blume Aralia	Araliaceae	E	Native	-	+	LC
67.	<i>Mallotus</i> sp.	Kumkum Tree	Euphorbiaceae	D	Native	-	+	LC
68.	<i>Mangifera indica</i>	Mango	Anacardiaceae	D	Native	-	+	LC
69.	<i>Mesua ferrea</i>	Ceylon Ironwood	Calophyllaceae	E	Native	-	+	LC

Sl. No.	Botanical Name	English Name	Family	Foliage Type	Origin	CZ	BZ	IUCN Status
70.	<i>Metrosideros robusta</i>	Heartwood Tree	Myrtaceae	E	Non-Native	-	+	LC
71.	<i>Michelia champaca</i>	Orange Champaka	Magnoliaceae	E	Native	-	+	LC
72.	<i>Musa paradisiaca</i>	Banana	Musaceae	E	Native	-	+	LC
73.	<i>Myrica esculenta</i>	Box Myrtle	Myricaceae	E	Native	-	+	LC
74.	<i>Neolamarckia cadamba</i>	Burr Flower Tree	Rubiaceae	D	Native	-	+	LC
75.	<i>Olea europaea</i>	Olive	Oleaceae	E	Non-Native	-	+	LC
76.	<i>Pandanus</i> sp.	Screw Palm	Pandanaceae	E	Non-Native	-	+	LC
77.	<i>Persea odoratissima</i>	Machilus	Lauraceae	E	Native	-	+	LC
78.	<i>Pinus kesiya</i>	Khasi Pine	Pinaceae	E	Native	-	+	LC
79.	<i>Pinus roxburghii</i>	Chir Pine	Pinaceae	E	Native	-	+	LC
80.	<i>Pithecellobium dulce</i>	Manila Tamarind	Fabaceae	D	Non-Native	-	+	LC
81.	<i>Plumeria rubra</i>	Red Jasmine	Apocynaceae	D	Non-Native	-	+	LC
82.	<i>Polyalthia longifolia</i>	Indian Mast Tree	Annonaceae	E	Native	-	+	LC
83.	<i>Pongamia pinnata</i>	Indian Beech	Faboideae	D	Native	-	+	LC
84.	<i>Prunus cerasoides</i>	Wild Himalayan Cherry	Rosaceae	D	Native	-	+	LC
85.	<i>Psidium guajava</i>	Guava	Myrtaceae	E	Non-Native	-	+	LC
86.	<i>Punica granatum</i>	Pomegranate	Lythraceae	D	Native	-	+	LC
87.	<i>Quercus</i> sp.	Oak	Fagaceae	D	Native	-	+	LC
88.	<i>Rhododendron arboreum</i>	Rhododendron	Ericaceae	E	Native	-	+	LC
89.	<i>Rhus semialata</i>	Chinese Sumac	Anacardiaceae	D	Native	-	+	LC
90.	<i>Saraca asoca</i>	Sorrowless Tree	Fabaceae	E	Native	-	+	EN
91.	<i>Saurauia napaulensis</i>	Dillenia	Actinidiaceae	E	Native	-	+	LC
92.	<i>Schima wallichii</i>	Needle Wood Tree	Theaceae	E	Native	-	+	LC
93.	<i>Sesbania bispinosa</i>	Prickly Sesban	Fabaceae	D	Native	-	+	LC
94.	<i>Shorea robusta</i>	Sal	Dipterocarpaceae	D	Native	-	+	LC
95.	<i>Spondias mombin</i>	Yellow Mombin	Anacardiaceae	D	Non-Native	-	+	LC
96.	<i>Symphler</i> sp.	Comfrey	Boraginaceae	P	Native	-	+	LC
97.	<i>Syzygium cumini</i>	Indian Blackberry	Myrtaceae	E	Non-Native	-	+	LC
98.	<i>Syzygium jambos</i>	Rose Apple	Myrtaceae	E	Native	-	+	LC
99.	<i>Tamarindus indica</i>	Tamarind	Fabaceae	D	Non-Native	-	+	LC
100.	<i>Tectona grandis</i>	Teak	Lamiaceae	D	Native	-	+	VU
101.	<i>Terminalia catappa</i>	Indian Almond	Combretaceae	D	Native	-	+	LC
102.	<i>Terminalia chebula</i>	Myrobalan	Combretaceae	D	Native	-	+	LC
103.	<i>Terminalia myriocarpa</i>	Hollock	Combretaceae	D	Native	-	+	LC
104.	<i>Tetrameles nudiflora</i>	False Hemp Tree	Tetramelaceae	D	Native	-	+	LC
105.	<i>Toona ciliata</i>	Poma	Meliaceae	D	Native	-	+	LC
106.	<i>Traversia palmate</i>	Snowflake Aralia	Araliaceae	E	Non-Native	-	+	LC
107.	<i>Tupidanthus calyptratus</i>	Mallet Flower	Araliaceae	E	Non-Native	-	+	LC
108.	<i>Xylia xylocarpa</i>	Burma Ironwood	Fabaceae	D	Non-Native	-	+	LC
109.	<i>Ziziphus jujuba</i>	Red Date	Rhamnaceae	D	Native	+	+	LC

Source: Field Survey; Upadhyaya *et al.*, 2003; Bamon *et al.*, 2022; Bamon & Lalnundanga, 2023, and other Secondary Sources.

Table No. 10. Floral Species of the Study Area other than Trees.

Sl. No.	Botanical Name	English Name	Family	Origin	CZ	BZ	IUCN Status
HABIT: SHRUB/ SMALL TREE							
1.	<i>Adhatoda vasica</i>	Malabar Nut / Shrub	Acanthaceae	Native	-	+	LC
2.	<i>Agapetes</i> sp.	Ornamental Heath	Ericaceae	Native	-	+	LC
3.	<i>Ardisia elliptica</i>	Duck's Eye	Myrsinaceae	Native	+	+	LC
4.	<i>Baliospermum montana</i>	Wild Castor	Euphorbiaceae	Native	-	+	LC
5.	<i>Clerodendron cootebrookianum</i>	East Indian Glory Bower	Lamiaceae	Native	+	+	LC
6.	<i>Clerodendrum viscosum</i>	Hill Glory Bower	Lamiaceae	Native	+	+	LC
7.	<i>Eupatorium odoratum</i>	Christmas Bush	Asteraceae	Non-Native	+	+	LC
8.	<i>Ficus hispida</i>	Hairy Fig	Moraceae	Native	-	+	LC
9.	<i>Gonionthalamus sesquipedalis</i>	Lai-Kham	Annonaceae	Native	-	+	LC

Sl. No.	Botanical Name	English Name	Family	Origin	CZ	BZ	IUCN Status
10.	<i>Lantana camara</i>	Shrub Verbena	Verbenaceae	Non-Native	+	+	LC
11.	<i>Leea indica</i>	Bandicoot Berry	Vitaceae	Native	-	+	LC
12.	<i>Mimosa himalayana</i>	Touch Me Not	Fabaceae	Native	+	+	LC
13.	<i>Morinda angustifolia</i>	Madder	Rubiaceae	Native	-	+	LC
14.	<i>Triumfetta tomentosa</i>	Pussy Ears	Malvaceae	Native	+	+	LC
15.	<i>Urena lobata</i>	Caesar Weed	Malvaceae	Native	+	+	LC
HABIT: ERECT HERB							
1.	<i>Achyranthes aspera</i>	Prickly Chaff Flower	Amaranthaceae	Native	-	+	NE
2.	<i>Acmella paniculata</i>	Toothache Plant	Asteraceae	Native	-	+	LC
3.	<i>Acorus calamus</i>	Sweet Flag	Acoraceae	Native	-	+	NE
4.	<i>Ageratum conyzoides</i>	Billygoat Weed	Asteraceae	Non-Native	-	+	NE
5.	<i>Ageratum tuberosum</i>	Floss Flower	Asteraceae	Non-Native	-	+	NE
6.	<i>Allium cepa</i>	Onion	Amaryllidaceae	Non-Native	-	+	NE
7.	<i>Allium sativum</i>	Garlic	Amaryllidaceae	Non-Native	-	+	NE
8.	<i>Alpinia bracteata</i>	Red Ginger	Zingiberaceae	Native	-	+	NE
9.	<i>Alpinia calcarata</i>	Snap Ginger,	Zingiberaceae	Native	-	+	NE
10.	<i>Anemone rivularis</i>	Riverside Windflower	Ranunculaceae	Native	-	+	NE
11.	<i>Apium graveolens</i>	Celery	Apiaceae	Non-Native	-	+	LC
12.	<i>Arundina graminifolia</i>	Bamboo Orchid	Orchidaceae	Native	-	+	NE
13.	<i>Begonia urphylla</i>	Begonia	Begoniaceae	Non-Native	-	+	NE
14.	<i>Bidens biternata</i>	Spanish Needles	Asteraceae	Native	-	+	NE
15.	<i>Bidens pilosa</i>	Beggar's Tick	Asteraceae	Native	-	+	NE
16.	<i>Boehmeria sp.</i>	Nettle	Urticaceae	Native	-	+	LC
17.	<i>Catharanthus roseus</i>	Madagascar Periwinkle	Apocynaceae	Non-Native	-	+	NE
18.	<i>Centella asiatica</i>	Gotu Kola	Apiaceae	Native	-	+	LC
19.	<i>Coriandrum sativum</i>	Coriander	Apiaceae	Non-Native	-	+	NE
20.	<i>Globba spathulata</i>	Yellow-Tail Swan	Zingiberaceae	Native	-	+	VU
21.	<i>Hedychium coronarium</i>	Butterfly Lily	Zingiberaceae	Native	-	+	DD
22.	<i>Lysionotus serratus</i>	Lysionotus	Gesneriaceae	Native	-	+	NE
23.	<i>Phrynium pubigerum</i>	Packing Leaf	Marantaceae	Native	-	+	NE
24.	<i>Zingiber officinale</i>	Ginger	Zingiberaceae	Native	-	+	NE
HABIT: EPIPHYTIC HERB							
1.	<i>Bulbophyllum cherrapunjeensis</i>	Common Orchid	Orchidaceae	Native	+	+	NE
2.	<i>Dendrobium chrysotoxum</i>	Fried-Egg Orchid	Orchidaceae	Native	-	+	NE
3.	<i>Pholidota imbricata</i>	Rattlesnake Orchids	Orchidaceae	Native	-	+	NE
4.	<i>Pleione maculata</i>	Maculatus	Orchidaceae	Native	-	+	NE
HABIT: CLIMBER							
1.	<i>Acacia pennata</i>	Climbing Acacia	Fabaceae	Native	-	+	LC
2.	<i>Aeschynanthes sikkimensis</i>	Lipstick Plant	Gesneriaceae	Native	-	+	NE
3.	<i>Aristolochia cathartii</i>	Dutchman's Pipe	Aristolochiaceae	Native	-	+	NE
4.	<i>Aristolochia saccata</i>	Pouch Birthwort	Aristolochiaceae	Native	-	+	NE
5.	<i>Aristolochia tagala</i>	Indian Birthwort	Aristolochiaceae	Native	-	+	NE
6.	<i>Aroides sp.</i>	Aroids	Araceae	Native	-	+	NE
7.	<i>Calamus sp.</i>	Sweet Flag	Arecaceae	Native	-	+	NE
8.	<i>Hoya fusca</i>	Yellow Wax Flower	Apocynaceae	Native	-	+	NE
9.	<i>Momordica charantia</i>	Bitter Gourd	Cucurbitaceae	Native	+	+	NE
10.	<i>Piper sarmentosum</i>	Wild Betel	Piperaceae	Native	+	+	NE
11.	<i>Pothos scandens</i>	Climbing Aroid	Araceae	Native	-	+	NE
12.	<i>Raphidophora calophyllum</i>	Mastwood	Araceae	Native	-	+	NE
13.	<i>Tinospora cordifolia</i>	Guduchi / Heartleaf	Menispermaceae	Native	+	+	NE
GROUP: GRASS							
1.	<i>Arundinella spp.</i>	Reed grass	Poaceae	Native	+	+	NE
2.	<i>Chrysopogon zizanioides</i>	Vetiver	Poaceae	Native	+	+	NE

Sl. No.	Botanical Name	English Name	Family	Origin	CZ	BZ	IUCN Status
3.	<i>Imperata cylindrica</i>	Cogon Grass	Poaceae	Native	-	+	LC
4.	<i>Ischaemum rugosum</i>	Himalayan Millet	Poaceae	Native	+	+	LC
5.	<i>Panicum</i> sp.	Torpedo Grass	Poaceae	Native	+	+	LC
6.	<i>Phragmites karka</i>	Common Reed	Poaceae	Native	-	+	LC
7.	<i>Saccharum arundinaceum</i>	Reedy Sugarcane	Poaceae	Native	+	+	NE
8.	<i>Saccharum spontaneum</i>	Wild Sugarcane	Poaceae	Native	+	+	LC
9.	<i>Themeda quadrivalvis</i>	Kangaroo Grass	Poaceae	Native	+	+	NE
10.	<i>Thysanolaena maxima</i>	Broom Grass	Poaceae	Native	+	+	NE
GROUP: BAMBOOS							
1.	<i>Bambusa balcooa</i>	Balcoo Bamboo	Bambusoideae	Native	-	+	NE
2.	<i>Bambusa tulda</i>	Indian Timber Bamboo	Bambusoideae	Native	-	+	NE
3.	<i>Dendrocalamus hamiltonii</i>	Giant Bamboo	Bambusoideae	Native	-	+	NE
4.	<i>Dendrocalamus strictus</i>	Male Bamboo	Bambusoideae	Native	+	+	NE
5.	<i>Melocanna baccifera</i>	Muli Bamboo	Bambusoideae	Native	-	+	NE
6.	<i>Schizostachyum dullooa</i>	Hill Bamboo	Bambusoideae	Native	-	+	NE
GROUP: PARASITIC HERB							
1.	<i>Cuscuta reflexa</i>	Giant Dodder	Convolvulaceae	Native	+	+	LC
Source: Field Survey; Upadhaya <i>et al.</i> , 2003; Bamon <i>et al.</i> , 2022; Bamon & Lahnundanga, 2023, and other Secondary Sources.							

A total of 109 tree and 15 shrub species belong to 104 and 13 families, respectively, were identified in the study area. Plant species other than trees and shrubs, including erect herbs, climbers and epiphytic herbs, parasitic herbs, grasses, and bamboos, were collectively identified in a total of 58 instances (Graph No. 1)

v. Phytosociological analysis on the Basis of Quadrat Study of Floral (Trees) Species

▪ Species Richness (S):	6
▪ Total Count:	43
▪ Total Number of Quadrats Studied:	10

Table No. 11. Phytosociological Analysis of Tree Species Observed

Sl. No.	Scientific Name	Count	RD	RF	RA	IVI
1.	<i>Castanopsis indica</i>	3	6.98	8.0	7.0	21.95
2.	<i>Erythrina</i> sp.	2	4.65	8.0	4.7	17.30
3.	<i>Pinus kesiya</i>	17	39.53	28.0	39.5	107.07
4.	<i>Quercus</i> spp.	8	18.60	16.0	18.6	53.21
5.	<i>Schima wallichii</i>	10	23.26	28.0	23.3	74.51
6.	<i>Toona ciliata</i>	3	6.98	12.0	7.0	25.95
TOTAL		100	100	100	100	300

Graph No. 1 Graphical Depiction of Phytosociological Analysis of Trees Species Observed

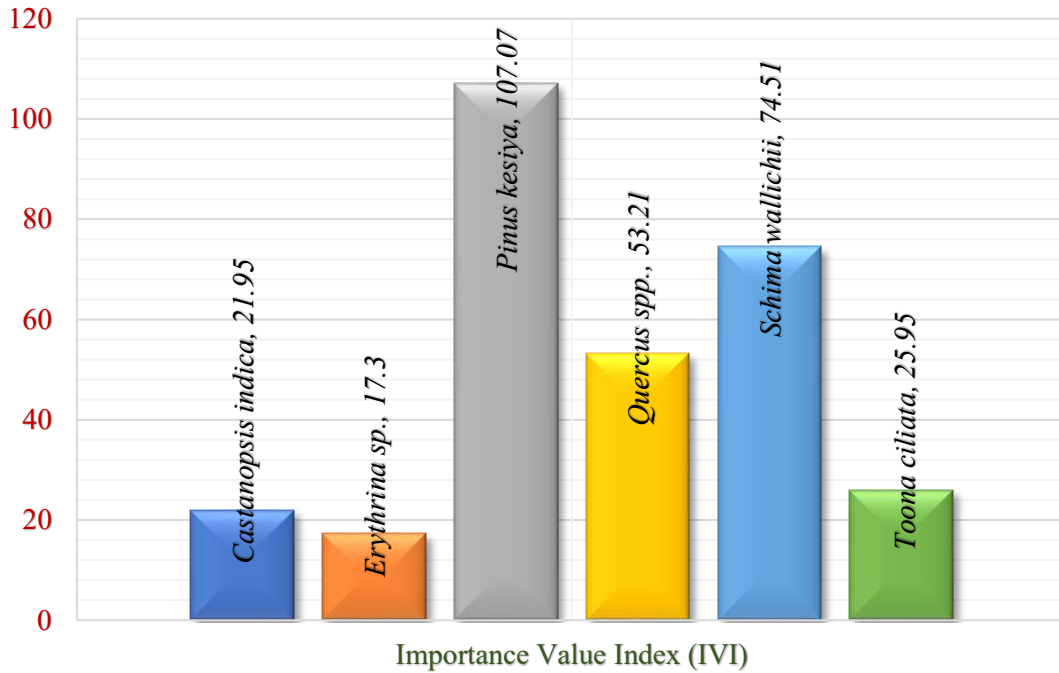


Table No. 12. Analysis of Phytosociological Study.

Sl. No.	Category	Count	P _i	P _i ²	P _i ln[P _i]	Measure	Value
1.	<i>Castanopsis indica</i>	3	0.070	0.005	-00.186	D	00.257
2.	<i>Erythrina sp.</i>	2	0.070	0.005	-00.186	1 - D	00.743
3.	<i>Pinus kesiya</i>	17	0.186	0.035	-00.313	E	00.856
4.	<i>Quercus spp.</i>	8	0.047	0.002	-00.143	1/D	3.891
5.	<i>Schima wallichii</i>	10	0.395	0.156	-00.367	H	1.533
6.	<i>Toona ciliata</i>	3	0.233	0.054	-00.339	S	6
TOTAL		43	1.001	-	-		

vi. Prevalent Terrestrial and Arboreal Fauna of the Study Area

Table No. 13. List of Mammalian Species of the Study Area.

Sl. No.	Zoological Name	Common Name	Family	FH	CZ	BZ	Sch*	IUCN Status
1.	<i>Atherurus macrourus</i>	Asiatic Brush-tailed Porcupine	Hystricidae	I	-	+	I	LC
2.	<i>Barbastella leucomelas</i>	Eastern Barbastelle	Vespertilionidae	H	-	+	-	LC
3.	<i>Bos indicus</i>	Domestic Cow	Bovidae	H	+	+	-	NE
4.	<i>Callosciurus erythraeus</i>	Pallas's Squirrel	Sciuridae	H	-	+	-	LC
5.	<i>Callosciurus pygerythrus</i>	Hoary-bellied Squirrel	Sciuridae	H	-	+	-	LC
6.	<i>Canis aureus</i>	Golden Jackal	Canidae	C	-	+	I	LC
7.	<i>Canis lupus familiaris</i>	Domestic Dog	Canidae	C	+	+	-	NE
8.	<i>Cannomys badius</i>	Lesser Bamboo Rat	Muridae	H	+	+	-	LC
9.	<i>Capra aegagrus hiscus</i>	Domestic Goat	Bovidae	H	-	+	-	NE
10.	<i>Crocidura attenuata</i>	Asian Grey Shrew	Soricidae	I	-	+	-	LC
11.	<i>Cynopterus sphinx</i>	Greater Short Nosed Fruit Bat	Pteropodidae	F	-	+	-	LC
12.	<i>Felis catus</i>	Domestic Cat	Felidae	P	-	+	-	LC
13.	<i>Funambulus pennanti</i>	Five-striped Palm Squirrel	Sciuridae	C	+	+	-	LC
14.	<i>Ia io</i>	Great Evening Bat	Vespertilionidae	C	-	+	-	NT
15.	<i>Kerivoula kachinensis</i>	Kachin Woolly Bat	Vespertilionidae	I	-	+	-	LC
16.	<i>Lepus nigricollis</i>	Indian Hare	Leporidae	H	-	+	II	LC
17.	<i>Macaca mulatta</i>	Rhesus Macaque	Cercopithecidae	O	-	+	-	LC
18.	<i>Megaderma lyra</i>	Greater False Vampire Bat	Megadermatidae	I	-	+	-	VU
19.	<i>Megaerops niphanae</i>	Niphane's Fruit Bat	Pteropodidae	F	-	+	-	LC
20.	<i>Miniopterus magnater</i>	Large Bent-winged Bat	Miniopteridae	F	-	+	-	LC
21.	<i>Miniopterus pusillus</i>	Lesser Bent-winged Bat	Miniopteridae	I	-	+	-	LC
22.	<i>Muntiacus vaginalis</i>	Northern Red Muntjac	Cervidae	H	-	+	I	LC
23.	<i>Murina huttoni</i>	Hutton's Tube-nosed Bat	Vespertilionidae	I	-	+	-	LC
24.	<i>Murina jaintiana</i>	Jaintia Tube-nosed Bat	Vespertilionidae	I	-	+	-	DD

Sl. No.	Zoological Name	Common Name	Family	FH	CZ	BZ	Sch*	IUCN Status
25.	<i>Murina pluvialis</i>	Rainforest Tube-nosed Bat	Vespertilionidae	I	-	+	II	DD
26.	<i>Mus booduga</i>	Little Indian Field Mouse	Muridae	O	+	+	-	LC
27.	<i>Mus musculus</i>	House Mouse	Muridae	O	-	+	-	LC
28.	<i>Myotis horsfieldii</i>	Horsfield's Myotis	Vespertilionidae	I	-	+	-	LC
29.	<i>Myotis longipes</i>	Kashmir Cave Bat	Vespertilionidae	I	-	+	-	LC
30.	<i>Myotis siligorensis</i>	Himalayan Whiskered Bat	Vespertilionidae	I	-	+	-	LC
31.	<i>Ovis aries</i>	Domestic Sheep	Bovidae	H	+	+	-	NE
32.	<i>Paradoxurus hermaphroditus</i>	Asian Palm Civet	Viverridae	O	-	+	I	LC
33.	<i>Pipistrellus paterculus</i>	Mount Popa Pipistrelle	Vespertilionidae	I	-	+	-	LC
34.	<i>Prionailurus bengalensis</i>	Leopard Cat	Felidae	C	-	+	I	LC
35.	<i>Rattus rattus</i>	Black Rat / House Rat	Muridae	O	-	+	-	LC
36.	<i>Ratufa bicolor</i>	Black Giant Squirrel	Sciuridae	F	-	+	I	LC
37.	<i>Rhinolophus spp.</i>	Horseshoe Bats	Rhinolophidae	I	-	+	-	LC
38.	<i>Suncus murinus</i>	Asian House Shrew	Soricidae	I	-	+	-	LC
39.	<i>Sus scrofa</i>	Wild Boar / Pig	Suidae	O	-	+	II	LC
40.	<i>Trachypithecus pileatus</i>	Capped Langur	Cercopithecidae	O	-	+	I	VU
41.	<i>Tylonycteris malayana</i>	Greater Bamboo Bat	Vespertilionidae	I	-	+	-	LC
42.	<i>Urva edwardsii</i>	Indian Grey Mongoose	Herpestidae	O	+	+	I	LC
FH: Food Habit, H: Herbivore, F: Frugivore, C: Carnivore, P: Piscivore, I: Insectivore, O: Omnivore.								
Sch*: WLP, 1972 and amendments thereof								
Source: Field Survey; Lyngdoh <i>et al.</i> , 2019; and other Secondary Sources.								

