CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Non-firing Brick Manufacturing Project in India
Ver. 0.2
21/03/2007

A.2. Description of the small-scale project activity:

The proposed project activity consists of the establishment of an energy-efficient brick factory and of its commercial operation to supply environmentally-friendly products. The purpose of this project activity is to introduce a non-firing bricks manufacturing process to brick manufactures in India to replace their current brick manufacturing process which is not energy efficient and emits a substantial amount of CO_2.

Brick is one of the major building materials in India, which is said to be produced 360 billion units per year by inefficient burning methods, consuming a greater amount of inferior coal and emitting a substantial amount of CO_2, SOx and NOx. Deterioration of lands due to the extraction of clay, which is the major source of bricks, and large groundwater consumption in the country with poor water resources are the other serious problems related to brick manufacturing. According to the results of a field investigation, an annual consumption of coal for firing bricks is over 400 million tons and their estimated CO_2 emission would be more than 84 million tons. Mixing and forming have been done manually in the current Indian process; hence, they are poor in productivity as well as in quality. A number of pollutants are emitted in a burning process, and therefore, the working environment is extremely poor.

Non-firing bricks are produced by a chemical reaction process without firing but recycling waste material such as fly ash. It is already commercialized in Japan as a way of effectively using unused resources and of using less fossil fuel. Non-firing bricks manufacturing process provides vast freedom in selection of raw materials, and has devices with unique design for mixing and forming processes. After forming, bricks are kept in open air for curing, to acquire sufficient strength in physical properties, so that they do not require a firing process.

The proposed production model with outstanding productivity and quality, emits no GHG or harmful gases throughout its whole process. Various unused resources can be utilized as the raw materials, minimizing the usage of scarce high-quality clay. This process is also free from the drainage of waste water, hence, it is nearly a “Non-firing/No waste/No drainage” zero-emission processing method. It is expected that the substitution of Indian conventional bricks by non-firing bricks would provide following benefits:

- Reducing the total coal consumption
- Preserving resources by substituting 90% of raw materials by wastes such as fly ash
- Securing stability in quality by mechanical production
- Saving approximately 30% of water resources

- Estimated CO_2 emission reduction by a single production line (annual production capacity is approximately 58 million units) is30,000 tons of CO_2 per year; if the technology would be applied to all over India, more than 186 million tons of CO_2 can be reduced.

In addition, the proposed project activity is expected to contribute to the sustainable development of India. The current brick making is implemented at open-air manufacturing sites, which does not allow operation on rainy days. Plus, their environmentally-unfriendly manufacturing practices have deteriorated the national land, and have consumed scarce groundwater, which is suspected to be one of the causes of the disastrous earthquake in West India. The environmentally-friendly manufacturing practices introduced by the proposed CDM activity will save the national land of India from further deterioration, and at the same time, will create the stable employment of local residents, which would, in turn, contribute to stability in brick production both in terms of quality and quantity.

A.3. Project participants:

Name of Party Involved(*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	Jyoti Transformers & Electricals (P) Ltd. (as the project owner)	No
Japan	Kamei Seito Co. Ltd., (as the project developer)	No

Kamei Seito Co. Ltd.,

Kamei Seito Co. Ltd., a company based in Gifu Prefecture, Japan, is the project developer (website: http://www.eco-angels.com). The company manufactures non-firing bricks by effectively recycling various non-organic wastes such as waste soil, incineration ashes, waste plastic, slag, etc., and delivers its products in many areas in Japan with the product name of “Earthen Bricks.” Kamei Seito Co. Ltd., has acquired the patent rights for this production under the title of “the manufacturing method of non-firing brick block.” This production utilizes more than 80% recycled raw materials, satisfying physical properties of JASS 7 M-101 standards as well as the environmental standards. Therefore, “Earthen Bricks” have been accredited for the Eco-mark Authorization, Waste recycling authorization product in Gifu Prefecture, Recycling material evaluation authorization product in Aichi Prefecture, and the Ministry of Land, Infrastructure and Transport NETIS registration product.

Kamei Seito Co. Ltd., has also entered into partnership with Tokyo Electric Power Co. Ltd., and Kansai Electric Power Co., Ltd., establishing the production plants respectively in Ibaraki and Himeji respectively for their utilization. Therefore, with the same philosophy and by the same product name, the waste of these areas could be recycled to realize a sustainable society. Moreover, this technology is highly appreciated by other countries, and has inquiries not only from India but also from China, Taiwan, Singapore, Tunisia, and South Korea.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

India

A.4.1.2. Region/State/Province etc.:

Orissa

A.4.1.3. City/Town/Community etc:

Sambalpur City, Sasan

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

Figure A.4-1. Map of the Project Location (Orissa)

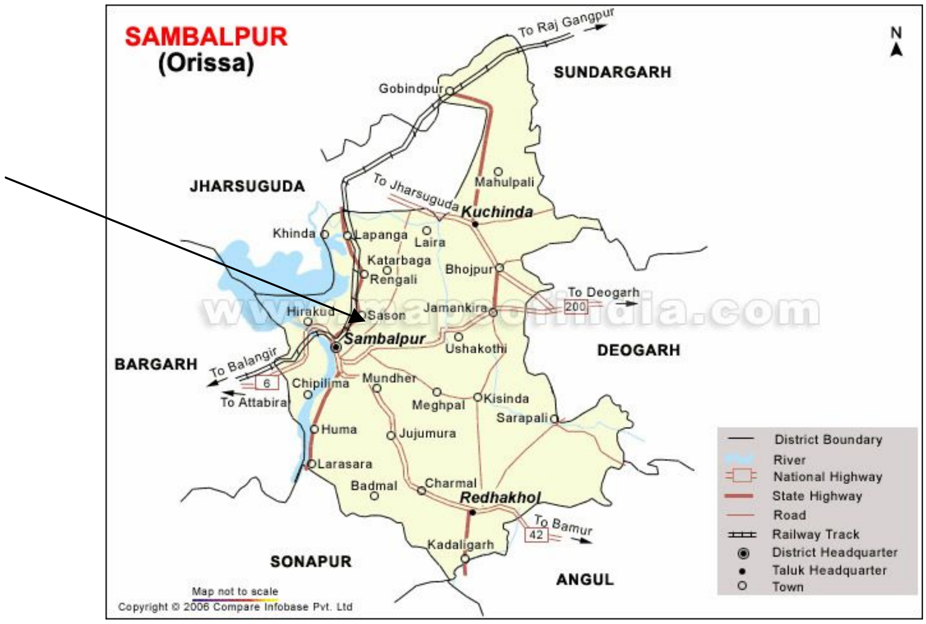

Figure A.4-2. Map of the Project Location (Sambalpur)

Sambalpur, a small town in the state of Orissa, is now famous for its tie and die style of colourful textiles. While the town is filled with greens during the rainy season, it turns to be like desert during the dry season. Hirakund dam, which is famous for being the largest in Asia, serves for flood control during the rainy season as well as for power generation. There are rich resources of coal and iron ores in the neighbourhood of Sambalpur, and large steel mills are found. The geographical coordinates of the area is 21° 33' 0N, 84° 2' 60E.

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

Type and category(ies) of the small-scale project activity

Type II.D. – Energy Efficiency and Fuel Switching Measures for Industrial Facilities

The project activity realizes fuel switching from coal to electricity by introducing a non-firing process in brick making. However, fuel switching is just a part of this whole efficiency improvement project: the non-firing process substantially reduces energy use itself compared with the conventional brick making. In addition, since the aggregate energy savings expected from the proposed project activity is 92.89GWh_{th}/year, which is below the threshold qualifying capacity of 180GWh_{th} (60GWh_e), the project activity can be regarded as a small-scale CDM project activity. Therefore, according to small-scale CDM modalities, the proposed project activity falls under Type II. D. – Energy Efficiency and Fuel Switching Measures for Industrial Facilities.

