**PROJECT DESIGN DOCUMENT FORM
FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Clinker Optimization in cement types production at Derba MIDROC cement Plant
Version number of the PDD	Version 7
Completion date of the PDD	November 11, 2013
[1]**Project participant(s)**	1. Derba MIDROC Cement Pvt Ltd Co 2. Ethan Bio-Fuels Pvt Ltd Co
Host Party(ies)	Federal Democratic Republic of Ethiopia
Sectoral scope and selected methodology(ies)	Scope 4; Manufacturing Industries Methodology ACM 0005 V07.1.0
Estimated amount of annual average GHG emission reductions	**435,341.36** tCO_{2e}

[1]Private Limited Company can be written in short form as Pvt Ltd Co or PLC in Ethiopia

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

"Clinker optimization in cement types' production at Derba MIDROC cement plant" CDM project activity is a cement project located in Derba Village, in the Oromia Regional State of Ethiopia. The project Greenfield cement plant is tentatively expected to be fully commissioned in November 2012. The project activity (measure) is cement feedstock switch in cement production thereby production of different blended cement types, recognized under the host country cement standard document. Blended cement is cement produced with clinker share below 95%. The project activity wishes to pioneer introducing low carbon cement by private plants to the domestic market to allow the host country achieve its sustainable development aspiration. It is planned to be achieved by producing several blended cement types through decreasing clinker below the benchmark clinker share in each type of cement. As per Ethiopian standard, Blended cement is produced as a composition of Clinker + Additive + (1-5%) of Gypsum. The minimum Clinker share and the type of Additive are commonly stated in national cement standards.

The scenario existing prior to the implementation of the project activity is characterized by a market supplied by the production or import of OPC (CEM I) as well as production by other plants, of high clinker share blended cement type CEM II/B-P which is produced using Pumice as Additive. These are the only two types of cement existed in the market. Annexed statistical data show that there exists production practice of these CEM I and CEM II/B-P cement types with high clinker share and import of only CEM I type into the host country; for applications to infrastructure, housing and other purposes in the construction sector. Through availing optimum clinker cement types (products) with different additives and/or different shares of clinker consistent with the national cement standard, sustainable development could be pursued while providing the required service through availing low carbon cement. The purpose of this project activity is to manufacture, promote and market domestically, optimum clinker blended cement types for the right construction application identified by the specification of the host country cement standard. The project blending level for the specific cement types have not been realized by any developer in the past. More over Limestone cement (CEM II/B-L) has never been produced. Among the cement types to be produced by the project plant, types (CEM IV/B), (CEM II/B-P) and (CEM II/B-L) are the relevant blended cement types of the CDM project activity. The former two use *Pumice* as raw material (Additive) while the later uses *Limestone*. To help achieve the desired result, the type of facility where the project activity will take place contains Geber Pfeiffer Vertical roller & ball mills in addition to a state of the art kiln system with dual chamber five stage suspended cyclone pre-heaters, a pre-calciner, a rotary kiln, grate cooler, efficient dust control with inline re-calciner, additive miner, conveyor, crushers, dryers, stores, processing facilities and cement mills for each type.

The baseline scenarios for each type of output i.e which are not prevented by barriers are as follows:

I. Output 1: Blended Cement Type CEM II / B-P

Alternative c; Continuation of the current production practice of this type of cement in manufacturing plants of other private cement project developers i.e. the continuation of production as per the current blending / clinker share practice of this cement type in other private cement plants the host country is the baseline scenario for this type of output. Currently the lowest clinker share allowed for CEMII/B-P by national standard is 65% and the clinker share of this cement type. The weighted average Clinker share calculated as per the least value among option (a) and Option (b) under the guidance in Step 2.1 of the methodology taking imports into consideration as a virtual plant and from those using similar raw materials and produced by plants in similar circumstances is 87.81%. Option (c) is not applicable since the project activity plant is a Greenfield plant. The project activity plans to produce it with lower clinker share than the calculated benchmark without exceeding the legal lowest 65% clinker limit.

II. Output 2,3 respectively: Blended Cement Types CEM II/B-L and CEM IV / B

Alternative b; other realistic and credible alternative scenarios (s) to the proposed CDM project activity scenario that deliver this output or cement of comparable quality i.e

In case of CEM IV/B: This Pozzolana cement type uses Pumice as additive. Hence production of CEM II/B-P or production of Portland cement (CEM I) or import of Portland cement (CEM I), are the only remaining alternative. Both CEM II/B-P and CEM IV/B need to use *Pumice* as Additive (raw material). Moreover all CEM I, CEM II/B-P and CEM IV/B fulfill the quality requirement of the Ethiopian cement standard shown in Table 001a below. The lowest clinker share of Portland cement (CEM I) allowed by the national standard for production or import is 95%. The weighted average Clinker share calculated as per the guidance in Step 2.1 of the methodology for CEM II/B-P produced in similar circumstances is 87.81%. Hence the Baseline Scenario is production of CEM II/B-P at 87.81% clinker share since it gives lower baseline emission than CEM I (95%) and hence conservative compared to taking the otherwise 95% clinker share benchmark .