Table No. 14. List of Avifauna Species of the Study Area.

Sl. No.	Zoological Name	Common Name	Family	FH	MP	Sch*	CZ	BZ	IUCN Status
1.	<i>Acridotheres fuscus</i>	Jungle Myna	Sturnidae	O	R	II	-	+	LC
2.	<i>Acridotheres tristis</i>	Common Myna	Sturnidae	O	R	II	-	+	LC
3.	<i>Alcedo atthis</i>	Common Kingfisher	Alcedinidae	C	R	II	-	+	LC
4.	<i>Arachnothera longirostra</i>	Little Spiderhunter	Nectariniidae	N, I	R	II	-	+	LC
5.	<i>Ardea alba</i>	Great White Egret	Ardeidae	C	LM	II	-	+	LC
6.	<i>Ardeola grayii</i>	Pond Heron	Ardeidae	C	R	II	-	+	LC
7.	<i>Bubo flavipes</i>	Tawny Fish Owl	Strigidae	C	R	I	-	+	LC
8.	<i>Bubulcus ibis</i>	Cattle Egret	Ardeidae	C	R	II	-	+	LC
9.	<i>Buceros bicornis</i>	Great Pied Hornbill	Bucerotidae	F	R	I	-	+	VU
10.	<i>Centropus sinensis</i>	Greater Coucal	Cuculidae	O	R	II	-	+	LC
11.	<i>Cinnyris asiaticus</i>	Purple Sunbird	Nectariniidae	N, I	R	II	-	+	LC
12.	<i>Columba livia</i>	Blue Rock Pigeon	Columbidae	G	R	-	-	+	LC
13.	<i>Copsychus saularis</i>	Magpie Robin	Muscicapidae	I	R	II	-	+	LC
14.	<i>Corvus corax</i>	Common Raven	Corvidae	O	R	II	-	+	LC
15.	<i>Corvus splendens</i>	Common Crow	Corvidae	O	R	-	-	+	LC
16.	<i>Dendrocitta formosae</i>	Grey Treepie	Corvidae	O	R	II	-	+	LC
17.	<i>Dicrurus macrocercus</i>	Black Drongo	Dicruridae	I	LM	II	-	+	LC
18.	<i>Egretta garzetta</i>	Little Egret	Ardeidae	C	R	II	-	+	LC
19.	<i>Eudynamis scolopacea</i>	Asian Koel	Cuculidae	O	R	II	-	+	LC
20.	<i>Francolinus gularis</i>	Swamp Francolin	Phasianidae	O	R	II	-	+	NT
21.	<i>Gallus gallus</i>	Red Junglefowl	Phasianidae	O	R	II	-	+	LC
22.	<i>Gracula religiosa</i>	Hill Myna	Sturnidae	F	R	II	-	+	LC
23.	<i>Gyps himalayensis</i>	Himalayan Vulture	Accipitridae	SCV	R	I	-	+	NT
24.	<i>Hirundo rustica</i>	Barn Swallow	Hirundinidae	I	LDM	II	-	+	LC
25.	<i>Hypsipetes leucocephalus</i>	Black Bulbul	Pycnonotidae	F, I	R	II	-	+	LC
26.	<i>Milvus migrans</i>	Black Kite	Accipitridae	C	SDM	II	-	+	LC
27.	<i>Myophonus caeruleus</i>	Blue Whistling Thrush	Muscicapidae	I	R	II	-	+	LC
28.	<i>Nyctornis athertoni</i>	Blue-Bearded Bee-Eater	Meropidae	I	R	II	-	+	LC
29.	<i>Passer domesticus</i>	House Sparrow	Passeridae	O	R	II	-	+	LC
30.	<i>Pellorneum palustre</i>	Marsh Babbler	Pellorneidae	I	R	-	-	+	VU
31.	<i>Pericrocotus speciosus</i>	Scarlet Minivet	Campephagidae	I	R	II	-	+	NE
32.	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	Phalacrocoracidae	P	R	-	-	+	LC
33.	<i>Psarisomus dalhousiae</i>	Long-Tailed Broadbill	Eurylaimidae	I	R	II	-	+	LC
34.	<i>Psittacula krameri</i>	Rose Ringed Parakeet	Psittaculidae	F	R	II	-	+	LC
35.	<i>Pycnonotus cafer</i>	Red-Vented Bulbul	Pycnonotidae	F, I	R	II	-	+	LC
36.	<i>Pycnonotus jocosus</i>	Red-Whiskered Bulbul	Pycnonotidae	F, I	R	II	-	+	LC
37.	<i>Scolopax rusticola</i>	Wood Cock	Scolopacidae	I	WM	II	-	+	LC
38.	<i>Sitta formosa</i>	Beautiful Nuthatch	Sittidae	I	R	I	-	+	VU
39.	<i>Spelaornis longicaudatus</i>	Tawny-Breasted Wren-Babbler	Timaliidae	I	R	I	-	+	NT

Sl. No.	Zoological Name	Common Name	Family	FH	MP	Sch*	CZ	BZ	IUCN Status
40.	<i>Streptopelia decaocto</i>	Collard Dove	Columbidae	H	NM, R	II	-	+	LC
41.	<i>Turdoides striata</i>	Jungle Babbler	Leiothrichidae	I	R	II	-	+	LC
42.	<i>Upupa epops</i>	Common Hoopoe	Upupidae	I	LM	II	-	+	LC
43.	<i>Vanellus malabaricus</i>	Yellow Wattled Lapwing	Charadriidae	I	R	II	-	+	LC
FH: Food Habit, H: Herbivore, F: Frugivore, G: Granivore, N, I: Nectarivore & Insectivore, F, I: Frugivore & Insectivore, C: Carnivore, P: Piscivore, I: Insectivore, O: Omnivore, SCV: Scavenger.									
MP: Movement Pattern, R: Resident, LM: Local Migrant, WM: Winter Migrant.									
Sch*: WLP, 1972 and amendments thereof									
Source: Field Survey; and Several Secondary Sources.									

Table No. 15. List of Herpetofauna Species of the Study Area.

Sl. No.	Zoological Name	Common Name	Family	FH	Sch*	CZ	BZ	IUCN Status
CLASS: REPTILIAN								
1.	<i>Amphiesma stolatum</i>	Buff Striped Keelback	Natricidae	C	-	-	+	LC
2.	<i>Argyrophis diardii</i>	Diard's Blindsnake	Typhlopidae	C	-	-	+	LC
3.	<i>Boiga gocoool</i>	Arrowback Tree Snake	Colubridae	C	-	-	+	LC
4.	<i>Calotes versicolor</i>	Garden Lizard	Agamidae	C	-	+	+	LC
5.	<i>Hemidactylus spp.</i>	Common Geckos	Gekkonidae	C	-	-	+	NE
6.	<i>Ophiophagus hannah</i>	King Cobra	Elapidae	C	I	-	+	VU
7.	<i>Ovophis monticola</i>	Chinese Mountain Pit Viper	Viperidae	C	-	-	+	LC
8.	<i>Pareas monticola</i>	Common Slug Snake	Pareidae	C	-	-	+	LC
9.	<i>Rhabdophis himalayanus</i>	Orange-Collared Keelback	Natricidae	C	-	-	+	LC
10.	<i>Sphenomorphus maculatus</i>	Spotted Forest Skink	Scincidae	C	-	+	+	LC
11.	<i>Varanus bengalensis</i>	Bengal Monitor	Varanidae	C	I	-	+	NT
Source: Field Survey; Chandramouli, 2021, and Several Secondary Sources.								
CLASS: AMPHIBIAN								
1.	<i>Amolops formosus</i>	Assam Sucker Frog	Ranidae	C	-	-	+	LC
2.	<i>Bufo himalayanus</i>	Himalayan Toad	Bufo	C	-	+	+	LC
3.	<i>Duttaphrynus melanostictus</i>	Common Indian Toad	Bufo	C	-	+	+	LC
4.	<i>Euphyctis cyanophlyctis</i>	Indian Skipping Frog	Dicroglossidae	C	-	-	+	LC
5.	<i>Fejervarya limnocharis</i>	Crickit Frog	Dicroglossidae	C	-	-	+	LC
6.	<i>Zhangixalus smaragdinus</i>	White Lipped Treefrog	Rhacophoridae	C	-	-	+	LC
Source: Field Survey; Saikia <i>et al.</i> , 2024, IUCN, 2024, and Several Secondary Sources.								
FH: Food Habit, C: Carnivore, Sch*: WLP, 1972 and amendments thereof								

A total of 42 mammals and 43 avifauna species, were evidenced in the study area. The herpetofauna species, were collectively identified in a total of 17 occurrences in which 11 are reptilians and 6 are amphibians and exhibit remarkable family richness recorded as 18 for mammals, 26 for birds, 10 for reptiles, and 4 for amphibians (Graph No. 3).

vii. Diversity of Butterflies in the Study Area

Numerous studies have established butterflies as reliable bioindicators of terrestrial ecosystem health (Kunte, 2000; Bonebrake *et al.*, 2010). They effectively reflect the impacts of anthropogenic disturbances (Kunte, 2000; Koh, 2007), climatic variations, and both seasonal and ecological shifts (Kunte, 1997). Among terrestrial taxa, butterflies exhibit relatively higher sensitivity to environmental changes (Thomas, 2005), making them a preferred model group in ecological research aimed at formulating conservation and management strategies. Beyond their indicative value, butterflies perform vital ecological functions as pollinators across diverse plant taxa and constitute an important component of food webs, serving as prey for birds, spiders, reptiles, and other faunal groups.

Based on the compiled data, indicates that, the present study area supports a diversity of butterfly species particularly a total of 19 butterfly species distributed across four families, including Lycaenidae, Pieridae, and Papilionidae, with Nymphalidae being the most dominant as among these, the Nymphalidae family is, comprising nine species, followed by the Papilionidae and Pieridae families, each represented by four species. So, the scenario is further emphasizing the ecological richness and

environmental significance of the study landscape. The detailed list of butterfly species recorded from the study area is presented in Table No. 16.

Table No. 16. List of Lepidopteran Species (Butterflies) of the Study Area.

Sl. No.	Zoological Name	Common Name	Family	Sch*	CZ	BZ	IUCN Status
1.	<i>Acytolepis puspa</i>	Common Hedge Blue	Lycaenidae	-	-	+	NE
2.	<i>Heliophorus epicles</i>	Purple Sapphire	Lycaenidae	-	-	+	NE
3.	<i>Aglais caschmirensis</i>	Indian Tortoiseshell	Nymphalidae	-	-	+	NE
4.	<i>Cirrochroa tyche</i>	Common Yeoman	Nymphalidae	-	-	+	NE
5.	<i>Danaus genutia</i>	Striped Tiger	Nymphalidae	-	-	+	NE
6.	<i>Mycalesis visala</i>	Long-branded Bush Brown	Nymphalidae	-	-	+	NE
7.	<i>Parantica melaneus</i>	Chocolate Tiger	Nymphalidae	-	-	+	NE
8.	<i>Phalanta phalantha</i>	Common Leopard	Nymphalidae	-	-	+	LC
9.	<i>Symbrenthia lilaea</i>	Common Jester	Nymphalidae	-	-	+	NE
10.	<i>Tirumala septentrionis</i>	Dark Blue Tiger	Nymphalidae	-	-	+	NE
11.	<i>Vanessa indica</i>	Indian Red Admiral	Nymphalidae	-	-	+	NE
12.	<i>Graphium eurypylus</i>	Great Jay	Papilionidae	II	-	+	NE
13.	<i>Papilio crino</i>	Common Banded Peacock	Papilionidae	-	-	+	NE
14.	<i>Papilio memnon</i>	Great Mormon	Papilionidae	II	-	+	NE
15.	<i>Papilio polytes</i>	Common Mormon	Papilionidae	-	-	+	NE
16.	<i>Appias lyncida</i>	Chocolate Albatross	Pieridae	II	-	+	NE
17.	<i>Eurema hecabe</i>	Common Grass Yellow	Pieridae	-	-	+	LC
18.	<i>Pieris canidia</i>	Indian Cabbage White	Pieridae	-	-	+	NE
19.	<i>Pieris melete</i>	Asian Green Veined White	Pieridae	-	-	+	NE

Source: Field Survey; Bora *et al.*, 2016, and Several Secondary Sources.

4.2 Aquatic Ecology & Biodiversity

The aquatic ecology and biodiversity of the study area is principally influenced by the fresh waterbodies furnished in the Table No.17.

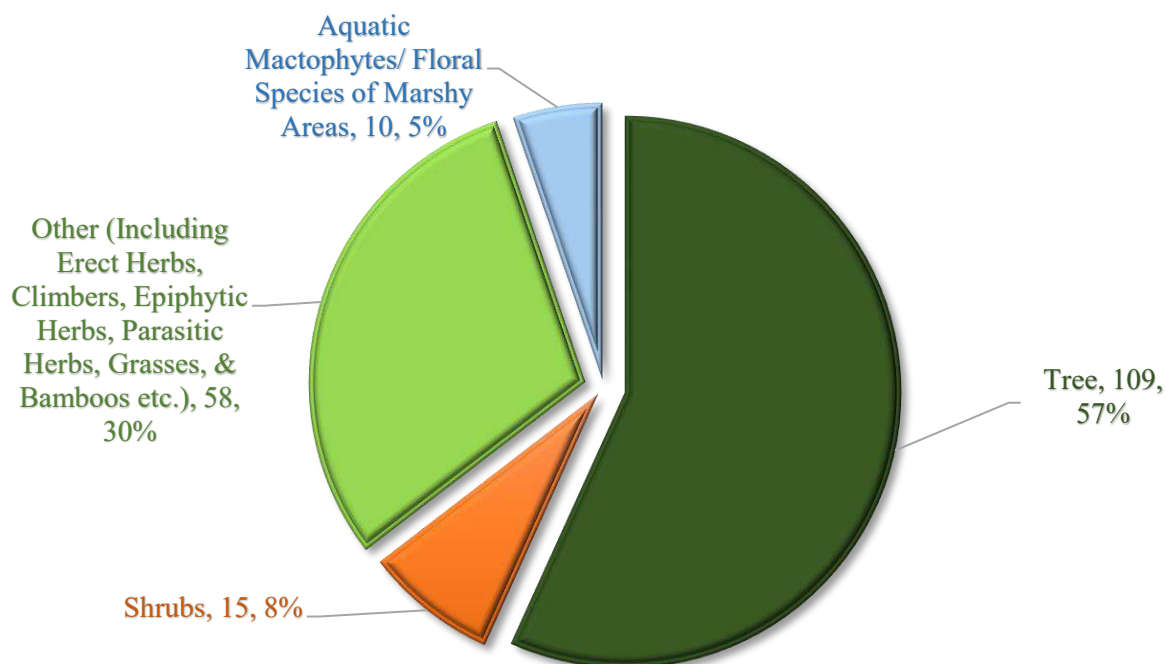
i. Prevalent Aquatic Flora of the Study Area

Table No. 17. Common Aquatic Macrophytes and the Floral Species of Marshy Areas.

Sl. No.	Botanical Name	Common Name	Family	CZ	BZ	IUCN Status	Type
1.	<i>Cyanodon dactylon</i>	Bermuda Grass	Poaceae	-	-	NE	Amphibious
2.	<i>Ceratophyllum demersum</i>	Hornwort	Ceratophyllaceae	-	-	LC	Free-floating
3.	<i>Eichhornia crassipes</i>	Water Hyacinth	Pontederiaceae	-	-	NE	Free-floating
4.	<i>Lemna minor</i>	Common Duckweed	Araceae	-	-	LC	Free-floating
5.	<i>Enhydra fluctuans</i>	Water Cress	Asteraceae	-	-	NE	Amphibious
6.	<i>Nymphaea stellata</i>	Blue Water Lily	Nymphaeaceae	-	-	EN	Free-floating
7.	<i>Neptunia oleracea</i>	Water Mimosa	Fabaceae	-	-	LC	Emergent
8.	<i>Rotala rotundifolia</i>	Roundleaf Rotala	Lythraceae	-	-	LC	Amphibious
9.	<i>Polygonum royerianum</i>	Knotweed	Polygonaceae	-	-	NE	Emergent
10.	<i>Trapa natans</i>	Water Chestnut	Lythraceae	-	-	LC	Free-floating

Sources: Field Survey, Zhang *et al.* 2011; Sarma *et al.*, 2014; Bharthi *et al.*, 2015; Lee *et al.*, 2019; Gaur *et al.*, 2021.

Graph No. 2 Graphical Representation on the Comparative Statistics of Tree, Shrubs and Other Terrestrial and Aquatic/Semi-Aquatic Plant Species in Terms of their Species Variability in the Study Area.

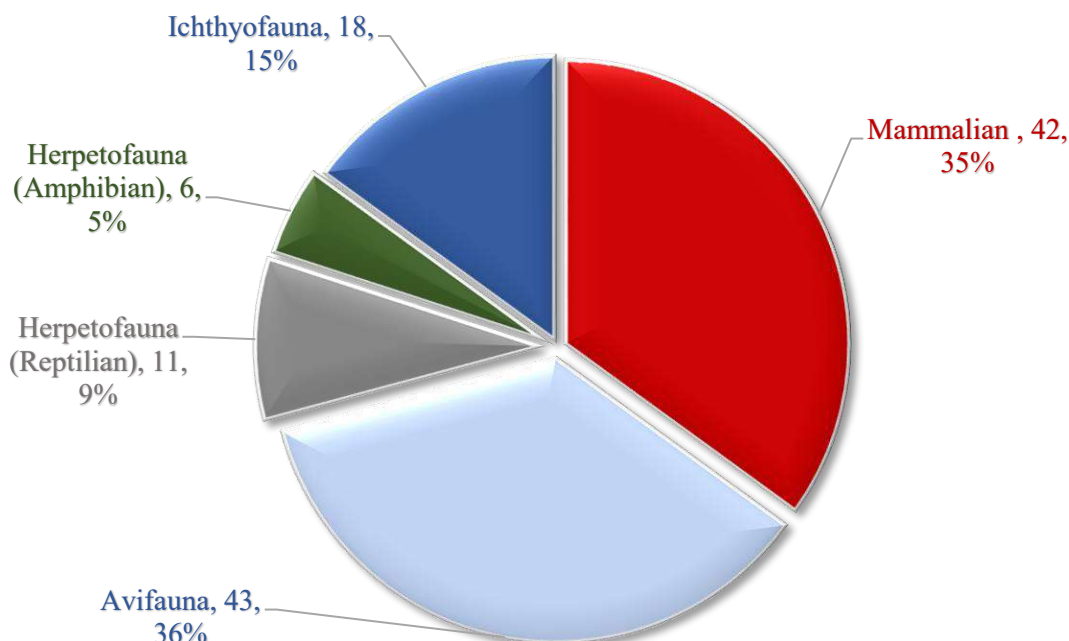


ii. Prevalent Aquatic Fauna of the Study Area

Table No. 18. Common Ichthyofauna of the Study Area.

Sl. No.	Zoological Name	Common Name	Family	Sch*	CZ	BZ	IUCN Status
1.	<i>Ailia coila</i>	Gangetic Ailia	Siluridae	-	-	+	NT
2.	<i>Amblypharyngodon mola</i>	Mola Carplet	Cyprinidae	-	-	+	LC
3.	<i>Chanda nama</i>	Elongate Glassy Perchlet	Ambassidae	-	-	+	LC
4.	<i>Channa punctatus</i>	Spotted Snakehead	Channidae	-	-	+	LC
5.	<i>Cirrhinus cirrhosus</i>	White Carp	Cyprinidae	-	-	+	VU
6.	<i>Cirrhinus reba</i>	Reba Carp	Cyprinidae	-	-	+	LC
7.	<i>Clarias magur</i>	Magur / Walking Catfish	Clariidae	-	-	+	EN
8.	<i>Gagata cenia</i>	River Catfish	Sisoridae	-	-	+	LC
9.	<i>Glyptothorax telchitta</i>	Sisorid Catfish	Sisoridae	-	-	+	LC
10.	<i>Gudusia chapra</i>	Indian River Shad	Clupeidae	-	-	+	LC
11.	<i>Labeo bata</i>	Bata	Cyprinidae	-	-	+	LC
12.	<i>Labeo gonius</i>	Kuria Labeo	Cyprinidae	-	-	+	LC
13.	<i>Labeo rohita</i>	Rohu	Cyprinidae	-	-	+	LC
14.	<i>Macrognathus pancalus</i>	Pancalus Spiny Eel	Mastacembelidae	-	-	+	LC
15.	<i>Pachypterus atherinoides</i>	Indian Anchovy Catfish	Schilbeidae	-	-	+	LC
16.	<i>Puntius sophore</i>	Freshwater Barb	Cyprinidae	-	-	+	LC
17.	<i>Schistura larketensis</i>	Larket Stone Loach	Nemacheilidae	-	-	+	NE
18.	<i>Semiplotus semiplotus</i>	Half-Bodied Carp	Cyprinidae	-	-	+	VU
Sources: Field Survey; Vaiphei and Gupta, 2017; Snaitang <i>et al.</i> , 2023; Kar, 2024; other Secondary Sources							
Sch*: Schedule as per WLP, 2023							

Graph No. 3. Graphical Illustration on the Comparative Statistics of Five Classes of Animal Species in Terms of their Species Variability in the Study Area.



iii. Plankton Diversity of the Study Area

The planktonic communities of the East Jaintia Hills District, Meghalaya, exhibit remarkable taxonomic diversity, reflecting the ecological health and productivity of the region's aquatic ecosystems. Among the phytoplankton, members of the Chlorophyta (green algae) constitute the most dominant group, followed by representatives of Bacillariophyta (diatoms) and Cyanophyta (blue-green algae), while Dinophyta and Euglenophyta occur in comparatively lower densities. Characteristic genera frequently observed include *Microcystis* sp., *Staurostrum* sp., *Cosmarium* sp., *Scenedesmus* sp., *Spirogyra* sp., *Navicula* sp., and *Pediastrum* sp., each contributing uniquely to the trophic dynamics and primary productivity of local water bodies. Dominant taxa comprise Rotifera, Cladocera, and Copepoda, while Rhizopoda and Ostracoda are represented with relatively low densities. Within these communities, Rotifera often account for the highest species richness, with notable taxa such as *Keratella* sp., *Asplanchna* sp., *Mesocyclops* sp., *Conochilus* sp., *Bosmina* sp., *Daphnia* sp., and various species of *Brachionus* (Das and Das, 2022; Kharbyngar *et al.*, 2024). Collectively, these planktonic assemblages highlight the ecological complexity and nutrient-rich nature of the freshwater habitats in East Jaintia Hills.