Table A.4-1. Expected Energy Savings from the Proposed Project Activity

BL Annual Energy Consumption		PJ Annual Energy Consumption		Annual Energy Reduction (GWh_{th})
Annual Coal Consumption (t)	24,503	Annual Electricity Consumption (GWh_e)	1.41	92.89
Thermal Content of Coal (kcal/kg)	3,409			
Annual Energy Consumption (kcal)	83,531,991,011	Annual Energy Consumption (GWh_{th})	4.24	
(GWh_{th}) [1kWh=860kcal]	97.13			

Technology of the small-scale project activity

Non-firing bricks are produced by a chemical reaction process without firing, but by recycling waste material such as fly ash. It is already commercialized in Japan as a way of effectively using unused resources and of using less fossil fuel. Non-firing bricks manufacturing process provides vast freedom in selection of raw materials, and has devices with unique design for mixing and forming processes. After forming, bricks are kept in open air for curing, to acquire sufficient strength in physical properties, so that they do not require a firing process.

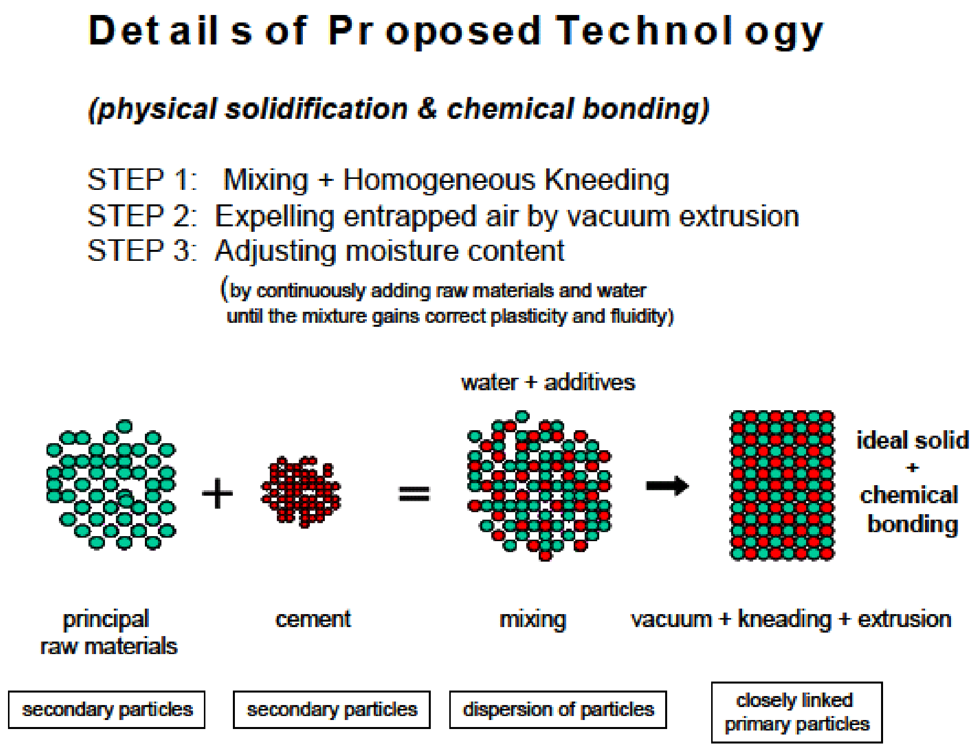

Figure A.4-3. Details of Proposed Technology

This process is a simple and viable method, which combines some basic ceramics technologies and know-how, and is transferable to developing countries, because it does not require complicated high-tech abilities.

Materials:

Clay (35%) – obtained at the project site

Slug cement (5%) – brought by 9t trucks from Bargarh Cements Works of the Associated Cement Companies Limited (ACC), located approximately 60km away from the project site.

Fly ash (30%) – brought by 9t trucks from Hindalco Coal Power Plant, located at Hirakud, Sambalpur, approximately 25km away from the project site.

Sponge iron (30%) – brought by 9t trucks from Shyam DRI Power Limited, located at Rengali Sambalpur, approximately 5km away from the project site.

Product Specification:

Size: 230mm (L) X 105mm (W) X 75mm(H)

Density: 2.0

Weight: 3.06kg

Plant Specification:

Rated Capacity: 196.14KW

Power Factor: 75%

Production: 58,000,000units/year

Operating Hours: 7,200 hrs/year

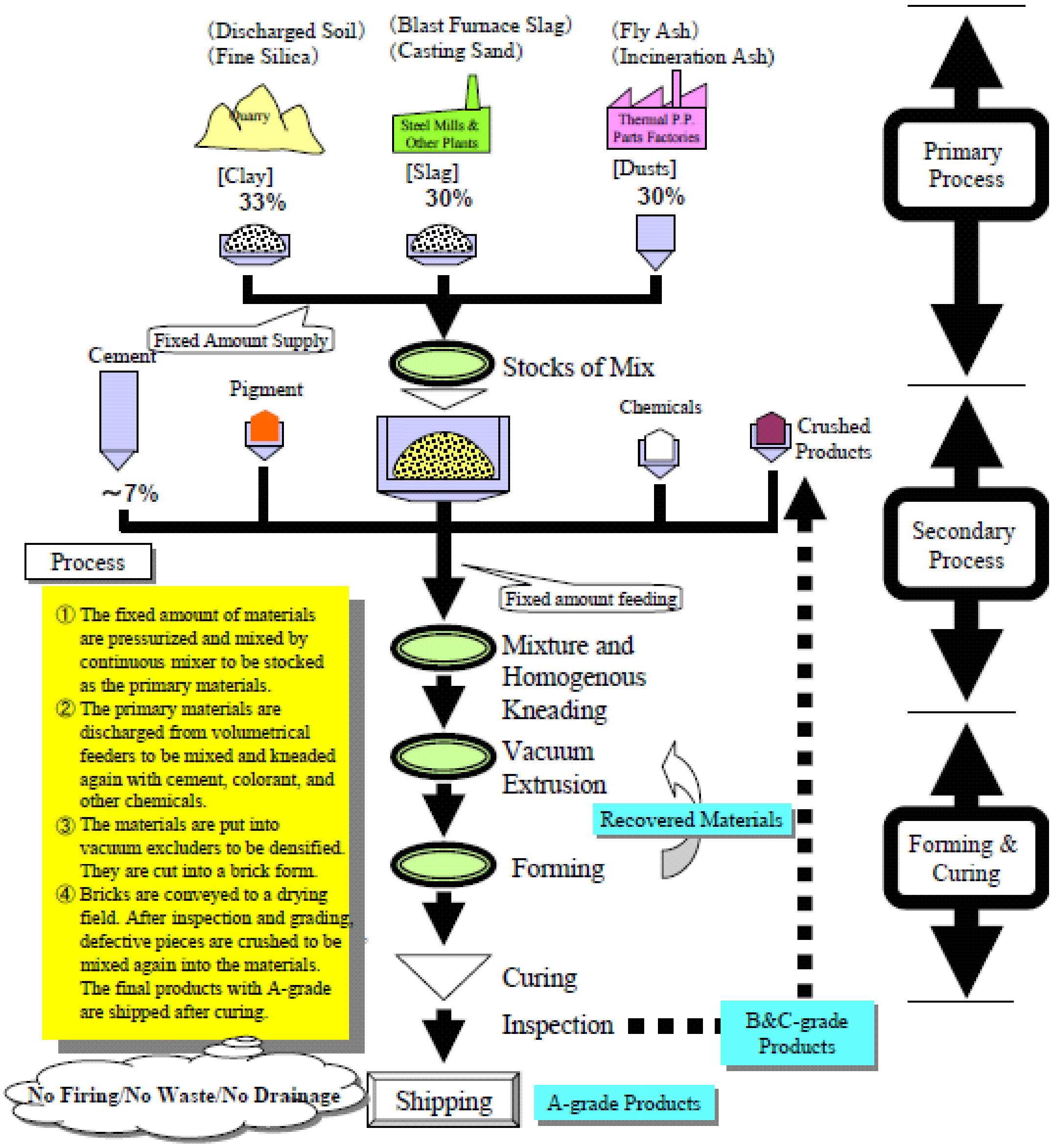

Figure A.4-4. Details of Manufacturing Process of Non-firing Bricks

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tonnes of CO_2e
2008	20,194
2009	30,292
2010	30,292