In case of CEM II/B-L: This is cement type needs to be produced using *Limestone* as Additive and hence also called Limestone cement under CEM II family of cement. There is no plant producing this type of cement in the host country nor is it being imported. There is not also any plant in host country producing cement using *Limestone* as Additive. Producing CEM II/B-P is not an alternative since it uses Pumice and not Limestone as Additive. Hence import or production of Portland cement (CEM I) by the project plant is the only alternative and hence should have been the baseline scenario as all CEM I fulfill the quality requirements of the Ethiopian cement standard shown in Table 001a below. The lowest clinker share of Portland cement (CEM I) allowed by the national standard for production or import certification is 95%. However as this was flagged in the request for review comment; PP's very conservatively chose the [2]baseline scenario to be; production of Limestone cement but at the benchmark clinker share of CEM II/B-P i.e 87.81% and hence conservative compared to taking the otherwise 95% clinker share benchmark.

The project activity plans to produce CEM II/B-L using Limestone as Additive, while producing the CEM II/B-P and CEM IV /B types using Pumice as Additive; at lower clinker share without exceeding the legal lowest 65%, 65% and 45% clinker share respectively.

The project uses the additive type allowed in the national standard in each of these blended cement types by displacing significant clinker share relative to the benchmark established as per the relevant section of the applicable methodology. Production may follow gradual introduction of producing new types as well as decrease in clinker share along the crediting years including as per the indicative production plan.

The increased additives displace some amount of clinker that could have otherwise filled the gap. Clinker production is inherently associated with GHG emission from calcinations of limestone (i.e. with main reaction equation of $CaCO3 \rightarrow CaO+CO2$), emission from burning kiln fuel and electricity consumption for running process equipment. Reducing the share of clinker in project activity cement would therefore result in reducing emission per unit product. However, considerable finance and effort for associated incremental capital, operation, comprehensive and routine R & D, product market creation, bag relabeling, awareness and public safeguard measures will be expended to achieve this goal.

The proposed project activity reduces greenhouse gas emissions by reducing the GHG intensity in cement produced, through installation of additive conveying and processing equipments utilizing additives from

[2] This is equivalent to producing CEM II/A-L which is the upper segment of Limestone cement that covers clinker share between 80% and 94% as per Ethiopian standard.

mining to displace some clinker share which would otherwise have resulted in GHG emissions. This substitution results in reduced emission of CO_2 from:-

- Reduced burning of limestone / reduced decarbonisation reaction in clinker making
- Reduced need of kiln fuel consumption used for enacting the de-carbonization reaction in clinker making

Emission from both of the sources above will be reduced per ton of Blended Cement by the project activity. The greenhouse gas targeted for emission reduction is CO_2.The estimated annual emission reduction is about 435,361.36tCO_{2e}.

The project participants believe that the project activity contributes to sustainable development as it:-

- bequeaths limestone reserves for future generation
- Avails abundant low carbon cement of optimum quality for economic development
- Promotes low carbon cement production and utilization culture
- Reduce CO_2 emissions and also serve as new source of foreign currency revenue
- Avail job for increased number of workers as part of the entire cement investment
- Reduces the annually imported Portland cement volume thereby saving foreign currency expenditure and associated emission

A.2. Location of project activity
A.2.1. Host Party(ies)

Federal Democratic Republic of Ethiopia (FDRE)

A.2.2. Region/State/Province etc.

Oromia is political region while the Host Country (FDRE) is taken as default CDM region as per relevant section of the applicable methodology.

A.2.3. City/Town/Community etc.

Derba village

A.2.4. Physical/Geographical location

The project plant location is the Oromia region of FDRE (Red in map below), Sululta Wereda Administration, 26 km off Chancho town, near Derba Village, Ethiopia. The Derba Cement plant site is about 66 km from Addis Ababa, the capital of Ethiopia.

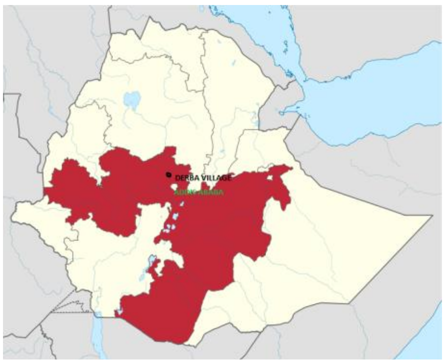


Diagram 001: Map of Oromia region in Ethiopia and pointer of Derba Village in Oromia

The coordinates and elevation of the plant areas are given below. The project location has representative Coordinates: Latitude: 09^0 27.5'28" N and Longitude: 38^0 34.5'31" E and is shown in the indicative map below. Elevation of Plant site: 2380 m to 2420 m above Mean Sea Level (MSL)

A.3. Technologies and/or measures

Ethiopian cements standard ES 1177-1:2005 composes of seven main types (i.e CEM I to CEM V) with a total of 27 brands. Each family of cement mothers couple of brands/types. Some of the brands under CEM II family are CEM II/A-L, CEM II/B-L, CEM II/A-P, CEM II/B-P. The brands under CEM IV family are CEM IV/A and CEM IV/B.

Family of cement	Minimum allowable clinker share, %	Maximum allowable clinker share, %	[3]Additive type
CEM I	95	99	-
CEM II	65	94	Pumice, Limestone, silica fume, burnt shale, fly ash
CEM III	5	84	Blast furnace slag
CEM IV	45	89	Pumice
CEM V	20	64	Pumice, Limestone, burnt shale, fly ash

Table 0.01 Family of cement in Ethiopian Standard

As found in Ethiopian cement standard ES 1177-1: 2005 section 7, Ethiopian standard has three requirements, i.e the Mechanical requirements, the physical requirements and the chemical requirements for assuring quality of the five main family of cement i.e CEM I to CEM V.

