Monitoring Report

CARBON OFFSET UNIT (CoU) PROJECT

Title: AAC block project by Starbigbloc Building Material Limited

Version 1.2

First CoU Issuance Period: 06 years 10 months 12 days

Monitoring Period: 20/02/2018 to 31/12/2024

Monitoring Report (MR)
CARBON OFFSET UNIT (CoU) PROJECT

Monitoring Report	
Title of the project activity	**AAC block project by Starbigbloc Building Material Limited**
UCR Project Registration Number	527
Version	1.2
Completion date of the MR	16/05/2025
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 01 Duration of this monitoring Period: (first and last days included (20/02/2018 to 31/12/2024)
Project participants	Starbigbloc Building Material Limited (Project Owner) Climate Detox Private Limited (Project Aggregator)
Host Party	India
Applied methodologies and standardized baselines	Applied Baseline Methodology: AMS-III.Z.: "Fuel Switch, process improvement and energy efficiency in brick manufacture", Version 06.0
Sectoral scopes	04 Manufacturing industries
Estimated amount of GHG emission reductions for this monitoring period in the registered PCN	**2018**: **12,683** CoUs (12,683 tCO_{2eq})
	2019: **33,646** CoUs (33,646 tCO_{2eq})
	2020: **32,936** CoUs (32,936 tCO_{2eq})
	2021: **37,949** CoUs (37,949 tCO_{2eq})
	2022: **34,453** CoUs (34,453 tCO_{2eq})
	2023: **35,428** CoUs (35,428 tCO_{2eq})
	2024: **37,187** CoUs (37,187 tCO_{2eq})
Total:	**2,24,282 CoUs (2,24,282 tCO_{2eq})**

SECTION A. Description of project activity

A.1. Purpose and general description of project activity >>

The **AAC block project by Starbigbloc Building Material Limited** is located in **Village Savli, Kheda District, Gujarat, India**.

The project aims to manufacture Autoclaved Aerated Concrete (AAC) blocks, a sustainable alternative to traditional red clay bricks. These blocks are produced using fly ash, cement, lime, aluminium powder, and water, undergoing a chemical reaction and high-pressure steam curing (autoclaving), resulting in lightweight, durable building material with excellent insulation properties.

Purpose of the project activity:

The main objective of the project is to reduce greenhouse gas emissions by displacing carbon-intensive red clay bricks with energy-efficient and eco-friendly AAC blocks. This shift leads to:

- Avoidance of emissions associated with coal combustion in brick kilns.
- Conservation of topsoil used in traditional brick manufacturing.
- Utilization of industrial by-products (fly ash), reducing waste.

The plant is owned by Starbigbloc Building Material Limited, a wholly owned subsidiary of Bigbloc Construction Ltd., one of India's leading AAC block manufacturers with over 13 years of experience. The facility is state-of-the-art, using modern equipment and fully automated processes to ensure quality, efficiency, and compliance with green building norms.

The installed capacity is approximately 2,50,000 cubic meters per annum of AAC blocks. These blocks are marketed under the "NXTBloc" brand and serve a range of infrastructure sectors including residential, commercial, and industrial projects.

The project not only contributes to climate action by reducing emissions but also supports the circular economy by using fly ash—a waste product from thermal power plants—as a primary raw material. This aligns with sustainable development and ESG (Environmental, Social, and Governance) principles, particularly in resource efficiency, emission reduction, and responsible production.

Transition from Traditional Masonry Systems

Prior to the implementation of AAC technology, construction projects predominantly used **red clay bricks** or **concrete blocks**, laid manually in a repetitive masonry process:

- **Brick/Block Placement**: Units were arranged using **trowels** and bonded with **cement mortar**, requiring significant labor.
- **Mortar Mixing**: Carried out using **mortar mixers**, consuming additional energy and materials.
- **Scaffolding Systems**: Temporary structures were erected to facilitate manual laying of bricks at height.

These **conventional systems were labor- and energy-intensive**, heavily dependent on fossil fuels for the production of red bricks in kiln-fired units. The environmental burden was considerable—mainly from:

- **Coal combustion** in kilns.
- **Topsoil degradation** for clay extraction.

- **GHG emissions** from sintering processes.

Innovation and Modernization through AAC

The **AAC block technology adopted by Starbigbloc** offers a significant leap forward:

- **Production Process**: Fly ash, lime, cement, gypsum, aluminum powder, and water are mixed and poured into molds. The slurry undergoes chemical aeration, is pre-cured, cut by wire, and steam-cured in autoclaves at ~180–200°C under pressure.
- **Lightweight Structure**: Reduces structural load and simplifies handling.
- **Thermal and Sound Insulation**: Improves energy efficiency and occupant comfort.
- **No Sintering Required**: Avoids fossil fuel combustion entirely in the forming process.

The result is a **reduction of 2,24,282 tCO_2e emission,** based on the displacement of energy-intensive red brick usage.

b) Brief description of the installed technology and equipment>>

Autoclaved Aerated Concrete (AAC) Block is an innovative and lightweight building material crafted from a blend of **cement, fly ash, lime, water, gypsum, and aluminium powder**. Through a unique combination of **chemical aeration, steam curing under high pressure, and accurate cutting techniques**, the final product consists of porous, thermally insulating blocks suitable for various types of construction.

AAC (Autoclaved Aerated Concrete) block manufacturing involves several steps, including raw material preparation, mixing, casting, cutting, and curing. The following is a description of the AAC block manufacturing process:

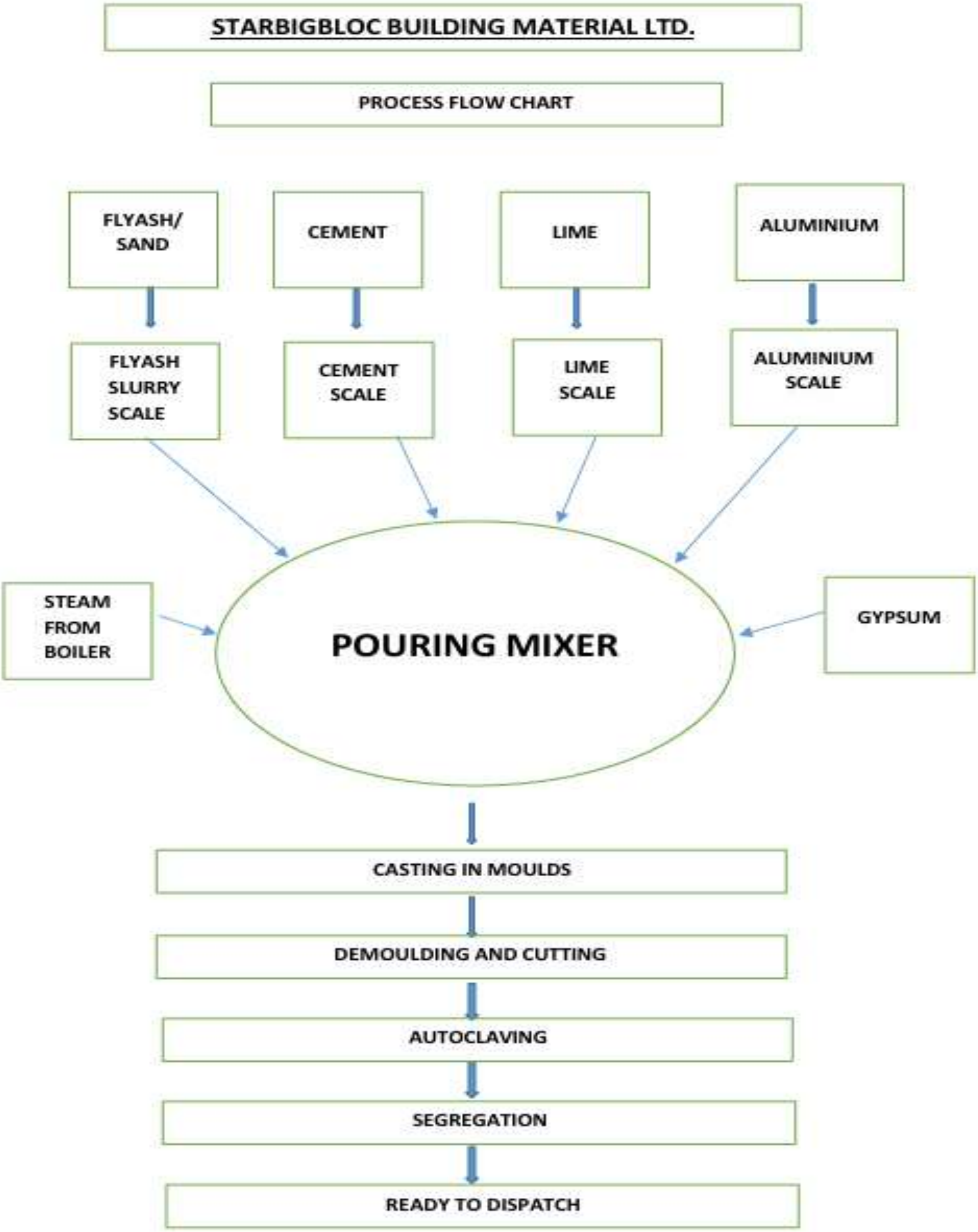

Figure 1 AAC Bloc Manufacturing Process

Figure 2 RAW Material Storage SILO (Cement, Lime)

Figure 3 Raw material mixing section

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Figure 4 Preparation of Mould

Figure 5 Cutting Section

Figure 6 Steam Curing Process (Autoclave Reactor)

c) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.)>>

The duration of the crediting period corresponding to the monitoring period is covered in this monitoring report. Here, the start date of generation has been considered as the date of the first invoice issued by Star Bigbloc Building Material Limited, reflecting the start of project operations under their ownership.

UCR Project ID or Date of Authorization: 527 or 30/04/2025
Start Date of Crediting Period: 20/02/2018
Project Commissioned: 16/06/2016 as per GPCB CTO

d) Total GHG emission reductions achieved or net anthropogenic GHG removals by sinks achieved in this monitoring period>>

The total GHG emission reductions achieved in this monitoring period is as follows:

Summary of the Project Activity and ERs Generated for the Monitoring Period	
Start date of this Monitoring Period	20/02/2018
Carbon credits claimed up to	31/12/2024
Baseline Emission	**4,72,929** tCO_{2eq}
Leakage Emission	**1,52,440** tCO_{2eq}
Project Emission	**96,207** tCO_{2eq}
Total ERs generated (tCO_{2eq})	**2,24,282** tCO_{2eq}

e) Baseline Scenario>>

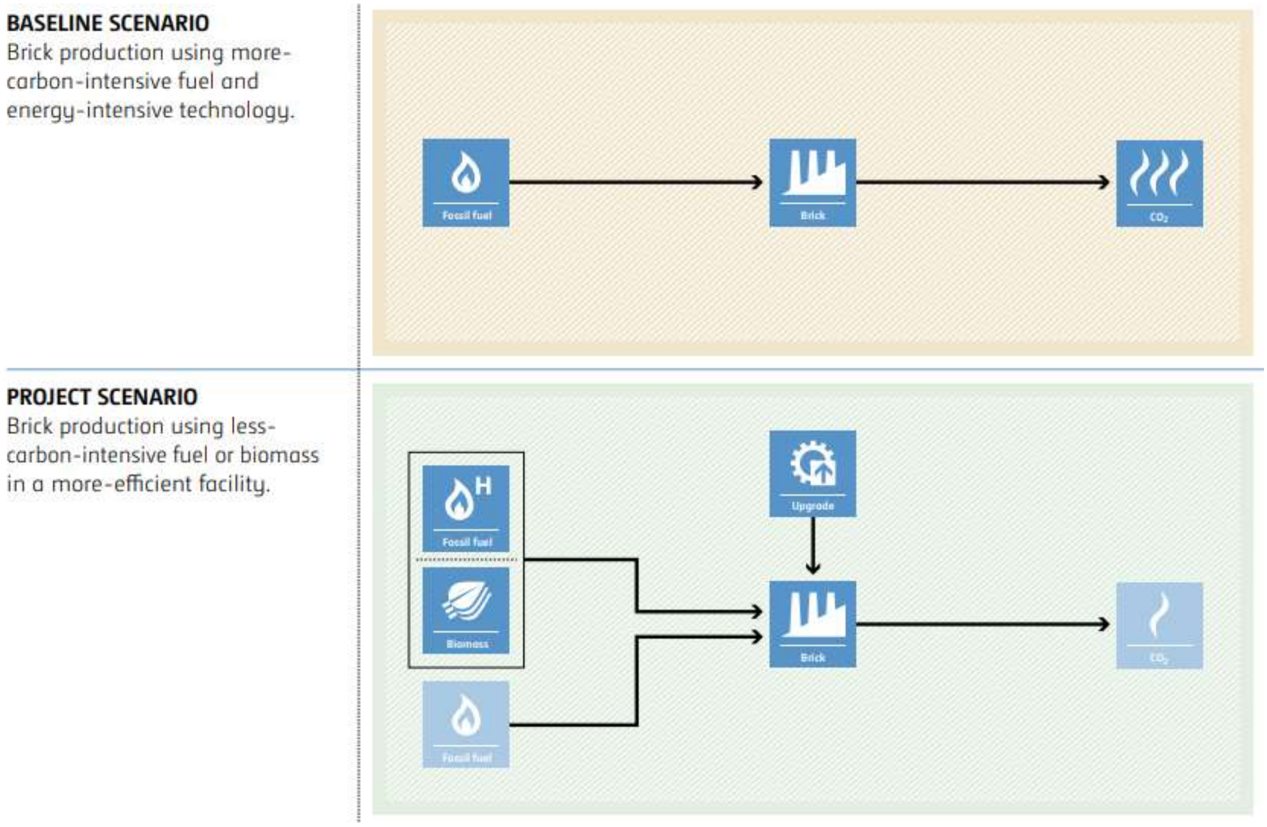
Baseline scenario is that the specific energy demand for manufacturing AAC blocks is lower compare to conventional bricks. AAC blocks are being manufactured by the autoclaving process, which is less energy intensive as compared to the thermal baking process used for manufacturing fired clay bricks. Thus, the project activity results in lower GHG emission as compared to the conventional clay bricks manufacturing process.

The baseline scenario is the continued production of traditional **fired clay bricks** using **coal- or fossil fuel-based kilns**, which is a highly energy- and emission-intensive process. These bricks are typically manufactured in Fixed Chimney Bull's Trench Kilns (FCBTKs), clamp kilns, or other inefficient designs across India.

In contrast, the proposed project involves the manufacturing of **Autoclaved Aerated Concrete (AAC) blocks** through a **steam-curing autoclaving process**, which **does not require high-temperature sintering** and therefore consumes significantly less energy.

The specific energy demand for manufacturing AAC blocks is substantially lower than that for conventional clay bricks.

Thus, the **project activity results in lower greenhouse gas (GHG) emissions** compared to the baseline scenario of coal-fired brick manufacturing.



A.2. Location of project activity>>

Country: India
District: Kheda
Village: Savli
State: Gujarat
Code: 387620
Coordinates: 22.95718, 73.10937

Google Location: STARBIGBLOC BUILDING MATERIAL LIMITED

A.3. Parties and project participants >>

Party (Host)	Participants
India	**Climate Detox Private Limited (Aggregator)** **Contact person:** Dhvani Kanani **Contact number:** +91-9898292011/+91-6358169569 **Email id**: dhvani.kanani@climatedetox.in **Address:** 310, Rajhans Montessa, Dumas Road, Magdalla, Surat-395007, Gujarat **Starbigbloc Building Material Limited (Project Owner)** **Contact Person:** Manish Saboo **Contact Number:** 9825161000 **Email id:** manish.saboo@nxtbloc.in **HO Address:** 908, Rajhans Montessa, Dumas Road, Magdalla, Surat-395007, Gujarat

A.4. References to methodologies and standardized baselines >>

SECTORAL SCOPE	:	04, Manufacturing industries
TYPE	:	III – other projects
CATEGORY	:	AMS-III.Z.. (Title: "Fuel Switch, process improvement and energy efficiency in brick manufacture", Version 06.0)

A.5. Crediting period of project activity >>

Start date of the crediting period: 20/02/2018
Crediting period corresponding to this monitoring period: 20/02/2018 to 31/12/2024

A.6. Contact information of responsible persons/entities >>

Participant 1	:	**Climate Detox Private Limited (Aggregator)**
Contact person	:	Dhvani Kanani
Mobile Number	:	+91-9898292011/+91-6358169569
Address		310, Rajhans Montessa, Dumas Road, Magdalla, Surat-395007, Gujarat

Participant 2	:	**Starbigbloc Building Material Limited (Project Owner)**
Contact person	:	Manish Saboo
Mobile Number	:	9825161000
Address		908, Rajhans Montessa, Dumas Road, Magdalla, Surat-395007, Gujarat

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity >>

a) Provide information on the implementation status of the project activity during this monitoring period in accordance with UCR PCN>>

The AAC Block project was initially commissioned and implemented by **Hilltop Concrete Private Limited** in the year **2016**. The plant was established for the manufacturing of Autoclaved Aerated Concrete (AAC) blocks using a mix of cement, fly ash, sand, water, lime, and aluminum powder.

In the year **2018**, the plant was officially taken over by **Bigbloc Construction Ltd.**, and the ownership of the AAC Block facility was transferred. Post-acquisition, the ownership was transferred under the name of Star Bigbloc Building Material Limited which undertook several modifications and upgrades in plant operations, machinery, and internal systems to improve the overall efficiency. These changes were implemented while maintaining the core technology and process of AAC block manufacturing as originally designed.

Given the change in ownership and operational restructuring, the start date of the project activity under Star Bigbloc's management has been considered as the date of the first invoice issued on 20th Feb 2018 by Star Bigbloc Building Materials Pvt Ltd. This date reflects the initiation of operations under the current ownership structure and serves as the basis for crediting and monitoring under this report.

The project involves the manufacturing of Autoclaved Aerated Concrete (AAC) blocks using an energy-efficient and low-emission autoclaving process. The key raw materials include fly ash, cement, lime, aluminium powder, and water. The installed technology consists of slurry mixers, autoclaves, cutting machines, boilers, conveyors, and material handling systems—integrated into a semi-automated production line. These systems function cohesively to produce uniform, lightweight AAC blocks with excellent thermal insulation and structural integrity.

During the monitoring period from **20/02/2018 to 31/12/2024**, the AAC block manufacturing facility operated continuously and in full alignment with the registered project design. The plant functioned as a single-site integrated facility located in Village Savli, Kheda District, Gujarat.

All major equipment and systems—including autoclaves, mixers, cutting machines, boilers, and conveyors—remained fully operational and were maintained in accordance with the plant's internal protocols. Operational efficiency was supported by ongoing internal improvements focused on optimizing material handling, process flow, and energy usage. These enhancements were within the scope of the original technological framework and did not result in any deviations from the registered project activity.

The monitoring plan was implemented throughout the crediting period, with data on production, raw material input, and energy consumption maintained by responsible departmental staff. Oversight of all monitoring activities was conducted under the supervision of the General Manager. No deviations from the approved methodology, baseline scenario, or project boundary were observed during the monitoring period. The Project Proponent, Climate Detox Private Limited, maintained close coordination with the plant team to ensure full compliance with all UCR monitoring and documentation requirements.

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b) For the description of the installed technology(ies), technical process and equipment, include diagrams, where appropriate>>

The description of the installed technologies, production processes has been detailed in **Section A.1 (b)** of this Monitoring Report. Kindly refer to that section for narrative descriptions, process flow details, and accompanying diagrams.
The **list of machinery and equipment** used in the facility is provided in the equipment table below.

List of Equipments

Sr. No	Name Of The Machinery	Make	Capacity	Qty	Purpose
1	Pond Agitator With Gear Box & Motor	Mingjie Enc,China	7.5 Kw & 11 Kw	8 Nos	Slurry Making
2	Storage Tank Agitator With Gear Box & Motor	Mingjie Enc,China	15 Kw	2 Nos	Slurry Storage
3	Pond Slurry Pump	China Zibo Dabo Pump Industry Ltd Company	8.0 Cu. M/Hr	8 Nos	Slurry Transfer
	Motor	Shangdong Huali	18.5 Kw	8 Nos	Slurry Pump
4	Pond Agitator With Gear Box	Mingjie Enc,China		8 Nos	Slurry Tank
5	Silo (Cement)	Home Made	200 Tone	1 Nos	Cement Storage
6	Silo (Lime)	Home Made	200 Tone	1 Nos	Lime Storage
7	Lime Crane With Elevator	Home Made	3 Ton	1 Nos	Lime Unloading
8	Pouring Mixture (Batching Slurry Mixture)	Mingjie Enc,China	3.6 Cu.M	1 Nos	Batch Mixing
9	Ferry Cart Gear Box and Roller Plumber Block Sn 510 & Motor	Mingjie Enc,China	3 Kw	1set	Ferrycart Use
10	Track Of Gear Box and Roller Plumber Block Sn 220 With Motor	Mingjie Enc,China	5.5 Kw	8 Set	Draught Device

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11	Demoulding Crane	Mingjie Enc,China	10 Tons	1 Nos	Cake Demoulding
12	Cutting Wagon Gear Box with Motor	Mingjie Enc,China	4 Kw	2 Nos	Cutting Trolley
13	Horizontal Cutting Machine	Mingjie Enc,China		1 Nos	Horizontal Size Cutting
14	Vertical Cutting Machine	Mingjie Enc,China		1 Nos	Vertical Size Cutting
15	Transfer Crane - In	Mingjie Enc,China	5 Tons	1 Nos	Cake Transfer
16	Plate Return Track 12no's Of Gear Box And Roller Plumber Block Sn 208 With Motor	Mingjie Enc,China	0.35kw	1 Set	Plate Transfer
18	Autoclave	Laxmi Fab. & Engg.	37.8 Cum	2 Nos	Mould Curing
		Mingjie Enc,China	37.8 Cum	8 Nos	Mould Curing
19	De-Watering Pump With Motor	Kirloskar	3.81 Kw	1 Nos	Water Transfer
20	Transfer Crane	Mingi Enc,China	5 Tons	1 Nos	Plate Transfer
21	Compressor With Motor	Elgi Equipment Ltd	3.17 Cu.M/Minute	1 Nos	Pneumatic Purpose
22	Boiler	Rajdeep	6.0 Ton/Hr	1 Nos	Steam Generation
23	Ro Plant Main Pump With Motor	Zion	10 Cu.M/Hr. 7.5 Kw	1 Nos	Water Treatment
24	Weight Bridge	Cibi (Giri Brothers)	60 Tons	1 Nos	Weighing
25	Transformers	Voltamp Transformer Ltd. Jn53186	800 Kva	1 Nos	Electrical
26	Generator Sets	Alternator-Stamford	500kva	1 Nos	Power Back Up
		Engine-Cummins India Ltd.			