2011	30,292
2012	30,292
2013	30,292
2014	30,292
2015	30,292
2016	30,292
2017	30,292
2018	10,097
Total estimated reductions (tonnes of CO2e)	**302,916**
Total number of crediting years	10 years
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	30,292

A.4.4. Public funding of the small-scale project activity:

There is no public funding from Annex I countries available for this project.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

According to Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities, a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; And
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The proposed small-scale project activity shall not be deemed to be a debundled component of a large project activity if the project doesn't accord with one or more of them, and the proposed project activity does not accord with any one of them. Therefore, the proposed project activity is not considered a debundled component of other project activities.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

AMS II.D./Version 8 "Type II.D. – Energy Efficiency and Fuel Switching Measures for Industrial Facilities"
Sectoral Scope: 4
23 December 2006

B.2 Justification of the choice of the project category:

The project activity realizes fuel switching from coal to electricity by introducing a non-firing process in brick making. However, fuel switching is just a part of this whole efficiency improvement project: the non-firing process substantially reduces energy use itself compared with the conventional brick making. In addition, since the aggregate energy savings expected from the proposed project activity is 92.89GWh$_{th}$/year (see Table A-1 in Section A.2.) which is below the threshold qualifying capacity of 180GWh$_{th}$ (60GWh$_{e}$), the project activity can be regarded as a small-scale CDM project activity. Therefore, according to small-scale CDM modalities, the project activity falls under Type II. D. – Energy Efficiency and Fuel Switching Measures for Industrial Facilities.

B.3. Description of the project boundary:

Table B.3-1 Description of How the Sources and Gases Included in the Project Boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Thermal use of coal at local brick factories	CO_2	Included	Coal is used for firing-process at the local brick factories.
		CH_4	Excluded	Minor Source
		N_2O	Excluded	Minor Source
	Transportation of coal	CO_2	Included	Emissions from the diesel use of trucks for transporting coal to local brick factories
		CH_4	Excluded	Minor Source
		N_2O	Excluded	Minor Source
	Transportation of final products	CO_2	Included	Emissions from the diesel use of trucks for transporting final products to users.
		CH_4	Excluded	Minor Source
		N_2O	Excluded	Minor Source
Project Activity	Electricity use at the project plant	CO_2	Included	According to Baseline Methodology ACM0002, CO2 emissions from the relevant regional grid must be calculated based on its OM and BM.
		CH_4	Excluded	Minor Source

		N_2O	Excluded	Minor Source
	Slug cement production	CO_2	Included	Non-slug portion of slug cement is responsible for CO_2 emission.
		CH_4	Excluded	Minor Source
		N_2O	Excluded	Minor Source
	Transportation of materials to the plant	CO_2	Included	Emissions from the diesel use of trucks for transporting materials to the PJ plant.
		CH_4	Excluded	Minor Source
		N_2O	Excluded	Minor Source
	Transportation of final products	CO_2	Included	Emissions from the diesel use of trucks for transporting final products to users.
		CH_4	Excluded	Minor Source
		N_2O	Excluded	Minor Source

B.4. Description of baseline and its development:

As specified in AMS II.D. – Energy Efficiency and Fuel Switching Measures for Industrial Facilities/Version 8, the baseline, in the case of replacement, consists of energy baseline of the existing facility or sub-system that is replaced. The existing facilities to be replaced are X local brick factories that have been producing conventional bricks in a conventional coal-intensive manner. As specified in the above methodology, each energy form in the emission baseline is multiplied by an emission coefficient. The emission sources for the baseline scenario, as described in Section B.3., are 1) CO_2 emissions from the thermal use of coal at the local brick factories, 2) CO_2 emissions by coal transportation from mining sites to those factories, and 3) CO_2 emissions by the transportation of final products from those factories to their users. Therefore, the baseline emissions are the sum of emissions from these three sources.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

The proposed project activity aims to realize energy efficiency in brick making by introducing a non-firing brick making system. In this new system, no coal is necessary for a firing process – all it needs is electric power to operate manufacturing lines in the project factory – material mixing, vacuum extrusion, and moisture adjustment, etc. The introduction of this system substantially decreases CO_2 emissions by reducing coal use, but at the same time, would generate additional amount of CO_2 by cement use. However, the total project emissions from these electricity and cement uses are substantially lower than the baseline emissions.

According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities, evidence to why the proposed project is additional must be offered under the following categories of barriers: (a) investment barrier, (b) technological barrier, (c) prevailing practice, or (d) other barriers.

b. technological barrier

The proposed non-firing brick making process is innovative, and the first of this kind in the project area.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline Emissions

As specified in B.3., as well as in B.4., the baseline emissions consist of emissions from three sources below:

1) CO_2 emissions from the thermal use of coal at the local brick factories
2) CO_2 emissions by coal transportation from mining sites to those factories
3) CO_2 emissions by the transportation of final products from those factories to their users

1) CO_2 emissions from the thermal use of coal at the local brick factories

Baseline CO_2 emissions from the above source can be calculated from coal input at the replaced factories (obtained from historical data) multiplied by the emission coefficient as follows:

$$BE_{coal,y} = \sum_{n} Q_{coal,n,y} * CEF_{coal}$$

where:

$BE_{coal,y}$	Baseline emissions from coal in the year y (CO_2t/y)
$Q_{coal,n,y}$	Coal Consumptions at baseline factory n in the year y (t/y)
CEF_{coal}	CO_2 emission factor of coal (CO_2t per ton of coal/MJ)

2) CO_2 emissions by coal transportation from mining sites to those factories

Baseline CO_2 emissions from the above source can be calculated from diesel consumption for the transporting vehicles (obtained from historical data or calculated from vehicle miles traveled (VMT) and fuel economy of the relevant vehicles) multiplied by the emission coefficient as follows:

$$BE_{transport,y} = \sum_{n} Q^{BL}_{diesel,coal,n,y} * EF_{diesel}$$

where:

$BE_{transport,y}$	Baseline CO_2 emissions from the transportation of coal from mining sites to baseline factories in the year y (tCO_2/y)
$Q^{BL}_{diesel,coal,n,y}$	The amount of diesel consumption for coal transportation from a mining site to a baseline factory n in the year y (l/y)
EF_{diesel}	CO_2 Emission factor of diesel (tCO_2/l)

The theoretical figure for diesel consumption necessary to transport materials for a given distance can be expressed as follows:

$$Q_{diesel,i,y} = \sum_{i,v} Q_{i,v,y} / LC_v * D_{i,v} / FE_v$$

where:

$Q_{diesel,i,y}$	The amount of diesel used for transportation of material *i* in the year *y* (l/y)
$Q_{i,v,y}$	The amount of transported material *i* by a vehicle mode *v* in the year *y* (t/y)
LC_v	Load capacity for a vehicle mode *v* (t)
$D_{i,v}$	Transportation distance (1 way) for transported material *i* by a vehicle mode *v* (km/y)
FE_v	Fuel Economy for a vehicle mode *v* (km/l)

3) CO_2 emissions by the transportation of final products from those factories to their users

Baseline CO_2 emissions from the above source can be calculated from diesel consumption for the transporting vehicles (obtained from historical data or calculated from vehicle miles traveled (VMT) and fuel economy of the relevant vehicles) multiplied by the emission coefficient as above 2):

$$BE_{transport,y} = \sum_n Q_{diesel,brick,n,y} * EF_{diesel}$$

where:

$BE_{transport,y}$	Baseline CO_2 emissions from the transportation of final products (bricks) from baseline factories to their users' sites in the year *y* (tCO_2/y)
$Q_{diesel,brick,,n,y}$	The amount of diesel consumption used for final product transportation from a baseline factory *n* to its users in the year *y* (l/y)
EF_{diesel}	CO_2 Emission factor of diesel (tCO_2/l)

For the theoretical figure for diesel consumption necessary to transport final products for a given distance, see 2) above.

Project Emissions

As specified in B.3., the project emissions consist of emissions from four sources below:
1) CO_2 emissions from electricity use at the project plant
2) CO_2 emissions from slug cement production
3) CO_2 emissions from the transportation of materials to the plant
4) CO_2 emissions from transportation of final products to users

1) CO_2 emissions from electricity use at the project plant

Based on the indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, AMS I.D.- Grid Connected Renewable Electricity Generation, the project emissions by using electricity from an existing grid can be calculated by multiplying electricity consumptions (kWh) at the project plant by the grid emission factor of the relevant grid:

$$PE_{electricity,y} = EC_y * EF_{grid}$$

Where:

$PE_{electricity,y}$	Project CO_2 emissions from electricity use in the year *y* (tCO_2/y)
EC_y	Electricity consumption at the project plant in the year *y* (kWh/y)
EF_{grid}	CO_2 emission factor of the relevant grid (tCO_2/kWh)

Based on the Baseline Methodology ACM0002/Version 06, "Consolidated Baseline Methodology for Grid-connected Electricity Generation by Renewable Sources", EF_{grid} can be calculated as 1:1 weighted average of the Operation Margin and Build Margin of the relevant grid. In October 2006, the Government of India, Ministry of Power, published Simple Operation Margin and Build Margin for its five regional grids, which are applied for the project emission calculation of this proposed project activity. Simple Operation Margin is defined as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. Build Margin is defined as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m*, which consists of either the five power plants that have been built most recently, or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Build Margin emission factor can be calculated ex-ante based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. EF_{grid} for this proposed project is Combined Margin of these two, which is 1:1 weighted average of Operation Margin and Build Margin by default.

2) CO_2 emissions from slug cement production

CO_2 emission from slug cement production is expressed by the following formula:

$$PE_{cement,y} = CP_y * EF_{cement}$$

Where:

$PE_{cement,y}$	Project CO_2 emissions from slug cement production (for a project material) in the year *y* (tCO_2/y)
CP_y	Cement consumptions at the project plant in the year *y* (t/y)
EF_{cement}	Emission factor of slug cement (tCO_2 per ton of slug cement)

3) CO_2 emissions from the transportation of materials to the plant

CO_2 emission from the transportation is calculated from diesel consumption for the transporting vehicles (obtained from historical data or calculated from vehicle miles traveled (VMT) and fuel economy of the relevant vehicles) multiplied by the emission coefficient as follows:

$$PE_{transport,y} = \sum_i Q^{PL}_{diesel,i,y} * EF_{diesel}$$

where:

$PE_{transport,y}$	Project CO_2 emissions from the transportation of materials from their original production sites to the project plant in the year *y* (tCO_2/y)
$Q^{PL}_{diesel,i,y}$	The amount of diesel consumption for the transportation of material *i* to the project plant in the year *y* (l/y)
EF_{diesel}	CO_2 Emission factor of diesel (tCO_2/l)

The theoretical figure for diesel consumption necessary to transport materials for a given distance can be expressed as follows:

$$Q_{diesel,i,y} = \sum_{i,v} Q_{i,v,y} / LC_v * D_{i,v} / FE_v$$

where:

$Q_{diesel,i,y}$	The amount of diesel used for transportation of material *i* in the year *y* (l/y)
$Q_{i,v,y}$	The amount of transported material *i* by a vehicle mode *v* in the year *y* (t/y)
LC_v	Load capacity for a vehicle mode *v* (t)
$D_{i,v}$	Transportation distance (1 way) for material *i* by a vehicle mode *v* (km)

FE_v Fuel Economy for a vehicle mode v (km/l)

4) CO_2 emissions from transportation of final products to users

CO_2 emission from the transportation is calculated from diesel consumption for the transporting vehicles (obtained from historical data or calculated from vehicle miles traveled (VMT) and fuel economy of the relevant vehicles) multiplied by the emission coefficient as indicated in above 3):

$$PE_{transport,y} = Q^{PL}_{diesel,brick,y} * EF_{diesel}$$

where:

$PE_{transport,y}$ Project CO_2 emissions from the transportation of final products (bricks) from the project plant to the users in the year y (tCO_2/y)

$Q_{diesel,brick,y}$ The amount of diesel consumption for the transportation of final products from the project plant to the users in the year y (l/y)

EF_{diesel} CO_2 Emission factor of diesel (tCO_2/l)

The theoretical figure for diesel consumption necessary to transport final products (bricks) for a given distance can be expressed as follows:

$$Q_{diesel,brick,y} = VMT^{PJ}_{brick,v,y} / FE_v$$

where:

$Q_{diesel,brick,y}$ The amount of diesel used for transportation of bricks in the year y (l/y)

$VMT^{PJ}_{brick,v,y}$ Vehicle Miles Traveled of brick transportation for a vehicle mode v in the year y (km)

FE_v Fuel Economy for a vehicle mode v (km/l)

Leakages

According to AMS II.D./Version 8, leakage is to be considered if the energy efficiency technology equipment is transferred from another activity or if the existing equipment is transferred to another activity.

In this specific project activity, the plant with the energy efficiency technology is newly introduced for this project purpose, and existing facilities will be abandoned and totally replaced by the project plant. Therefore, leakage does not need to be considered.

Emission Reductions

Emission Reductions are calculated as follows:

$$ER_y = BE_y - PE_y - L_y$$

where:

ER_y Emission Reductions in year y. (tCO_2/y)

BE_y Baseline Emissions in the year y. (tCO_2/y)
Based on discussions in B.4., $BE_y = BE_{coal,y} + BE_{transport,y}$

PE_y Project Emissions in the year y. (tCO_2/y)
Based on discussions in B.6.1., $PE_y = PE_{electricity,y} + PE_{cement,y} + PE_{transport,y}$

L_y Leakage in the year y. (tCO_2/y) Ly=0 for this specific project.