- The mechanical requirements are the *Standard compressive strength (N) and early strength (R). As shown in* section 7.1.1 of Ethiopian cement standard ES 1177-1: 2005, Ethiopian standard has three standard strength classes i.e 32.5, 42.5 and 52.5 suggesting that all cement types can attain these compressive strength (N) characteristics at 28 days. As per section 7.1.2, early strengths (R) are observed at 2 days and 7 days.

- *The Physical requirements are the* initial *setting time and the soundness*. Table 2 of the same standard under 7.1.2 shows that all the 32.5 class, 42.5 class and 52.5 class need to exhibit Initial setting time in 75 minutes, 60 minutes and 45 minutes respectively. All of these strength classes in all cement types need have also 10mm soundness requirement, suggesting that all cement types under each strength class need to attain similar physical requirements.

- The chemical requirements investigate % of Loss on Ignition (LOI), insoluble residue, sulphate content and pozzolanicity. None other cement types than CEM I and CEM III have LOI requirements while the % requirement for other parameters overlap depending on strength class.

[3] All cement types technically need Gypsum 1-5% to allow grinding clinker lumps that are hard otherwise.

The most commonly observed requirement in construction practice, the mechanical requirement has been tabulated below.

<table>
<tr><td rowspan="3"></td><td colspan="4">Compressive strength
MPa</td><td rowspan="3">Initial setting Time (min)</td><td rowspan="3">Soundness (expansion) mm</td></tr>
<tr><td colspan="2">Early strength</td><td colspan="2">Standard strength</td></tr>
<tr><td>2 days</td><td>7 days</td><td colspan="2">28 days</td></tr>
<tr><td>[4]32.5N</td><td>-</td><td>16</td><td rowspan="2">32.5</td><td rowspan="2">52.5</td><td rowspan="2">75</td><td rowspan="6">10</td></tr>
<tr><td>32.5R</td><td>10</td><td></td></tr>
<tr><td>42.5N</td><td>10</td><td></td><td rowspan="2">42.5</td><td rowspan="2">52.5</td><td rowspan="2">60</td></tr>
<tr><td>42.5R</td><td>20</td><td></td></tr>
<tr><td>52.5N</td><td>20</td><td></td><td rowspan="2">52.5</td><td rowspan="2"></td><td rowspan="2">45</td></tr>
<tr><td>52.5R</td><td>30</td><td></td></tr>
</table>

Table 001a: Ethiopian Cement classes, physical and mechanical quality requirements

All of the Ethiopian cement types (i.e CEM I to CEM V) should confirm to the above requirement. The smallest compressive strength of the mortar cube as per this standard is 32.5 MPA and should be achievable in 28days after casting the cement concrete. The highest compressive strength of the mortar cube required by the standard is 52.5 and should be attained in 28 days. Each of the cement types can be manufactured to suit the specific construction requirement on when the strength is intended to be achieved. For example; a manufacturer can produce CEM II/B-L cement to a 32.5R class whereby it would achieve 10MPA strength in 2 days after casting and achieve 32.5MPA strength in 28days after casting. If attaining early strength of 10MPa in 2 days is not required by consumer application, it can produce and market 32.5N class which would attain at least 32.5MPa at the 28ths day after casting. The initial setting time describes the time in minutes after casting, which the concrete mixed using the specific cement class, would start to cure (lose all water). It nearly starts within one hour as shown in above table with small deviation on both sides depending on cement class. The soundness is common for all classes.

In terms of ease of achieving the standard, the higher the clinker share in cement is the easier it is to get high early strength (R) and higher standard (ultimate) strength (N). However high (ultimate) compressive strength (N) is still possible to achieve with lower clinker share (higher additive share) but requires the relevant technology in that the additives be well dried, ground with increased fineness and hence requires increased effort and cost in conveying, drying, crushing and processing. The ease of achieving fineness is also a factor of the type of Additive itself.

The project activity measure is increasing additives in cement through substitution of some portion of clinker with additives. In practice the less the intended clinker share is, the more fine the relevant additives should be for the cement to achieve the requirements as per the above standard. The project activity achieves this through significant efforts and investment on installation/operation of the required conveying systems, storages, dryers and improved additive processing technology. Among the 27 brands of the standard under the five families of cement, the following blended cement types will be produced by the project activity. These project types will be used in Ethiopian construction applications as required by the building code.

[4] Key: This class achieves 7 days compressive strength of 16 MPA, standard strength of 32.5MPA and ultimate (28days) strength of 52.5MPa.