4.3 List of Schedule I species (as per WLPA, 2023) of the Study Area

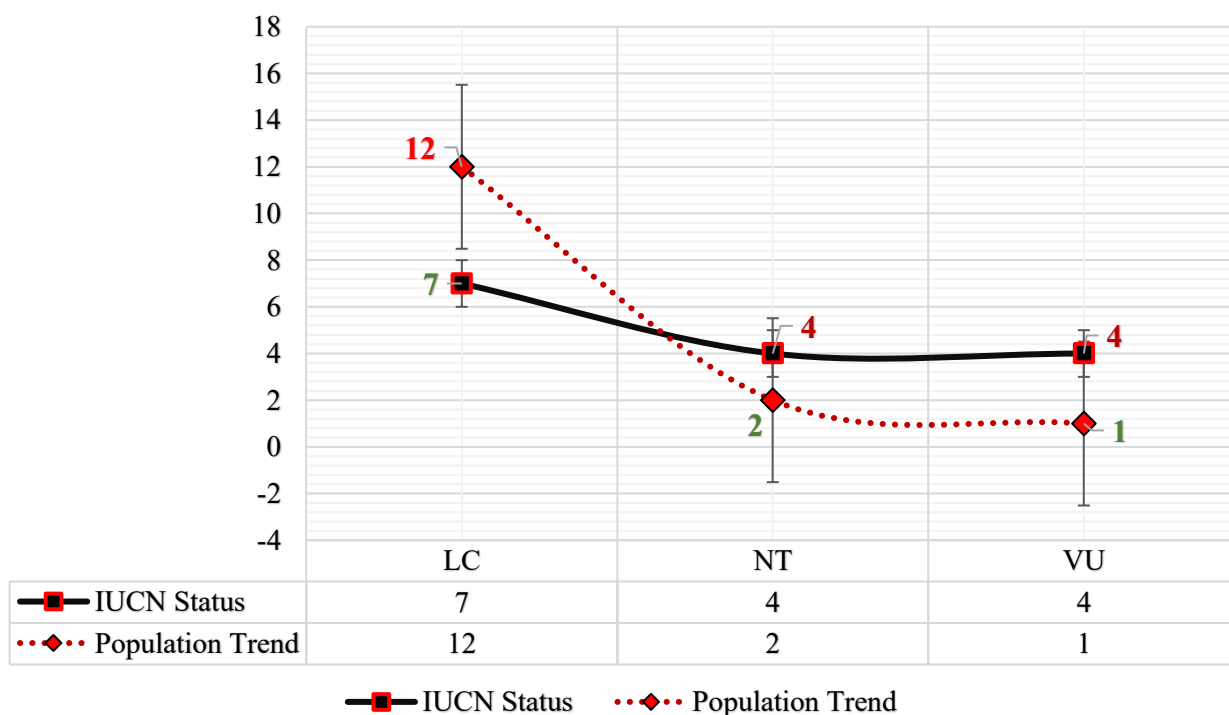
Empirical evidence derived from comprehensive field investigations and corroborated by secondary data sources underscores the presence of ecologically robust habitats within the study area, thereby signifying a pronounced degree of species richness and biodiversity integrity. Synthesizing the outcomes of both primary reconnaissance and secondary datasets, the study discerned the occurrence of six (06) faunal taxa enumerated under Schedule I of the Wildlife (Protection) Act, 2023 ([India Code, 2023](#)), emblematic of their elevated conservation significance and warranting priority protection measures. Nonetheless, during the course of field reconnaissance, the ecological assessment team did not record any Schedule I or otherwise highly susceptible species that would suggest immediate vulnerability or jeopardy to their sustained persistence within the extant natural habitats.

The detailed enumeration of Schedule I species, as collated from secondary sources, is presented in Table 19.

Table No. 19. Schedule I Species of the Study Area as per WLPA, 1972 (Amendments thereafter).

Sl. No.	Zoological Name	Common Name	Family	IUCN Status	Population Trend
Class: Mammalia					
1.	<i>Atherurus macrourus</i>	Asiatic Brush-tailed Porcupine	Hystriidae	LC	Decreasing
2.	<i>Canis aureus</i>	Golden Jackal	Canidae	LC	Increasing
3.	<i>Muntiacus vaginalis</i>	Northern Red Muntjac	Cervidae	LC	Decreasing
4.	<i>Paradoxurus hermaphroditus</i>	Asian Palm Civet	Viverridae	LC	Decreasing
5.	<i>Prionailurus bengalensis</i>	Leopard Cat	Felidae	LC	Stable
6.	<i>Ratufa bicolor</i>	Black Giant Squirrel	Sciuridae	NT	Decreasing
7.	<i>Trachypithecus pileatus</i>	Capped Langur	Cercopithecidae	VU	Decreasing
8.	<i>Urva edwardsii</i>	Indian Grey Mongoose	Herpestidae	LC	Stable
Class: Aves					
9.	<i>Bubo flavipes</i>	Tawny Fish Owl	Strigidae	LC	Decreasing
10.	<i>Buceros bicornis</i>	Great Hornbill	Bucerotidae	VU	Decreasing
11.	<i>Gyps himalayensis</i>	Himalayan Vulture	Accipitridae	NT	Decreasing
12.	<i>Sitta formosa</i>	Beautiful Nuthatch	Sittidae	VU	Decreasing
13.	<i>Spelaornis longicaudatus</i>	Tawny-Breasted Wren-Babbler	Timaliidae	NT	Decreasing
Class: Reptilia					
14.	<i>Ophiophagus hannah</i>	King Cobra	Elapidae	VU	Decreasing
15.	<i>Varanus bengalensis</i>	Bengal Monitor	Varanidae	NT	Decreasing

Graph No. 4. Graphical Depiction on the Comparative Statistics of Animal Species in Terms of their Conservation Significance in the Study Area.



4.4 Details on 15 Schedule I species (as per WLPA, 2023) of the Study Area

i. *Atherurus macrourus* (Asiatic Brush-tailed Porcupine)

- **Introduction**

Atherurus macrourus, commonly known as the Asiatic Brush-tailed Porcupine, is a medium-sized, nocturnal rodent species belonging to the family Hystricidae. It is native to tropical and subtropical forests across South and Southeast Asia, including India, China, Myanmar, Thailand, and parts of the Malay Peninsula. The species is known for its distinctive tail ending in a brush-like tuft of flattened, quill-like scales which it rattles when alarmed. It plays an important ecological role as a seed predator and disperser in forest ecosystems.



Figure No. 6 *Atherurus macrourus*

- **Taxonomy**

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Rodentia
Family	Hystricidae
Genus	<i>Atherurus</i>
Species	<i>Atherurus macrourus</i> (Linnaeus, 1758)

- **Description**

The Asiatic Brush-tailed Porcupine has a slender body compared to other porcupines, with a head-body length of 45–60 cm and a tail measuring 12 - 20 cm. The body is covered with short, stiff spines mixed with coarse hair, unlike the longer quills of *Hystrix* species. The tail ends with a flat brush of modified scales that produce a rattling sound when vibrated. Its coloration varies from dark brown to greyish-black. The species has small eyes, rounded ears, and strong claws adapted for digging.

- **Habitat**

Atherurus macrourus inhabits evergreen and semi-evergreen forests, bamboo forests, and secondary woodlands, typically at altitudes between 200 to 3,000 meters. It prefers moist habitats with abundant undergrowth and soil suitable for burrowing. The species is commonly found in forest floors with rocky crevices, hollow logs, and root systems that provide shelter.

- **Behaviour and Food Habit**

The species is nocturnal and terrestrial, and non-migrant. spending the day in burrows or crevices. It is omnivorous, feeding mainly on roots, tubers, bark, fruits, nuts, and fallen seeds, occasionally consuming insects and carrion. Its foraging activity contributes significantly to seed dispersal and forest regeneration. When threatened, it emits grunts and rattles its tail, serving as a warning signal to predators.

- **Ecological Niche**

As a forest floor forager, *Atherurus macrourus* occupies a niche that influences soil turnover, seed predation, and nutrient cycling. Its burrowing activity enhances soil aeration and decomposition

processes. By selectively feeding on seeds and fruits, it indirectly affects plant recruitment patterns and forest composition.

- **Communication**

Communication occurs through acoustic signals, scent marking, and tactile interactions. Tail rattling serves as a defensive auditory signal, while scent glands near the anus are used to mark territory and trails. Vocalizations include grunts, growls, and squeaks, especially during social interactions or mating.

- **Reproduction**

Breeding can occur throughout the year, though peaks are noted during the rainy season. The gestation period lasts about 100 days, after which a female gives birth to 1 - 3 precocial young. The young are born with soft quills that harden within days. Both parents participate in nest defence, and juveniles attain sexual maturity at around 9 - 12 months.

- **Lifespan**

In the wild, *Atherurus macrourus* is estimated to live for 7 - 10 years, while in captivity, individuals may survive up to 12 years under optimal care and protection.

- **Relationship with Humans**

The species is occasionally hunted for bushmeat and traditional medicine, and its quills are used for ornamentation and local crafts. It may also raid agricultural crops, leading to minor conflicts with farmers. Despite this, it remains an important component of the natural forest ecosystem and is sometimes tolerated due to its role in controlling certain plant populations.

- **Threats and Conservation Status**

Major Threats

- Habitat loss due to deforestation, shifting cultivation, and logging.
- Hunting and poaching for meat and traditional uses.
- Forest fragmentation restricting genetic exchange between populations.

Conservation Status

The IUCN Red List (2024) categorizes *Atherurus macrourus* as Least Concern (LC) due to its wide distribution and presumed large population, though localized declines are reported in parts of its range. Conservation measures include habitat protection within protected areas, awareness programs, and control of illegal hunting.

ii. *Canis aureus* (Golden Jackal)

- **Introduction**

The Golden Jackal, *Canis aureus*, is a highly adaptable canine. This resourceful predator, smaller than its wolf and coyote cousins, thrives in diverse habitats – from grasslands and woodlands to mountains and even deserts. Golden Jackals are known for their opportunistic hunting tactics, feeding on rodents, small mammals, birds, and even carrion. They are also intelligent scavengers, and their keen sense of smell helps them locate hidden meals. Living in family groups, Golden Jackals exhibit complex social behaviours, including cooperative hunting and pup rearing. Their distinctive golden fur and characteristic howl make them a fascinating element of the wildlife tapestry across their vast range.



Figure No. 7 *Canis aureus*

- **Taxonomy**

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Carnivora
Family	Canidae
Genus	<i>Canis</i>
Species	<i>Canis aureus</i> (Linnaeus, 1758)

- **Description**

The Golden Jackal is characterized by its slender body, pointed muzzle, and large, erect ears. It typically measures between 60 to 90 centimetres in length and weighs around 7 to 15 kilograms. Its coat varies in colour from pale yellow to golden brown, with lighter underparts. This adaptive coloration allows it to blend seamlessly with its surroundings.

- **Habitat**

Golden Jackals are highly adaptable and can thrive in various habitats, including forests, savannas, scrublands, and agricultural landscapes. They are often found in close proximity to water sources such as rivers, lakes, and wetlands. Despite their ability to adapt to human-modified environments, they prefer areas with sufficient cover for hunting and denning.

- **Behaviour and Food Habit**

Golden Jackals are primarily nocturnal and crepuscular, meaning they are most active during dawn and dusk. They are social animals that typically form monogamous pairs or small family groups. Their communication involves a variety of vocalizations, including howls, yips, and barks, which help in maintaining social bonds and territorial defence. The species has the ability to exploit food ranging from fruit and insects to small ungulates. It attacks domestic fowl and domestic mammals up to the size of domestic water buffalo calves.

- **Ecological Niche**

Golden jackals play an important role in their ecosystems as both predators and scavengers. They help regulate prey populations and facilitate nutrient cycling through scavenging. Their adaptability allows them to thrive in diverse habitats, making them integral components of various ecosystems. Protecting the ecological niche of golden jackals involves preserving their habitats, ensuring the availability of prey species, and minimizing human disturbances in their environments.

- **Communication**

Golden jackals communicate through a variety of vocalizations including howls, barks, whines, and growls. These vocalizations are used for a range of purposes including maintaining territory, coordinating group activities, and signalling danger. Understanding their communication patterns is crucial for studying their behaviour and social structure, which in turn informs conservation strategies aimed at preserving their natural habitats and minimizing human-wildlife conflicts.

- **Lifespan**

Golden jackals typically live for 8 to 12 years in the wild, although some individuals have been recorded to live up to 16 years in captivity.

- **Relationship with Humans**

The relationship between golden jackals and humans has been complex and often influenced by human activities. Historically, they have been both revered and persecuted by humans. In some cultures, they are considered symbols of cunningness and adaptability, while in others they are seen as pests and threats to livestock.

- **Reproduction**

The period of gestation in the jackal is usually said to be sixty-three days, the same as in the wolf and dog; but, as might be expected, there is some variation, and there appears good reason for believing that the time in the jackal is a few days less on an average. The female jackal brings forth about four young in holes in the ground, occasionally in dry drains in cantonments.

- **Threats and Conservation Status**

Major Threats

The golden jackal (*Canis aureus*) faces several threats to its survival, primarily driven by human activities. Habitat loss and fragmentation due to agricultural expansion, urbanization, and infrastructure development are significant concerns, leading to the degradation and loss of crucial habitats for golden jackals. Additionally, golden jackals are often persecuted by humans due to conflicts with livestock and perceived threats to game species. They are also subjected to hunting and trapping for their fur and body parts in some regions. Competition with other carnivores, such as wolves and domestic dogs, further exacerbates their vulnerability. These threats have resulted in population declines and local extinctions in certain areas. The conservation status of golden jackals varies across their range, with some populations facing significant declines while others remain relatively stable.

Conservation Status

Canis aureus (Golden Jackal) is classified as Least Concern (LC) under the IUCN Red List, with an overall increasing population trend. It is protected under Schedule I of the Wildlife (Protection) Act, 1972, amended 2023, and is widely distributed across India, inhabiting forests, scrublands, agricultural areas, and peri-urban landscapes. As a meso-predator and scavenger, it plays a vital ecological role in controlling smaller prey populations and maintaining ecosystem cleanliness.

However, the species faces localized threats from habitat fragmentation, road mortality, and disease transmission from domestic dogs. Despite these pressures, its high adaptability to human-altered environments ensures a relatively stable conservation outlook.

iii. *Muntiacus vaginalis* (Northern Red Muntjac / Indian Muntjac)

- **Introduction**

Muntiacus vaginalis, commonly known as the Northern Red Muntjac or Indian Barking Deer, is a small, solitary ungulate widely distributed throughout South and Southeast Asia. Recognized for its reddish-brown coat and dog-like alarm call, this species inhabits a range of forest ecosystems from foothill jungles to montane regions. It plays an essential ecological role as a browser and seed disperser, maintaining understory vegetation balance and serving as prey for large carnivores such as tigers, leopards, and dholes.



Figure No. 8 *Muntiacus vaginalis*

- **Taxonomy**

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Artiodactyla
Family	Cervidae
Genus	<i>Muntiacus</i>
Species	<i>Muntiacus vaginalis</i> (Boddaert, 1785)

- **Description**

The Northern Red Muntjac is a small deer, measuring 90 to 110 cm in body length, with a shoulder height of 45–55 cm and weight ranging from 15 to 30 kg. It has a short reddish-brown coat, lighter on the underparts, with a dark dorsal stripe extending from the crown to the tail. Males possess short, unbranched antlers (8 to 15 cm) that arise from long pedicels and tusk-like upper canines used in combat. The face bears distinctive dark markings, and the tail is short with a white underside visible when alarmed.

- **Habitat**

Muntiacus vaginalis exhibits remarkable adaptability, occupying tropical and subtropical forests, secondary growth, scrublands, and agricultural edges. It ranges from sea level up to 3,000 meters. It

prefers dense undergrowth near water sources, where it can easily conceal itself. The species is found across India, Nepal, Bhutan, Bangladesh, Myanmar, southern China, Thailand, Laos, Cambodia, and Vietnam.

- **Behaviour and Food Habit**

Primarily solitary and crepuscular, the Indian Muntjac is active during dawn and dusk. It feeds on young leaves, shoots, fruits, seeds, and bark, occasionally consuming fallen flowers and small invertebrates. It relies heavily on olfactory and auditory cues to detect predators. When alarmed, it produces a loud, repetitive ‘bark’ sound, hence the name barking deer. It maintains small, overlapping territories, which are scent-marked using preorbital glands located below the eyes.

- **Ecological Niche**

As a medium-sized browser, *M. vaginalis* regulates forest undergrowth and influences plant regeneration dynamics. It contributes to seed dispersal through defecation and selective feeding. Being a major prey species for large carnivores, it forms an integral link in tropical forest food webs, supporting predator populations and trophic stability.

- **Communication**

The species communicates through vocal, chemical, and visual cues. The characteristic barking serves as an alarm call and territorial warning. Scent marking with preorbital gland secretions and scraping of the ground define territorial boundaries.

Body posture and antler display are also used during aggressive encounters and courtship.

- **Reproduction**

Breeding occurs throughout the year, with seasonal peaks varying by region. After a gestation period of about 210 days, a single fawn (rarely two) is born and concealed in dense vegetation. Females become sexually mature by one year, while males mature around 18 months. The mother nurses the young for up to three months before independence. Males engage in short but intense fights, using antlers and canines to compete for mates.

- **Lifespan**

In the wild, *Muntiacus vaginalis* lives for about 8 to 12 years, while in captivity it may reach up to 16 years under managed care. Natural mortality is influenced by predation and habitat pressure.

- **Relationship with Humans**

The Indian Muntjac is relatively common across its range but is often hunted for meat, hides, and traditional medicine. In agricultural areas, it sometimes browses on crops, causing minor human-wildlife conflict. Conversely, it holds cultural and ecological significance in many forest-dependent communities and is a key indicator species of forest health.

- **Threats and Conservation Status**

Major Threats

- Hunting and poaching for subsistence and trade.
- Habitat loss and fragmentation due to logging and agricultural expansion.
- Vehicle collisions and predation by feral dogs near human settlements.

Conservation Status

According to the IUCN Red List (2024), *Muntiacus vaginalis* is classified as Least Concern (LC) owing to its broad range and stable population trends. It is included in CITES Appendix III (Nepal), affording partial protection. The species occurs in several protected areas such as Kaziranga, Manas, Namdapha, and Khao Yai National Parks. Conservation focus includes habitat restoration, anti-poaching patrols, and community-based awareness programs.

iv. *Paradoxurus hermaphroditus* (Asian Palm Civet / Common Palm Civet)

• Introduction

Paradoxurus hermaphroditus, commonly known as the Asian Palm Civet or Common Palm Civet, is a small nocturnal mammal native to South and Southeast Asia. It belongs to the family Viverridae and is recognized for its adaptability to both forested and human-modified habitats. This omnivorous, tree-dwelling species plays a key ecological role as a seed disperser, especially of tropical fruiting trees like figs and coffee. Although often misunderstood as a pest, it contributes significantly to forest regeneration and ecosystem health.



Figure No. 9
Paradoxurus hermaphroditus

• Taxonomy

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Carnivora
Family	Viverridae
Genus	<i>Paradoxurus</i>
Species	<i>Paradoxurus hermaphroditus</i> (Pallas, 1777)

• Description

The Asian Palm Civet is a medium-sized viverrid, with a body length of 50 to 65 cm and a tail measuring 40 to 60 cm, weighing around 2 to 5 kg. Its fur is coarse, greyish-brown with darker markings on the face and a distinctive black mask around the eyes. The muzzle is pointed, the ears are small and rounded, and the tail is long and non-prehensile. It has five toes on each limb, equipped with sharp, semi-retractile claws that aid in climbing.

Sexual dimorphism is minimal, and despite its name, the species is not hermaphroditic, the name refers to early confusion about its reproductive anatomy.

- **Habitat**

Paradoxurus hermaphroditus is an arboreal and terrestrial generalist, inhabiting tropical evergreen, semi-evergreen, and deciduous forests, as well as plantations, urban gardens, and agricultural landscapes. It occurs from sea level up to 2,500 meters in elevation.

The species thrives in areas with fruiting trees and dense canopy cover but also adapts well to human environments, making it one of the most widespread small carnivores in Asia.

- **Behaviour and Food Habit**

The species is nocturnal and solitary, spending daytime in tree hollows, rock crevices, or abandoned buildings. It is omnivorous, feeding on fruits (bananas, figs, mangoes, papayas), small mammals, birds, eggs, insects, and nectar. It is notably known for consuming and excreting coffee cherries, a process that produces the world-famous “civet coffee” (Kopi Luwak). Its flexible diet allows it to survive in fragmented and human-dominated landscapes. The animal marks its territory with scent from perineal glands and uses latrine sites repeatedly.

- **Ecological Niche**

As an important seed disperser, *Paradoxurus hermaphroditus* plays a crucial role in forest succession and regeneration, aiding the spread of many tropical fruit species. It also helps control small animal populations through predation. Its adaptability to varied diets and habitats makes it an ecological generalist species, often serving as a bioindicator of ecosystem diversity and resilience.

- **Communication**

Communication occurs through vocal calls, olfactory marking, and visual cues. It emits hisses, growls, and mews when threatened or during social encounters. Scent marking using perineal glands is essential for territory demarcation and sexual signalling. Visual cues such as tail posture and facial expressions are used during courtship and aggression.

- **Reproduction**

Breeding can occur year-round, with peaks varying regionally. The gestation period lasts approximately 60 to 75 days, after which the female gives birth to 2 to 4 young in a concealed nest. The young are born blind and helpless, opening their eyes at about 10 days and weaning at 2 months. Sexual maturity is reached by 11 to 12 months. Males do not participate in parental care, and females typically rear their offspring alone in secluded dens.

- **Lifespan**

In the wild, *Paradoxurus hermaphroditus* typically lives for 15 to 20 years, while in captivity it can survive up to 25 years under suitable care and nutrition. Mortality in the wild is often due to hunting, predation, and road accidents.