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	$Q_{coal,n,y}$
Data unit:	ton/y
Description:	Coal Consumptions at baseline factory *n* in the year *y*
Source of data used:	Measurement data at 11 sample factories, obtained through questionnaires
Value applied:	24,503ton/y
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	To be replaced as actual numbers obtained from questionnaires

Data / Parameter:	CEF_{coal}
Data unit:	CO_2t per ton of coal
Description:	CO_2 emission factor of coal
Source of data used:	Sample analysis by Nagoya Institute of Technology and IPCC 1996 Guidelines
Value applied:	1.5092 tCO_2/t-coal
Justification of the choice of data or description of measurement methods and procedures actually applied :	CO_2 emission factor of coal (CO_2t per ton of coal) is calculated as follows: *$CEF_{Coal,}$= Thermal Content of Coal (TJ/t)*Carbon Emission Factor for Coal (tC/TJ)* Oxidation Factor* Unit Conversion (CO_2/C)* *=Thermal Content of Coal (TJ/t)*[Coal Consumption (t) *Fixed Carbon /(Coal Consumption (t)*Thermal Content of Coal (MJ/t))]*Oxidation Factor* Unit Conversion (CO_2/C)* *= Fixed Carbon*Oxidation Factor*Unit Conversion (CO_2/C)* For the rate of Fixed Carbon, the result of sample analysis by Nagoya Institute of Technology is applied, which is 42%. For the Oxidation Factor of coal, the default value in IPCC 1996 Guidelines, which is 98%, is applied, and the unit conversion from C to CO_2 is 44/12. With these figures plugged in, CO_2 emission factor of the baseline coal is calculated as follows: $CEF_{Coal,}$= 0.42 * 0.98 *44/12 =1.5092tCO_2/t-coal
Any comment:	

Data / Parameter:	EF_{diesel}
Data unit:	CO_2t per litre of diesel
Description:	CO_2 Emission factor of diesel
Source of data used:	IEA, Energy Prices and Taxes, 4th Quarter 2006, p417 (India) and IPCC 2006 Guidelines
Value applied:	
Justification of the	$EF_{diesel,}$= Thermal Content of Diesel (kcal/kg)* Density Factor

choice of data or description of measurement methods and procedures actually applied :	(kg/l)*Carbon Emission Factor for Diesel (t-C/TJ) * Unit Conversion (CO_2/C) =10,080kcal/kg * 4.186 MJ/kcal* 0.82kg/l *74.1tC/TJ *44/12 =0.00256tCO_2/l
Any comment:	

Data / Parameter:	$Q_{coal,20t,y}$
Data unit:	ton/y
Description:	The amount of transported coal by 20t trucks in the year *y*
Source of data used:	Interviews with the baseline factories
Value applied:	24,503ton/year
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$Q_{brick,9t,y}$
Data unit:	ton/y
Description:	The amount of transported final products to users by 9t trucks in the year *y*
Source of data used:	Interviews with the baseline factories
Value applied:	158,180ton/y
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	LC_v
Data unit:	ton
Description:	Load capacity for a vehicle mode *v*
Source of data used:	Interviews with the baseline factories
Value applied:	9t trucks = 5t, and 20t trucks = 20t
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$D^{BL}_{coal,20t}$
Data unit:	km
Description:	Transportation distance for coal (from a coal mine to a baseline factory) by 20t trucks
Source of data used:	Interviews with the baseline factories
Value applied:	74km
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$D^{BL}_{brick,9t}$
Data unit:	km
Description:	Average transportation distance of final products (from a baseline factory to users sites) by 9t trucks
Source of data used:	Interviews with the baseline factories
Value applied:	5km
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	FE_{20t}
Data unit:	km/l
Description:	Fuel economy for a 20t truck
Source of data used:	Interviews with the baseline factories and reference to other indicators
Value applied:	2.2km/l
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	FE_{9t}
Data unit:	km/l
Description:	Fuel economy for a 9t truck
Source of data used:	Interviews with the baseline factories and reference to other indicators

Value applied:	3km/l
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	EF_{grid}
Data unit:	tCO_2/KWh
Description:	Emission factor of the relevant grid
Source of data used:	Central Electricity Authority, "CO_2 Baseline Database for the Indian Power Sector", Oct 2006.
Value applied:	1.04 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the calculation by Central Electricity Authority, Ministry of Power, Government of India, Simple Operation Margin and Build Margin of Eastern grid, where the project site is located, are 1.18tCO_2/MWh and 0.90 tCO_2/MWh, respectively. Therefore, its Combined Margin, which is 1:1 weighted average of Operation and Build Margins by default, 1.04 tCO_2/MWh is applied for this specific project.
Any comment:	

Data / Parameter:	EF_{cement}
Data unit:	tCO_2 per ton of cement
Description:	Emission factor of cement
Source of data used:	Battelle/WBCSD *"Toward a Sustainable Cement Industry",* 2002
Value applied:	0.49tCO_2/t
Justification of the choice of data or description of measurement methods and procedures actually applied :	The composition of slug cement is slugs=47%, gypsum=5%, and clinker 48%. With the component of slugs, not contributing to CO_2 emissions, emissions from slug cement production is 53% of those from ordinary cement production. Given the CO_2 emission factor for cement production in India as 0.93tCO_2/t according to the above source, the CO_2 emission factor for slug cement production can be calculated as 0.49tCO_2/t.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Baseline Emissions

Based on discussions in B.4., the baseline emission for the proposed project activity is calculated as follows:

$$BE_y = BE_{coal,y} + BE_{transport,y}$$
$$= (\Sigma Q_{coal,n,y} * CEF_{coal}) + (\Sigma Q^{BL}_{diesel,coal,n,y} * EF_{diesel}) + (\Sigma Q^{BL}_{diesel,brick,n,y} * EF_{diesel})$$

$$=\left(\sum_{n}^{n} Q_{coal,n,y} * CEF_{coal}\right) + \left(\sum_{n,v}^{n} Q_{coal,20t,y} / LC_{20t} * D^{BL}_{coal,20t} / FE_{20t} * EF_{diesel}\right)$$

$$+ \left(\sum_{n,v}^{n} Q_{brick,9t,y} / LC_{9t} * D^{BL}_{brick,9t} / FE_{9t} * EF_{diesel}\right)$$

where:

$Q_{coal,n,y}$ Coal Consumptions at baseline factory *n* in the year *y* (t/y)
The project proponent took samples of brick production and coal consumption at 11 brick factories out of the total X brick factories to be replaced. Given the similar production manners and conditions among those brick factories, coal consumption for the total 58,000,000 units of bricks is estimated by calculating the average coal consumption per a unit of bricks. The average coal consumption is 422.47ton/year per 1,000,000 units of bricks. Therefore, the total coal consumption to produce 58,000,000 units of bricks is to be 24,503ton per year. This is considered to be stable during the whole crediting period, given the production amount is fixed as 58,000,000 units.

CEF_{coal} CO_2 emission factor of coal (CO_2t per ton of coal) is calculated as follows:
*$CEF_{Coal,}$ = Thermal Content of Coal (TJ/t)*Carbon Emission Factor for Coal (tC/TJ)* Oxidation Factor* Unit Conversion (CO_2/C)*
=Thermal Content of Coal (TJ/t)[Coal Consumption (t) *Fixed Carbon /(Coal Consumption (t)*Thermal Content of Coal (MJ/t))]*Oxidation Factor* Unit Conversion (CO_2/C)*
*= Fixed Carbon*Oxidation Factor*Unit Conversion (CO_2/C)*

For the rate of Fixed Carbon, the result of sample analysis by Nagoya Institute of Technology is applied, which is 42%. For the Oxidation Factor of coal, the default value in IPCC 1996 Guidelines, which is 98%, is applied. The unit conversion from C to CO_2 is 44/12. With these figures plugged in, CO_2 emission factor of the baseline coal is calculated as follows:
$CEF_{Coal,}$= 0.42 * 0.98 *44/12 =1.5092tCO_2/t-coal

$Q_{coal,20t,y}$ The amount of transported coal by 20t trucks in the year *y* (t/y). See calculation for Annex 3.

$Q_{brick,9t,y}$ The amount of transported bricks by 9t trucks in the year *y* (t/y). See calculation for Annex 3.