No	Cement type	[5]Lowest allowable clinker share in the National standard (%)	Lowest Clinker share (%) targeted by project activity	Additive
1	CEMII/B-P	65	65	Pumice
2	CEM II/B-L	65	65	Limestone
3	CEM IV/B	45	45	Pumice

Table 001b: Project activity cement types and targeted share of clinker

The project cement types will also easily meet all the Characteristic compressive Strength requirements of cement concrete as per the Ethiopian building code standard (EBCS 2); as tabulated below

Ethiopian Grades of Concrete	C5	C15	C20	C25	C30	C40	C50	C60
Compressive strength, F_{ck} in MPa	0	12	16	20	24	32	40	48

[6]Table 001c: Characteristic compressive strength requirement of cement concrete

As shown in the above table, cement concrete products used in Ethiopian construction applications can have Grades ranging from C5 to C60. C5 cement is used in lean concrete and doesn’t require compressive strength at all but only bonding characteristics. Hence the smallest compressive strength requirement is 12MPa and the highest compressive strength requirement is 48MPa. All of the cement types (i.e CEM I to CEM V) can achieve all of these strength requirements as described in the previous paragraphs.

- Raw mix preparation

Before going to the raw mill, raw materials are suitability proportioned in the raw mix so that they may deliver the quality of clinker required. The project raw materials will largely contain limestone. Material is crushed before batched to the mix preparation stage. The prepared mix is sent to the raw mill for grinding and drying. The raw mix will be ground to the required size in the raw mill to the required minimum sieve diameter.

It also goes through drying process simultaneously with milling. The heat for drying the raw mix will be sourced from the pre heater or cooler end of the kiln. The ground mix will be sent to a homogenizer which intern sends it to the kiln through the pre heater end. The raw mill is operated by power sourced from the grid.

- The kiln system

The project activity kiln system is composed of the pre heaters, the pre-Calciner, the rotary kiln, the cooler, the burners, the dust control devices and other auxiliary accessories each with specific purposes. The kiln system performs the thermal decomposition processing of the raw mix to deliver clinker. It is obtained through pyro-processing of raw materials in the kiln. Power required for moving equipment is

[5]Ethiopian cement standard ES 1177 - 1:2005 (now named CES 28), Page 8
[6] Ethiopian building code standard (EBCS 2); chapter 2

sourced from the grid. Clinker is a product which is the main constituent in any cement type. It comes out from kiln as balls of agglomerates.

- Additive preparation and cement grinding

The clinker from the kiln system will then be further processed to cement after grinding with gypsum to change to powder and relevant additive co-grounded for producing the relevant type of cement. All additives will be sourced from quarry sources identified and leased in concession. *Gypsum* which is an additive mandatorily added to help crush clinker is used in all cement types and ranges from 1-5%.

The project gypsum is sourced from quarry in vicinity of limestone. Additives targeted for blended cement are volcanic ash (pumice) and limestone. Limestone will be sourced from the same quarry where limestone used for clinker making is sourced. Pumice (volcanic ash) will be sourced from pumice quarry located around AlemTena locality about 125km from plant. All of the additives are available in massive reserve leased by plant operator under concession for several decades. The mining certificates are available and submitted for validation together with PDD.

While all other ingredients are transported in conveyor belts, the pumice will be mined and transported using trucks to the plant site for crushing. Interim storage, hoppers and stackers will be used to store intermediate products.

After drying, crushing and grinding to the required size, it will be sent to the cement mills to be ground with the set percentage share of clinker to produce CEMII/B-P and CEMIV/B. Similarly limestone will be ground with set percentage of clinker to produce cement type CEMII/B-L. It would be difficult to introduce at once new cement type at its lowest allowable clinker share to the market due to consumer stigma and brand risk associated with it. Therefore, the share of new cement types in the total production would be subject to level of market absorption. Similarly clinker share in cement may be gradually reduced towards the lowest allowable limit along the crediting period, especially in new cement types. When the product promotion allows the target would be, as much increased production of new types and as much reduced clinker share as possible without exceeding the lowest limit. All of the cement types will be tested on continuous spot sampling using methods and frequencies as per the requirements of the national standard before being sent to the market. Finally cement is sent to the market in bulk or after packaging. A typical process flow in cement production is shown in diagram 002.

- Equipment and machineries of the project plant related to the project activity.

All major equipments of cement plant are indicated in the table below. The equipments related to sourcing additives and cement grinding is the equipment directly related to incremental investment. Raw and additives quarry equipment will be utilized to mine raw materials and additives. Land transport trucks will be used to transport Pumice while product collection &Conveyor belts (cross country and in plant) will be used to deliver the rest of the materials and fuel to the processing equipment.