27	Mould	Size 4350*650*1250	3.15 Cbm.	26	Casting
28	Winch Machine	Mingjie Enc,China	11 Kw ,5 Ton	3 Set	Wagon Movement
29	Ball Mill	Teeyer,China	210kw ,10 Ton	1 Nos	Sand Grinding
30	Belt Conveyor	Teeyer,China		2set	Coal,Sand Convey
		Home Made			
31	Wagon	Mingjie Enc,China		62 Nos	Cake Transfer With Plate
		Home Made		18 Nos	Cake Transfer With Plate
32	Mould Plate	Mingjie Enc,China		150 Nos	Cake Transfer
		Home Made		36 Nos	Cake Transfer
33	Root Blower	Root		2 Nos	Cement Unloading
34	Lime Unloading Crane	Home Made	2ton	1 Nos	Lime Unloading
35	Lime Bucket Elevator	Home Made		1 Nos	Lime Transfer To Silo
36	Coal Bucket Elevator	Home Made		1 Nos	Coal Transfer
37	Pallets	Home Made	1.5 Cbm	2700 Nos	Block Storage

The following is a description of the AAC block manufacturing process:

MIXING SECTION	Fly ash is mixed with water in appropriate proportion to prepare fly ashslurry. After attaining required
BATCHING SECTION	All the raw materials are mixed in pouring mixer as per pre-determinedrecipe for around 5 minutes & then
RISING & CURING SECTION	After casting in mould rising process takes place for a period of around 45mins where millions of tiny pores are created due to the liberation of hydrogen gas.After
CUTTING SECTION	Once proper hardness is attained, mould is lifted by tilting crane & is placedat cutting section for cutting
AUTOCLAVING	Green cakes are placed in autoclave where it is steam cured at around 12 bar pressure & around 190 degree
SEGREGATION	After proper curing in autoclave, blocks are segregated on pallets as per size & forklift lifts the
READY TO DISPATCH	After 48-72 hours of stocking in yard, blocks are loaded in trucks as per requirements with proper

B.2 Do no harm or Impact test of the project activity

The AAC block project by Starbigbloc Building Material Limited provides substantial social, environmental, economic, and technological benefits that support sustainable development and ensures no harm is caused to local communities or ecosystems. The project has undergone an internal impact assessment, demonstrating positive outcomes across the following dimensions:

Social benefits:

- **Employment Generation**: The project creates both direct and indirect job opportunities for skilled and unskilled workers in the Kheda district, especially benefitting the rural community of Savli village.
- **Skill Development**: Local labour is trained in advanced, automated AAC production systems, contributing to long-term employability.
- **Health and Safety**: Unlike conventional brick kilns that emit harmful particulates, the AAC process eliminates combustion-related exposure, resulting in cleaner air and improved worker and community health.

Environmental benefits:

- **Emission Reduction:** The project avoids GHG emissions from coal-fired brick kilns by using an autoclaving process powered by lower-energy inputs.
- **Resource Conservation:** Utilizes fly ash—a hazardous industrial waste—as a primary input, reducing environmental burden and conserving natural topsoil.
- **Pollution Control:** No air emissions or sintering processes are involved, leading to lower particulate pollution and minimal solid waste generation.

Economic benefits:

- **Cost-Efficient Construction:** AAC blocks are lightweight and offer better thermal insulation, reducing energy costs and structural load in buildings.
- **Local Economic Boost:** The project supports regional supply chains and industrial symbiosis by sourcing fly ash from nearby thermal plants.

SDG Goal	Goal Description	Project Contribution
SDG 9 	Industry, Innovation and Infrastructure	The project promotes modern, energy-efficient infrastructure and introduces innovative green manufacturing practices in the construction sector.

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SDG 11	Sustainable Cities and Communities	By producing eco-friendly building materials, the project supports green construction and sustainable urban development.
SDG 12	Responsible Consumption and Production	Uses fly ash, an industrial waste, as a raw material, promoting circular economy and reducing landfill burden.
SDG 13	Climate Action	Replaces high-emission clay brick production with a low-carbon process, resulting in substantial GHG emission reductions.

B.3. Baseline Emissions>>

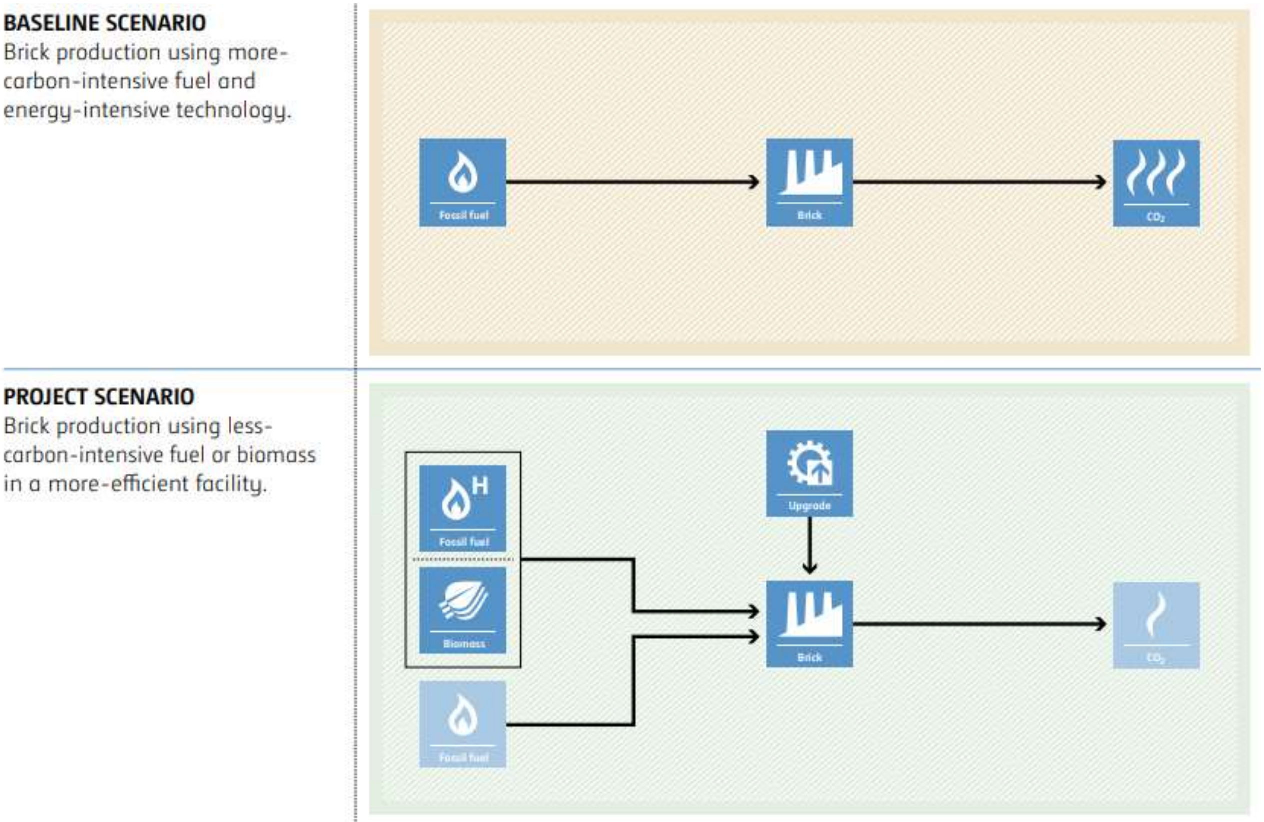
Baseline scenario is that the specific energy demand for manufacturing AAC blocks is lower compare to conventional bricks. AAC blocks are being manufactured by the autoclaving process, which is less energy intensive as compared to the thermal baking process used for manufacturing fired clay bricks. Thus, the project activity results in lower GHG emission as compared to the conventional clay bricks manufacturing process.

The baseline scenario is the continued production of traditional fired clay bricks using coal- or fossil fuel-based kilns, which is a highly energy- and emission-intensive process. These bricks are typically manufactured in Fixed Chimney Bull's Trench Kilns (FCBTKs), clamp kilns, or other inefficient designs across India.

In contrast, the proposed project involves the manufacturing of Autoclaved Aerated Concrete (AAC) blocks through a steam-curing autoclaving process, which does not require high-temperature sintering and therefore consumes significantly less energy.

The specific energy demand for manufacturing AAC blocks is substantially lower than that for conventional clay bricks.

Thus, the project activity results in lower greenhouse gas (GHG) emissions compared to the baseline scenario of coal-fired brick manufacturing.



B.4. Debundling>>

The project is not a de-bundled component of a larger project activity.

SECTION C. Application of methodologies and standardized baselines

C.1. References to methodologies and standardized baselines >>

SECTORAL SCOPE: 04, Manufacturing industries
TYPE: III – other projects
CATEGORY- AMS-III.Z.. (Title: "Fuel Switch, process improvement and energy efficiency in brick manufacture", Version 06.0)

C.2. Applicability of methodologies and standardized baselines >>

The project activity involves installation of a new technology for brick/block manufacturing which is not a traditional activity in India. This activity leads to reduction of burning of coal, which is a major contributor in Green House Gas (GHG) emission in the environment. The project activity produces on average 2,50,00 m3 of AAC blocks. The emission reduction is below 60,000 tCO2e and it will qualify as small-scale project activity under Type-III of the Small-Scale methodology. The project status is corresponding to the methodology AMS-III.Z., Version 06.0 and applicability of methodology is discussed below:

Applicability condition	Justification of compliance
The methodology comprises one or more technology / measures listed below in brick[1] production facilities: (a) Shift to an alternative brick production technology/process or installation of a new brick production technology/process; (b) Complete/partial substitution of fossil fuels or non-renewable biomass (NRB) with renewable biomass (including biomass from dedicated plantations or solid biomass residues such as sawdust and food industry organic liquid residues);[2] (c) Complete/partial substitution of high carbon fossil fuels with low carbon fossil fuels;[3] (d) Reduce the consumption of fossil fuels or NRB due to improvement of the production process.	The proposed project activity adopts option (a) installation of a new brick production technology/process. **Hence, Project activity meets the applicability criterion.**

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1 Brick in the context of this methodology includes solid bricks and blocks as well as hollow blocks used in building construction.

2 Fatty acids from oil extraction, waste oil and waste fat of biogenic origin (includes waste oil from restaurants, agro and food industry, slaughterhouses or related commercial sectors). The sources/origin of waste oil/fat and respective volumes must be identified and clearly documented in the PDD. No CERs from waste oil/fat can be claimed under this methodology if it is not produced from biogenic origin, biogenic shall mean the oils and/or fats originate from either vegetable or animal biomass, but not from mineral (fossil) sources.