LC_{20t} Load capacity for a 20t truck = 20t

LC_{9t} Load capacity for a 9t truck = 9t

$D^{BL}_{coal,20t}$ Average transportation distance (1 way) for coal by 20t trucks (from a coal mine to a baseline factory) (km/y). See calculation for Annex 3.

$D^{BL}_{brick,9t}$ Average transportation distance (1 way) for bricks by 9t trucks (from a baseline factory to users) (km/y). See calculation for Annex 3.

FE_{20t} Fuel Economy for of 20t truck = 2.2km/l

FE_{9t} Fuel Economy for of 9t truck = 3km/l

EF_{diesel} CO_2 emission factor of diesel = Thermal Content of Diesel (kcal/kg)* Density Factor (kg/l)*Carbon Emission Factor for Diesel (t-C/TJ) * Unit Conversion (CO_2/C)
=10,080kcal/kg * 4.186 MJ/kcal *0.82kg/l*74.1tC/TJ *44/12 =0.00256tCO_2/l
Data for Thermal Content of Diesel and Density Factor are taken from IEA Energy Prices & Taxes, 4th Quarter 2006.

With all these numbers plugged in, the baseline emissions in a given year can be calculated as follows:

$$BE_y = BE_{coal,y} + BE_{transport,y}$$
$$= (\sum_n Q_{coal,n,y} * CEF_{coal}) + (\sum_n Q^{BL}_{diesel,coal,n,y} * EF_{diesel}) + (\sum_n Q^{BL}_{diesel,brick,n,y} * EF_{diesel})$$
$$= (\sum_n Q_{coal,n,y} * CEF_{coal}) + (\sum_n Q_{coal,20t,y} \div LC_{20t} * D^{BL}_{coal,20t} \div FE_{20t} * EF_{diesel})$$
$$+ (\sum_n Q_{brick,9t,y} \div LC_{9t} * D^{BL}_{brick,9t} \div FE_{9t} * EF_{diesel})$$

=(24,503t*1.5092tCO_2/t-coal)+(24,503t÷20t*74km÷2.2km/l*0.00256tCO_2/l)
+(158,180t÷9t*5km÷3km/l*0.00256tCO_2/l)
= 36,980tCO_2/y+106tCO_2/y +75tCO_2/y =**37,161tCO_2/y**

Table B.6-1 Baseline Fuel Consumptions and CO_2 Emissions

BL Fuel Consumptions and CO2 Emissions	Coal Consumption (t)	Diesel Consumption for Coal Transportation (l)	Diesel Consumption for Brick Transportation (l)	Total (tCO2)
Annual Consumption (t)	24,503	41,210.21	29,292.66	**37,161**
Emission Factor	1.5092 (tCO2/t-Coal)	0.00256 (tCO2/t-Coal)	0.00256 (tCO2/t-Coal)	
Emission Amount (tCO2	**36,980**	**106**	**75**	

Project Emissions

Based on discussions in B.6.1., Project Emissions in year *y* is:

$$PE_y = PE_{electricity,y} + PE_{cement,y} + PE_{transport,y}$$
$$= (EC_y * EF_{grid}) + (CP_y * EF_{cement}) + (Q^{PJ}_{diesel,SC,y} * EF_{diesel}) + (Q^{PJ}_{diesel,FA,y} * EF_{diesel}) + (Q^{PJ}_{diesel,SI,y} * EF_{diesel}) + (Q^{PJ}_{diesel,brick,y} * EF_{diesel})$$

$$= (EC_y * EF_{grid}) + (CP_y * EF_{cement}) + (Q_{SC,9t,y} \div LC_{9t} * D^{PJ}_{SC} \div FE_{9t} * EF_{diesel}) + (Q_{FA,9t,y} \div LC_{9t} * D^{PJ}_{FA} \div FE_{9t} * EF_{diesel}) + (Q_{SI,9t,y} \div LC_{9t} * D^{PJ}_{SI} \div FE_{9t} * EF_{diesel}) + (VMT^{PJ}_{brick,9t,y} / FE_{9t} * EF_{diesel})$$

where:

EC_y — Electricity consumption at the project plant in the year *y* (kWh/y)
This parameter will be taken from actual measurement data during the crediting period, but for the purpose of ex-ante calculation, it is assumed to be 1,412,208kWh based on 7,200hours/year of operating hours of the project plant with the rated capacity of 196.14kW (power rate = 75%).

EF_{grid} — Emission factor of the relevant grid (tCO_2/kWh)
According to the calculation by Central Electricity Authority, Ministry of Power, Government of India, Simple Operation Margin and Build Margin of Eastern grid, where the project site is located, are 1.18tCO_2/MWh and 0.90 tCO_2/MWh, respectively. Therefore, its Combined Margin, which is 1:1 weighted average of Operation and Build Margins by default, 1.04 tCO_2/MWh is applied for this specific project.

CP_y — Slug cement consumptions at the project plant in the year *y* (t/y)
This parameter will be taken from actual measurement during the crediting period. Given cement inclusion rate of 5%, it is estimated to be 3.06kg/unit of brick*5%*58,000,000units = 8,874t/year for the purpose of ex-ante calculation.

EF_{cement} — CO_2 emission factor of slug cement (tCO_2 per ton of slug cement)
With its composition of slugs=47%, gypsum=5%, and clinker 48%, CO_2 emissions from slug cement production is 53% of those from ordinary cement production, with slugs that do not contribute to CO_2 emissions. Given the CO_2 emission factor for ordinary cement production in India is 0.93tCO_2/t according to Battelle/WBCSD *"Toward a Sustainable Cement Industry"*, the CO_2 emission factor for slug cement production can be calculated to be 0.49tCO_2/t.

$Q_{SC,9t,y}$ — The amount of slug cement transported to the project plant by 9t trucks in the year *y* (t/y). Since the all slug cement (CP_y) is assumed to be transported by 9t trucks, the ex-ante figure for this parameter is 8,874t/year.

$Q_{FA,9t,y}$ — The amount of fly ash transported to the project plant by 9t trucks in the year *y* (t/y), which is assumed to be 53,244t/year (30% of the total production).

$Q_{SI,9t,y}$ — The amount of sponge iron transported to the project plant by 9t trucks in the year *y* (t/y), which is assumed to be 53,244t/year (30% of the total production).

LC_{9t} — Load capacity for a 9t truck = 9t

$D^{PJ}_{SC,9t}$ — Transportation distance of slug cement by 9t trucks from Bargarh Cements Works of the Associated Cement Companies Limited to the project plant (1way) (km), which is approximately 60km.

$D^{PJ}_{FA,9t}$	Transportation distance of fly ash by 9t trucks from Hindalco Coal Power Plant to the project plant (1 way) (km), which is approximately 25km.
$D^{PJ}_{SI,9t}$	Transportation distance of sponge iron by 9t trucks from Shyam DRI Power Limited to the project plant (1 way) (km), which is approximately 5km.
$VMT^{PJ}_{brick,v,y}$	Vehicle Miles Traveled of brick transportation for a vehicle mode *v* in the year *y* (km/y) For ex-ante calculation, $VMT_{brick,v,y}$ is calculated by multiplying the estimated average distance from the project plant to users' sites by the number of travels (total production amount divided by the load factor (9t)). The average distance from the project plant to users' sites is estimated to be the sum of average distance from the baseline factories to the project plant (25km) and their average baseline distance to their users' sites (5km), which is in total 30km. The number of travels is estimated by dividing the total production amount of 177,480t by the load capacity of 9t truck, which is 19,720 times. Therefore, $VMT_{brick,v,y}$ = 30km*19,720 times = 591,600km.
FE_{9t}	Fuel economy for 9t trucks (km/l). Based on interviews with relevant companies, 3km/l is applied for the transportation of fly ash, sponge iron, and final products. For slug cement, 3.75km/l is applied.
EF_{diesel}	CO_2 Emission factor for diesel = Thermal Content of Diesel (kcal/kg)* Density Factor (kg/l)*Carbon Emission Factor for Diesel (t-C/TJ) * Unit Conversion (CO_2/C) =10,080kcal/kg * 4.186 MJ/kcal * 0.82kg/l*74.1tC/TJ *44/12 =0.00256tCO_2/l Data for Thermal Content and Density Factor of Diesel in India are taken from IEA Energy Prices & Taxes, 4th Quarter 2006.