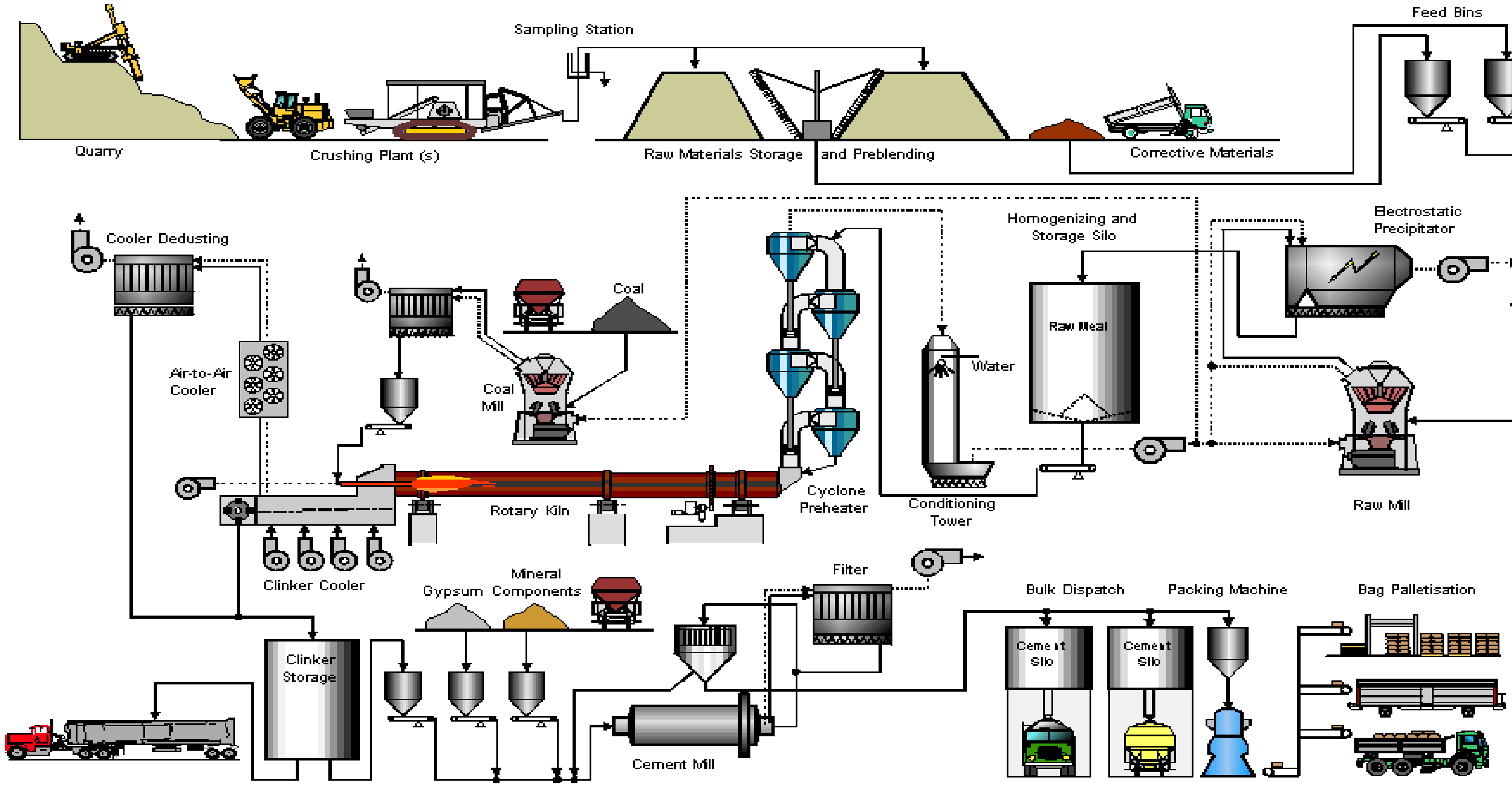
The Kiln system is the equipment that processes clinker raw materials into clinker. Cement Mills (3) will be used to grind clinker with additives to deliver the cement types of the project activity. Cement packing equipments pack cement into standard bags. The X-ray fluorescence, Lab equipments, weigh feeders, weighbridges& meters will be used to measure either mineralogical contents of materials or the amount of material flowing into a process thereby sending data to the nearby computer of the central control room. Central Control Room is the rooms where all plant control parameters are monitored and corrective actions taken in each stage of process. It is also where most of the CDM specific data are monitored.

Equipment	Process	Type & performance	Source of energy
Raw and additives quarry equipment	Mining	Excavate, blast, load	Diesel Fuel
Land transport trucks	transport	Trucks to transport pumice	Diesel Fuel
Conveyor belts & product collection	Delivery	From limestone, gypsum and interim	Grid Electricity
Kiln system	Pyro processing	5600 tpd , five stage PH, PC, rotary kiln& grate cooler	Kiln fuel (coal)
Cement Mills (3)	Grinding clinker with additives	Additive crushers, bins of 600t,600tph mill, feed systems, separators, de-dusting solutions	Grid Electricity
Cement Packing	Labeling and Packing cement for dispatch	Bag manufacturing plant, packing line	Grid electricity
X-ray fluorescence, Lab equipments& meters	measurements	As required	
Central Control Room	Display computers	Display operating parameters and consumptions	

Table002: Key equipment and facilities of the project activity cement plant

With respect to environmental contribution, the chosen cement technology is state of the art globally in every section and process. The clinker manufacturing technology is a dry process dual chamber five stage suspended pre heater with pre-calciner kiln. No similar technology (in efficiency and scale) has ever been transferred into the host country before. The cement grinding technology is also state of the art mills to help achieve the required cement quality specifications. The dust capture devices are top performing with maximum dust release less than 25mg/Nm3. In addition the kiln has inline re-calciner to recycle. The tentative cement production plan is shown in Appendix 4.

Diagram 002: typical cement production process pectoral illustration



[7]Statistical data of cement plants in the host country before starting date of project activity dictate that there is only one type of blended cement produced historically. Plants produce it at higher clinker share than the project activity. The project activity proposes to produce various types of cement among the types covered under the national cement standard through utilizing optimum clinker share in each type.

In the absence of the project activity;-

- The project plant would produce CEM I type cement (Portland cement) and blended cement CEM II/B-P of higher clinker share
- Imported Portland cement will continue to be availed to the market to meet the demand/supply gap, for all construction purposes, resulting in high clinker cement utilization with associated emission.