3 For example, from anthracite coal to natural gas

<table>
<tr><td>The measures may replace, modify, retrofit[4] or add capacity to systems in existing facilities or be installed in a new facility.</td><td>The proposed project activity is a new facility (Greenfield project activity).
Hence, Project activity meets the applicability criterion.</td></tr>
<tr><td>The methodology is applicable for the production of:
(a) Bricks that are the same in the project and baseline cases; or
(b) Bricks that are different in the project case versus the baseline case due to a change(s) in raw materials, use of different additives, and/or production process changes resulting in reduced use or avoidance of fossil fuels for forming, sintering (firing) or drying or other applications in the facility as long as it can be demonstrated that the service level of the project brick is comparable to that of the baseline brick (see paragraph 11). Examples include pressed mud blocks (soil blocks) with cement or lime stabilization [5] and other ‘unburned’ bricks that attain strength due to fly ash, lime/cement and gypsum chemistry.</td><td>While the blocks produced under the project activity differ from those in the baseline scenario in terms of raw materials, additives, and production process—including the avoidance of fossil fuels for forming, sintering, or drying—the end-use application, compressive strength, and functional performance of the blocks remain equivalent or superior compared to the baseline bricks.
As per the comparative analysis sourced http://aerconindia.com/aac-vs-bricks.html the blocks produced in the baseline and project scenario demonstrate [6] as follows:
<table>
<tr><th>Parameter</th><th>Baseline</th><th>Project</th></tr>
<tr><td>Minimum Compressive strength (N/mm2)</td><td>2.5-3</td><td>3.0 to 4.0 N/mm2(IS 2185, Part-3)</td></tr>
<tr><td>Dry density (kg/m3)</td><td>1950</td><td>550 – 650</td></tr>
</table>
Hence, Project activity meets the applicability criterion.</td></tr>
<tr><td>New facilities (Greenfield projects) and project activities involving capacity additions are only eligible if they comply with the requirements for Greenfield projects and capacity increase projects specified in the “General guidelines for SSC CDM methodologies”.</td><td>In line with paragraph 37 of the “General Guidelines for SSC CDM Methodologies, v23.1”[7] this project qualifies as a Type III Greenfield project, representing new facilities. The most plausible baseline scenario has been determined to be "burnt clay brick manufacturing using conventional technologies." This baseline scenario has been identified following the prescribed steps, which involved assessing various alternatives, ensuring regulatory compliance, and evaluating potential barriers. This baseline scenario is in full alignment with the Type III small-scale methodology.
Therefore, the project activity fulfils the necessary applicability criteria.</td></tr>
<tr><td>The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the “General guidelines for SSC CDM methodologies”. If the remaining lifetime of</td><td>The project activity is not a replacement or retrofit to an existing facility. In fact, it is being implemented as a Greenfield project.
Hence, criteria is not applicable.</td></tr>
</table>

4 For example, to, replace and/or modify an existing heating and/or firing facility (ies) to enable the use of biomass residues

5 May involve mechanical and hydraulic systems for energy transmission to the soil block via a lever, toggle, cam, pivot, ball and socket joint, piston, etc.

6 http://aerconindia.com/aac-vs-bricks.html

7 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210211212225226/MethSSC_Guid25ver23.1.pdf

the affected systems increases due to the project activity, the crediting period shall be limited to the estimated remaining lifetime, i.e. the time when the affected systems would have been replaced in the absence of the project activity.	
For existing facilities, it shall be demonstrated, with historical data, that for at least three years immediately prior to the start date of the project implementation, only fossil fuels or NRB (non-renewable biomass) were used in the brick production systems that are being modified or retrofitted. In cases where small quantities of renewable biomass were used for experimental purposes this can be excluded.	The project activity is not being implemented at an existing facility. It is being implemented as a Greenfield project. **Hence, criteria is not applicable.**
The renewable biomass utilized by the project activity shall not be chemically processed (e.g. esterification to produce biodiesel, degumming and/or neutralization by chemical reagents) prior to the combustion but it may be processed mechanically (e.g. pressing, filtering) and/or thermally (e.g. gasification to produce syngas).[8]	The project activity does not involve use of biomass. **Hence, criteria is not applicable.**
In cases where the project activity utilizes charcoal produced from renewable biomass as fuel, the methodology is applicable provided that: (a) Charcoal is produced in kilns equipped with a methane recovery and destruction facility; or (b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the production of charcoal shall be considered. A default value of 0.030 t CH4/t charcoal may be used in accordance with “AMS-III.BG.: Emission reduction through sustainable charcoal production and consumption”; (c) If charcoal is produced from other CDM project activities, it shall be ensured that no double counting of the emission reductions occurs.	The project does not involve use of charcoal produced from renewable biomass. **Hence, criteria is not applicable.**
In the case of project activities involving changes in raw materials (including additives), it shall be demonstrated that additive materials are abundant in the country/region, according to the following procedures:	The project involves altering the raw materials used compared to the traditional method of manufacturing burnt clay bricks. It is a small-scale project with an annual capacity of 250,000 cubic meters of AAC (Autoclaved Aerated Concrete) blocks. This

8 The syngas shall be derived from gasification of renewable biomass only and no methane emissions are to be released to the atmosphere, thus demonstrating the complete use for combustion of the syngas in the project equipment.

(a) Step 1: using relevant literature and/or interviews with experts, a list of raw materials to be utilized is prepared based on the historic and/or present consumption of such raw materials; (b) Step 2: the current supply situation for each type of raw material to be utilized is assessed and their surplus availability is demonstrated using one of the approaches below: (i) Approach 1: demonstrate that the raw materials to be utilized, in the region of the project activity, are not fully utilized. For this purpose, demonstrate that the quantity of material is at least 25 per cent greater than the demand for such materials or the availability of alternative materials for at least one year prior to the project implementation; (ii) Approach 2: demonstrate that suppliers of the raw materials to be utilized, in the region of the project activity, are not able to sell all of their supply of these materials. For this purpose, project participants shall demonstrate that a representative sample of suppliers of the raw materials to be utilized, in the region, had a surplus of materials (e.g. at the end of the period during which the raw material is sold) that they could not sell and that is not utilized.	assessment focuses on using waste products as raw materials rather than commercially valuable industrial products. The primary raw material for the project is fly ash, a waste product, supplemented by small quantities of gypsum, lime, cement, and aluminium. Therefore, the assessment specifically considers the use of ash. Step 2- Approach 1 The project activity uses around 65 wt.% of the fly ash. Being a byproduct of coal-based thermal power plants with annual generation of millions of tons, fly ash is abundantly available within a feasible distance from the plant. Its surplus availability has been demonstrated according to Approach 1 provided by the methodology. As per the "REPORT ON FLY ASH GENERATION AT COAL / LIGNITE BASED THERMAL POWER STATIONS AND ITS UTILIZATION IN THE COUNTRY FOR THE YEAR 2021 – 22" (https://cea.nic.in/wp-content/uploads/tcd/2022/08/Fly_ash_Generation_and_utilisation_Report_2021_22-1.pdf) page 55, TABLEXIX shows that in the year 2015-16 (one year prior to the project implementation) around 117 million tons of fly ash generated and only 60.97% were utilized. Thus, it may be concluded that fly ash is available in abundance and the project activity meets the applicability criterion. **Therefore, this demonstrates the abundant availability of fly ash and confirms that the project aligns with the relevant eligibility criteria.**
This methodology is applicable under the following conditions: (a) The service level of project brick shall be comparable to or better than the baseline brick, i.e. the bricks produced in the brick production facility during the crediting period shall meet or exceed the performance level of the baseline bricks (in terms of, for example dry compressive strength, wet compressive strength, density). An appropriate national standard shall be used to identify the strength class of the bricks; bricks that have compressive strengths lower than the lowest class bricks in the standard are not eligible under this methodology. Project bricks are tested in nationally approved laboratories at	a)While the blocks produced under the project activity differ from those in the baseline scenario in terms of raw materials, additives, and production process—including the avoidance of fossil fuels for forming, sintering, or drying—the **end-use application, compressive strength, and functional performance of the blocks remain equivalent or superior** compared to the baseline bricks. As per the comparative analysis sourced http://aerconindia.com/aac-vs-bricks.html the blocks produced in the baseline and project scenario demonstrate [9] as follows: <table><tr><th>Parameter</th><th>Baseline</th><th>Project</th></tr><tr><td>**Minimum Compressive strength (N/mm2)**</td><td>2.5-3</td><td>3.0 to 4.0 N/mm2(IS 2185, Part-3)</td></tr></table>

9 http://aerconindia.com/aac-vs-bricks.html

six-month intervals (at a minimum) and test certificates on compressive strength are made available for verification; (b) The existing facilities involving modification and/or replacement shall not influence the production capacity beyond ±10 per cent of the baseline capacity unless it is demonstrated that the baseline for the added capacity is the same as that for the existing capacity in accordance with paragraph 5 above; (c) Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually.	<table><tr><td>**Dry density (kg/m3)**</td><td>1950</td><td>550 – 650</td></tr></table>b) This criteria is not applicable as this project is a greenfield activity. c) Annual emission reductions from the project activity are on average 33000 tCO2e/year, which is less than the methodology limit of 60,000 tCO2e. **Hence, the applicability conditions are being fulfilled**.
This methodology is not applicable if local regulations require the use of the proposed technologies or raw materials for the manufacturing of bricks unless widespread non-compliance (i.e. less than 50 per cent of brick production activities in the country comply) of the local regulation evidenced.	There are no such regulations which make it mandatory for the use of this technology in the region and Project proponent use this technology voluntarily, therefore this criterion does not apply to the project activity.
In cases where the project activity utilizes biomass sourced from dedicated plantations, applicability conditions prescribed in the tool "Project emissions from cultivation of biomass" shall apply. If the project activity involves reducing the NRB consumption, project participants shall demonstrate that NRB has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	The project activity does not involve use of biomass. **Hence, criteria is not applicable.**
The following cases are exempted from 'determining the occurrence of debundling' as per the "Guidelines on assessment of debundling for SSC project activities": (a) Project activities that aggregate brick units with holistic production cycles i.e. from raw material procurement to finished product, where each unit is not larger than 5 per cent of the Type III small-scale CDM project activity thresholds i.e. 3,000 t CO2e; or (b) Project activities that aggregate brick units, where each unit qualifies as Type III microscale CDM project activity and the geographic location of the project activity is a least developed countries/small island developing states (LDC)/(SIDS) or special underdeveloped zone (SUZ) of the host country as identified by the government in	The project activity is not a de-bundled activity. **Hence this criterion is not applicable.**

accordance with the guideline on "Demonstrating additionality of microscale project activities".	

C.3 Applicability of double counting emission reductions >>

There is no double accounting of emission reductions in the project activity as the project is uniquely identifiable based on its location coordinates and it was not registered previously on other registry.

C.4. Project boundary, sources and greenhouse gases (GHGs)>>

As per paragraph 19 of methodology AMS.III. Z. Fuel Switch, process improvement and energy efficiency in brick manufacture 6.0[10], the project boundary is the physical, geographical site where the brick production takes place during both the baseline and crediting periods. It also includes all installations, processes or equipment affected by the switching. In cases where the renewable biomass is sourced from dedicated plantations it also includes the area of the plantations. In cases involving thermo-mechanical processing of the biomass (e.g. charcoal; briquettes; syngas) the sites where these processes are carried out shall be within the project boundary.