With all these numbers plugged in, ex-ante estimation of project emissions in a given year can be calculated as follows:

$$PE_y = PE_{electricity,y} + PE_{cement,y} + PE_{transport,y}$$
$$= (EC_y * EF_{grid}) + (CP_y * EF_{cement}) + (Q^{PJ}_{diesel,SC,y} * EF_{diesel}) + (Q^{PJ}_{diesel,FA,y} * EF_{diesel}) + (Q^{PJ}_{diesel,SI,y} * EF_{diesel}) + (Q^{PJ}_{diesel,brick,y} * EF_{diesel})$$

$$= (EC_y * EF_{grid}) + (CP_y * EF_{cement}) + (Q_{SC,9t,y} \div LC_{9t} * D^{PJ}_{SC,9t} \div FE_{9t} * EF_{diesel}) + (Q_{FA,9t,y} \div LC_{9t} * D^{PJ}_{FA,9t} \div FE_{9t} * EF_{diesel}) + (Q_{SI,9t,y} \div LC_{9t} * D^{PJ}_{SI,9t} \div FE_{9t} * EF_{diesel}) + (VMT^{PJ}_{brick,9t,y} / FE_{9t} * EF_{diesel})$$
= (1.41208MWh*1.04tCO_2/MWh)+(8,874t*0.49tCO_2/t)+(8,874t÷9t*60km÷3.75km/l*0.00256tCO_2/l) +(53,244t÷9t*25km÷3.75km/l*0.00256tCO_2/l) + (53,244t÷9t*5km÷3.75km/l*0.00256tCO_2/l)+ (177,480t÷9t*30km÷3km/l*0.00256tCO_2/l)
= 1,469tCO_2/y+4,703 tCO_2/y +40tCO_2/y +126 tCO_2/y +25 tCO_2/y +505.6 tCO_2/y
=6,870 tCO_2/y

Table B.6-2 Estimated Project Emissions from Electricity Use

Rated Capacity	196.14	KW
Power Factor	0.75	
Operating Capacity	147.105	KW
Operating Hours	7,200	hrs
Power Consumption	1,412,208	KWh
EF for Eastern Grid (CM	1.04	tCO2/MWh
CO2 Emissions	1,469	tCO2

Table B.6-3 Estimated Project Emissions from Material Transportation

Material	Transported from	Transportation Dist.(km)	Vehicle Mode (t)	Fuel Economy (km/l)	No. of Travels (times)	VMT (km)	Fuel Consumptio n (l)	CO2 Emission Factor (tCO2/l)	CO2 Emissions (tCO2)
clay	Project Site	0	-	-	0	0	0	0	0
slug cement	ACC	60	9	3.75	986	59,160	15,776	0.00256	40
fly ash	Hindalco	25	9	3	5,916	147,900	49,300	0.00256	126
sponge iron	Shyam DRI Power	5	9	3	5,916	29,580	9,860	0.00256	25
Total									192

Table B.6-4 Estimated Project Emissions from Final Product Transportation

Ave Dist from BL factories to PJ plant (km)	Ave Dist from BL factories to Buyers (km)	Total Dist from PJ plant to Buyers (km)	Vehicle mode (t)	Fuel Economy (km/l)	No. of Travels (times)	VMT (km)	Fuel Consumptio n (l)	CO2 Emission Factor (tCO2/l)	CO2 Emissions (tCO2)
25	5	30	9	3	19,720	591,600	197,200	0.00256	506

Table B.6-4 Estimated Total Project Emissions

Total PJ Emissions	tCO2
Power Use	1,469
Cement Production	4,703
Material Transportation	192
Product Transportation	506
Total	6,870

Leakages

Based on discussions in B.6.1., $L_y = 0$

Emission Reductions

Emission Reduction from the proposed project activity in a given year *y* is calculated as follows:

$ER_y = BE_y - PE_y - L_y$

$= 37{,}161 tCO_2/y - 6{,}870 CO_2/y - 0 tCO_2/y =$ **$30{,}292\ tCO_2/y$**

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emissions (tCO_2e/yr)	Estimation of baseline emissions (tCO_2e/yr)	Estimation of leakage (tCO_2e/yr)	Estimation of overall emission reduction (tCO_2e/yr)
Year 2008	4,580	24,774	0	20,194
Year 2009	6,870	37,161	0	30,292
Year 2010	6,870	37,161	0	30,292
Year 2011	6,870	37,161	0	30,292
Year 2012	6,870	37,161	0	30,292
Year 2013	6,870	37,161	0	30,292
Year 2014	6,870	37,161	0	30,292
Year 2015	6,870	37,161	0	30,292
Year 2016	6,870	37,161	0	30,292
Year 2017	6,870	37,161	0	30,292
Total (tonnes of CO_2e)	66,406	359,225	0	292,819

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	EC_y
Data unit:	kWh/y
Description:	Electricity consumption at the project plant in the year *y*
Source of data to be used:	Actual measurements and account books
Value of data	1,412,208kWh
Description of measurement methods and procedures to be applied:	Receipt from a power company and the readings of power meter
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	CP_y
Data unit:	ton/y
Description:	Slug cement consumptions in the year *y*
Source of data to be used:	Actual measurements and account books
Value of data	8,874t/y

Description of measurement methods and procedures to be applied:	Hard data should be taken from actual measurement and invoices/receipts from the cement company during the crediting period. Given cement inclusion rate of 5%, it is estimated to be 3.06kg/unit of brick*7%*58,000,000units = 8,874t/year for the purpose of ex-ante calculation.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$Q_{SC,v,y}$
Data unit:	ton/y
Description:	The amount of a transported slug cement to the plant by a vehicle mode *v* in the year *y*
Source of data to be used:	Actual measurement and accounting books
Value of data	8,874t/y
Description of measurement methods and procedures to be applied:	During the implementation of the project, hard data should be collected from actual measurement and transportation logs. All slug cement (CP_y) is assumed to be transported by 9t trucks for ex-ante calculation. During the actual implementation, Q_{SC} must be collected for vehicles with different load factor, if there are trucks with other load factors.
QA/QC procedures to be applied:	Data of actual measurement of transported slug cement must be double-checked with invoices from the cement company.
Any comment:	

Data / Parameter:	$Q_{FA,v,y}$
Data unit:	ton/y
Description:	The amount of fly ash transported to the project plant by a vehicle mode *v* in the year *y*
Source of data to be used:	Actual measurement and accounting books
Value of data	53,244t/y
Description of measurement methods and procedures to be applied:	During the implementation of the project, hard data should be collected from actual measurement and transportation logs. All fly ash is assumed to be transported by 9t trucks for ex-ante calculation. During the actual implementation, Q_{FA} must be collected for vehicles with different load factor, if there are trucks with other load factors.
QA/QC procedures to be applied:	Data of actual measurement of transported fly ash must be double-checked with invoices from the power company.
Any comment:	

Data / Parameter:	$Q_{SI,v,y}$
Data unit:	ton/y
Description:	The amount of sponge iron transported to the project plant by 9t trucks in the year *y*
Source of data to be used:	Actual measurement and accounting books