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A :Federal Democratic Republic of Ethiopia (host)	1. Derba MIDROC cement Pvt Ltd Co	No
	2. Ethan Bio-Fuels Pvt Ltd Co	No

A.5. Public funding of project activity

There is no public funding or ODA commitment from annex I countries diverted into the project activity.

SECTION B. Application of selected approved baseline and monitoring methodology
B.1. Reference of methodology

Approved consolidated baseline and monitoring methodology ACM0005, Increasing the Blend in Cement Production. Version 07.1.0

- "Tool to calculate the emission factor for an electricity system" (Version 2.2.1)
- "Tool for the demonstration and assessment of Additionality" (Version 06.0.0)
- "Guidelines on the assessment of investment analysis" (Version 05)
- "Guidelines for objective demonstration and assessment of barriers" (Version 01)
- "Assessment of the validity of the original/current baseline and to update of the baseline at the renewal of crediting period" (Version 01)
- "Project and leakage emissions from road transport of freight" (Version 01)

More information about the methodology, tools and guidance can be found on the website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

[7] Supporting documents listed in annex 3

B.2. Applicability of methodology

Blended cement is cement with clinker share lower than 95% as also maintained by the Methodology. “Blended Cement types are distinct products with different uses that have different additives and different shares of clinker as per the host country national standard”.

The project activity would produce some of the blended cement types of the national cement standard document. It will be implemented through decreasing of clinker share to achieve the lowest allowable limit in the respective cement type under the national standard and correspondingly increase in the share of Additives in the production of cement. It will therefore result in reduction of the amount of clinker per tonne of blended cement. The project activity accounts only for GHG emission reductions achieved due to the increased share of additives in blended cement.

ACM0005 (Version 07.1.0) is applicable to project activities in the cement industry, which aim to reduce the share of clinker in cement types they would produce. Benchmark blending rate will be established through assessment of clinker share of the relevant cement type from data in the market, using the provision under Step 2.1 (a) and (b) of the methodology including its associated guidance on consideration of imports data. For each cement type of the project activity (i.e whether cement type exists in the market or are newly introduced), the benchmark is established through assessment of the historical production clinker share of the relevant alternative cement type in the market, the clinker share of imported cement. The Methodology defines Blended Cement as cement with clinker share below 95%.

“This methodology is applicable to project activities that produce blended cement (BC) beyond current practices in the host country either: (i) in Greenfield cement plant or (ii) in existing cement production plant by increasing the share of additives (i.e. reduce the share of clinker).” The project activity produces various blended cement types on Greenfield plant, beyond the current practice in the host country and hence the methodology is applicable.

The Project activity meets Applicability criteria of the methodology as established below:-

- This methodology is applicable to domestically sold output of the project activity plant and excludes export of blended cement (if any);

Blended cement types are basically for domestic market and in any case only those domestically sold cement types will be included in and accounted for in the project activity.

- The methodology is not applicable if blending of cement outside the cement production plants is a common practice in the host country (ex: localized blending in construction sites).

Cement availed to the Ethiopian market (and transported to construction sites) is supplied only either from existing manufacturing plants or imported from international market. As per the confirmation letter dated November 4, 2013 obtained from Ethiopian Standards Agency of the Government of F.D.R Ethiopia, cement production requires continuous spot sampling/testing and that it is not permitted to produce blended cement outside cement plants. Hence, there is no cement blending/grinding activity taking place outside cement plants (on construction sites).

As per the evidence letter provided by The Ministry of Industry of Ethiopia, all of the cement manufacturing plants in operation in the country during the assessment period (which are shown in table below) are complete cement plants (composed of clinker manufacturing and additive grinding) as tabulated in Table 003 below.

No	[8]Name of cement plant in the host country before start date	Ownership/operation	Type of plant	Type of cement produced	Year plant commissioned
1	Mugher Cement	Federal Government owned	Kiln plus grinding	CEM II/B-P	1984
2	Mossobo cement	Regional government/ Endowment Owned	Kiln plus grinding	CEM II/B-P	1999
3	Dire Dawa/National cement	80% Privatized	Kiln plus grinding	CEM II/B-P	2006
4	Abyssinia Cement	Private	Kiln plus grinding	CEM I	2008
5	Jema Cement	Private	Kiln plus grinding	CEM I	2008
6	Dejen (Dashen) Cement	Private	Kiln plus grinding	CEM I	2008

Table 003; plants in the host country producing clinker and cement in the project boundary

Therefore blending of clinker and additives to produce cement outside the cement production plants (on construction sites) is not a common practice in the host country.

- All clinker used in the project activity shall be produced by the cement plant that is included within the project boundary, hence, cement grinding only plants cannot use this methodology (e.g. plants with no clinker manufacturing facility)

The TEFR and other supporting documents submitted for validation to DOE show that the project plant is an integrated cement plant (Raw mill + Clinker Kiln + Additive mill+ cement mill) and hence it is not cement grinding only plant. These evidence documents as well as the actual installed kiln capacity also demonstrate that all of the project activity clinker (guaranteed minimum design of 5600tpd) will be produced by the clinker kiln of the project activity plant, within the project boundary.

- Adequate data are available on cement types in the market.

Cement availed to the Ethiopian market is supplied only either from existing manufacturing plants or imported from international market. There is adequate statistical data of cement in the market (i.e on cement production by name of plant, type of cement produced, type of cement imported, clinker share and annual volume for the relevant years. All of these data were obtained from regulatory Government Authorities and submitted to DOE for validation.