- **Relationship with Humans**

The Asian Palm Civet has a complex relationship with humans. While valued for its role in producing civet coffee, it is also hunted for meat, pelts, and traditional medicine, and sometimes kept as a pet. In urban areas, it may be considered a nuisance for raiding fruit trees or poultry. Ethical concerns have arisen over the inhumane practices in captive civet coffee production. Despite these conflicts, the species remains ecologically valuable and contributes to biodiversity maintenance.

- **Threats and Conservation Status**

Major Threats

- Hunting and illegal trade for civet coffee production and bushmeat.
- Habitat loss and fragmentation due to deforestation and urbanization.
- Persecution in urban areas where it is considered a pest.
- Road mortality and predation by domestic dogs.

Conservation Status

According to the IUCN Red List (2024), *Paradoxurus hermaphroditus* is classified as Least Concern (LC) due to its wide distribution and adaptability. It is listed under CITES Appendix III (India), offering limited trade regulation. The species occurs in numerous protected areas, including Periyar, Buxa, and Namdapha National Parks. Conservation priorities include promoting ethical wildlife trade regulation, habitat protection, and public education on its ecological importance.

v. *Prionailurus bengalensis* (Leopard Cat)

- **Introduction**

Prionailurus bengalensis, commonly known as the Leopard Cat, is a small wild felid widely distributed across South, Southeast, and East Asia. Renowned for its striking spotted coat resembling that of a leopard, it is one of Asia's most adaptable wild cats. The species inhabits a range of ecosystems, from tropical rainforests and temperate woodlands to agricultural landscapes. Agile, elusive, and predominantly nocturnal, the Leopard Cat is an important mesopredator, regulating populations of small mammals, birds, and reptiles, thereby maintaining ecological balance.



Figure No. 10 *Prionailurus bengalensis*

- **Taxonomy**

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Carnivora
Family	Felidae
Genus	<i>Prionailurus</i>

Species *Prionailurus bengalensis* (Kerr, 1792)

- **Description**

The Leopard Cat is a small to medium-sized wild cat, with a head-body length of 40 to 60 cm, a tail of 20 to 30 cm, and a weight ranging from 3 to 6 kg. Its coat is yellowish-brown to greyish, marked with distinct black spots and streaks. The underparts are whitish, and the tail bears several dark rings with a black tip. The head is small and rounded, with white facial lines and large, oval eyes adapted for nocturnal vision. Morphological variation occurs across its range, with northern populations being larger and paler, and southern ones smaller and darker.

- **Habitat**

Prionailurus bengalensis occupies diverse habitats, including tropical evergreen forests, moist deciduous forests, montane woodlands, grasslands, scrublands, and agricultural landscapes. It is often found near water sources such as rivers and wetlands. The species ranges from sea level to altitudes exceeding 3,000 meters, demonstrating high ecological adaptability. It occurs across India, Nepal, Bhutan, Bangladesh, Myanmar, China, Thailand, Laos, Vietnam, Malaysia, Indonesia, Korea, Japan (Tsushima Island), and the Russian Far East.

- **Behaviour and Food Habit**

The Leopard Cat is nocturnal, solitary, and territorial. It is an excellent climber and swimmer, though it primarily hunts on the ground. Its diet consists mainly of small mammals (rodents, shrews, bats), birds, reptiles, amphibians, and insects. It also consumes eggs and occasionally fish. The species uses stealth and ambush tactics typical of felids, aided by its acute senses. Each individual maintains a home range marked with urine spray and claw scratches. Activity patterns peak at dusk and dawn.

- **Ecological Niche**

As a mesopredator, *P. bengalensis* occupies a vital niche in controlling populations of small vertebrates, thereby maintaining prey diversity and ecological balance. In agricultural ecosystems, it helps regulate rodent populations, indirectly benefiting crop protection. It coexists with larger predators like leopards and dholes by adopting nocturnal and arboreal habits to minimize competition.

- **Communication**

Communication in *Prionailurus bengalensis* involves vocal, olfactory, and visual signals. Vocalizations include growls, mews, purrs, and hisses, primarily used during mating or territorial defence. Scent marking through urine and faeces defines home ranges, while facial rubbing and body posturing serve as social and reproductive cues. Visual signals such as raised tails and ear positions express dominance or submission.

- **Reproduction**

The species breeds seasonally or year-round, depending on the region. The mating season in tropical areas peaks between February and April, while in temperate regions it occurs in spring. The gestation period is about 65 to 75 days, after which 2 to 4 kittens are born in a concealed den, such as a hollow

log, tree cavity, or rocky crevice. The kittens open their eyes after 10 - 12 days, are weaned at 2 - 3 months, and attain independence by 6–8 months. Sexual maturity occurs at 1 year of age.

- **Lifespan**

In the wild, the Leopard Cat lives approximately 8 to 12 years, while in captivity it may survive up to 15 years under managed conditions. Natural mortality factors include predation, disease, and habitat pressures.

- **Relationship with Humans**

Prionailurus bengalensis often coexists near agricultural and rural areas, occasionally preying on domestic poultry, leading to minor conflict. Historically, it has been hunted for its fur and sometimes captured for the pet trade. However, it also contributes to pest control by limiting rodent populations in farmlands.

Notably, the Bengal Cat, a popular domestic hybrid, was developed by crossing *Prionailurus bengalensis* with domestic cats (*Felis catus*).

- **Threats and Conservation Status**

Major Threats

- Habitat loss and fragmentation from deforestation, agriculture, and urbanization.
- Poaching and illegal trade for fur and exotic pets.
- Road mortality and human-wildlife conflict in rural landscapes.
- Hybridization with domestic cats, threatening genetic integrity in some areas.

Conservation Status

According to the IUCN Red List (2024), *Prionailurus bengalensis* is listed as Least Concern (LC) due to its wide distribution and stable population. However, some regional populations are declining due to habitat degradation. The species is protected under CITES Appendix II, and in India under Schedule I of the Wildlife (Protection) Act, 1972, affording it the highest legal protection. Conservation priorities include habitat connectivity, anti-poaching enforcement, and public awareness on the importance of small carnivores.

vi. *Ratufa bicolor* (Black Giant Squirrel)

- **Introduction**

Ratufa bicolor, commonly known as the Black Giant Squirrel, is one of the largest squirrels in the world. It is an arboreal rodent native to South and Southeast Asia, inhabiting tropical and subtropical forests with dense canopy cover. Known for its striking black and cream coloration and large size, it is an important seed disperser and indicator of forest health. The species' presence reflects the ecological integrity of mature forest ecosystems. Due to habitat fragmentation and hunting, its populations are declining in several parts of its range.



Figure No. 11 *Ratufa bicolor*

- **Taxonomy**

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Rodentia
Family	Sciuridae
Genus	<i>Ratufa</i>
Species	<i>Ratufa bicolor</i> (Sparrman, 1778)

- **Description**

The Black Giant Squirrel is a large, diurnal tree squirrel measuring 35 to 50 cm in body length with a tail of equal or slightly greater length (45 to 60 cm), and weighs around 1.0 to 1.5 kg. Its fur coloration varies geographically but is typically glossy black or dark brown on the upper parts and cream, buff, or orange on the underparts. The tail is long, bushy, and aids in balance during arboreal movement. It has a robust body, strong limbs, and large claws adapted for gripping tree bark. The head is rounded with small ears fringed with short hair.

- **Habitat**

Ratufa bicolor primarily inhabits tropical evergreen, semi-evergreen, and moist deciduous forests, and is also found in pine forests and hill jungles. It prefers tall, mature forest canopies and rarely descends to the ground except to cross gaps or retrieve fallen fruits. The species occurs from sea level up to 2,500 meters in elevation. Its distribution extends across India (Northeast and Western Ghats), Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Laos, Cambodia, Vietnam, southern China, and the Malay Peninsula.

- **Behaviour and Food Habit**

The species is diurnal and arboreal, spending most of its time in the upper canopy. It is solitary or found in pairs, occasionally in small family groups. The Black Giant Squirrel feeds on fruits, nuts, seeds, flowers, bark, and young leaves, occasionally consuming bird eggs. Its feeding behaviour promotes seed dispersal and forest regeneration. It constructs large spherical nests (drays) of leaves and twigs, usually at the junction of tall branches, used for resting and breeding. When alarmed, it emits a loud, sharp call resembling a bark.

- **Ecological Niche**

As a large-bodied frugivore and seed disperser, *Ratufa bicolor* plays a crucial ecological role in maintaining forest diversity. By feeding on fruits and caching or dropping seeds, it facilitates natural regeneration of canopy trees. It also serves as prey for large raptors such as eagles and forest-dwelling carnivores. Its dependence on mature forest structure makes it a valuable indicator species for undisturbed forest habitats.

- **Communication**

Communication occurs through vocal calls, visual signals, and scent marking. The loud chattering or barking calls serve as alarm or territorial warnings. Tail flicking and body postures are used for signalling during social or aggressive interactions. Olfactory communication is achieved through glandular scent marking around nesting and feeding areas.

- **Reproduction**

Breeding occurs once or twice a year, depending on regional climate. The gestation period lasts around 28 to 35 days, and the female gives birth to 1 to 2 young per litter. Nests are built high in trees, providing protection from predators. The young are born blind and hairless, developing fur and opening eyes within 2 to 3 weeks. Juveniles remain with the mother for several months before becoming independent. Parental care is exclusively maternal.

- **Lifespan**

In the wild, *Ratufa bicolor* has an average lifespan of 10 to 12 years, though individuals in captivity have been known to live up to 15 years. Survival depends on habitat quality, predation pressure, and food availability.

- **Relationship with Humans**

The species is non-aggressive and shy, but human activities pose serious threats. It is hunted for meat and fur in some regions and sometimes persecuted as a crop pest when feeding on fruits and nuts. However, it contributes positively to forest regeneration and biodiversity conservation. In parts of Northeast India and Southeast Asia, it holds cultural significance in traditional folklore and ecological beliefs.

- **Threats and Conservation Status**

Major Threats

- Habitat loss and fragmentation from logging, shifting cultivation, and plantation expansion.
- Hunting and poaching for meat and pelts.
- Decline of mature forest canopy due to selective tree felling.
- Human disturbance and predation by domestic animals.

Conservation Status

According to the IUCN Red List (2024), *Ratufa bicolor* is classified as Near Threatened (NT) due to ongoing habitat loss and hunting pressure. It is protected under Schedule I of the Indian Wildlife

(Protection) Act, 1972, and listed in CITES Appendix II. Populations occur within several protected areas including Namdapha National Park, Pakke Tiger Reserve, Silent Valley, and Khao Yai National Park. Conservation measures include habitat preservation, hunting regulation, and community-based awareness programs promoting coexistence with forest fauna.

vii. *Trachypithecus pileatus* (Capped Langur)

• Introduction

Trachypithecus pileatus, commonly known as the Capped Langur, is a medium-sized arboreal primate endemic to the forests of the Eastern Himalayas and Northeast India. It is easily recognized by its characteristic dark “cap” of fur on the crown of the head, contrasting with its paler face and body. The species is social, diurnal, and folivorous, inhabiting tropical and subtropical forests at mid to high elevations. As a primary folivore, it plays an important role in regulating forest vegetation and aiding in seed dispersal. However, extensive habitat loss and hunting have caused significant population declines, placing it under a threatened conservation status.



Figure No. 12 *Trachypithecus pileatus*

• Taxonomy

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Primates
Family	Cercopithecidae
Genus	<i>Trachypithecus</i>
Species	<i>Trachypithecus pileatus</i> (Blyth, 1843)

• Description

The Capped Langur is a slender, long-tailed colobine monkey with a head–body length of 45–60 cm and a tail length of 70 to 90 cm. Adults weigh around 9 to 14 kg, with males slightly larger than females. Its pelage colour varies regionally, typically greyish-brown to dark chestnut on the back with lighter underparts. The head bears a distinct black or dark brown cap of short fur, from which the species derives its name. The face is pale grey or bluish, with a white ruff around the cheeks. The long limbs and prehensile tail facilitate agile arboreal movement through the canopy.

• Habitat

Trachypithecus pileatus inhabits tropical and subtropical evergreen, semi-evergreen, and moist deciduous forests, including bamboo forests and riverine habitats. It is primarily distributed across Northeast India (Assam, Arunachal Pradesh, Meghalaya, Mizoram, Nagaland, and Tripura), extending into Bhutan, Bangladesh, and western Myanmar. It prefers canopy-dense forests between 100 m and

2,800 m elevation, often avoiding degraded or open areas. The species is highly dependent on intact, contiguous forest canopies for movement and feeding.

- **Behaviour and Food Habit**

The Capped Langur is diurnal and arboreal, spending most of its time in the upper canopy. It lives in social groups of 5 to 20 individuals, typically with one adult male, several females, and their young. The species is folivorous, feeding primarily on young leaves, shoots, fruits, flowers, and seeds. Occasionally, it consumes bark and mineral-rich soil to aid digestion. Seasonal dietary variation occurs based on food availability. Foraging occurs in the early morning and late afternoon, while midday is spent resting and social grooming.

- **Ecological Niche**

As a leaf- and fruit-eating primate, *Trachypithecus pileatus* plays a vital ecological role in seed dispersal and maintaining plant diversity. Its feeding behaviour helps in controlling foliage density and promoting canopy regeneration. Being a mid-canopy specialist, it influences forest structure and serves as an indicator of healthy, stratified habitats. The species is also a prey base for large raptors and carnivores such as clouded leopards.

- **Communication**

Capped Langurs communicate through vocal, visual, and tactile signals. Loud whooping and barking calls are used for maintaining group cohesion and territory defence. Facial expressions and body postures signal aggression, submission, or alarm. Grooming serves as a key tactile communication tool, strengthening social bonds within groups.

- **Reproduction**

Breeding in *Trachypithecus pileatus* is seasonal, often synchronized with the monsoon cycle. The gestation period lasts about 200 to 210 days, after which the female gives birth to a single infant. Newborns have a bright orange coat, which darkens to adult coloration within six months. The mother provides prolonged care, while other females in the group may also assist (alloparenting).

Sexual maturity is attained at 3 to 4 years, and the interbirth interval ranges from 18–24 months. Males typically leave their natal groups upon maturity.

- **Lifespan**

In the wild, the Capped Langur lives for approximately 18 to 20 years, while in captivity individuals can survive up to 25 years. Longevity is influenced by habitat quality, predation risk, and group stability.

- **Relationship with Humans**

Trachypithecus pileatus maintains a mostly neutral relationship with humans but is increasingly affected by deforestation, hunting, and habitat encroachment. In some rural areas, it is occasionally considered a minor crop pest, though its ecological importance as a forest regenerator is recognized. The species holds

cultural reverence in certain indigenous communities of Northeast India, often symbolizing forest guardianship and agility.

• Threats and Conservation Status

Major Threats

- Habitat loss and fragmentation due to shifting cultivation, logging, and infrastructure expansion.
- Hunting for bushmeat and traditional medicine.
- Human–wildlife conflict in agricultural landscapes.
- Lack of habitat connectivity, restricting gene flow between subpopulations.

Conservation Status

According to the IUCN Red List (2024), *Trachypithecus pileatus* is listed as Endangered (EN) due to severe population decline across its range. It is included in Schedule I of the Indian Wildlife (Protection) Act, 1972, offering the highest level of legal protection. The species is also listed under CITES Appendix I. Populations are found in protected areas such as Namdapha National Park, Balpakram National Park, Nokrek Biosphere Reserve, and Manas Tiger Reserve. Conservation priorities include habitat restoration, anti-poaching initiatives, and community awareness programs that promote coexistence and forest conservation.

viii. *Urva edwardsii* (Indian Grey Mongoose)

• Introduction

The Indian grey mongoose, also known as the Asian grey mongoose (*Urva edwardsii* or *Herpestes edwardsii* or *Ichneumon edwardsii*), is a fascinating mammal native to the Indian subcontinent and extending into parts of West Asia. These adaptable creatures thrive in various habitats like open forests, scrublands, and even cultivated fields, often venturing close to human settlements. Indian grey mongooses are known for their inquisitive nature and bold demeanour, but remain cautious, staying close to cover. They are skilled climbers and primarily live solitary lives or form pairs. Interestingly, this mongoose species is famous for its resistance to cobra venom, making it a natural predator of these deadly snakes.



Figure No. 13 *Urva edwardsii*

• Taxonomy

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Carnivora

Family	Herpestidae
Genus	<i>Urva</i>
Species	<i>Urva edwardsii</i> (É. Geoffroy Saint-Hilaire, 1818)

- **Description**

The *Urva edwardsii*, also known as the Indian Ornate Narrow-headed Mantis, is a fascinating insect with a body that perfectly exemplifies its predatory lifestyle. Its elongated, slender body is typically a light brown or green color, providing excellent camouflage amidst leaves and branches. The most striking feature is the triangular head, narrow and highly mobile, allowing it to swivel and pinpoint prey with exceptional precision. Two large, bulging compound eyes dominate the head, offering a wide field of view for spotting unsuspecting insects. The *Urva edwardsii* also possesses two raptorial forelimbs, covered in sharp spines and perfectly adapted for swiftly grasping its prey. Overall, the *Urva edwardsii*'s body design is a marvel of adaptation, perfectly suited for its role as an ambush predator in the Indian ecosystem.

- **Habitat**

The Indian grey mongoose, also known as *Urva edwardsii*, thrives in a variety of habitats across its range in India and West Asia. These adaptable creatures are comfortable in open forests with scattered trees, but they also flourish in scrublands and cultivated fields. Interestingly, they often find themselves close to human settlements, taking advantage of hedgerows, thickets, and even drainage ditches for shelter. While a bold and curious animal, the Indian grey mongoose is wary of venturing far from cover, preferring the security of burrows, groves, or the shade of rocks and bushes. This versatility in habitat selection contributes to the widespread success of the Indian grey mongoose.

- **Behaviour and Food Habit**

Mongoose are terrestrial, diurnal solitary hunters that search during the day and into late evening in search of reptiles, mainly snake. This species is known for its behavior in combating snakes. In a fight against a snake, a mongoose utilizes special techniques and adaptations. At first the aggressive mongoose displays its teeth. They use a quick trot, moving constantly, scanning the area for food. They are rarely seen climbing trees. They are fossorial, motile, sedentary, territorial, social and show dominance in hierarchies. The Indian grey mongoose (*Urva edwardsii*) is an opportunistic omnivore, meaning it adapts its diet to what's readily available. They are skilled hunters, primarily targeting small animals like rodents, lizards, snakes (including venomous ones!), and ground-dwelling birds and their eggs. However, their diet isn't limited to just meat. They also enjoy a variety of insects, beetles, and even fruits, berries, and roots to supplement their nutritional needs. This dietary flexibility allows them to thrive in diverse habitats and contributes to their success as a widespread and adaptable mongoose species.

- **Ecological Niche**

In their natural environment, Indian grey mongoose prey on ground birds, reptiles, small mammals, and insects. They are therefore likely to affect populations of these animals. Their ability to prey on snakes has been well noted, and they have been introduced to many areas for that purpose.

- **Communication**

Urva edwardsii likely use a combination of vocalizations, body postures, and scents to communicate with each other. Species within the mongoose family are known to utilize scent marking to establish territory and social status, and it's possible that Indian Grey Mongooses do the same. Vocalizations might include alarm calls to warn others of danger, hisses or growls during conflicts, and perhaps even playful sounds during social interactions. Further research is needed to fully understand the communication repertoire of this interesting mammal.

- **Lifespan**

The longest a mongoose has been known to live is 12.5 years. They generally live about seven years.

- **Relationship with Humans**

The Indian grey mongoose (*Urva edwardsii*) has a complex relationship with humans. While sometimes seen as beneficial, this connection can be double-edged. On the positive side, the mongoose is known for its predation on snakes, including venomous species like cobras. This can be helpful around human settlements, potentially reducing encounters with dangerous reptiles. However, their effectiveness in snake control is debated, as their diet includes a wider range of prey. On the other hand, mongooses can themselves be pests, raiding farms for poultry and eggs. Additionally, their burrowing behaviour can damage property. They may also carry diseases transmissible to humans and pets. Overall, the relationship between humans and the Indian grey mongoose is one of coexistence with some potential for conflict. Managing mongoose populations and habitat can be crucial in mitigating negative interactions.

- **Reproduction**

Urva edwardsii (Indian Grey Mongoose) exhibits seasonal breeding, with reproductive activity generally peaking during the spring and early summer months. The species attains sexual maturity within 9 to 12 months of age. After a gestation period of about 60 days, the female gives birth to two to four young in concealed burrows or rock crevices. Both parents often participate in rearing, and the young become independent within two to three months. The species is known for its high reproductive potential and adaptability, enabling it to maintain stable populations even in human-modified environments.

- **Threats and Conservation Status**

Major Threats

Ecologically, it serves as an important predator of rodents, reptiles, and insects, contributing to pest control and ecosystem balance. *Urva edwardsii*, commonly known as Edward's long-tailed giant rat, has a complex relationship with humans. Found in Southeast Asia, these rodents often inhabit agricultural areas and human settlements, where they can be considered pests due to their ability to damage crops and structures. However, they also play a role in ecosystem dynamics by serving as prey for predators and aiding in seed dispersal. Efforts to manage human-rodent conflicts while promoting coexistence are crucial for the conservation of *Urva edwardsii* and the maintenance of ecological balance in their shared habitats. Major threats include habitat loss, roadkills, and illegal trade for fur and traditional medicine, although the species remains locally abundant and resilient in most regions. The greatest threat to a mongoose's survival is the use of toxic agro-chemicals in farming areas.

Conservation Status

Urva edwardsii (Indian Grey Mongoose) is classified as Least Concern (LC) by the IUCN and listed under CITES Appendix III and Schedule I of the Wildlife (Protection) Act, 1972 (amended 2023). Highly adaptable, it inhabits forests, grasslands, farmlands, and human settlements. As a key predator of rodents, reptiles, and insects, it supports ecological balance and pest control. Despite threats from habitat loss, road mortality, and illegal trade, the species remains locally abundant and resilient across its range.

ix. *Bubo flavipes* (Tawny Fish Owl)

• Introduction

Bubo flavipes or *Ketupa flavipes*, commonly known as the Tawny Fish Owl, is a large nocturnal bird of prey belonging to the family *Strigidae*. It is closely associated with forested riverine habitats and hill streams across parts of the Eastern Himalayas, Northeast India, and Southeast Asia. Distinguished by its tawny plumage and feathered legs, the species is an efficient fish and crustacean hunter, often observed along forest streams at dusk. As a top nocturnal predator in riparian ecosystems, it plays a crucial ecological role in maintaining aquatic food web balance. Despite its wide but patchy distribution, the species faces increasing threats from habitat disturbance and pollution of waterways.