In both Baseline and Project Scenario, boundary is depicted diagrammatically as below:

Source		Gas	Included?	Justification/Explanation
Baseline	Fossil fuel combustion in red clay brick kiln	**CO_2**	**Yes**	**Main emission source**
		CH_4	No	Neglected for simplicity
		N_2O	No	Neglected for simplicity
		Other	No	Neglected for simplicity
Project	Electricity consumption for operating plant Machinery	**CO_2**	**Yes**	**Main emission source**
		CH_4	No	Neglected for simplicity
		N_2O	No	Neglected for simplicity
		Other	No	Neglected for simplicity
	Coal consumption in autoclave Boiler	**CO_2**	**Yes**	**Main emission source**
		CH_4	No	Neglected for simplicity
		N_2O	No	Neglected for simplicity
		Other	No	Neglected for simplicity
	Diesel consumption for plant operations	CO_2	No	**Minor emission source**
		CH_4	No	Neglected for simplicity
		N_2O	No	Neglected for simplicity
		Other	No	Neglected for simplicity

10 https://cdm.unfccc.int/methodologies/DB/VLZZ1DVT1QI3KHZKSM6QECOAKNSCXZ

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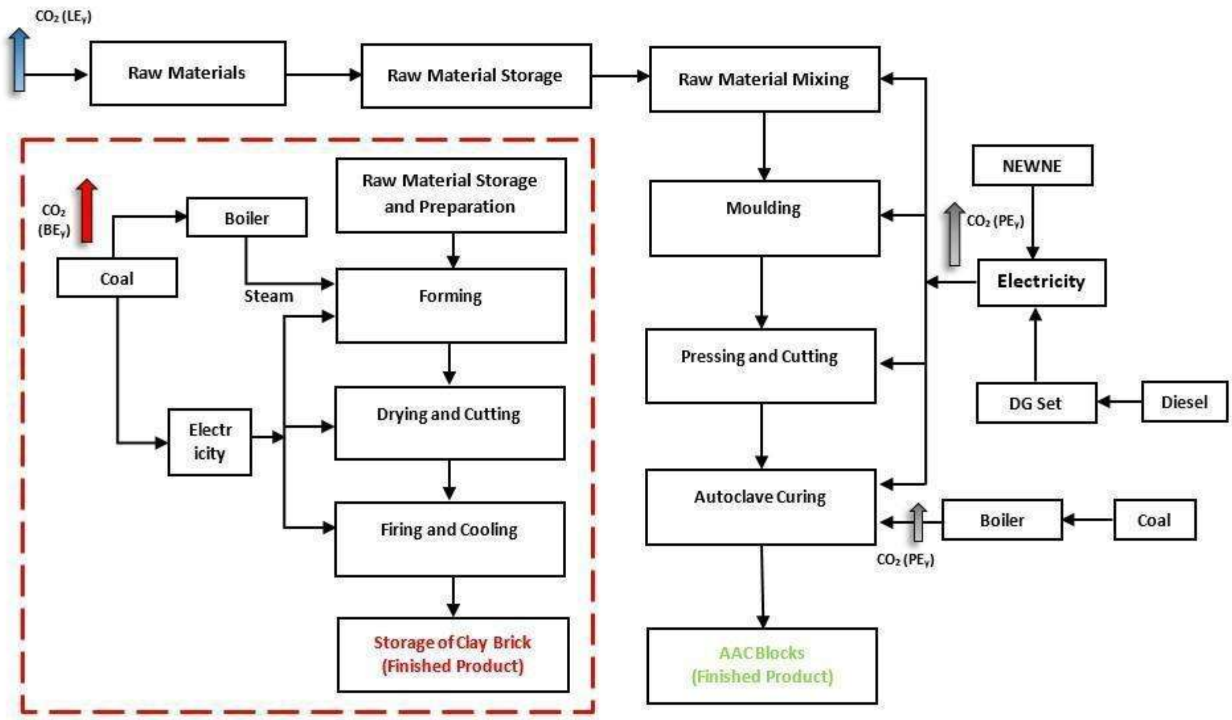

C.5. Establishment and description of baseline scenario (UCR Protocol) >>

C.5.1. Baseline Emissions

The baseline emissions are the fossil fuel and NRB consumption related emissions associated with the system(s), which were or would have otherwise been used, in the brick production facility(ies) in the absence of the project activity.The emissions are calculated as below:

$$BE_y = SEC_{BL} \times EF_{BL} \times P_{PJ,y}$$

Where:

BE_y	=	The annual baseline emissions from fossil fuels or NRB displaced by the project activity in t CO_2e in year y (of the crediting period)
SEC_{BL}	=	Specific energy consumption of brick production in the baseline, TJ per unit volume or mass unit (kg or m^3)
EF_{BL}	=	The emission factor of baseline fuel(s), in t CO_2/TJ
$P_{PJ,y}$	=	The annual net production of the facility in year y, in kg or m3

The specific energy consumption (SEC^{BL}) and the emission factor of the baseline fuel(s) (EF^{BL}) for installation of systems in a new facility or for capacity addition in an existing system shall be determined using one of the options below:

(a) Using manufacturers" specifications such as for brick production rate, energy consumption in the process;
(b) Using specifications of comparable units having similar techno-economic parameters;
(c) Using reference plant approach.

In the project activity scenario annual production specific emission factor for installation of systems in a new facility is determined using option (b) as stated above. Indian Brick Industry falls under the unorganized small and medium enterprise category, wherein the economic considerations are comparable.

The baseline emission factor shall be calculated from emissions data of other brick manufacturing plants of capacity 2,50,000 m^3/annum and using the common practice technology. As mentioned in section A6 of the PCN, the common practice technology in this sector is red clay fired clay bricks, across all plant capacities in India. For this project activity, the lower range of the emission factor of 195 gCO2/kg[15] of brick has been directly sourced from the research paper. So, only the density of AAC blocks produced in the project plant is different from that of baseline bricks. So, the emission factor of 195 gCO2/kg of brick has been converted into a volumetric emission factor as follows:

The annual production specific baseline emission factor during monitoring period as follows:

$$\mathbf{EF_{BL} = (EF_{CO2,\ brick} \ / \ W_{brick})*(D_{brick}/1000)}$$

EF_{BL}	=	The annual production specific emission factor for year y
$EF_{CO2,brick}$	=	CO2 emission per baseline brick produced (as obtained from third party documents)
W_{brick}	=	Weight of each baseline brick produced
D_{brick}	=	Density of each baseline brick produced

The annual production specific emission factor (EF_{BL}) = 195 gCO2/kg*(1950kg/m^3/1000)
= 0.38025 tCO2/m^3

The total Baseline Emissions during the Monitoring period are as below:

Year	Annual Production (m3/year)	EF_{BL}(tCO2/m^3)	Baseline Emissions (tCO2/year)*
2018 (20th Feb - 31st Dec)	75,293	0.380	28,630
2019	1,69,202	0.380	64,338
2020	1,72,695	0.380	65,667
2021	2,11,901	0.380	80,575
2022	2,11,638	0.380	80,475
2023	2,04,116	0.380	77,615
2024 (1st Jan – 31st Dec)	1,98,894	0.380	75,629

(*All values have been rounded down for conservative approach)

Total baseline emission reductions during monitoring period (*BE*) = 472929 tCO_2

C.5.2. Project Emissions

Project emissions shall be calculated using the following equation:

$$PE_y = PE_{elec,y} + PE_{fuel,y} + PE_{cultivation,y} + PE_{CH4,y}$$

Where:

PE_y = Project emissions in year y (t CO_2)
$PE_{elec,y}$ = Project emissions due to electricity consumption in year y (t CO_2)
$PE_{fuel,y}$ = Project emissions due to fossil fuel or NRB consumption in year y (t CO_2)
$PE_{cultivation,y}$ = Project emissions from cultivation of biomass in a dedicated plantation in year y (t CO_2e)
$PE_{CH4,y}$ = Project emissions due to the production of charcoal in kilns not equipped with a methane recovery and destruction facility in year y (t CO_2e)

Since the project does not involve any cultivation of biomass, production of charcoal in kilns, the $PE_{Cultivation,y}$, $P_{CH4,y}$ are considered zero.

Project emission from electricity consumption:

Referring to, "Tool to calculate baseline, project and/or leakage emission from electricity consumption, version no. 03"[11], the project emission from electricity consumption has been calculated as follows:

As per the tool, the tool is applicable if one out of the following three scenarios applies to the sources of electricity consumption:

Scenario A: Electricity consumption from the grid
Scenario B: Electricity consumption from (an) off grid fossil fuel fired captive power plant
Scenario C: Electricity consumption from the grid and fossil fuel fired captive power plant.

As discussed earlier, the project would consume electricity from the state electricity grid. Under scenario A of the tool. Electricity would be imported from the regional grid during the monitored period.

As per the tool, the emission factor for electricity generated should be higher of the emission factors of electricity sources used (i.e. the regional grid in this case). Emission factor for grid electricity is calculated using option A1 of the tool. The default emission factor of 0.757 tCO2/MWh[12] is used. Further, the default transmission and distribution loss for project emission calculation of 17.68%[13] has been used. As per the baseline methodology procedure provided in the tool, project emissions from electricity consumption are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor to account for transmission losses as follows:

$$PE_{EC,y} = \sum ECPJ_{,j,y} \times EFEF_{,j,y} \times (1 + TDL_{j,y})$$

11 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf
12 https://cea.nic.in/wp-content/uploads/2021/03/User_Guide_Version_20.0.pdf
13 https://cea.nic.in/wp-content/uploads/pdm/2024/08/Growth_Book_2024.pdf

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Where;

$PE_{EC,y}$ = Project emissions from electricity consumption in year *y* (t CO2 / yr)

$ECP_{j,y}$ = Quantity of electricity consumed by the project electricity consumption source *j* in year *y* (MWh/yr)

$EF_{EF,j,y}$ = Emission factor for electricity generation for source *j* in year *y* (t CO2/MWh)

$TDL_{j,y}$ = Average technical transmission and distribution losses for providing electricity to source *j* in year *y*

Year	Electricity consumption (MWh/year)	Emission factor of electricity source (tCO2/MWh)	T&D losses (%)	Project emission due to electricity consumption (tCO2/yr)
2018 (20th Feb - 31st Dec)	648	0.921	20.66	720
2019	1,189	0.911	20.46	1305
2020	1,123	0.903	20.73	1224
2021	1,415	0.915	19.27	1544
2022	1,487	0.919	17.68	1608
2023	1,686	0.757	17.68	1502
2024 (1st Jan – 31st Dec)	1,550	0.757	17.68	1381

Project Emission from fossil fuel consumption:

Sources of fossil fuel consumption in the project activity include coal consumption in the autoclave boiler. Thus, fossil fuel consumption in the project activity boiler is the only source of project emissions from fossil fuel consumption that has been accounted using the "Tool to calculate project or leakage CO2 emission from fossil fuel combustion"[14]. The project emission from coal combustion in boilers has been calculated as follows:

$$PE_{FC,j,y} = \sum FC_{i,j,y} \times COEF_{i,y}$$

Where:

$PE_{FC,j,y}$ = Are the CO2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO2/yr)

14 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf

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$FC_{i,j,y}$	=	Is the quantity of fuel type *i* combusted in process *j* during the year *y* (mass or volume unit/yr)
$CO_{EFi,y}$	=	Is the CO2 emission coefficient of fuel type *i* in year *y* (tCO2/mass or volume unit)
i	=	Are the fuel types combusted in process *j* during the year *y*

As per the tool, the CO_2 emission coefficient can be calculated using one of the options, depending on the availability of data

Option A: Based on the chemical composition of the fossil fuel type i
Option B: Based on the net calorific value and the CO2 emission factor of the fuel type i.

Option A should be the preferred approach, if the necessary data is available.