The following table is summary of the cement statistical data. The statistics show that cement types CEMII/B-L and CEM IV/B are not produced by any existing cement plant.

[8] All of these cement plants existing by the start date contain clinker kiln and grinding equipment

No	Name of cement plant sending cement to the market in the host country	Ownership/operation	Year plant commissioned	Average Annual Production statistics (tons)		
				CEM I	CEM II/B-P	CEMII/B-L, CEM IV/B
1	Mugher Cement	Federal Government owned	1984		662,278.0	0
2	Mosobo cement	Regional government/ Endowment Owned	1999		798,963.0	0
3	[9]Dire Dawa/National cement	80% Privatized	2006	7,913.00	89,820.62	0
4	Abyssinia Cement	Private	2008	33,684.02		0
5	Jema Cement	Private	2008	26,966.90		0
6	Dejen (Dashen) Cement	Private	2008	10,723.02		0
7	Imported	Virtual plant	2008	621,029		
	Total Average annual(each), t			700,315.94	1,551,061.6	0
	Total average annual, t			2,251,377.54		

Table 004a; table showing statistics of cement availed to the market, by source and type

		Produced and imported (tons)		
	Type of cement	2007	2008	2009
1	CEM I	110,408.00	18,636.00	182,806
2	CEMII/B-P	2, 346,827	2, 430,950,94	1,115,817
4	CEM II/B-L	0	0	0
5	CEM IV/B-P	0	0	0
	Total	2, 457,235	2, 451,581	1,298,623

Table 004b; table showing statistics of cement availed to the market, by type and year

All of the applicability conditions of the methodology ACM0005 (Version 07.1.0) are fulfilled by the Project activity as explained above and supported with evidences submitted to DOE.

[9] This plant is privatised in 2006 and started production in 2007 after renovation of a 70 year old plant.