Figure No. 14
Bubo flavipes

• Taxonomy

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Aves
Order	Strigiformes
Family	Strigidae
Genus	<i>Bubo</i>
Species	<i>Bubo flavipes</i> (Hodgson, 1836)

• Description

The Tawny Fish Owl is a large, powerfully built owl, measuring 48–58 cm in length, with a wingspan of about 120–140 cm. It is characterized by warm tawny to rufous-brown plumage, heavily streaked with darker markings. The head bears prominent ear tufts, and the eyes are bright yellow, giving it a striking appearance in low light. Unlike many other owls, its legs and toes are fully feathered, aiding in thermoregulation and camouflage near water. The underparts are lighter with bold brown streaks. The species' call is a deep, resonant “who-oo-hoo-hoo” that carries far through forest valleys during night-time.

• Habitat

Bubo flavipes inhabits tropical and subtropical evergreen forests, riverine woodlands, and hilly regions with perennial streams and lakes. It prefers areas below 2,000 meters elevation, though it can occur up

to 2,500 m in the Himalayas. The owl requires dense riparian canopy cover for roosting and nesting, and clear freshwater bodies rich in fish for foraging. In India, it is recorded from Arunachal Pradesh, Assam, Meghalaya, Nagaland, Mizoram, and northern West Bengal, extending into Bhutan, Nepal, and Southeast Asia. It avoids urban and open agricultural landscapes.

- **Behaviour and Food Habit**

The Tawny Fish Owl is strictly nocturnal, roosting in thick foliage or tree hollows during the day. It emerges at dusk to hunt along riverbanks and ponds, perching silently before swooping down to snatch prey from water surfaces. Its diet primarily includes fish, frogs, crabs, aquatic insects, and occasionally small mammals and birds. It hunts using keen eyesight and silent flight, typical of the *Bubo* genus. Pairs are territorial, and during the breeding season, males perform low, booming calls to mark their territory. The species is largely sedentary, maintaining long-term territories.

- **Ecological Niche**

As a specialized piscivorous predator, *Bubo flavipes* occupies a key ecological niche in riparian forest ecosystems. By preying on fish, amphibians, and crustaceans, it helps regulate aquatic populations, maintaining balance in freshwater food webs. Its nesting and roosting preferences in mature trees make it a good indicator of healthy forest-stream ecosystems. Additionally, its presence reflects the availability of unpolluted, undisturbed freshwater habitats.

- **Communication**

Communication occurs through deep, resonant vocalizations and visual displays. The species' primary call, a series of hooting notes, is used for pair bonding and territory advertisement. Both sexes vocalize, but the male's call is lower-pitched. Non-vocal communication includes wing-flapping, postural displays, and bill snapping, especially during courtship and nest defence.

- **Reproduction**

Breeding occurs mainly between January and April, depending on regional climate. The species nests in large tree hollows, rock crevices, or occasionally on cliff ledges near water. Clutch size typically ranges from 1 to 2 eggs, which are incubated by the female for about 35 to 38 days, while the male provides food. Fledging occurs after 8 to 10 weeks, and juveniles remain dependent on the parents for several months. The breeding pair often uses the same nesting site for successive years, demonstrating high site fidelity.

- **Lifespan**

In the wild, the Tawny Fish Owl lives for approximately 15 to 20 years, while in captivity, individuals may survive up to 25 years. Longevity depends on prey availability, nesting success, and absence of human disturbance.

- **Relationship with Humans**

Though shy and elusive, *Bubo flavipes* occasionally comes into conflict with humans through disturbance of nesting sites, fishing activities, and logging. In some local traditions, owl calls are

considered omens, leading to persecution. However, it holds ecological and symbolic significance, representing the health of riparian forests. Its presence benefits fisheries by naturally controlling frog and small fish populations, thus contributing to ecosystem balance.

- **Threats and Conservation Status**

Major Threats

- Habitat destruction from deforestation, dam construction, and stream pollution.
- Disturbance of nesting sites due to tourism and logging.
- Decline in fish populations from overfishing and water contamination.
- Persecution and trapping driven by superstition and illegal wildlife trade.

Conservation Status

According to the IUCN Red List (2024), *Bubo flavipes* is listed as Least Concern (LC), though populations are decreasing and locally scarce in parts of its range. It is protected under Schedule I of the Indian Wildlife (Protection) Act, 1972, and listed in CITES Appendix II. Conservation measures include riparian forest protection, anti-poaching enforcement, and awareness programs to dispel negative beliefs. It occurs in protected areas such as Namdapha National Park, Balpakram National Park, and Manas Biosphere Reserve.

x. *Buceros bicornis* (Great Piped Hornbill)

- **Introduction**

Buceros bicornis (Concave-Casqued Hornbill, Great Indian hornbill or Great Pied Hornbill) is one of the most iconic avian species of the Indian subcontinent, renowned for its massive yellow and black casque atop the bill and its striking plumage. It inhabits evergreen and moist deciduous forests of the Himalayan foothills, Northeast India, and parts of the Western Ghats. The great hornbill, is one of the larger members of the hornbill family. As a large frugivorous bird, it plays a vital ecological role in seed dispersal and forest regeneration, but also preys on small mammals, reptiles and birds.



Figure No. 15 *Buceros bicornis*

- **Taxonomy**

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Aves
Order	Bucerotiformes
Family	Bucerotidae
Genus	<i>Buceros</i>
Species	<i>Buceros bicornis</i> (Linnaeus, 1758)

- **Description**

Great hornbills are fairly large, ranging from 95 to 120 cm in length and featuring a wingspan of 151 to 178 cm. On average, they weigh 3 kg. They are vividly coloured and easily recognizable. The body, head, and wings are primarily black; the abdomen and neck are white. The tail is white and is crossed by a subterminal black band. A preen gland near the tail secretes tinted oil, which is spread across the feathers by the bird during grooming. This may give the bill, neck, casque, and tail and wing feathers coloration varying from yellow to red. The most recognizable feature of hornbills is the casque, which is a hollow structure located on top of the bill. It may be used by males to fight with other males and attract females. Like many other hornbills, these birds have prominent eyelashes. Males and females are similar except that the irises of males are red while those of females are white, and males have slightly larger bills and casques. The feature that distinguishes *Buceros bicornis* from other species is its greatly curved bill and prominent casque.

- **Habitat**

Great hornbills are arboreal and live mainly in wet, tall, evergreen forests. Old-growth trees that extend beyond the height of the canopy are preferred for nesting. The height of the tree and the presence of a natural cavity large enough to hold a female and her eggs are more important than the type of tree. The same nesting site is used year after year if possible. They are known to inhabit elevations of 600 to 2000 m.

- **Behaviour and Food Habit**

Great hornbills tend to stay in small groups of monogamous pairs and their offspring. They are active during the day and at night they gather in large communal roosts which may contain hundreds of individuals. They are a non-migratory species but generally move within an area of 14.7 square kilometre. Males fight each other by butting their casques, possibly as a display of dominance in competition for females. One notable behavioural feature is the sealing up of the female in the nest tree during the breeding season. Members of this species are predominantly frugivores that feed on both lipid-rich and sugar-rich fruits but feed on small mammals, birds, amphibians, reptiles, and insects.

- **Ecological Niche**

Due to its large gape, *Buceros bicornis* is able to transport and disperse seeds of trees in the genus *Myristica*, which tend to be too large for other organisms. These trees rely on *Buceros bicornis* for seed dispersal since only a few other birds, such as *Ocyrceros griseus* are able to ingest the seeds intact to later disperse. They also impact populations of small mammals, birds, amphibians, reptiles and insects that they occasionally consume.

- **Communication**

Except for the time during nesting season, *Buceros bicornis* vocalizes very loudly. The sounds they produce can be described as "cackling" or "roaring." Great hornbills are most vocal within large, communal night roosts. Pairs of great hornbills use duets as part of courtship, where a male and female alternate calls to each other. The location of individuals can be identified by sound alone due to their vocalizations combined with the characteristic "whooshing" sound produced by their flight. Male great

hornbills use tactile forms of communication to compete for mates. Males collide bill casques, often in flight, during the time preceding the breeding season. The size of male bill casques also likely serves as visual communication to potential mates. Like all birds, great hornbills perceive their environments through visual, tactile, auditory and chemical stimuli.

- **Reproduction**

Great hornbills breed between the months of February and May. Male casque size is important in attracting and fighting for mates. Males compete for females by butting into each other in the presence of a female prior to the breeding season. This could possibly be a display of superiority in competition for a mate. Mates, or potential mates, also perform duets where the male calls, the female replies, and they continue on in a loud volley. *Buceros bicornis* tends to be monogamous, and the pair remains together throughout their lives. A unique feature of *Buceros bicornis* is the way that the female incubates and cares for her eggs. During the breeding period, which lasts between February and May, a monogamous pair chooses a tree in which to lay the eggs. This tree is usually a very tall, old-growth tree and the same one is used every year if possible. The incubation period usually lasts between 38 and 40 days. Female lays two eggs on average. After the chicks' hatch, the female remains confined in the tree for around five weeks when she emerges to help the male gather food for the growing young.

- **Lifespan**

The lifespan of the species generally ranges between 35 - 40 years in wild and average lifespan of the species is around 50 years in captivity.

- **Relationship with Humans**

Buceros bicornis (Great Hornbill) is occasionally hunted by local communities for ornamental casques, meat, and feathers for subsistence, ritualistic, or medicinal purposes. Ecologically, it serves as a key seed disperser, facilitating forest regeneration. The species poses no known threats to humans.

- **Threats and Conservation Status**

Major Threats

The species faces numerous threats to its survival, primarily driven by habitat loss, hunting, and human-wildlife conflict. Deforestation, urbanization, and agricultural expansion result in the destruction and fragmentation of their natural habitats. Their large size and distinctive sounds make great hornbills relatively easy targets for hunters, who value them for their meat, feathers and casque, which is used for ornamental purposes among natives. Therefore, biggest threat to this species is habitat destruction, and particularly the removal of the old-growth trees that these birds require for nesting.

Conservation Status

Buceros bicornis is considered 'Near Threatened' on the IUCN Red List. They are listed under CITES appendix I which restricts trade of the species for exceptional purposes only. So, continued habitat loss, poaching, and human-wildlife conflict pose significant threats to their long-term survival. Conservation efforts should focus on protecting their habitats, enforcing legislation against poaching and habitat

destruction, and raising public awareness about the importance of conserving of the species and their ecosystems. The species is also included as a Schedule I species, in the Wildlife Protection Act of India for providing utmost protection. Educating communities about the ecological importance of the species and implementing measures to reduce human-wildlife conflict are essential for conservation. *Buceros bicornis* is kept in zoos in various parts of the world. Efforts to breed this species in captivity are generally not successful.

xi. *Gyps himalayensis* (Himalayan Griffon Vulture)

• Introduction

Gyps himalayensis, commonly known as the Himalayan Griffon Vulture, is one of the largest Old-World vultures and a prominent scavenger of the Himalayan ecosystem. It is a soaring raptor found across the Himalayan and Trans-Himalayan ranges, often seen gliding effortlessly above high-altitude cliffs and valleys. This species plays an indispensable role as a biological recycler, cleaning up carcasses and maintaining ecosystem hygiene. Adapted to extreme altitudes and low oxygen levels, the Himalayan Griffon is a true mountain specialist, though its population is now facing pressures due to poisoning, food scarcity, and habitat disturbance.



Figure No. 16 *Gyps himalayensis*

• Taxonomy

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Aves
Order	Accipitriformes
Family	Accipitridae
Genus	<i>Gyps</i>
Species	<i>Gyps himalayensis</i> (Hume, 1869)

• Description

The Himalayan Griffon is a massive, broad-winged vulture with a body length of 100 to 120 cm, wingspan of 270 to 310 cm, and a weight ranging from 8 to 12 kg. Its plumage is pale buff to cream-colored on the body with contrasting dark brown flight feathers. The neck and head are covered with whitish down feathers, while the collar of long ruff-like feathers gives a distinctive appearance. It has bare bluish facial skin, stout hooked beak, and powerful talons adapted for tearing carrion. Juveniles are darker and browner than adults. In flight, the bird displays broad, fingered wings and a short wedge-shaped tail, soaring with minimal wingbeats using thermal updrafts.

• Habitat

This species inhabits high-altitude mountain regions, primarily between 1,200 and 5,500 meters above sea level. It frequents open grasslands, alpine meadows, cliffs, and dry valleys across the Himalayan range from Pakistan, India, Nepal, Bhutan, and Tibet to western China. In India, it is found in Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh. It prefers areas with abundant ungulate

populations and livestock that provide carrion. The Himalayan Griffon roosts and nests on inaccessible cliffs and rocky ledges, ensuring safety from predators and human disturbance.

- **Behaviour and Food Habit**

The Himalayan Griffon is diurnal and highly social, often seen in flocks around carcasses or thermal updrafts. It feeds almost exclusively on carrion, consuming flesh from dead animals such as yak, goat, sheep, and wild ungulates. Equipped with a strong beak and long neck, it can reach deep into carcasses inaccessible to smaller scavengers. The species does not kill live prey. Griffons rely heavily on visual cues to locate carcasses, often following other scavengers like ravens or eagles. They exhibit soaring flight patterns, gliding high to conserve energy while searching for food. Bathing and preening are frequent behaviours after feeding.

- **Ecological Niche**

As a primary scavenger, *Gyps himalayensis* plays a vital role in maintaining ecosystem health by rapidly disposing of animal carcasses, thus preventing the spread of infectious diseases. It serves as an indicator of ecosystem cleanliness and prey abundance. The species also competes with other scavengers like Lammergeiers (*Gypaetus barbatus*) and Cinereous Vultures (*Aegypius monachus*), contributing to the ecological balance of high-altitude carrion communities.

- **Communication**

Communication in the Himalayan Griffon occurs mainly through visual and behavioural cues, as the species is largely silent. Vocalizations are limited to hisses, grunts, and wheezing sounds during feeding or at nesting colonies. Postural displays such as wing-spreading and head-bobbing are used for dominance or threat display. Group cohesion during flight relies heavily on synchronized soaring behaviour and visual tracking of conspecifics.

- **Reproduction**

Breeding occurs between December and April, depending on altitude. The species nests colonially on cliffs and rocky crags. The nest is a large platform of sticks and grass, often reused annually. Females lay a single white egg, incubated for about 50 to 55 days by both parents. Chicks' hatch covered in white down and fledge after 4 to 5 months. Juveniles remain dependent on adults for several weeks post-fledging. The breeding success is strongly correlated with food availability and weather conditions. Pairs are monogamous and maintain long-term bonds.

- **Lifespan**

The Himalayan Griffon lives for approximately 20 to 25 years in the wild, though individuals in captivity may survive up to 35 years. Mortality is often due to poisoning, starvation, or collision with power lines.

- **Relationship with Humans**

Historically, *Gyps himalayensis* has been revered in Himalayan cultures, especially among Tibetan and Buddhist communities, where vultures are associated with sky burials and natural decomposition cycles. However, recent decades have seen increasing conflict with human activities, particularly due to

livestock poisoning and carcass management changes. The species indirectly benefits pastoral systems by disposing of carcasses, but is often unintentionally poisoned by diclofenac-contaminated livestock remains.

- **Threats and Conservation Status**

Major Threats

- Secondary poisoning from veterinary drugs like diclofenac and nimesulide.
- Decline in carrion availability due to carcass disposal changes and fewer wild ungulates.
- Electrocution and collision with power lines.
- Disturbance at nesting cliffs from tourism and construction.
- Habitat loss and food scarcity in fragmented landscapes.

Conservation Status

According to the IUCN Red List (2024), *Gyps himalayensis* is listed as Near Threatened (NT), with a decreasing population trend. It is included in Schedule I of the Indian Wildlife (Protection) Act, 1972, and CITES Appendix II. Conservation efforts focus on vulture-safe zones, ban of toxic NSAIDs, monitoring breeding colonies, and community-based carcass disposal programs. The species is found in Hemis National Park, Nanda Devi Biosphere Reserve, Singalila National Park, and Namdapha NP Park.

xii. *Sitta formosa* (Beautiful Nuthatch)

- **Introduction**

Sitta formosa (Beautiful Nuthatch) is a vividly coloured and rare forest bird of the Eastern Himalayas and Southeast Asia, inhabiting montane evergreen forests with moss-covered trees. Noted for its remarkable climbing agility and striking plumage, it stands out among the nuthatch family. Due to its restricted range, fragmented populations, and habitat loss, the species is classified as Endangered, underscoring the need for urgent forest habitat conservation.



Figure No. 17 *Sitta formosa*

- **Taxonomy**

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Aves
Order	Passeriformes
Family	Sittidae
Genus	<i>Sitta</i>
Species	<i>Sitta formosa</i> (Blyth, 1843)

- **Description**

The Beautiful Nuthatch is a medium-sized, vividly coloured bird measuring about 16 to 18 cm in length and weighing around 25 to 35 grams. It is distinguished by its glossy blue upperparts, black crown and

eye-stripe, and rich rufous-orange underparts. The wings and tail are dark bluish-black with metallic reflections. The throat and upper breast are paler, sometimes washed with buff. It has a slender, slightly curved black bill, dark eyes, and blue-grey legs. Its coloration and graceful movements make it unmistakable among forest birds. Both sexes are similar in plumage, while juveniles are duller.

- **Habitat**

Sitta formosa inhabits subtropical and montane evergreen forests, often dominated by oak (*Quercus*), rhododendron, and magnolia species, with dense epiphyte and moss cover. It prefers altitudes between 1,500 and 3,000 meters, occasionally descending lower in winter. In India, it occurs in Arunachal Pradesh, Nagaland, Manipur, Mizoram, and Meghalaya, with records also from Bhutan, Myanmar, Thailand, Laos, and Vietnam. The species favours undisturbed mature forests, usually near ridges and stream valleys with tall, mossy trunks that support abundant insect prey.

- **Behaviour and Food Habit**

The Beautiful Nuthatch is diurnal and arboreal, spending most of its time foraging along large tree trunks and branches. It exhibits typical nuthatch behaviour, climbing both upward and head-downward in search of food. Its diet mainly includes insects, larvae, spiders, and small invertebrates, occasionally supplemented by seeds and berries during lean seasons. The bird is generally solitary or found in pairs, but sometimes joins mixed-species foraging flocks with other forest birds such as titmice and treecreepers. It is shy and elusive, making field observations challenging.

- **Ecological Niche**

Sitta formosa (Beautiful Nuthatch) is an insectivorous canopy bird that regulates insect populations, particularly bark-boring insects, thereby supporting tree health in montane forests. Its reliance on large, old trees makes it an indicator of primary forest integrity, and its movements contribute indirectly to seed dispersal and forest regeneration.

- **Communication**

The Beautiful Nuthatch communicates primarily through soft, high-pitched whistling calls described as “see-wee” or “pee-pee”. Its calls are less harsh compared to other nuthatches. Vocalizations are used for pair contact, territory maintenance, and alarm signalling. Visual communication includes wing flicking and tail spreading during courtship or territorial displays.

- **Reproduction**

Breeding is believed to occur from April to June, although detailed observations are limited. The species is monogamous, forming long-term pair bonds. Nests are built in tree cavities or natural holes, lined with bark flakes, moss, feathers, and soft plant fibers. The clutch size ranges from 3 to 5 eggs, which are white with reddish-brown speckles. Both parents participate in incubation and chick rearing. Fledging occurs after approximately 20 to 25 days, and the young remain dependent for several weeks before dispersing.

- **Lifespan**

The exact lifespan of *Sitta formosa* in the wild is not well documented, but similar nuthatch species live around 7 to 10 years. Longevity is likely influenced by habitat stability, predation pressure, and food availability.

- **Relationship with Humans**

The Beautiful Nuthatch has minimal direct interaction with humans, as it inhabits remote forested areas. However, its presence is highly valued by ornithologists and birdwatchers as an indicator of healthy forest ecosystems. The species faces indirect threats from deforestation, shifting cultivation, and logging, particularly in Northeast India. It holds aesthetic and ecotourism significance, contributing to regional biodiversity appeal.

- **Threats and Conservation Status**

Major Threats

- Habitat loss and fragmentation due to logging, jhum (shifting cultivation), and agricultural expansion.
- Degradation of old-growth forests, reducing availability of large nesting trees.
- Restricted range and small population size, increasing vulnerability to stochastic events.
- Climate change potentially altering montane habitat zones.

Conservation Status

According to the IUCN Red List (2024), *Sitta formosa* is categorized as Endangered (EN), primarily due to its small and declining population coupled with a highly restricted geographic range. In India, the species is listed under Schedule I of the Wildlife (Protection) Act, 1972, providing it with the highest level of legal protection. It occurs within several protected areas, notably Namdapha National Park, Eaglenest Wildlife Sanctuary, and Balpakram National Park, where suitable montane forest habitats are conserved. Current conservation efforts emphasize the preservation of primary forest tracts, systematic population monitoring, and the implementation of community-based habitat protection initiatives in Northeast India, aimed at mitigating habitat loss and ensuring long-term species survival.

xiii. *Spelaornis longicaudatus* (Tawny-Breasted Wren-Babbler)

- **Introduction**

Spelaornis longicaudatus (Tawny-Breasted or Long-Tailed Wren-Babbler) is a small, secretive bird endemic to the Eastern Himalayas, mainly in north-eastern India. It inhabits dense undergrowth of subtropical and montane forests, where it is more often heard than seen due to its melodious calls. Characterized by a long tail and distinct vocalizations, the species faces threats from habitat degradation within its limited range and is regarded as a species of conservation concern.



Figure No. 18
Spelaornis longicaudatus

- **Taxonomy**

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Aves
Order	Passeriformes
Family	Timaliidae
Genus	<i>Spelaeornis</i>
Species	<i>Spelaeornis longicaudatus</i> (Moore, 1854)

- **Description**

The Long-tailed Wren-Babbler is a small, compact bird measuring about 12 to 15 cm in length, characterized by a disproportionately long tail, short rounded wings, and a slender, slightly decurved bill. Plumage is mostly rich brown with fine barring, especially on the underparts, giving a mottled appearance suited for camouflage among leaf litter. The face shows a faint supercilium (eyebrow stripe), and the throat is paler. Both sexes look similar, while juveniles are duller with less distinct barring. The long tail is often cocked and flicked nervously as the bird forages through undergrowth. Its melodious, flute-like calls are often heard in duets.

- **Habitat**

This species occupies dense undergrowth, bamboo thickets, and secondary growth in subtropical broadleaf and evergreen montane forests, generally between 900 and 2,200 meters above sea level. It prefers shaded, moist forest interiors near streams or ravines. In India, it is primarily found in Meghalaya (Khasi, Jaintia, and Garo Hills), with potential occurrence in neighbouring Assam and Nagaland. The species relies on intact forest understories, avoiding open or heavily degraded habitats. Seasonal movements are minimal, though it may shift slightly in elevation.