Value of data	53,244t/y
Description of measurement methods and procedures to be applied:	During the implementation of the project, hard data should be collected from actual measurement and transportation logs. All sponge iron is assumed to be transported by 9t trucks for ex-ante calculation. During the actual implementation, Q_{SI} must be collected for vehicles with different load factor, if there are trucks with other load factors.
QA/QC procedures to be applied:	Data of actual measurement of transported sponge irons must be double-checked with invoices from the steel company.
Any comment:	

Data / Parameter:	$D^{PJ}_{SC,v}$
Data unit:	km
Description:	Transportation distance of slug cement by 9t trucks from Bargarh Cements Works of the Associated Cement Companies Limited to the project plant (1way)
Source of data to be used:	Actual measurement
Value of data	60km
Description of measurement methods and procedures to be applied:	During the implementation of the project, hard data should be collected from transportation logs. All slug cement is assumed to be transported by 9t trucks for ex-ante calculation.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$D^{PJ}_{FA,9t}$
Data unit:	km
Description:	Transportation distance of fly ash by 9t trucks from Hindalco Coal Power Plant to the project plant (1 way)
Source of data to be used:	Actual measurement
Value of data	25km
Description of measurement methods and procedures to be applied:	During the implementation of the project, hard data should be collected from transportation logs. All fly ash is assumed to be transported by 9t trucks for ex-ante calculation.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$D^{PJ}_{SI,9t}$
Data unit:	km
Description:	Transportation distance of sponge iron by 9t trucks from Shyam DRI Power Limited to the project plant (1 way)
Source of data to be used:	Actual measurement

Value of data	5km
Description of measurement methods and procedures to be applied:	During the implementation of the project, hard data should be collected from transportation logs. All sponge iron is assumed to be transported by 9t trucks for ex-ante calculation.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$VMT^{PJ}_{brick,v,y}$
Data unit:	km/y
Description:	Vehicle Miles Traveled of brick transportation for a vehicle mode *v* in the year *y*
Source of data to be used:	Actual measurement
Value of data	591,600km/y
Description of measurement methods and procedures to be applied:	During the implementation of the project, actual VMT for vehicles with different load factor should be recorded for calculation. However, for ex-ante calculation, $VMT_{brick,v,y}$ is calculated by multiplying the estimated average distance from the project plant to users' sites by the number of travels (total production amount divided by the load factor (9t)). The average distance from the project plant to users' sites is estimated to be the sum of average distance from the baseline factories to the project plant (25km) and their average baseline distance to their users' sites (5km), which is in total 30km. The number of travels is estimated by dividing the total production amount of 177,480t by the load capacity of 9t truck, which is 19,720 times. Therefore, $VMT_{brick,v,y}$ = 30km*19,720 times = 591,600km.
QA/QC procedures to be applied:	
Any comment:	

B.7.2 Description of the monitoring plan:

>>

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of completion 21/03/2007
Name of the responsible persons determining the baseline and monitoring methodology:

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SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

XX/08/2008

C.1.2. Expected operational lifetime of the project activity:

30 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

N.A.

C.2.1.2. Length of the first crediting period:

N.A.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

XX/08/2008

C.2.2.2.	Length:

10 years

SECTION D. Environmental impacts

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D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

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SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

E.2. Summary of the comments received:

>>

E.3. Report on how due account was taken of any comments received:

>>

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Building:	
City:	Sambalpur
State/Region:	Orissa
Postfix/ZIP:	
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Represented by:	
Title:	Managing Director
Salutation:	Mr
Last Name:	Sharma

Middle Name:	
First Name:	Rakesh
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I countries available for this project.

Annex 3

BASELINE INFORMATION

Table Anx3-1. Baseline Brick Production, Coal Consumption and Diesel Consumption

Name of Factory	Address	Annual Production (Unit/yr)	Annual Production (t/yr)	Annual Production of A Grade (Unit/yr)	Annual Production of A Grade (t/yr)	Annual Coal Consumptions (t/year)	Distance from Mine to Factory (km)	Annual VMT for Coal Transportation (km/yr)	Diesel Consumption for Coal Transportation (l/yr)	CO2 Emissions from Coal Transportation (tCO2)	Average Distance from Factory to Brick Buyers	Annual VMT for Final Product Transportation (km)	Diesel Consumption from Brick Transportation (l)
RK Bricks	Pithermpur	4,000,000	14,000	3,200,000	11,200	1,600	60	4,800	2,182	8.3	5	6,222	2,074
BB Bricks	Pithermpur	2,400,000	8,400	1,800,000	6,300	1,120	60	3,360	1,527	5.8	5	3,500	1,167
Rath Bricks	Attabira Bargarh	2,400,000	8,400	1,800,000	6,300	1,120	90	5,040	2,291	8.7	5	3,500	1,167
BB Bricks	Attabira Bargarh	2,000,000	7,000	1,500,000	5,250	960	90	4,320	1,964	7.5	5	2,917	972
Patra Bricks	Attabira Bargarh	3,200,000	11,200	2,560,000	8,960	1,360	90	6,120	2,782	10.6	5	4,978	1,659
KK Bricks	Rangali	4,000,000	14,000	3,000,000	10,500	1,600	60	4,800	2,182	8.3	5	5,833	1,944
OSI Bricks	Rangali	4,000,000	14,000	3,200,000	11,200	1,600	60	4,800	2,182	8.3	5	6,222	2,074
DEV Bricks	Rangali	2,400,000	8,400	1,920,000	6,720	1,120	90	5,040	2,291	8.7	5	3,733	1,244
BBB Bricks	Lapanga	4,000,000	14,000	3,000,000	10,500	1,600	60	4,800	2,182	8.3	5	5,833	1,944
V55 Bricks	Lapanga	4,000,000	14,000	3,200,000	11,200	1,600	60	4,800	2,182	8.3	5	6,222	2,074
JMS Bricks	Lapanga	3,200,000	11,200	2,560,000	8,960	1,360	90	6,120	2,782	10.6	5	4,978	1,659
Total		35,600,000	124600	27,740,000	97,090	15,040	810	54,000	24,545	93.5		53,939	17,980
Average 1,000,000 units		1,000,000	3,500	779,213	2,727	422.47	74	1,555	707	2.7	5	1,515	505
Estimate for 58,000,000 units		58,000,000	203,000	45,194,382	158,180	24,503.37	74	90,662	41,210	157.0	5	87,878	29,293

Table Anx3-2. CO_2 Emission Factor Calculation for Coal

UHV of F Grade Coal (kcal/kg)	Conversion (kJ/kcal)	EF (tC/TJ)	Oxidation Factor	CO2 Emission Factor (tCO2/t)
3,409	4.186	29.43	0.98	1.5092

Source of Data: NCV for F Grade = Sample from Brajarajnagar (the baseline coal mine) examined by Nagoy Institute of Technology.
EF(tC/TJ) = Calculated from UHV and fixed carbon % of the sample
Oxidation Factor = from IPCC 1996 Guidelines. To be replaced with actual data when obta

Table Anx3-3. CO_2 Emission Factor Calculation for Diesel

NCV of Diesel in India (kcal/kg)	Conversion (kJ/kcal)	Density (kg/l)	EF (tCO2/TJ)	CO2 Emission Factor (tCO2/l)
10,080	4.186	0.82	74.1	0.00256

Source of Data: NCV of Diesel in India = IEA Energy Prices & Taxes, 4th Quarter 2006
Density = ditto
EF(tC/TJ) = IPCC 2006 Guidelines

Annex 4

MONITORING INFORMATION

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