In absence of available data to implement option A, option B has been used to calculate the CO_2 emission co-efficient as follows:

$$COEF^{i,y} = NCV^{i,y} \times EF^{CO2,i,y}$$

Where:

$COEF_{i,y}$	=	Is the CO2 emission coefficient of fuel type *i* in year *y* (tCO2/mass or volume unit)
$NCV_{i,y}$	=	Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	Is the weighted average CO2 emission factor of fuel type *i* in year *y* (tCO2/GJ)
i	=	Are the fuel types combusted in process *j* during the year *y*

Year	Specific coal consumption (kg/m3)	Coal consumption annually (kt/yr)	NCV of coal (TJ/kt)	CO2 EF for coal (tCO2/TJ)	Project emission from coal consumption (tCO2/yr)
2018 (20th Feb - 31st Dec)	35.48	2.67	25.8	94.6	6,521
2019	24.34	4.11	25.8	94.6	10,051
2020	24.55	4.23	25.8	94.6	10,348
2021	27.92	5.91	25.8	94.6	14,437
2022	32.13	6.79	25.8	94.6	16,597
2023	31.04	6.33	25.8	94.6	15,464
2024	27.81	5.53	25.8	94.6	13,502

Total Project emission during monitoring period *PE*:

Year	Project emission from electricity consumption (tCO2/yr)	Project emission from coal consumption (tCO2/yr)	Project emissions (tCO2/year)*
2018 (20th Feb - 31st Dec)	720	6,521	7,242
2019	1,305	10,051	11,356
2020	1,224	10,348	11,573
2021	1,544	14,437	15,981
2022	1,608	16,597	18,205
2023	1,502	15,464	16,967
2024 (1st Jan – 31st Dec)	1,381	13,502	14,883

(*All values have been rounded up for conservative approach)

C.5.3. Leakage Emissions

As per the paragraph 29 and 30 of the methodology, Leakage emissions can be calculated by following below two options:

Source of leakage emission	Relevant/Not relevant to the project activity
Leakage emissions on account of the diversion of biomass residues from other uses (competing uses) shall be calculated as per the "General guidance on leakage in biomass project activities". Specifically, where NRB is involved, the leakage specified in leakage section of AMS-II.G. shall also be considered.	Not Relevant to the Project activity.
In the case of project activities involving a change in the production process or a change in the type or quantity of raw and/or additive materials as compared to the baseline, the incremental emissions associated with the production/consumption and transport of those raw and/or additive materials consumed as compared to baseline, shall be calculated as leakage.	The project involves the use of fly ash, cement, lime, gypsum, and a small amount of aluminum powder as raw materials. In contrast, the baseline method utilizes clay sourced from the project site for producing baked clay bricks. Consequently, the project necessitates the transportation of various raw materials to the site. Additionally, considering that cement, lime, and other materials are employed in the production of AAC blocks, it is essential to account for emissions stemming from their manufacturing process. The project activity takes into consideration two sources of emissions:

	i. Emissions related to the transportation of fly ash, cement, lime, gypsum, and aluminium powder procurement. i. Emissions originating from the consumption of cement, lime, gypsum, and aluminium powder (note that fly ash is a waste product and does not contribute to additional emissions during its production). To calculate emissions linked to transportation, we will use monitored parameters, while emissions tied to production will be determined by monitoring the consumption of raw materials and then multiplying the monitored values by predefined default GHG emission factors.

The applicable equation is as below for calculating the leakage emission:

$$\mathbf{LE_y = LE_{rm,prod,y} + LE_{TR,m}}$$

Where,

LE_y	=	Leakage emissions associated with consumption and transport of raw and/or additive materials in the year y.
$LE_{rm,prod,y}$	=	Leakage emissions associated with consumption of raw and/or additive materials in the year y
$LE_{TR,m}$	=	Leakage emission associated with transportation of raw and/or additive materials in the year y

<u>Leakage emissions due to raw material consumption:</u>

$$\mathbf{LE_{rm,prod,y} = Q_{cement,y} * EF_{cement} + Q_{lime,y} * EF_{lime} + Q_{Aluminium,y} * EF_{Aluminium} + Q_{Gypsum,y} * EF_{Gypsum}}$$

Where,

$LE_{rm,prod,y}$	=	Leakage emissions associated with consumption of raw and/or additive materials in the year y
$Q_{cement,y}$	=	Quantity of cement consumed for the production of AAC blocks in the year y
EF_{cement}	=	CO2emission factor of the cement production
$Q_{lime,y}$	=	Quantity of lime consumed for the production of AAC blocks in the year y
EF_{lime}	=	CO2emission factor of the lime production
$Q_{Aluminium,y}$	=	Quantity of Aluminium Powder consumed for the production of AAC blocks in the year y.

$EF_{Aluminium}$	=	CO2emission factor of the Aluminium production
$Q_{Gypsum,y}$	=	Quantity of Gypsum consumed for the production of AAC blocks in the year y.
EF_{Gypsum}	=	CO2emission factor of the Gypsum production

Leakage emission due to raw material transportation:

As per the methodological tool "Project and leakage emissions from road transportation of freight" Version 01[15] the emissions due to the raw material transportation can be calculated as below:

$$LE_{TR,m} = \sum D_{fm} * FR_{f,m} \times EF_{CO2,f} \times 10^{-6}$$

Where,

$LE_{TR,m}$	=	Leakage emission from road transportation of freight monitoring period m (tCO2)
D_{fm}	=	Return trip road distance between the origin and destination of freight transportation activity f in monitoring period m (km)
$FR_{f,m}$	=	Total mass of freight transported in freight transportation activity f in monitoring period m (t)
$EF_{CO2,f}$	=	Default CO2emission factor for freight transportation activity f (t CO2e/km)
F	=	Freight transportation activities conducted in the project activity in monitoring period m

Freight transportation activities conducted in the project activity in monitoring period m

Sr. No	Freight Type	Weight (Tonne)	Origin	Destination	Road Distance(Km)	Vehicle Class
1	Cement	19,404.19	Chittorgarh	Kapadvanj	331 (Single Trip)	Heavy
2	Fly Ash	57,500.14	Balasinor	Kapadvanj	53.8 (Round Trip)	Heavy
3	Lime	8,316.145	Jodhpur	Kapadvanj	461(Single	Heavy

15 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf

					Trip)	
4	Gypsum	2,056	Rajkot	Kapadvanj	274(Single Trip)	Heavy
5	Aluminium	77.22	Nagpur	Kapadvanj	783(Single Trip)	Heavy
6	Coal	4,074.84	Magdalla	Kapadvanj	255(Single Trip)	Heavy

Total Leakage emission during monitoring period *LE*:

Year	Leakage emission due to raw material production (tCO2/yr)	Leakage emission due to raw material transportation (tCO2/yr)	Total Leakage emissions (tCO2/year) *
2018 (20th Feb - 31st Dec)	7,790	915	8,705
2019	17,398	1,937	19,336
2020	19,097	2,061	21,158
2021	24,107	2,537	26,645
2022	25,156	2,660	27,817
2023	22,732	2,488	25,220
2024 (1st Jan – 31st Dec)	21,140	2,419	23,559

(*All values have been rounded up for conservative approach)

C.5.4. Emission Reduction

Emission Reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where;

ERy	=	Emission reductions in year y (t CO2e)
BEy	=	Baseline emissions in year y (tCO2e)
PEy	=	Project emissions in year y (tCO2e)
LEy	=	Leakage emissions in year y (tCO2e)

Emissions Reductions and Removals

Year	Baseline emissions	Project emissions	Leakage emissions	Emission Reduction
2018 (20th Feb - 31st Dec)	28,630	7,242	8,705	12,683
2019	64,338	11,356	19,336	33,646
2020	65,667	11,573	21,158	32,936
2021	80,575	15,981	26,645	37,949
2022	80,475	18,205	27,817	34,453
2023	77,615	16,967	25,220	35,428
2024 (1st Jan – 31st Dec)	75,629	14,883	23,559	37,187
Total	**4,72,929**	**96,207**	**1,52,440**	**2,24,282**

ER = 4,72,929 – 96,207 - 1,52,440 = 2,24,282 tCO2e

Thus, as per the ex-ante calculations the project will displace heat generation from coal consumption leading to an emission reduction of **2,24,282 tCO2e** equivalent every year. In the absence of the proposed project activity, the steam demand would have been supplied to the processing plants by the coal-based boiler.

C.6. Prior History>>

The project activity was not applied to any other GHG program for generation or issuance of carbon offsets or credits for the said crediting period.

C.7. Monitoring period number and duration>>

Monitoring Period : 06 years 10 months 12 days
Date : 20/02/2018 to 31/12/2024

C.8. Changes to start date of crediting period >>

There is no change in the start date of crediting period.

C.9. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>

As this is the first version, there are no methodology deviations applied. Hence, this section is not applicable to the project.

C.10. Monitoring plan>>

Monitoring data related to production, raw materials, electricity consumption, and dispatch is maintained regularly by designated departmental staff.
The plant's operations are overseen by the Director, who provides overall guidance and ensures smooth coordination across all departments. The General Manager facilitates interdepartmental coordination and motivates teams to achieve optimal performance. The Assistant General Manager ensures effective execution of top-level plans and contributes suggestions for continual improvement. The Production Manager is responsible for planning and executing the production process while maintaining coordination with other departments. The Maintenance Head and Electrical Head work to minimize breakdowns and ensure the efficient functioning of mechanical and electrical systems, respectively. The Quality Head ensures that finished products meet quality standards and supports the procurement of high-quality raw materials. The HR department manages recruitment and the implementation of HR policies. The Transport Head oversees logistics to ensure timely delivery of finished goods to clients.

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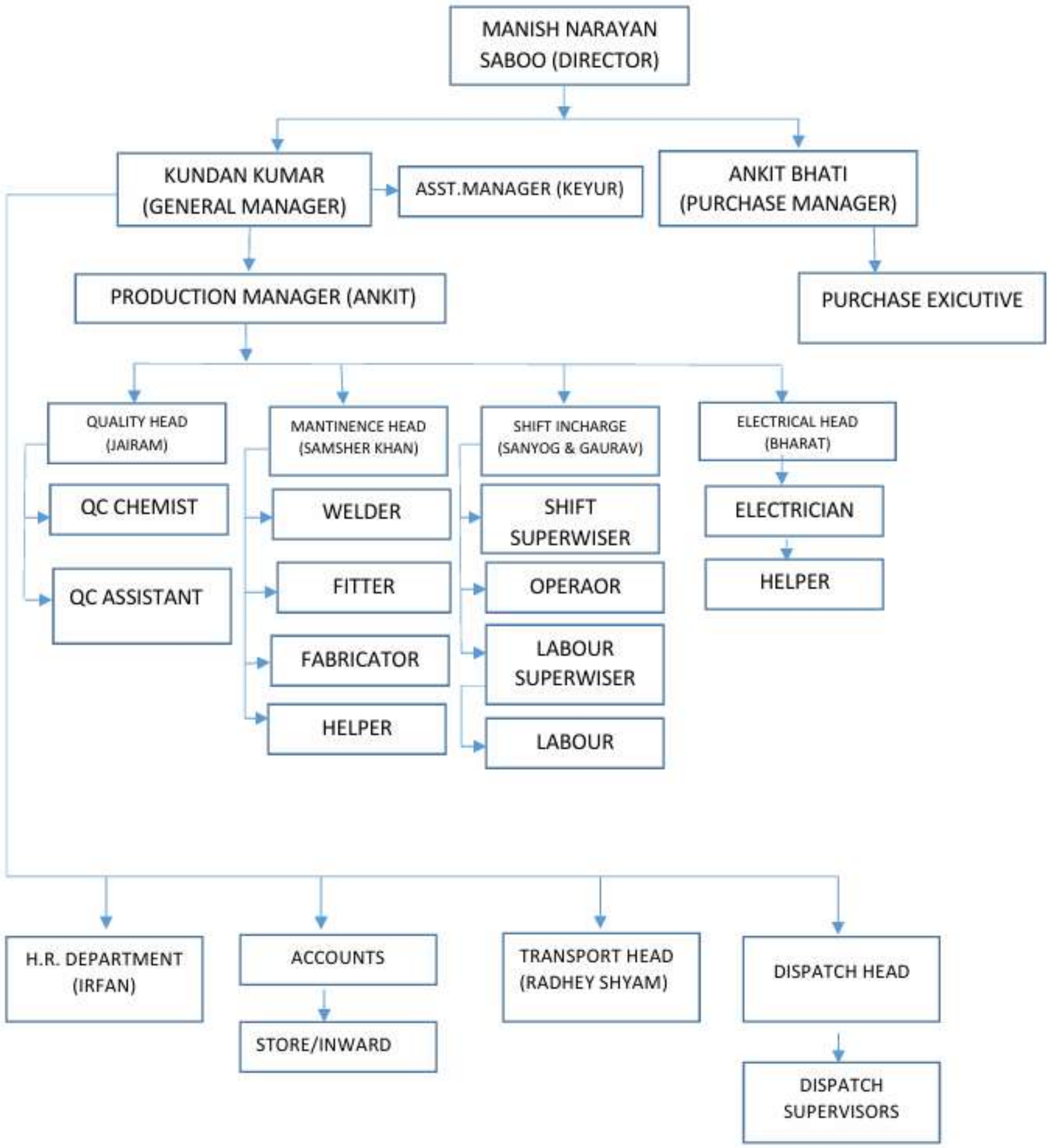
The roles and hierarchy of the responsible personnel are illustrated in the organizational chart:



Data / Parameter:	**EF_{BL}**
Data unit:	t CO_2/m^3
Description:	The annual production specific baseline emission factor
Value Applied	0.38
Source of data:	Calculated based on data taken from:

	1. "CO_2 emission factor for clay brick" taken from https://www.sciencedirect.com/science/article/abs/pii/S09596 52616308381 2. "Density of bricks" taken from http://aerconindia.com/aac-vs-bricks.html
Justification of choice of data or description of measurement methods and procedures applied	The value is calculated value. It is derived based on CO_2 emission per weight of brick data which is simplified value and density of brick. The values taken are from an authentic source and can be verified further.
Purpose of Data:	For the calculation of baseline emission.
Any comment:	The value is the derived value.

Data / Parameter:	**EF_{cement}**
Data unit:	t CO2/t
Description:	CO2 emission factor of cement production
Value Applied	0.576
Source of data:	https://aeee.in/emission-reduction-approaches-for-the-cement-industry/
Justification of choice of data or description of measurement methods and procedures applied	Alliance for an Energy Efficient Economy (AEEE) published the data using The International Energy Agency (IEA), Cement Sustainability Initiative (CSI), and World Business Council for Sustainable Development (WBCSD) as a reference. So, the source is reliable.
Purpose of Data:	Calculation of leakage emissions
Any comment:	The value is fixed ex-ante

Data / Parameter:	**$EF_{aluminium}$**
Data unit:	t CO_2/t
Description:	CO_2 emission factor of aluminium production
Value Applied	1.7
Source of data:	IPCC report of 2006 on NGGI[16] (Vol. 3, Ch. 4, Pg. No. 4.47, Table 10)
Justification of choice of data or description of measurement methods and procedures applied	The IPCC Report is a reliable source of information. Additionally, Prebake and Soderberg, two available processes for producing aluminium, are chosen for

16 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_4_Ch4_Metal_Industry.pdf

	leakage emission since they are more emission intensive.
Purpose of Data:	For the calculation of leakage emission.
Any comment:	-

Data / Parameter:	$\mathbf{EF_{lime}}$
Data unit:	t CO_2/t
Description:	CO_2 emission factor of lime production
Value Applied	0.75
Source of data:	IPCC Guidelines 2006 for NGGI (Vol 3 Ch 2 Eqn 2.8)[17]
Justification of choice of data or description of measurement methods and procedures applied	IPCC report is a reliable source of information which is acknowledged worldwide.
Purpose of Data:	For the calculation of leakage emission.
Any comment:	

Data / Parameter:	$\mathbf{EF_{gypsum}}$
Data unit:	t CO_2/t
Description:	CO_2 emission factor of gypsum production
Value Applied	0.01
Source of data:	EU ETS post 2012 Sector report for the gypsum industry (4.2, Pg. No. 9)[18]
Justification of choice of data or description of measurement methods and procedures applied	The European Union Emissions Trading System (EU ETS) Report is a reliable source of information which is acknowledged worldwide.
Purpose of Data:	For the calculation of leakage emission.
Any comment:	-

Data / Parameter:	$\mathbf{EF_{CO2,f}}$
Data unit:	g CO2/t-km
Description:	Default CO2 emission factor for freight transportation activity f
Value Applied	Heavy Vehicles - 129
Source of data:	Based on the methodological tool " Tool to calculate Project and leakage emissions from road transportation of freight."(Version 01.0.0)

17 https://climate.ec.europa.eu/system/files/2016-11/bm_study-gypsum_en.pdf

18 https://climate.ec.europa.eu/system/files/2016-11/bm_study-gypsum_en.pdf

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	For raw material (Fly ash, Gypsum, Cement, Lime, Aluminium Powder) transportation generally heavy vehicles are being used. So PP has considered the values for the emission factor of Heavy vehicles.
Justification of choice of data or description of measurement methods and procedures applied	Default value as provided in the methodological Tool no : 12, "Tool to calculate Project and leakage emissions from road transportation of freight (version 1.1)", para 5.3, table no 01
Purpose of Data:	For the calculation of leakage emission.
Any comment:	The values are default.

Data / Parameter:	D_{brick}
Data unit:	kg/m3
Description:	Density of each baseline brick produced
Value Applied	1950
Source of data:	Aercon India report on "Comparison between AAC BLOCKS VS. CLAY BRICKS"[19]
Justification of choice of data or description of measurement methods and procedures applied	This is a default data as provided by Aercon India and is an authentic source of data.
Purpose of Data:	For the calculation of baseline emission.
Any comment:	

Data / Parameter:	$EF_{CO2,brick}$
Data unit:	gCO_2/kg of brick
Description:	CO_2 emission factor for clay brick
Value Applied	195
Source of data:	Report by Journal of Cleaner Production on "Carbon footprint of solid clay bricks fired in clamps of India"[20]
Justification of choice of data or description of measurement methods and procedures applied	This is a default data as provided by Journal of Cleaner Production and is an authentic source of data.
Purpose of Data:	For the calculation of baseline emission.
Any comment:	-

Data / Parameter:	$EF_{EL,plant,y}$
Data unit:	tCO_2/MWh

19 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_2_Ch2_Mineral_Industry.pdf

20 https://www.sciencedirect.com/science/article/abs/pii/S0959652616308381

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Description:	Emission factor for electricity used in project plant in year y
Value Applied	<table><tr><th>Year</th><th>EF</th></tr><tr><td>2018</td><td>0.921</td></tr><tr><td>2019</td><td>0.911</td></tr><tr><td>2020</td><td>0.903</td></tr><tr><td>2021</td><td>0.915</td></tr><tr><td>2022</td><td>0.919</td></tr><tr><td>2023</td><td>0.757</td></tr><tr><td>2024</td><td>0.757</td></tr></table>
Source of data:	CO2 Baseline Database for the Indian Power Sector User Guide 2018-https://cea.nic.in/wp-content/uploads/baseline/2024/01/User_Guide__Version_19.0.pdf 2019-2024 - https://cea.nic.in/wp-content/uploavds/2021/03/User_Guide_Version_20.0.pdf
Justification of choice of data or description of measurement methods and procedures applied	---
Purpose of Data:	For the calculation of project emission.
Any comment:	

Data / Parameter:	**$P_{PJ,y}$**
Data unit:	m^3
Description:	The annual production of the facility in year y.
Value Applied	<table><tr><th>Year</th><th>Production (m³/year)</th></tr><tr><td>2018 (20th Feb - 31st Dec)</td><td>7,52,93</td></tr><tr><td>2019</td><td>1,69,202</td></tr><tr><td>2020</td><td>1,72,695</td></tr></table>

	2021 | 2,11,901 2022 | 2,11,638 2023 | 2,04,116 2024 | 1,98,894
Source of data:	Plant Records
Justification of choice of data or description of measurement methods and procedures applied	The production is monitored manually. Volume of blocks manufactured can be known by converting the number of cakes into volume using the standard volume of each cake.
Purpose of Data:	For the calculation of baseline emission.
Any comment:	All the data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter:	**$NCV_{coal,y}$**
Data unit:	TJ/kT
Description:	Average Net Calorific Value of coal in the year y.
Value Applied	25.8
Source of data:	IPCC Guidelines 2006 on NGGI (Vol. 2, Ch. 1, Pg. No. 1.18, Table 1.2)[21]
Justification of choice of data or description of measurement methods and procedures applied	Net Calorific Value is a default value taken from IPCC Report.
Purpose of Data:	For the calculation of project emission.
Any comment:	

Data / Parameter:	**Q_{cement}**
Data unit:	Tonne/year
Description:	Quantity of cement used in AAC Block production during the monitoring period.
Value Applied	**Year** | **Quantity** 2018 (20th Feb - 31st Dec) | 8,084.61 2019 | 19,246.43

21 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

	<table><tr><td>2020</td><td>20,601.31</td></tr><tr><td>2021</td><td>27,224.3</td></tr><tr><td>2022</td><td>28,300.54</td></tr><tr><td>2023</td><td>25,059.51</td></tr><tr><td>2024</td><td>22,677.06</td></tr></table>
Source of data:	Receipt
Justification of choice of data or description of measurement methods and procedures applied	Continuous monitoring, monthly recording of data in logbook and management system.
Purpose of Data:	For the calculation of leakage emission.
Any comment:	All the data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter:	$\mathbf{Q_{flyash}}$
Data unit:	Tonne/year
Description:	Quantity of fly ash used in AAC Block production during the monitoring period.
Value Applied	<table><tr><th>Year</th><th>Quantity</th></tr><tr><td>2018 (20th Feb - 31st Dec)</td><td>27,665.16</td></tr><tr><td>2019</td><td>58,328.37</td></tr><tr><td>2020</td><td>59,131.04</td></tr><tr><td>2021</td><td>65,363.71</td></tr><tr><td>2022</td><td>60,115.05</td></tr><tr><td>2023</td><td>65,749.55</td></tr><tr><td>2024</td><td>73,434.00</td></tr></table>
Source of data:	Goods Receipt
Justification of choice of data or description of measurement methods and procedures applied	Continuous monitoring, monthly recording of data in logbook and management system.
Purpose of Data:	For the calculation of leakage emission.