- **Behaviour and Food Habit**

The Long-tailed Wren-Babbler is highly secretive and terrestrial, spending much of its time on or near the forest floor. It is insectivorous, feeding mainly on insects, spiders, small larvae, and other invertebrates, which it gleans from leaf litter and low vegetation. It forages alone or in pairs, occasionally joining mixed-species flocks during the non-breeding season. The species is active and restless, hopping swiftly among shrubs and roots, often flicking its tail and wings. When alarmed, it disappears into dense vegetation, emitting soft alarm calls.

- **Ecological Niche**

Spelaeornis longicaudatus occupies the forest floor and lower understory niche, playing a key ecological role in controlling invertebrate populations and aiding in the decomposition cycle through leaf-litter disturbance. As a bioindicator, its presence reflects healthy undergrowth and moist forest microhabitats. Its dependence on dense, undisturbed vegetation makes it particularly sensitive to forest fragmentation.

- **Communication**

The species is noted for its elaborate, whistling songs, often performed as duets between mated pairs for territory defence and pair bonding. Its vocal repertoire also includes contact notes, scolding calls, and rapid trills. Visual communication involves subtle tail and wing movements during social interactions.

- **Reproduction**

Breeding occurs primarily between April and July, coinciding with the pre-monsoon and early monsoon period. The nest is a domed structure with a side entrance, built close to the ground among roots, moss, or low vegetation. It is constructed of moss, leaves, bamboo fibers, and rootlets. The clutch size ranges from 2 to 4 eggs, white or pale pink with reddish-brown specks. Both parents share incubation duties and feeding of the chicks. The incubation period lasts around 14 to 16 days, and fledging occurs about 12 to 15 days after hatching.

- **Lifespan**

Although detailed data are scarce, similar wren-babblers have an average lifespan of 5 to 8 years in the wild. Survival is influenced by predation, habitat stability, and food availability.

- **Relationship with Humans**

Spelaornis longicaudatus (Long-tailed Wren-Babbler) is a shy, forest-dwelling species with minimal direct human interaction but is indirectly threatened by deforestation, shifting cultivation, and infrastructure development in Northeast India. It serves as an indicator of forest ecosystem health and holds ecotourism value for ornithological enthusiasts in the Eastern Himalayas.

- **Threats and Conservation Status**

Major Threats

- Habitat loss and degradation from deforestation, logging, and jhum (shifting cultivation).
- Fragmentation of forest patches, isolating small populations.
- Encroachment and land-use change in montane forest zones.
- Limited knowledge and monitoring, hampering conservation planning.

Conservation Status

According to the IUCN Red List (2024), *Spelaornis longicaudatus* is classified as Near Threatened (NT), due to its restricted range and suspected population decline. It is protected under Schedule I of the Indian Wildlife (Protection) Act, 1972. The species occurs in several protected areas of Meghalaya, such as Balpakram National Park, Nokrek Biosphere Reserve, and Siju Wildlife Sanctuary. Conservation priorities include habitat preservation, forest restoration, and long-term population monitoring through community-based participation.

xiv. *Ophiophagus hannah* (King Cobra)

- **Introduction**

Ophiophagus hannah (King Cobra) is the world's longest venomous snake, belonging to the family *Elapidae*. Endemic to South and Southeast Asia, it primarily inhabits dense forests, bamboo thickets, mangroves, and areas in proximity to water bodies. Unlike most snakes, it predominantly preys on other snakes, including venomous species, exhibiting ophiophagy as a key dietary trait. The species is listed as Vulnerable (VU) under the IUCN Red List due to habitat loss, human persecution, and poaching for skin and traditional medicine. Notably, the King Cobra is highly elusive, exhibiting solitary behaviour except during breeding and nesting periods, and plays a critical ecological role as a top predator regulating snake populations.



Figure No. 19
Ophiophagus hannah

- **Taxonomy**

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Reptilia
Order	Squamata
Family	Elapidae
Genus	<i>Ophiophagus</i>
Species	<i>Ophiophagus hannah</i> (Cantor, 1836)

- **Description**

The king cobra is sexually dimorphic, with males being larger and paler in particular during the breeding season. Males weighed up to 10 kg and females had a maximum weight of 5 kg. The largest known king cobra was 5.59 m long and captured in Thailand. The King Cobra's average length is 10-12 feet, but can reach 18 feet. The full-grown King Cobra is yellow, green, brown, or black. There are usually yellowish or white cross-bars or chevrons on its body. The belly may be uniform in color or ornamented with bars. The throat is light yellow or cream-colored. The juveniles are jet-black, with yellow or white cross-bars on the body and tail and four similar cross-bars on the head. It is larger, has a narrower and longer stripe on the neck. The King Cobra is regarded as a fierce and aggressive snake, and its length and size give it an awesome appearance. It differs from other cobra species by size and hood.

- **Habitat**

Near streams in dense or open forest, bamboo thickets, adjacent agricultural areas, and dense mangrove swamps.

- **Behaviour and Food Habit**

These snakes are diurnal, whereas other cobras are commonly active in the evening but not exclusively nocturnal. Although the King Cobra is undoubtedly a very dangerous snake, it prefers to escape unless it is cornered or provoked. This is not true of nesting females, which may attack without provocation. When in a threat display, these snakes can raise the anterior part of their body about one meter off the ground and are able to follow their enemy in this position over considerable distances. *Ophiophagus hannah* normally restricts its diet to cold-blooded animals, particularly other snakes. Some specimens develop a rigid diet of a single species of snake and will refuse any other type. The snakes eaten by the

King Cobra are mostly the larger harmless species, such as Asian rat snakes, dhamans, and pythons up to about 10 feet in length.

- **Ecological Niche**

The species is an apex predator and dominant over all other snakes except large pythons. Its diet consists primarily of other snakes and lizards, including Indian cobra, banded krait, rat snake, pythons, green whip snake, keelback, banded wolf snake and Blyth's reticulated snake, therefore controls in proliferation of snake species and maintains an ecological balance in which they stay.

- **Communication**

The 'growl' of the *Ophiophagus hannah* differs from the 'typical' snake hiss in consisting solely of frequencies below 2500 Hertz, with a dominant frequency near 600 Hertz. Its eyesight is better than most snakes'. It's good enough to see a moving person almost 100 meters away. The cobra's hiss is much lower than most snakes', more like a dog's growl. It is produced by tiny holes in the trachea and is resonated by the lung. To impress a rival, male king cobras' resort to wrestling. Male combat is a ritual conflict in which the first one to push the other's head to the ground wins. The threat display of this elapid includes spreading its neck-flap, raising its head upright, making eye contact, puffing, hissing and occasionally charging. Given the size of the snake, it is capable of striking at a considerable range and height, sometimes sustaining a bite.

- **Reproduction**

King Cobras are oviparous and lay 21 to 40 eggs. The female pushes leaves and branches into a nest pile where the eggs are incubated by the elevated temperatures of decomposition. The female remains on top of the nest to guard the eggs, and the male also remains close by. During the brood care period, the king cobra tends to be very aggressive toward approaching humans. Breeding usually occurs from January through April. The eggs of the king cobra incubate during spring and summer, hatching in the fall.

- **Lifespan**

The average lifespan of the species generally 17.1 years in captivity.

- **Relationship with Humans**

King Cobras are among the most attractive highlights in large display terrariums for eco-tourism. The venom of *Ophiophagus hannah* is very potent. It is a strong neurotoxin, which affects respiratory centres in the medulla of the brain. Death results from respiratory arrest and cardiac failure. Death may occur in a very short time, but, as with any bite, the location of the bite and the efficacy of first aid and medical treatment may delay or prevent death. The anti-venom, sometimes referred to as anti-venin, reverses the actions of the neurotoxins (proteins and enzymes). Anti-venin, even after five or six decades, is still the most trusted and commonly used method in controlling snake venom poisoning.

- **Threats and Conservation Status**

Major Threats

King Cobras, as well as all snakes, are threatened from the destruction of their habitats, and by persecution by humans afraid of them. The species also faces numerous threats to its survival, primarily driven by habitat loss, killing in fear, for medicine, and other human-wildlife conflict. Deforestation, urbanization, and agricultural expansion result in the destruction and fragmentation of their natural habitats. So, continued habitat loss, killing, and human-wildlife conflict pose significant threats to their long-term survival.

Conservation Status

The conservation status of the species is currently listed it has been listed as ‘Vulnerable’ on the IUCN Red List since 2010. Regarded as the national reptile of India. Conservation efforts should focus on protecting their habitats, enforcing legislation against poaching and habitat destruction, and raising public awareness about the importance of conserving the species and their ecosystems. The species is included as a Schedule I species, in the last amended Wildlife Protection Act of India. Educating communities about the ecological importance of the species and implementing measures to reduce human-wildlife conflict are essential for conservation.

xv. *Varanus bengalensis* (Bengal Monitor)

- **Introduction**

Varanus bengalensis is a large, terrestrial lizard belonging to the family *Varanidae*, widely distributed across the Indian subcontinent and parts of Southeast Asia. It inhabits a variety of ecosystems, including forests, scrublands, agricultural fields, and human-influenced areas. Renowned for its impressive size and adaptability, the Bengal Monitor plays a crucial role in controlling pest populations and maintaining ecosystem balance. However, habitat loss, poaching, and human-wildlife conflict pose significant threats to its survival. This conservation plan aims to outline strategies to protect and conserve the Bengal Monitor and its habitat. The species is listed under Schedule I of the Indian Wildlife (Protection) Act, 1972, and classified as Least Concern (LC) by the IUCN, though it faces localized threats from habitat loss and poaching for skin and traditional medicine.



Figure No. 20 *Varanus bengalensis*

- **Taxonomy**

Rank	Taxon
Kingdom	Animalia
Phylum	Chordata
Class	Reptilia
Order	Squamata
Family	Varanidae
Genus	<i>Varanus</i>
Species	<i>Varanus bengalensis</i> (Daudin, 1802)

- **Description**

Adult Bengal monitors are generally grey or greenish-grey in colour, with a ventral pattern of grey to black crossbars from the chin to the tail. The Bengal Monitor is characterized by its elongated body, long tail, and robust limbs. Adults typically measure between 1.2 to 1.5 meters in length, with males being slightly larger than females. They have a distinctive pattern of yellowish-brown or greyish-brown scales with dark markings, providing camouflage in their terrestrial habitats. Their powerful jaws are lined with sharp teeth, adapted for capturing and consuming prey.

- **Habitat**

These monitors inhabit a diverse range of habitats, including forests, grasslands, scrublands, mangroves, and human settlements. They are commonly found in areas with access to water sources such as rivers, lakes, and wetlands. Bengal Monitors are adaptable and can thrive in both natural and human-modified landscapes.

- **Behaviour and Food Habit**

Varanus bengalensis is a solitary, terrestrial, and diurnal species that spends much of the day actively foraging. Interactions between individuals primarily occur during the breeding season, when males compete for mates. It is a strictly carnivorous predator and scavenger with a broad diet of over 200 recorded prey species, including invertebrates, amphibians, reptiles, birds, small mammals, and eggs. Occasional cannibalism of eggs and juveniles has been documented, though adult predation is rare.

- **Ecological Niche**

Bengal monitors are primary predators of many smaller animals in the ecosystems they inhabit. Juveniles are preyed upon by larger predators, including other monitors. There are four tick species known to infect Bengal monitors, including, *Aponommon gervaisi*, *Aponommon varanensis*, *Aponommon laeve*, and *Amblyomma helvolum*. In addition, trematodes, cestode worms, nematodes, filarial worms, and sporozoan protozoans are known to infect these monitors.

- **Communication**

Like most varanids, Bengal monitors use primarily scent as their main method of communication and perception. They ‘taste’ the environment around them by constantly flicking their highly sensitive tongues while moving their head from side to side. This is useful in tracking prey and mates and in signalling between monitors of the same species.

- **Reproduction**

Breeding in Bengal Monitors typically occurs during the warmer months of the year. Chemical cues play an important role in the ability of males to recognize receptive females. These chemical cues are produced by the female, from glands located in skin of the abdomen. In captivity, females show the greatest chances of successful copulation by mating with only one or two individual males in successive years, though they still may be courted by several other males. After mating, females lay their eggs in burrows or other suitable nesting sites, where they are protected from predators and environmental extremes. The number of eggs laid can vary, with clutch sizes ranging from 10 to 30 eggs on average.

The incubation period lasts several weeks, after which the hatchlings emerge and are independent from birth.

- **Lifespan**

Bengal Monitors are relatively long-lived. In the wild, Bengal Monitors have an average lifespan of 10 to 15 years. However, individuals in captivity can live longer, with some reaching up to 20 years or more with proper care. Monitoring their lifespan is essential for assessing population health and implementing effective conservation measures.

- **Relationship with Humans**

Bengal Monitors have a complex relationship with humans. While they are often feared and persecuted due to their size and predatory nature, they also provide valuable ecosystem services by controlling rodent populations and scavenging on organic waste. However, they may come into conflict with humans when they raid poultry farms, disturb livestock, or enter urban areas in search of food. Educating communities about the ecological importance of Bengal Monitors and implementing measures to reduce human-wildlife conflict are essential for conservation.

- **Threats and Conservation Status**

Major Threats

The Bengal Monitor faces numerous threats to its survival, primarily driven by habitat loss, poaching, and human-wildlife conflict. Deforestation, urbanization, and agricultural expansion result in the destruction and fragmentation of their natural habitats, reducing available foraging and nesting sites. Additionally, they may be targeted by poachers for their meat, skin, and body parts, which are used in traditional medicine and cultural practices.

Conservation Status

The conservation status of *Varanus bengalensis* is currently listed as Least Concern on the IUCN Red List of Threatened Species, indicating that it is not considered to be at immediate risk of extinction. However, continued habitat loss, poaching, and human-wildlife conflict pose significant threats to their long-term survival. Conservation efforts should focus on protecting their habitats, enforcing legislation against poaching and habitat destruction, and raising public awareness about the importance of conserving Bengal Monitors and their ecosystems.

5. CHAPTER: 5: IMPACT IDENTIFICATION & MITIGATION

5.1 Impact Identification & Impact Mitigation

The cement manufacturing process is inherently resource- and energy-intensive, generating multiple stressors on the environment, notably air emissions, carbon footprint, and dust dispersion. Adoption of Best Available Techniques (BAT) such as energy optimization, process automation, co-processing of waste, and greenbelt buffering ensures compliance with MoEFCC, CPCB, and ISO 14001 environmental standards while maintaining sustainable production efficiency. The systematic identification and mitigation of project-induced impacts necessitate a comprehensive assessment of potential positive and negative ecological consequences, coupled with the development of targeted intervention strategies aimed at minimizing or eliminating deleterious effects. This methodology is fundamental to ensuring project sustainability and ecological accountability, thereby aligning developmental initiatives with overarching environmental conservation objectives.

The proposed project activities are anticipated to exert measurable influences on regional flora and fauna, thereby mandating the formulation and implementation of robust ecological impact assessments and corresponding mitigation measures. The project site is located within a predominantly agricultural and rural matrix; however, the presence of Reserved Forest fragments and patches of remnant natural vegetation within a 10 km radius provides refuge for various taxa, including avifauna, small mammals, reptiles, and pollinator species.

Although the likelihood of frequent wildlife encounters within the immediate project footprint is assessed as low, sporadic movement of fauna into and through the area remains plausible, particularly during the construction phase. Activities such as vegetation clearance, excavation, and enhanced vehicular traffic may transiently disrupt proximate habitats. Environmental reconnaissance, encompassing primary field surveys, secondary data acquisition, and exhaustive literature reviews, indicates the potential occurrence of multiple faunal species in the broader landscape. While the core project zone does not constitute legally recognized wildlife habitat, the incidental passage of highly adaptable species cannot be precluded. Consequently, the adoption of carefully calibrated mitigation measures is imperative. These measures are designed to: (i) minimize habitat disturbance, (ii) regulate and reduce dust and noise emissions associated with construction operations, (iii) ensure environmentally sound waste management, and (iv) enhance ecological connectivity through the strategic establishment of greenbelts and buffer zones.

In an Environmental Impact Assessment (EIA), the framework comprising environmental component and or factors, potential impact, and evidence-based and regulatory compliant mitigation measures provide a systematic basis for evaluating and managing project–environment interactions. Each environmental component, such as air, water, soil, noise, ecology, and socio-economic conditions—represents a critical element that may be influenced by project activities. The potential impact defines the type and extent of alteration these components may undergo due to developmental interventions, assessed through scientific methods and predictive modelling. Correspondingly, mitigation measures outline technically and scientifically validated actions designed to prevent, minimize, or offset these adverse effects. By adhering to evidence-based approaches and ensuring compliance with national and regulatory frameworks (such as MoEFCC and CPCB guidelines), this structure ensures that environmental management remains both scientifically robust and legally accountable, promoting sustainable and responsible project execution (Table No. 20).

Table No. 20. Framework for Evidence-Based & Legally Compliant Environmental Impact Mitigation

Sl. No.	Environmental Factors	Potential Impact	Mitigation Measures
1.	Air Environment	Emission of particulate matter (PM ₁₀ , PM _{2.5}), NO _x , SO ₂ , and CO ₂ from kiln operations, clinker cooler, raw mill, and material handling may lead to ambient air quality deterioration, respiratory irritation, and acidic deposition.	• Installation of high-efficiency bag filters/ESP at kiln, cooler, and raw mill. • Adoption continuous emission monitoring systems (CEMS). • Enforcements of greenbelt development (≥33% area) as per CPCB norms. • Use low-NO_x burners and optimize combustion temperature.

Sl. No.	Environmental Factors	Potential Impact	Mitigation Measures
			Introduce dust suppression at conveyor junctions and transfer points.
2.	Water Environment	Wastewater discharge from cooling, domestic, and utility processes may cause increase in TDS, pH imbalance, and thermal pollution, potentially contaminating nearby surface/ground water.	- Implementation of zero liquid discharge (ZLD). - Implementation of recycle process and cooling water through closed-circuit systems. - Installation of STP and ETP with tertiary treatment. - Maintaining impervious lining around fuel and raw material storage areas. - Regular monitoring of groundwater quality and levels.
3.	Soil and Land	Deposition of fugitive dust and improper disposal of solid waste (kiln dust, fly ash) may cause alkalinity increase, soil compaction, and reduced microbial activity.	- Installation of dust collection and reuse systems. - Implementation of scientific disposal of kiln dust and sludge. - Utilization of fly ash in PPC cement and co-processing in kiln. - Development of stabilized greenbelt buffer zones with native vegetation.
4.	Noise Environment	High noise levels (>85 dB(A)) from crushers, mills, and heavy equipment can cause noise-induced hearing loss and disturb nearby settlements or wildlife.	- Installation of acoustic enclosures and silencers. - Proper maintenance of equipment lubrication schedules. - Providence of PPEs (ear plugs, muffs) to workers. - Development of dense vegetation barriers around plant periphery.
5.	Ecology and Biodiversity	Habitat alteration and dust deposition on vegetation may lead to reduced photosynthetic efficiency, floral/faunal displacement, and ecological imbalance.	- Maintaining the no-disturbance buffer between industrial and natural zones. - Implementation of afforestation with native species. - Avoidance of night-time construction and high-intensity lighting. - Conducting periodic biodiversity monitoring and wildlife rescue protocols.
6.	Socio-Economic Environment	Population influx and resource pressure may cause strain on local infrastructure, while emissions can affect public health.	- Implementation of CSR initiatives (health camps, education, water supply). - Employment of local workforce and skill development programs. - Maintaining regular stakeholder consultation and grievance redressal.
7.	Solid and Hazardous Waste	Generation of kiln dust, refractory waste, used oil, and contaminated	Segregation of hazardous and non-hazardous waste streams.

Sl. No.	Environmental Factors	Potential Impact	Mitigation Measures
		packaging materials can lead to soil and groundwater contamination if improperly managed.	- Storing the hazardous waste in impervious, roofed areas. - Disposal through authorized TSDF and recyclers (as per HW Rules 2016). - Reusing of fly ash and gypsum in cement blending.
8.	Climate Change / GHGs	Cement manufacturing is a carbon-intensive process, contributing significantly to CO ₂ emissions through calcination and fuel combustion.	- Usage of alternative fuels and raw materials (AFR). - Increase in clinker substitution ratio. - Adoption of energy-efficient VRM technology and WHRS. - Participation in carbon footprint reduction programs (PAT, CDM).

The following table presents a project-specific phase-wise anticipated impacts on local biodiversity, accompanied by recommended mitigation strategies aimed at minimizing ecological perturbations will be conformed by project proponent consequently (Table No.).

Table No. 21. Decisive Mitigation Approaches for Potential Impacts from the Proposed Project

Sl. No	Activity	Potential Impact	Mitigation Measures
Construction Phase			
1.	Site clearing and vegetation removal.	Disturbance and/ or displacement of the fauna due to habitat alterations.	- Since there is no habitats of any major fauna exists within core of the study area, proposed project is not anticipated to causing any habitat fragmentation. - Avoidance of clearing vegetation during peak breeding/ movement seasons. - Restriction in clearing of vegetation will be maintained at the minimum level. - The development of green belt area will be done in 33% of total plot area as specified in the Terms of References (ToR).
2.	Earthworks, machinery, and noise.	Temporary displacement of wildlife due to noise, vibration, and other associated human activities.	- Use of low noise producing equipment and installation of noise barriers will be encouraged. - Proper maintenance (oil and greasing) of machineries will be done. - Construction works will be strictly limited in daytime. - Regular basis noise quality monitoring will be conducted at a particular interval of six months by NABET-QCI accredited & MoEFCC certified laboratory.

Sl. No	Activity	Potential Impact	Mitigation Measures
			Redundant noise generation will be restricted substantially.
3.	Dust emission will lead to increase in PM.	Increased PM Level will result in deposition of dust on leaves which may cause decrease in Transpiration rate of flora. Increased dust emission can lead also to climate change which eventually will result in decrease in plant/tree cover. Aesthetic view loss may also be anticipated	- Regular water sprinkling will be done to reduce the dust generation. - Dust suppression systems will be installed at the internal road to abate dust generation. - Regular basis AAQ quality monitoring will be conducted at a particular interval of six months by NABET-QCI accredited & MoEFCC certified laboratory. - A time bound Progressive Greenbelt Development will be done. The species selected for green belt in view of greater ecological values and of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution. This will act as a carbon sink and will enrich the biodiversity of the area.
4.	Vehicle movement near forest edges.	Risk of road kills or accidental encounter with fauna.	- Strict norms will be defined for safe transport by imposing control in speed limits near forest patches. - Workers will be trained for wildlife-sensitive driving.
5.	Illumination during night work	Disruption of nocturnal animal activity and disorientation.	- Unnecessary night lighting and limitations in night works will be implemented. - Down-shielded, warm-spectrum lights usage will be endorsed.
• Operation Phase			
1.	Continuous human presence and plant activity.	Long-term avoidance behavior or stress in nearby wildlife.	- A dense greenbelt will be created and maintained as pollution buffer belt. - faunal activity at site boundary will be monitored either through CCTVs and/or manually. - Limitations in unnecessary human movement and encroachments will be strictly fortified near ecologically sensitive areas and forest edges.
2.	Dust and gaseous emission will lead to increase in PM.	Increased PM Level will result in deposition of dust on leaves which may cause decrease in transpiration rate of flora.	- Regular water sprinkling will be done during excavation to reduce the dust generation. - Dust curbing nets and solid barriers will be used.

Sl. No	Activity	Potential Impact	Mitigation Measures
		Increased dust emission can lead to climate change which eventually will result in decrease in plant/tree cover.	Regular basis AAQ quality and stack emission monitoring will be conducted at a particular interval of six months by NABET-QCI accredited & MoEFCC certified laboratory.
3.	Noise generation.	Stress or migration of fauna from adjacent forested patches.	- Use of low noise producing equipment and installation of noise barriers will be encouraged. - Proper maintenance (oil and greasing) of machineries will be done. - Operation works will be strictly limited in daytime. - Regular basis noise quality monitoring will be conducted at a particular interval of six months by NABET-QCI accredited & MoEFCC certified laboratory.
4.	Transportation of goods/materials	Risk of wildlife-vehicle collisions, especially in dawn/dusk hours	- Vehicular movement near and or through the forests will be restricted. - Proper road signage will be displayed and maintain throughout the project life cycle. - Trained drivers will always be hired for allied activities.
5.	Loading & unloading of raw material and finished products.	Dust emission and Noise emission ecological health. Increased PM Level will result deposition of dust on leaves which may cause decrease in Transpiration rate of flora. Increased dust emission can lead to climate change which eventually will result in decrease in plant/tree cover. Increased noise will cause disturbance of existing avifauna; however, avifauna is not restricted to one place for a long time, thus it will not result in their displacement.	- Regular water sprinkling before loading and unloading will be done to reduce the dust generation. - Proper maintenance (oil and greasing) of machineries will be done.
6.	Solid and liquid waste disposal	Contamination risk to soil/water may impact fauna health	- Zero-discharge liquid (ZLD) arrangement will be implemented. - All the effluents will be treated before final discharge into surround environment. - Industrial discharge and runoff from the project premises will be strictly prevent from discharges

Sl. No	Activity	Potential Impact	Mitigation Measures
			into natural drainage and/or forest zones. - Regular basis WQ quality monitoring will be conducted at a particular interval of six months by NABET-QCI accredited & MoEFCC certified laboratory. - Solid wastes will be disposed through authorized vendors.
7.	Lighting of plant and infrastructure	Interference with nocturnal species near forest edge	- Motion-sensor or time-controlled lighting will be used. - Illumination intensity will always be maintained lowest near buffer/greenbelt zones - Limitations in night operations will be encouraged. - down-shielded, warm-spectrum lights will be used.
8.	Proximity to Reserved Forests Area with a 10 km of Buffer Zone.	Potential long-term disturbance to regional faunal corridors	- For the purposes of monitoring and periodic biodiversity surveys for early impact detection a strong coordination will always be maintained with the allied Forest Departments. - No activities within Reserved Forest boundaries will be allowed and carried out.

6. CHAPTER: 6: INTENT CONSERVATION & MANAGEMENT PLAN

6.1 Implications of Intent Conservation and Management Plan

A wide-ranging strategy for wildlife conservation and management plan intrinsically embodies strategic measures aimed at preserving the integrity of the existing natural milieu while simultaneously advancing habitat restoration, mitigating anthropogenic pressures, and ensuring the rehabilitation of threatened taxa. Furthermore, it underscores the imperative of systematic biodiversity monitoring, adaptive management based on empirical observations, and the proactive engagement of local communities as integral stakeholders in the continuum of conservation governance.

6.2 Action-Oriented Approach towards Wildlife Conservation

The monitoring approach in the future will be contingent upon the executing agency. If funds are deposited with the forest department and the execution of work falls under their purview, the forest department will assume responsibility for monitoring and reporting results. The Forest Department will provide the proponent with a utilization certificate, outlining all the wildlife conservation mitigation measures implemented during the preceding financial year. Alternatively, if the project proponent is executing the plan, an annual audit can be implemented as follows: the project proponent is required to

submit a comprehensive compliance report every six months, accompanied by photographs, outlining all the wildlife conservation mitigation measures taken.

Table No. 22. Strategic Actions for Successful Wildlife Conservation

Actions	Frequency	Concern
- Assessment of Water Quality & Availability. - Routine Maintenance and Upkeep Initiatives. - Implementation of Community Participation Programs.	Biannually at Regular Interval Intervals	M/s. Shree Cement Limited in coordination with the Forest Department
- Evaluation of Food Resource Availability and Habitat Enrichment Measures. - Diversification of Native Tree Species. - Promotion of Sustainable Agro-ecosystem Practices.	Biannually at Regular Interval Intervals	M/s. Shree Cement Limited in coordination with the Forest Department
- Organization of Conservation Awareness Campaigns. - Execution of Structured Environmental Education Programs. - Impact Assessment, Capacity Building, and Skill Development Training.	Once in a Year.	M/s. Shree Cement Limited in coordination with the Forest Department
- Community Outreach and Engagement Activities. - Facilitation of Active Local Participation and Stewardship.	Biannually at Regular Interval Intervals.	M/s. Shree Cement Limited in coordination with the Forest Department
Administrative Expenditure for Inspection, Review, and Compliance Processing.	One Time.	M/s. Shree Cement Limited in coordination with the Forest Department
Periodic Tree Plantation and Greenbelt Development near Urban and/or Rural Settled Areas.	Quarterly at Regular Interval Intervals.	M/s. Shree Cement Limited in coordination with the Forest Department
Refurbishment and Perpetuation of Developed Greenbelt Area.	Quarterly at Regular Interval Intervals.	M/s. Shree Cement Limited in coordination with the Forest Department

6.3 Projected Activities for Conservation Plan

- Enrichment of Natural Habitat and Niche Development:** Implement afforestation and native tree-planting programs to restore forest cover, establish water resources such as ponds and watering points to ensure wildlife access to potable water, construct shelter structures to improve habitat complexity and promote breeding success, and actively encourage the proliferation of indigenous vegetation.
- Enabling of Veterinary Attention:** Collaborate with veterinary professionals and wildlife specialists to deliver medical interventions for injured or ailing fauna, including the establishment of dedicated wildlife rescue centres or deployment of mobile veterinary units for field-based treatment.
- Facilitation of Essential Tools and Apparatus:** Procure and maintain specialized instruments and logistical support required for wildlife monitoring, rescue, and rehabilitation operations, including vehicles, medical apparatus, communication systems, and field surveillance equipment.

- iv. **Technical Training and Capacity Building:** Conduct structured training sessions and capacity enhancement programs for Forest Department personnel, local volunteers, and community stakeholders actively engaged in wildlife conservation initiatives.
- v. **Warranting Effective Coordination:** Serve as a liaison between the Forest Department and local communities, facilitating communication channels, streamlining volunteer engagement, and ensuring synchronized conservation actions.
- vi. **Assistance for Outreach and Environmental Education:** Organize and facilitate public awareness campaigns, educational workshops, and community outreach programs aimed at fostering societal participation and enhancing understanding of wildlife conservation imperatives.

6.4 Development Plan for Green Belt

The establishment of a green belt surrounding the plant premises serves multiple functions, including the attenuation of fugitive emissions from operational activities, reduction of ambient noise levels, and enhancement of the site's visual and ecological appeal. Within the Indian context, environmental protection is recognized as a fundamental aspect of industrial and developmental undertakings. Accordingly, this component has been strategically designed to address these environmental challenges. The project area lies within the North-East India - Khasi-Jaintia Hills Sub-Region of the Indo-Burma Biodiversity Hotspot, characterized by a humid subtropical to montane monsoonal climate, with an average annual precipitation ranging from approximately 5,000 to 8,000 mm. The terrain exhibits red loamy hill soils, lateritic formations, and both old and recent alluvial deposits (CPCB, 2000). In light of these edaphic and climatic conditions, the most suitable plant species for greenbelt development include:

Table No. 23. Evidence-Based Native Tree and Shrub Species Recommended for Greenbelt Development in East Jaintia Hills, Meghalaya (as per CPCB, 2000 Guidelines)

[Biogeographic Region: North-East India – Khasi-Jaintia Hills Sub-Region (Indo-Burma Hotspot)]

Sl. No.	Botanical Name	Common Name	Family	Tolerance (Dust / SO ₂ / NO _x)	GR	Regeneration	FRP	Ecological Function
Growth Habit: Shrub								
1.	<i>Clerodendrum infortunatum</i>	Bhant	Lamiaceae	Moderate	F	Root suckers	D	- Understorey regeneration. - Ecological balance.
2.	<i>Garcinia pedunculata</i>	Sohiong	Clusiaceae	High	M	Natural	E	- Fruit provision for wildlife, - ecological enrichment
3.	<i>Syzygium fruticosum</i>	Wild Jamun	Myrtaceae	High	M	Natural	E	- Frugivore support. - habitat complexity.
4.	<i>Viburnum foetidum</i>	Viburnum	Adoxaceae	Moderate	M	Natural	E	- Understorey growth. - biodiversity support.
Growth Habit: Tree (Small)								
5	<i>Rhododendron arboreum</i>	Rhododendron	Ericaceae	Moderate	S	Natural	E	- Montane understorey, - aesthetic appeal
Growth Habit: Tree (Medium)								
1.	<i>Albizia lebeck</i>	Siris	Fabaceae	High	F	Coppicing	D	Shade provision, aesthetic value
2.	<i>Albizia procera</i>	White Siris	Fabaceae	High	F	Coppicing	D	Nitrogen fixation, rapid growth
3.	<i>Alnus nepalensis</i>	Alder	Betulaceae	High	F	Natural	D	Nitrogen fixation, slope stabilization
4.	<i>Artocarpus heterophyllus</i>	Jackfruit	Moraceae	Moderate	M	Seed / Coppice	E	Fruit provision, community utility
5.	<i>Dillenia indica</i>	Elephant Apple	Dilleniaceae	High	M	Natural	E	Fruit for wildlife, understorey support
6.	<i>Ficus racemosa</i>	Cluster Fig	Moraceae	High	M	Natural	D	Supports frugivores, forest stratification
7.	<i>Lagerstroemia speciosa</i>	Queen's Flower	Lythraceae	High	M	Coppicing	D	Flowering canopy,

WLCP for the Project of Integrated Cement Plant [Schedule: 3(b), Category: B1] by M/s. Shree Cement Limited, at Khara Siang Lum Pyrshin, Elaka: Nongkhlieh Dolloiship, Village: Daistong, District: East Jaintia Hills, State: Meghalaya, India.

Sl. No.	Botanical Name	Common Name	Family	Tolerance (Dust / SO ₂ / NO _x)	GR	Regeneration	FRP	Ecological Function
								aesthetic enhancement
8.	<i>Michelia champaca</i>	Champak	Magnoliaceae	Moderate	M	Coppicing	E	- Pollinator support, - aesthetic enhancement
9.	<i>Pterospermum acerifolium</i>	Kanak Champa	Malvaceae	Moderate	M	Coppicing	D	- Ornamental, - biodiversity support
10.	<i>Spondias pinnata</i>	Hog Plum	Anacardiaceae	Moderate	M	Natural	D	- Fruit provision, - wildlife support
11.	<i>Syzygium cumini</i>	Jamun	Myrtaceae	High	M	Coppicing	E	- Wildlife sustenance, - ecological balance
12.	<i>Terminalia arjuna</i>	Arjun	Combretaceae	High	M	Coppicing	D	- Riparian and roadside planting, - water conservation
13.	<i>Terminalia myriocarpa</i>	Hollock	Combretaceae	Moderate	F	Natural	D	- Timber, - greenbelt reinforcement
14.	<i>Toona ciliata</i>	Red Cedar	Meliaceae	Moderate	F	Coppicing	D	- Timber, - biodiversity enrichment
Growth Habit: Tree (Large)								
1.	<i>Acrocarpus fraxinifolius</i>	Shivan	Fabaceae	High	F	Coppicing	D	- Pioneer, - habitat restoration
2.	<i>Bombax ceiba</i>	Silk Cotton	Malvaceae	High	F	Natural	D	- Nesting support for birds, - seasonal canopy
3.	<i>Castanopsis indica</i>	Castanopsis	Fagaceae	Moderate	M	Natural	E	- Forest cover restoration, - soil enrichment
4.	<i>Ficus benghalensis</i>	Banyan	Moraceae	High	M	Aerial roots / Suckers	E	- Shade, - wildlife habitat
5.	<i>Ficus religiosa</i>	Peepal	Moraceae	High	M	Natural seeding	SE	- Cultural significance, - ecological stability
6.	<i>Gmelina arborea</i>	Gamhar	Lamiaceae	High	F	Coppicing	D	- Pollution mitigation, - quick cover
7.	<i>Mesua ferrea</i>	Nagkesar	Calophyllaceae	Moderate	S	Natural	E	- Habitat restoration, - biodiversity support
8.	<i>Pinus kesiya</i>	Khasi Pine	Pinaceae	High	M	Natural seeding	E	- Air pollution attenuation, - slope stabilization
9.	<i>Quercus</i> spp.	Oak	Fagaceae	Moderate tolerance to dust and air pollutants	Medium	Natural seeding, moderately fast	Evergreen/Semi-evergreen (species dependent)	- Large canopy tree; - Provides shade, - Stabilizes soil, - Supports arboreal fauna, - Enhances microclimate, and - Contributes to multi-tiered greenbelt structure
10.	<i>Schima wallichii</i>	Schima	Theaceae	High	M	Natural	E	- Soil retention, - habitat provision
11.	<i>Tetrameles nudiflora</i>	Tetrameles	Datisceae	Moderate	F	Natural	D	- Habitat enhancement, - canopy formation
Growth Habit: Tree (Pioneer)								
1.	<i>Bischofia javanica</i>	Bishopwood	Phyllanthaceae	High	F	Coppicing	SE	- Rapid establishment, - habitat stabilization
FRP: Foliage Retention Pattern, E: Evergreen, SE: Semi-Evergreen, D: Deciduous, GR: Growth Rate, F: Fast, M: Moderate, S: Slow								
Ref: CPCB (March, 2000) Guidelines for developing green belts PROBES/75/1999-2000								

The greenbelt development strategy emphasizes multi-tiered planting, incorporating tall canopy trees, mid-storey species, and understorey shrubs to optimize pollution mitigation, microclimatic regulation, and ecological resilience. Multi-tiered planting enhances particulate filtration, attenuates noise, and provides diverse habitat niches for wildlife, thereby maintaining ecological balance. The technique involves establishing a tall tree layer with fast-growing canopy species such as *Pinus kesiya*, *Mesua ferrea*, and *Schima wallichii*; a mid-storey layer using medium-height species like *Artocarpus heterophyllus*, *Syzygium cumini*, and *Dillenia indica*; and a shrub layer with species such as

Rhododendron arboreum, *Clerodendrum infortunatum*, and *Garcinia pedunculata*. For roadside plantations, hardy, fast-growing, and pollution-tolerant species like *Gmelina arborea*, *Albizia procera*, and *Bombax ceiba* are recommended. Near human habitations, species with aesthetic and environmental benefits, including *Ficus benghalensis*, *Michelia champaca*, and *Syzygium fruticosum*, are ideal. In agricultural landscapes, fruit-bearing and nitrogen-fixing species such as *Spondias pinnata*, *Albizia lebbeck*, and *Alnus nepalensis* provide ecological and livelihood support. For mined-out areas, pioneer and soil-stabilizing species such as *Acrocarpus fraxinifolius*, *Tetrameles nudiflora*, and *Castanopsis indica* help in rapid rehabilitation and slope stabilization.

The use of locally sourced seedlings ensures higher survival rates and preserves genetic integrity, while strict monitoring for 2 to 3 years post-plantation prevents establishment of invasive species and ensures optimal growth and ecological function of the greenbelt.

6.5 Habitat Conservation & Impact Mitigation Measures

Habitat conservation, and impact mitigation particularly for vulnerable species, is vital for maintaining biodiversity, ecosystem functionality, and ecological balance. It supports human well-being by underpinning agriculture, enhancing food security, regulating climate, and purifying air and water. Implementing habitat restoration and species recovery strategies ensures the long-term survival of threatened species and preserves ecological heritage for future generations. For this specific project element, success of initiatives will hinge upon the following critical considerations and strategic priorities:

- Arboreal mammals (*Ratufa bicolor*, *Trachypithecus pileatus*, *Paradoxurus hermaphroditus*) benefit from intact canopy, nest trees, connectivity and zero disturbance.
- Ground/forest-floor species (e.g., *Muntiacus vaginalis*, *Urva edwardsii*) require under-growth, forest connectivity, minimal fragmentation and predation/poaching control.
- Small carnivores/omnivores (*Canis aureus*, *Prionailurus bengalensis*) require large habitat patches, connectivity, prey base, low human threat; corridors mitigate isolation.
- Birds of prey and large birds as *Bubo flavipes*, *Buceros bicornis*, *Gyps himalayensis*) rely on large undisturbed trees/cliffs for nest/roost, clean corridors, carrion availability (vultures) and minimal human disturbance.
- Secretive forest birds (*Sitta formosa*, *Spelaornis longicaudatus*) require intact understory and mid-canopy, little disturbance, specialized micro-habitat. Typically, *Sitta formosa* inhabits subtropical and montane evergreen forests, often dominated by oak (*Quercus*), and rhododendron, species, with dense epiphyte and moss cover.
- Reptiles as *Ophiophagus hannah*, *Varanus bengalensis* depend on unfragmented forest, riparian zones, rock outcrops/trees for hide, stable prey base, low human conflict.

6.5.1. Habitat Conservation

Habitat conservation, particularly for vulnerable species, is vital for maintaining biodiversity, ecosystem functionality, and ecological balance. It supports human well-being by underpinning agriculture, enhancing food security, regulating climate, and purifying air and water. Implementing habitat restoration and species recovery strategies ensures the long-term survival of threatened species and preserves natural heritage for future generations. The implementation of gap plantation is projected to

yield substantial advantages in locales where natural vegetation is lacking and ecological restoration efforts are required. It is essential to determine the most suitable plant species for this purpose, particularly in relation to the habitat management of the Schedule I species.

- The incorporation of native tree species such as *Castanopsis indica*, *Erythrina* sp., *Pinus kesiya*, *Quercus* spp., *Schima wallichii*, and *Toona ciliata*, together with previously identified greenbelt species including *Chrysopogon zizanioides*, *Imperata cylindrica*, *Syzygium cumini*, *Dillenia indica*, and *Rhododendron arboreum*, plays a pivotal role in creating a resilient and congenial habitat for wildlife in the East Jaintia Hills. These species contribute to structural and functional diversity by forming canopy, mid-storey, and understorey layers that provide shelter, nesting sites, and foraging opportunities for a wide range of fauna, including Schedule I species. Evergreen canopy species such as *Castanopsis indica* and *Quercus* spp. ensure year-round habitat continuity and food availability, while nitrogen-fixing *Erythrina* sp. improves soil fertility and supports pollinators. Fast-growing pioneers like *Pinus kesiya* stabilize slopes, mitigate dust and noise, and enhance microclimate, whereas *Schima wallichii* provides dense canopy cover and supports arboreal wildlife. *Toona ciliata* enriches mid-storey diversity and facilitates understorey regeneration, supporting invertebrates and small vertebrates. Collectively, these species establish a multi-tiered greenbelt system that stabilizes soils, enhances water retention, intercepts pollutants, ensures ecological connectivity, and promotes species richness, thereby supporting the long-term conservation of both common and threatened wildlife, including Schedule I species. So, the suitable species identified for greenbelt development will be successfully utilized to promote the growth of natural forest ecosystems.
- Grassland development is essential for the restoration and conservation of ecosystems, as it fosters biodiversity, enhances soil quality, and helps combat climate change. The process of grassland restoration employs methods such as reintroducing native plant species and eradicating invasive flora to establish harmonious habitats. Furthermore, this initiative improves soil health, facilitates carbon storage, and provides support for a diverse range of wildlife. For the development of grasslands, the native grass species are significant. The grasses *Arundinella* spp., *Chrysopogon zizanioides*, *Imperata cylindrica*, *Ischaemum rugosum*, *Panicum* sp., *Phragmites karka*, *Saccharum arundinaceum*, *Saccharum spontaneum*, *Themeda quadrivalvis*, and *Thysanolaena maxima* play a vital role in habitat conservation by stabilizing soils and prevent erosion through dense root networks, tolerate dust and soil pollutants, and act as pioneer species to reclaim degraded or mined-out areas. Additionally, they create microhabitats that support ecological succession and fauna, while serving as a vegetative buffer to intercept fugitive emissions and reduce environmental stress, thereby enhancing the overall resilience and ecological function of greenbelt and restoration areas (CPCB, 2000) will be executed accordingly.
- Moderate grasslands will be maintained through consistent cutting, controlled burns, and grazing practices.
- The work of either restoration and/or development of waterholes will be vital for ecosystem restoration and conservation in the study area, as it offers critical water resources, fosters biodiversity, and enhances overall ecological well-being and also can bolster resilience to drought, improve habitats for a range of species, and help reduce conflicts between humans and wildlife. For the arid periods, thorough monitoring and maintenance will be executed for natural and/or man-made waterholes which is essential for the survival of both livestock and wildlife in the project influenced areas as these water sources not only improve water accessibility but also

bolster resilience against drought, mitigate the effects of climate change in local ecosystems, and deter carnivores from preying on cattle.

- Wild animals typically favour spending time near water, particularly during hot weather, as the waterholes also aid in their foraging activities, therefore, execution of a system for waterhole management not only during extended droughts but also throughout the year will be taken into special considerations.
- The systematic oversight of the encroachment and growth of alien plant species like *Chromolaena odorata*, *Mikania micrantha*, and *Lantana camara* will be maintained as these exotic species will impact adversely on natural grassland habitat.
- Carrying out a detailed study on spatial and temporal food availability in the habitat will be considered effectively.
- Execution of an allied systems for summer days will be done.
- Proactive measures will be taken to diminish the effects of severe flooding on species and habitats during the monsoon season.
- Ongoing monitoring of habitat characteristics is substantial and the same will be conducted with a serious note.
- Regular assessments of current wetland habitats and allied terrestrial expanses will be carried out.

6.5.2. Impact Mitigation Measures

A systematically formulated mitigation and conservation plan is essential to attenuate the environmental impacts associated with the project, thereby safeguarding biodiversity and facilitating sustainable development. This strategic framework encompasses a suite of interventions, integrating engineering, ecological, and socio-environmental approaches, aimed at ecosystem preservation, optimized resource management, and enhancement of community well-being. In the event of any adverse incidents, a robust array of proactive mitigation measures will be deployed to effectively address and manage emerging challenges.