Any comment:	All the data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter:	**Q_{lime}**
Data unit:	Tonne/year
Description:	Quantity of lime used in AAC Block production during the monitoring period.
Value Applied	<table><tr><th>Year</th><th>Quantity</th></tr><tr><td>2018 (20th Feb - 31st Dec)</td><td>4,091.49</td></tr><tr><td>2019</td><td>8,217.58</td></tr><tr><td>2020</td><td>9,445.29</td></tr><tr><td>2021</td><td>10,999.68</td></tr><tr><td>2022</td><td>11,565.13</td></tr><tr><td>2023</td><td>10,828.07</td></tr><tr><td>2024</td><td>10,552.64</td></tr></table>
Source of data:	Plant Records (Receipt)
Justification of choice of data or description of measurement methods and procedures applied	Continuous monitoring, monthly recording of data in logbook and management system.
Purpose of Data:	For the calculation of leakage emission.
Any comment:	All the data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter:	**Q_{gypsum}**
Data unit:	Tonne/year
Description:	Quantity of gypsum used in AAC Block production during the monitoring period.
Value Applied	<table><tr><th>Year</th><th>Quantity</th></tr><tr><td>2018 (20th Feb - 31st Dec)</td><td>715.867</td></tr></table>

<table>
<tr><td></td><td>

2019	2067.87
2020	1636.45
2021	2019.98
2022	2380.23
2023	2512.58
2024	2,088.30

</td></tr>
<tr><td>Source of data:</td><td>Plant Records (Receipt)</td></tr>
<tr><td>Justification of choice of data or description of measurement methods and procedures applied</td><td>Continuous monitoring, monthly recording of data in logbook and management system.</td></tr>
<tr><td>Purpose of Data:</td><td>For the calculation of leakage emission.</td></tr>
<tr><td>Any comment:</td><td>All the data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.</td></tr>
</table>

<table>
<tr><td>Data / Parameter:</td><td>$\mathbf{Q_{aluminium}}$</td></tr>
<tr><td>Data unit:</td><td>Tonne/year</td></tr>
<tr><td>Description:</td><td>Quantity of aluminium used in AAC Block production during the monitoring period.</td></tr>
<tr><td>Value Applied</td><td>

Year	**Quantity**
2018 (20th Feb - 31st Dec)	33.76
2019	75.42
2020	76.48
2021	91.93
2022	92.72
2023	88.93
2024	83.75

</td></tr>
<tr><td>Source of data:</td><td>Plant Records (Receipt)</td></tr>
<tr><td>Justification of choice of data or description of measurement methods and procedures applied</td><td>Continuous monitoring, monthly recording of data in logbook and management system.</td></tr>
<tr><td>Purpose of Data:</td><td>For the calculation of leakage emission.</td></tr>
</table>

Any comment:	All the data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter:	**Q_{Coal}**
Data unit:	Tonne/year
Description:	Quantity of aluminium used in AAC Block production during the monitoring period.
Value Applied	<table><tr><th>Year</th><th>Quantity</th></tr><tr><td>2018 (20th Feb - 31st Dec)</td><td>2,671.66</td></tr><tr><td>2019</td><td>4,117.90</td></tr><tr><td>2020</td><td>4,239.87</td></tr><tr><td>2021</td><td>5,915.24</td></tr><tr><td>2022</td><td>6,799.75</td></tr><tr><td>2023</td><td>6,335.75</td></tr><tr><td>2024</td><td>5,531.64</td></tr></table>
Source of data:	Plant Records (Receipt)
Justification of choice of data or description of measurement methods and procedures applied	Continuous monitoring, monthly recording of data in logbook and management system.
Purpose of Data:	For the calculation of leakage emission.
Any comment:	All the data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter:	**FR_{Cement}**
Data unit:	Tonne/year
Description:	Quantity of Cement Purchase during monitoring period
Value Applied	<table><tr><th>Year</th><th>Quantity</th></tr><tr><td>2018 (20th Feb - 31st Dec)</td><td>8,105.67</td></tr><tr><td>2019</td><td>19,404.19</td></tr></table>

	2020 — 20,674.66 2021 — 27,061.83 2022 — 28,361.11 2023 — 25,049.19 2024 — 22,847.01
Source of data:	Plant Records (Receipt)
Justification of choice of data or description of measurement methods and procedures applied	Continuous monitoring of each batch received at the plant facility, through calibrated weighbridge, which is recorded in logbook and as well as management system.
Purpose of Data:	For the calculation of leakage emission.
Any comment:	

	2020
	20,674.66

Year (cont.)	Quantity
2020	20,674.66
2021	27,061.83
2022	28,361.11
2023	25,049.19
2024	22,847.01

Data / Parameter:	**FR_{Flyash}**
Data unit:	Tonne/year
Description:	Quantity of Fly ash Purchase during monitoring period
Value Applied	(see table below)
Source of data:	Plant Records (Receipt)
Justification of choice of data or description of measurement methods and procedures applied	Continuous monitoring of each batch received at the plant facility, through calibrated weighbridge, which is recorded in logbook and as well as management system.
Purpose of Data:	For the calculation of leakage emission.
Any comment:	

Year	Quantity
2018 (20th Feb - 31st Dec)	28,759.64
2019	57,500.11
2020	59,526.20
2021	65,325.39
2022	62.309.23
2023	67,675.01
2024	79,117.70

Data / Parameter:	FR_{lime}
Data unit:	Tonne/year
Description:	Quantity of Lime Purchase during monitoring period
Value Applied	<table><tr><th>Year</th><th>Quantity</th></tr><tr><td>2018 (20th Feb - 31st Dec)</td><td>4,129.55</td></tr><tr><td>2019</td><td>8,316.14</td></tr><tr><td>2020</td><td>9,464.77</td></tr><tr><td>2021</td><td>10,981.93</td></tr><tr><td>2022</td><td>11,663.54</td></tr><tr><td>2023</td><td>10,838.81</td></tr><tr><td>2024</td><td>10603.29</td></tr></table>
Source of data:	Plant Records (Receipt)
Justification of choice of data or description of measurement methods and procedures applied	Continuous monitoring of each batch received at the plant facility, through calibrated weighbridge, which is recorded in logbook and as well as management system.
Purpose of Data:	For the calculation of leakage emission.
Any comment:	

Data / Parameter:	FR_{Gypsum}
Data unit:	Tonne
Description:	Quantity of Gypsum Purchase during monitoring period
Value Applied	<table><tr><th>Year</th><th>Quantity</th></tr><tr><td>2018 (20th Feb - 31st Dec)</td><td>745</td></tr><tr><td>2019</td><td>2,056</td></tr><tr><td>2020</td><td>1,561</td></tr><tr><td>2021</td><td>2,021.1</td></tr><tr><td>2022</td><td>2,347.89</td></tr><tr><td>2023</td><td>2,543.00</td></tr></table>

	<table><tr><td>2024</td><td>2084.99</td></tr></table>
Source of data:	Plant Records (Receipt)
Justification of choice of data or description of measurement methods and procedures applied	Continuous monitoring of each batch received at the plant facility, through calibrated weighbridge, which is recorded in logbook and as well as management system.
Purpose of Data:	For the calculation of leakage emission.
Any comment:	

Data / Parameter:	**$FR_{Aluminium}$**
Data unit:	Tonne
Description:	Quantity of Aluminium Purchase during monitoring period
Value Applied	<table><tr><th>Year</th><th>Quantity</th></tr><tr><td>2018 (20th Feb - 31st Dec)</td><td>37.47</td></tr><tr><td>2019</td><td>77.22</td></tr><tr><td>2020</td><td>77.04</td></tr><tr><td>2021</td><td>91.83</td></tr><tr><td>2022</td><td>89.88</td></tr><tr><td>2023</td><td>94.09</td></tr><tr><td>2024</td><td>83.48</td></tr></table>
Source of data:	Plant Records (Receipt)
Justification of choice of data or description of measurement methods and procedures applied	Continuous monitoring of each batch received at the plant facility, through calibrated weighbridge, which is recorded in logbook and as well as management system.
Purpose of Data:	For the calculation of leakage emission.

Data / Parameter:	**FR_{Coal}**
Data unit:	Tonne
Description:	Quantity of Coal Purchase during monitoring period
Value Applied	<table><tr><th>Year</th><th>Quantity</th></tr></table>

	<table><tr><td>2018 (20th Feb - 31st Dec)</td><td>2,835.19</td></tr><tr><td>2019</td><td>4,074.84</td></tr><tr><td>2020</td><td>4,220.71</td></tr><tr><td>2021</td><td>5,901.74</td></tr><tr><td>2022</td><td>7,030.34</td></tr><tr><td>2023</td><td>6,212.09</td></tr><tr><td>2024</td><td>5,518.62</td></tr></table>
Source of data:	Plant Records (Receipt)
Justification of choice of data or description of measurement methods and procedures applied	Continuous monitoring of each batch received at the plant facility, through calibrated weighbridge, which is recorded in logbook and as well as management system.
Purpose of Data:	For the calculation of leakage emission.

Data / Parameter:	**$EC_{PJ,y}$**
Data unit:	MWh
Description:	Quantity of electricity consumed by the project plant in year y.
Value Applied	<table><tr><th>Year</th><th>Electricity Consumption (KWh)</th></tr><tr><td>2018 (20th Feb - 31st Dec)</td><td>6,48,033</td></tr><tr><td>2019</td><td>1,18,8834</td></tr><tr><td>2020</td><td>1,12,2663</td></tr><tr><td>2021</td><td>1,41,5144</td></tr><tr><td>2022</td><td>1,48,6913</td></tr><tr><td>2023</td><td>1,68,6165</td></tr><tr><td>2024</td><td>1,54,9887</td></tr></table>
Source of data:	Electricity Bills

Justification of choice of data or description of measurement methods and procedures applied	–
Purpose of Data:	For the calculation of project emission.
Any comment:	

Data / Parameter:	**$D_{f,m, flyash}$**
Data unit:	Km
Description:	Return trip road distance between the origin and destination of fly ash transportation activity f in monitoring period m
Value Applied	53.8
Source of data:	The distance is measured by the coordinates provided of the manufacturing unit to that of suppliers.
Justification of choice of data or description of measurement methods and procedures applied	Number of trips aggregated monthly
Purpose of Data:	Calculation of leakage emission
Any comment:	

Data / Parameter:	**$D_{f,m, gypsm \& POP}$**
Data unit:	Km
Description:	Road distance between the origin and destination of gypsum and POPtransportation activity f in monitoring period m
Value Applied	274
Source of data:	The distance is measured by the coordinates (Google) provided of the manufacturing unit to that of suppliers.
Justification of choice of data or description of measurement methods and procedures applied	1. As the Google map is an authentic and verifiable source. 2. As the transportation of raw materials was conducted using the seller's vehicle. Since the company did not deploy its own vehicle for return transit, there is no return trip involved; hence, accounting for a one-way distance
Purpose of Data:	Calculation of leakage emission
Any comment:	

Data / Parameter:	**$D_{f,cement}$**
Data unit:	Km

Description:	Road distance between the origin and destination of cement transportation activity f in monitoring period m
Value Applied	331
Source of data:	The distance is measured by the coordinates (Google) provided of the manufacturing unit to that of suppliers.
Justification of choice of data or description of measurement methods and procedures applied	1. As the Google map is an authentic and verifiable source. 2. As the transportation of raw materials was conducted using the seller's vehicle. Since the company did not deploy its own vehicle for return transit, there is no return trip involved; hence, accounting for a one-way distance
Purpose of Data:	Calculation of leakage emissions
Any comment:	

Data / Parameter:	$D_{f,m,lime}$
Data unit:	Km
Description:	Road distance between the origin and destination of lime transportation activity f in monitoring period m
Value Applied	461
Source of data:	The distance is measured by the coordinates (Google) provided of the manufacturing unit to that of suppliers.
Justification of choice of data or description of measurement methods and procedures applied	1. As the Google map is an authentic and verifiable source. 2. As the transportation of raw materials was conducted using the seller's vehicle. Since the company did not deploy its own vehicle for return transit, there is no return trip involved; hence, accounting for a one-way distance
Purpose of Data:	Calculation of leakage emissions
Any comment:	

Data / Parameter:	$D_{f,m\ Aluminium}$
Data unit:	Km
Description:	Road distance between the origin and destination of aluminium transportation activity f in monitoring period m
Value Applied	783
Source of data:	The distance is measured by the coordinates (Google) provided of the manufacturing unit to that of suppliers.

Justification of choice of data or description of measurement methods and procedures applied	1. As the Google map is an authentic and verifiable source. 2. As the transportation of raw materials was conducted using the seller's vehicle. Since the company did not deploy its own vehicle for return transit, there is no return trip involved; hence, accounting for a one-way distance
Purpose of Data:	Calculation of leakage emissions
Any comment:	-