- Anthropogenic pressures will be strictly regulated to minimize human-wildlife conflicts.
- Comprehensive strategies will be developed and implemented to anticipate, prevent, and resolve conflict-related issues.
- Pollution abatement technologies and devices will be installed wherever required, with mitigation measures applied proactively and adaptively.
- The use of ecological contaminants detrimental to species habitats will be stringently restricted.
- Vehicular emissions and disturbances from increased traffic density, particularly along road networks traversing wildlife habitats, will be monitored and controlled.
- Systematic species censuses will be conducted to assess population status and detect emerging threats.
- Anthropogenic disturbances will be evaluated to understand species' adaptive responses and resilience.
- Adequate veterinary services and facilities will be provided, including ambulances equipped with transport cages, a wildlife rescue centre, and allocation of veterinary funds in close coordination with the Forest Department.
- Infrastructure development will focus on habitat conservation, promoting sustainable land-use practices, and targeted removal of invasive flora within ecologically sensitive zones.

- Restoration of water bodies, including ponds and waterholes, will involve the clearance of overgrown vegetation (bushes, weeds, bamboo thickets) and the creation of access pathways to facilitate wildlife movement.
- Soil and water conservation measures will be implemented, such as plugging gullies, constructing nala bunds, desilting, and developing water harvesting structures to sustain aquatic resources for wildlife during dry periods.
- Reforestation of degraded areas will utilize native species, coupled with systematic monitoring of key wildlife populations.
- Community engagement will be prioritized through participatory conservation initiatives, targeting local residents and educational institutions. Activities will include at least two annual camps, awareness programs, poster exhibitions, quiz contests, educational competitions, and dissemination of conservation literature in both the local language and English.
- Conservation messaging will also be reinforced through the strategic placement of banners in local languages and English along roadside areas to promote environmental stewardship.

It is therefore imperative to recognize that ongoing habitat degradation, poaching, and human-wildlife conflicts present significant threats to the long-term survival of all six Schedule I species previously identified. Conservation initiatives must prioritize the protection and restoration of their habitats, alongside stringent enforcement of laws against illegal hunting and environmental destruction. Incentivizing informants through rewards may further strengthen anti-poaching and wildlife trafficking deterrence. Equally important is the systematic implementation of public awareness campaigns to highlight the urgent need for species and ecosystem conservation. Community education programs should emphasize the ecological roles of these species and promote strategies to mitigate human-wildlife conflicts. Additionally, rigorous population censuses and targeted research are essential to assess potential threats, monitor population trends, and inform adaptive management strategies for the long-term preservation of these species.

6.6 Approaches for Eradicating Invasive Plant Species

Strategies targeting the removal of invasive plant species are essential for conserving native biodiversity, maintaining ecosystem integrity, and preventing adverse ecological, economic, and social impacts. Invasive species can outcompete indigenous flora, alter habitat structure, and disrupt ecological processes, ultimately affecting human well-being. The following presents key methodologies for the effective management and eradication of invasive plant species within ecosystems.

- **Chemical Control:** Utilizing herbicides is considered one of the most effective and resource-efficient approaches to the management of invasive plant populations.
- **Mechanical Control/ Non-Chemical Control:** Mechanical approaches, including pulling, digging, mowing, tilling, and the use of prescribed fire, are typically prioritized in the management of invasive plant species.
- **Biological Control:** This approach employs plant pathogens or insect natural enemies that are generally indigenous to the same geographical area as the species being targeted.
- **Integration and Monitoring:** The Integrated Invasive Species Management (IISM) approach combines chemical, mechanical, and biological strategies. Continuous monitoring is essential to assess the effectiveness of interventions, prevent non-target impacts, and facilitate the natural regeneration of native flora. Proper planning ensures that invasive species management contributes

to habitat restoration, biodiversity conservation, and the overall ecological resilience of greenbelt and forested expanses of the study area.

The table below provides examples of the control procedures for the most destructive invasive species (Table No. 24):

Table No. 24. Methods of Few Invasive Plant Species Management for the Current Project

Control Method	Target Species	Agents / Techniques	Mode of Action / Effect	Remarks / Implementation Notes
Chemical	<i>Chromolaena odorata</i> , <i>Mikania micrantha</i> , <i>Lantana camara</i>	Herbicides: Glyphosate, 2,4-D, Metsulfuron-methyl, Triclopyr	Suppresses or eradicates invasive plants; inhibits growth and regeneration	Requires careful dosage, timing, and method (foliar spray, basal bark, cut-stump) to minimize soil and water contamination; often combined with manual/mechanical control
Mechanical	<i>Chromolaena odorata</i> , <i>Mikania micrantha</i> , <i>Lantana camara</i>	Uprooting, cutting, mowing, slashing	Immediate reduction of biomass; prevents recolonization if follow-up is conducted	Effective near sensitive habitats or water bodies where chemicals are unsuitable; labor-intensive but critical for restoration
Biological	<i>Mikania micrantha</i>	<i>Puccinia spegazzinii</i> (rust fungus)	Infects leaves, stems, and petioles; reduces growth, flowering, and biomass	Host-specific; long-term suppression; integrate with chemical/mechanical methods
		<i>Alternaria gossypina</i> (leaf-spot fungus)	Colonizes leaf tissue, penetrates stomata, inhibits vine growth	Best used in integrated management; requires monitoring for effectiveness
	<i>Chromolaena odorata</i>	<i>Septoria ekmaniana</i> , <i>Pseudocercospora eupatorii-formosani</i> , <i>Mycovellosiella perfoliata</i> , <i>Cionothrix praelonga</i> (rust fungus)	Cause leaf spot, necrosis, and reduced biomass; limit spread	Variable virulence; suitable for humid tropical conditions; should be combined with mechanical/chemical measures

7. CHAPTER: 7: BUDGETARY ALLOCATION

Allocating unfaltering budgetary resources for wildlife conservation is of paramount importance, as it ensures strict compliance with India's environmental regulatory framework. Such financial commitment not only facilitates the timely acquisition of statutory environmental clearances, thereby avoiding procedural delays and penalties, but also enables the implementation of scientifically grounded mitigation measures essential for safeguarding wildlife and their habitats. By securing the funds necessary for impact reduction, habitat management, and long-term conservation interventions, project proponents demonstrate environmental accountability and strengthen the ecological sustainability of the development initiative.

7.1 Proposed Budget Allocation for Conservation Initiatives

The commencement of a new project of integrated cement plant & thermal power plant will take place only after obtaining environmental clearance and all other necessary approvals from the relevant statutory bodies. The overall estimated cost of the project, along with an evaluation of its economic feasibility, is expected to be Rs. 1264 Crore. The budget proposed for environmental protection measures includes a capital expenditure of Rs. 23.5 Crore and an annual recurring cost of Rs. 0.30 Crore. In addition, Rs. 60 Lakh is allocated for conservation initiatives over a five-year period, aimed at environmental protection and conservation efforts. The detailed financial plan is provided below.

Table No. 25. Project Statement Showing the Activities Proposed Under the Budget

Sl. No.	Activity & Provision	Year					Total in Lakhs	Rationale
		1 st	2 nd	3 rd	4 th	5 th		
1.	Greenbelt, Shelterbelt & Micro-Niche Development	4.0	3.0	2.5	2.0	1.5	13.0	Establishes ecological buffers, attenuates pollution, and enhances habitat continuity.
2.	Water Resource & Soil-Moisture Conservation	4.0	3.0	2.0	2.0	1.0	12.0	Ensures perennial water availability for wildlife; improves hydrology and soil structure.

Sl. No.	Activity & Provision	Year					Total in Lakhs	Rationale
		1 st	2 nd	3 rd	4 th	5 th		
3.	Noise, Light & Barrier-Free Movement Management	2.0	2.0	2.0	1.5	1.0	8.5	Reduces sensory disturbance and prevents obstruction of wildlife movement patterns.
4.	Native Vegetation Restoration & Invasive Species Control	1.5	1.0	1.0	0.75	0.75	5.0	Restores native biodiversity; suppresses invasive flora to improve habitat quality.
5.	Community Engagement & Awareness Initiatives	1.5	1.0	1.0	1.0	1.0	5.5	Enhances community stewardship, reduces conflict, and strengthens long-term conservation outcomes.
6.	Administrative Review & Compliance Audits	0.75	0.75	0.50	0.50	0.50	3.0	Ensures regulatory compliance, reporting, and monitoring as mandated under MoEFCC guidelines.
7.	Wildlife Rescue, Rehabilitation & Veterinary Support	1.5	1.0	1.0	0.75	0.75	5.0	Provides emergency care, rescue support, and health surveillance for vulnerable fauna.
8.	Wildlife Population Monitoring.	1.0	0.75	0.75	0.75	0.75	4.0	Tracks population trends, habitat use, and threat indicators to guide adaptive management.
9.	Habitat Quality Enhancement (Waterholes, Corridors)	1.0	1.0	0.75	0.75	0.50	4.0	Improves forage and hydration conditions, supports movement corridors, and enhances ecological resilience.
TOTAL		17.25	13.5	11.5	10.0	7.75	60.0	---

7.2 Budget Narrative

The proposed Wildlife Conservation Plan (WLCP) budget of Rs. 60.00 lakh has been systematically allocated across five years to address the ecological, hydrological, and socio-environmental requirements of the study area. Major financial emphasis has been placed on greenbelt and habitat development, water resource augmentation, and noise/light mitigation, which directly influence habitat quality and wildlife movement near the project boundary.

Strategic investments in invasive species control, native vegetation restoration, and habitat enhancement structures such as waterholes, ensure the retention of ecological integrity and the long-term survival of sensitive fauna, including Schedule I species. A dedicated portion of the budget supports wildlife rescue, veterinary care, and population monitoring, facilitating science-based adaptive management. Simultaneously, resources allocated for community engagement and awareness programmes promote coexistence, reduce conflict, and build local stewardship—essential elements of sustainable conservation. The budget also includes funds for mandatory regulatory compliance, audits, and

administrative oversight to ensure alignment with MoEFCC guidelines, CPCB norms, and Wildlife (Protection) Act requirements.

Overall, the financial distribution ensures a balanced, implementable, and ecologically meaningful conservation programme that aligns with statutory expectations and promotes long-term biodiversity resilience.

8. CHAPTER: 8: SUMMARY AND INTERPRETATION

The forests of East Jaintia Hills District, Meghalaya, exhibit remarkable ecological diversity, ranging from tropical evergreen and moist deciduous to subtropical pine forests, shaped by the region's altitudinal and climatic variations. Vegetation within Reserved Forest Areas is dominated by *Schima wallichii*, *Pinus kesiya*, *Areca catechu*, *Castanopsis* spp., and *Anacardium occidentale*, while adjoining rural landscapes show a mix of tropical and subtropical species. Important non-timber forest products (NTFPs) include *Terminalia bellirica*, *Careya arborea*, *Emblica officinalis*, and *Cinnamomum tamala*, although invasive alien species (IAS) such as *Chromolaena odorata*, *Mikania micrantha*, and *Lantana camara* are increasingly degrading native habitats and regeneration potential. Grassland and edge communities are primarily composed of *Saccharum spontaneum*, *Chrysopogon zizanioides*, *Panicum* spp., and *Arundinella* spp., while *Pinus kesiya* dominates higher elevations and *Schima wallichii* co-occurs with *Castanopsis* and *Quercus*, defining mid-elevation forests. Several recorded tree species hold conservation importance, including *Tectona grandis* (VU), *Aegle marmelos* (NT), *Saraca asoca* (EN), and the herb *Globba spathulata* (VU), reflecting ongoing habitat pressures. Diversity indices, such as a Shannon–Wiener Index of 1.533 and Pielou's Evenness of 0.856, indicate moderate diversity and stable community structure without dominance of any single species.

Aquatic ecosystems host a balanced array of amphibious, emergent, and free-floating macrophytes, supporting nutrient cycling and water quality; notably, *Nymphaea stellata* is Endangered. As part of the Indo-Burma Biodiversity Hotspot, Meghalaya sustains nearly 38% of India's mammalian fauna, underlining its global ecological value. The study documented 42 mammals, 43 bird, 17 herpetofaunal, and 18 fish species, revealing strong taxonomic richness across vertebrate classes and all indicating high habitat sensitivity. The ichthyofauna is dominated by *Cyprinidae* and *Siluridae*, with most species being Least Concern, though *Clarias magur* (EN), *Cirrhinus cirrhosus* (VU), and *Ailia coila* (NT) reflect localized declines due to overfishing and pollution. Particularly, the endemic *Schistura larketensis* remains Not Evaluated, warranting urgent attention.

The presence of fifteen (15) Schedule I species within the study area, encompassing Mammalia, Aves, and Reptilia, underscores the region's high conservation value and ecological sensitivity. These taxa, many of which are globally Near Threatened (NT) or Vulnerable (VU) as per the IUCN Red List, exhibit alarming population declines primarily attributed to habitat degradation, fragmentation, anthropogenic disturbances, and poaching pressures. The occurrence of flagship and keystone species such as *Trachypithecus pileatus* (Capped Langur), *Buceros bicornis* (Great Hornbill), and *Ophiophagus hannah*

(King Cobra) indicates that the area functions as a crucial ecological corridor sustaining trophic balance and genetic continuity among forest-dwelling fauna.

So, overall, the study area demonstrates exceptional biodiversity with conservation importance, with coexisting Vulnerable, Endangered, and endemic species across forest, grassland, and aquatic ecosystems. The findings stress the need for habitat protection, invasive species control, sustainable resource management, and long-term biodiversity monitoring to maintain ecological stability and resilience in this critical landscape.

A scientifically robust and site-specific Wildlife Conservation Plan (WLCP) is therefore imperative to ensure in-situ protection, habitat integrity, and population stabilization of these taxa. The plan must integrate habitat restoration, anti-poaching surveillance, corridor connectivity, and community-based conservation frameworks, supported by continuous ecological monitoring. The consistent “Decreasing” population trend across most species highlights the urgency for adaptive management interventions, particularly within zones subjected to industrial expansion and infrastructural development. Furthermore, the co-occurrence of species under varying conservation categories from *Canis aureus* (LC, increasing) to *Sitta formosa* (VU, decreasing), demonstrates the ecological heterogeneity and functional interdependence of the faunal community. Hence, a solid WLCP, aligned with MoEFCC and IUCN conservation guidelines, **is vital not only to mitigate project-induced impacts but also to reinforce long-term biodiversity resilience and ecosystem stability within the landscape requires collective responsibility. While, as project proponents, remain committed to conservation, external and uncontrolled factors can still jeopardize wildlife. Hence, coordinated action from all stakeholders is essential to ensure that ecological gains are fully protected.**

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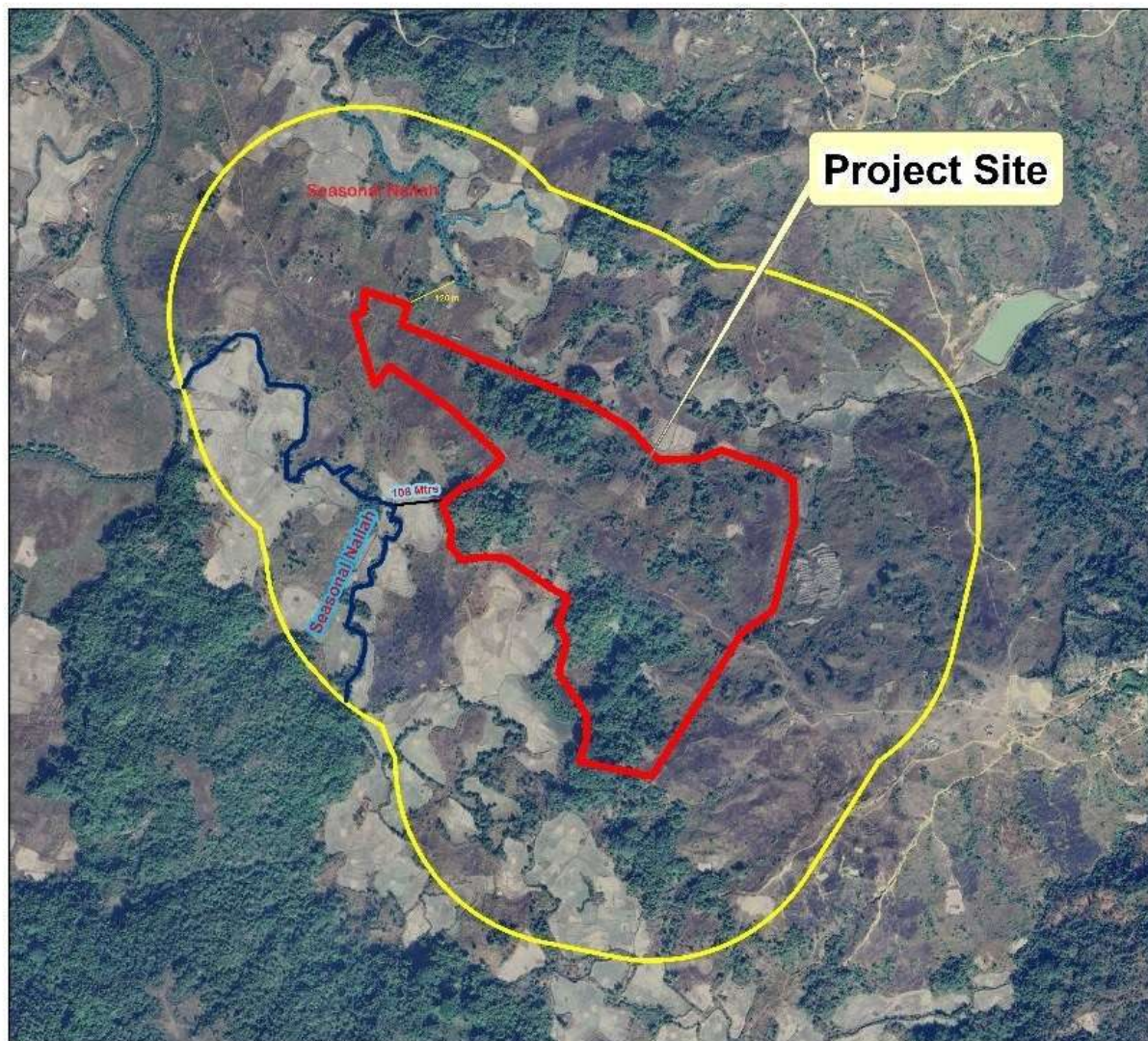
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500 METERS BUFFER MAP OF THE STUDY AREA



Project Site



Buffer Boundary

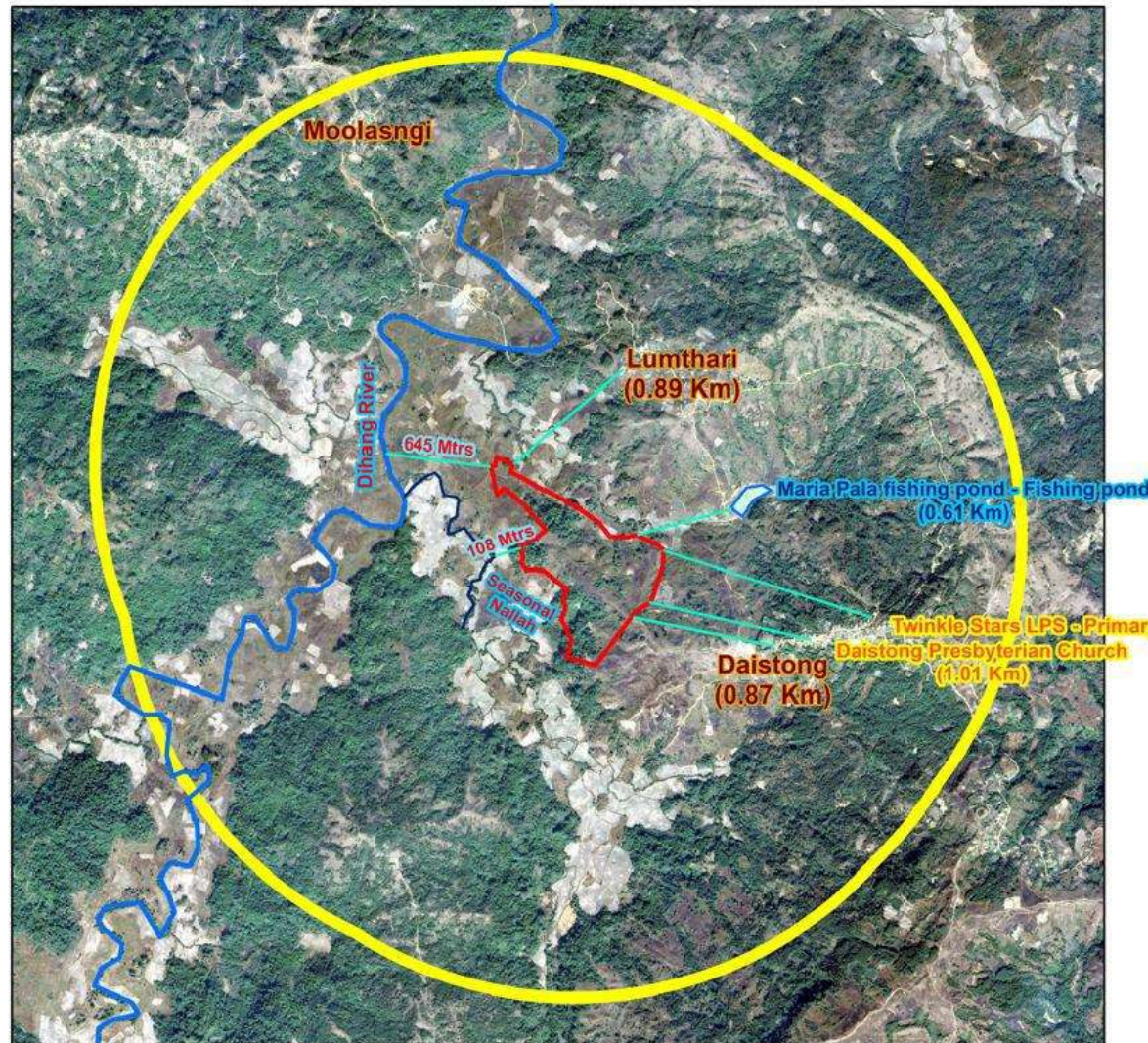


Seasonal Nallah

**Shree Cement Ltd.
District - East Jaintia Hills
Meghalaya. (Area: 25.08 Ha).**



2.5 KM BUFFER MAP OF THE STUDY AREA



LEGEND



Project Site



Buffer Boundary



School



Church



Fishing Pond

Shree Cement Ltd.
Village - Daistong, Elaka - Nongkhlieh,
District - East Jaintia Hills
Meghalaya. (Area: 25.87 Ha).