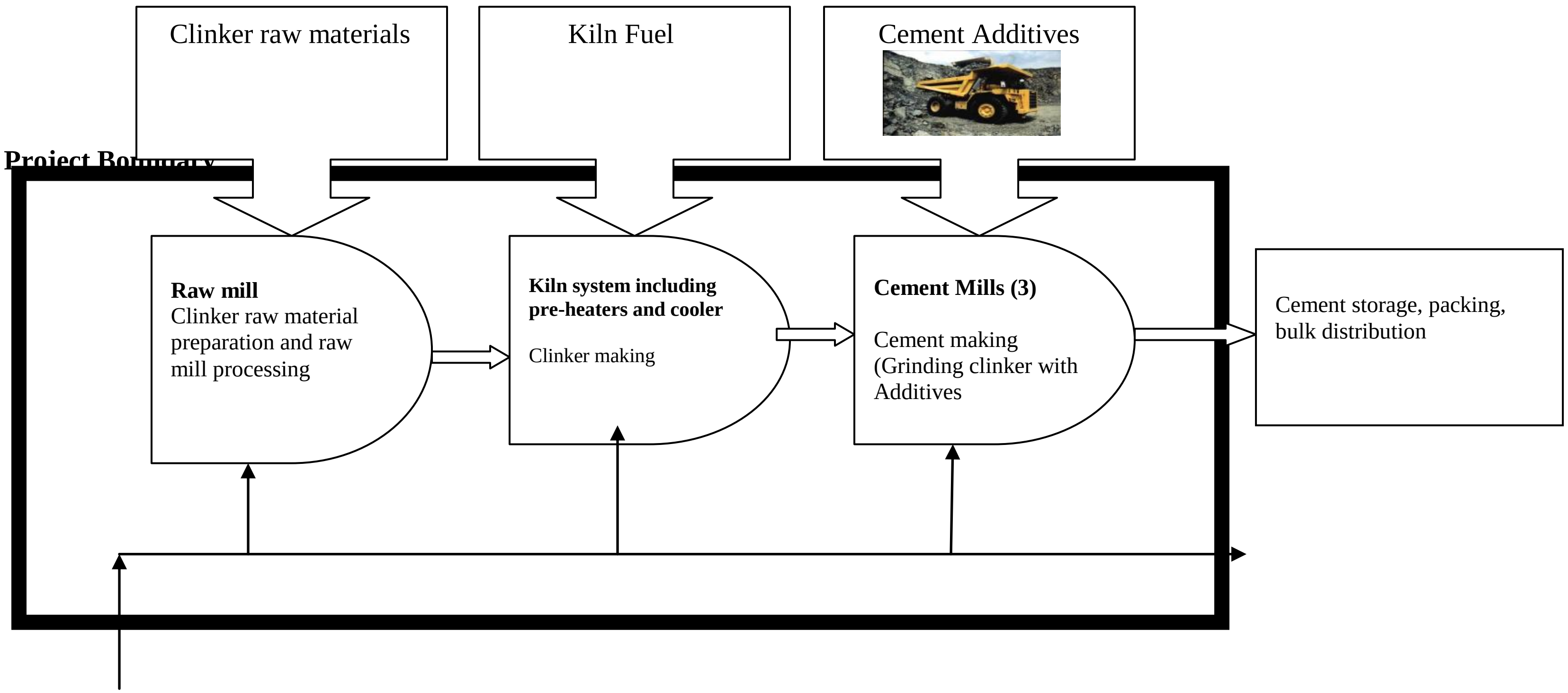
B.3. Project boundary

	Source	**Gas**	Included?	**Justification / Explanation**
Baseline	Calcinations of raw material in the kiln	Co_2	Yes	Direct emission from clinker kiln.
		CH_4	Excluded	Emissions negligible, excluded for simplification
		N_2O	Excluded	Emissions negligible, excluded for simplification
	Use of fuel in the kiln including burner	CO_2	Yes	Direct emissions from clinker kiln.
		CH_4	Excluded	Emissions negligible, excluded for simplification
		N_2O	Excluded	Emissions negligible, excluded for simplification
	Use of fuel for drying raw materials & kiln fuel	CO_2	Excluded	excluded for simplification
		CH_4	Excluded	Emissions negligible, excluded for simplification
		N_2O	Excluded	Emissions negligible, excluded for simplification
	Use of electricity (grid and self-generated) for the preparation of fuels and raw materials for clinker, and for the operation of equipments related to the kiln (engines, compressors, fans,	CO_2	Yes	Direct emission from self-generation sources and indirect emission from plants connected to the grid supplying the plant with electricity for feeding system, preparation of materials, and driving kiln
		CH_4	Excluded	Emissions negligible, excluded for simplification
		N_2O	Excluded	Emissions negligible, excluded for simplification
	Use of electricity (grid and self-generated) for the preparation of Additives and for Grinding cement types	CO_2	Yes	Direct emission from self-generation sources and indirect emission from plants connected to the grid supplying the plant with electricity for crushing and grinding Additives and grinding cement
		CH_4	Excluded	Emissions negligible, excluded for simplification
		N_2O	Excluded	Emissions negligible, excluded for simplification
Project activity	Calcinations of raw material in the kiln	Co_2	Yes	Direct emission from clinker kiln.
		CH_4	Excluded	Emissions negligible, excluded for simplification
		N_2O	Excluded	Emissions negligible, excluded for simplification
	Use of fuel in the kiln including burner	CO_2	Yes	Direct emission from clinker kiln.
		CH_4	Excluded	Emissions negligible, excluded for simplification
		N_2O	Excluded	Emissions negligible, excluded for simplification

	Use of fuel in driers for drying raw materials & kiln fuel	CO_2	Excluded	excluded for simplification
		CH_4	Excluded	Emissions negligible, excluded for simplification
		N_2O	Excluded	Emissions negligible, excluded for simplification
	Use of electricity (grid and self-generated) for the preparation of fuels and raw materials for clinker, and for the operation of equipments related to the kiln (engines, compressors, fans,	CO_2	Yes	Direct emission from self-generation sources and indirect emission from plants connected to the grid supplying the plant with electricity for feeding system, preparation of materials, and driving kiln
		CH_4	Excluded	Emissions negligible, excluded for simplification
		N_2O	Excluded	Emissions negligible, excluded for simplification
	Use of electricity (grid and self-generated) for the preparation of Additives and for Grinding cement types	CO_2	Yes	Direct emission from self-generation sources and indirect emission from plants connected to the grid supplying the plant with electricity for crushing and grinding Additives and grinding cement
		CH_4	Excluded	Emissions negligible, excluded for simplification
		N_2O	Excluded	Emissions negligible, excluded for simplification

Table 005: table of GHG gases and sources in the project boundary

Diagram 003: Diagram showing flow of mass, equipments and project boundary



Electricity from National Grid

B.4. Establishment and description of baseline scenario

As per "**Identification of the baseline scenario**" of ACM 0005 V07.1.0, "The most plausible baseline scenario among all realistic and credible alternatives(s) is identified using Steps 2 and/or 3 of the latest approved version of the "Tool for the demonstration and assessment of Additionality"

In doing so, "project participants (PPs) shall consider all realistic and credible production scenarios **for the relevant cement type** that are consistent with current rules and regulations, including the **existing practice of cement production**, **the proposed project activity**, and **practices in other manufacturing plants** in the region **using similar input/raw materials, and facing similar economic, market and technical circumstances**. If only two scenarios, i.e. the existing practice of cement production and the proposed project activity, are realistic and credible alternatives, the most likely baseline scenario can be identified with the latest version of the "Tool for the demonstration and assessment of Additionality."

In line with the same, manufacturing plants using similar inputs/raw materials (similar Additive type) producing the relevant cement type and facing similar economic, market and technical circumstances are assessed. Public/endowment cement plants are excluded from analysis. Public/endowment plants are normally establishment using state, public or similar funds. The driving forces of such investments have more social and political weight than profit and hence will be financed and facilitated anyway. Moreover their commissioning dates as shown on table 009 show that their investment decision dated at least a decade back and hence not comparable due to different investment era than the date of investment decision for project plant.

No	Cement type	Dejen	Abyssinia	Jema	National/Dire Dawa
1	CEM I	Yes	Yes	Yes	Yes
2	CEMII / B-P	No	No	No	Yes
3	CEM II/B-L	No	No	No	No
4	CEM IV / B	No	No	No	No
	Year Established	2008	2008	2008	2006

[10]Table006: relevant cement types production practice by private manufacturing plants in the host country

Step 2 & 3 of the "Tool for the demonstration and assessment of Additionality"V.06.0.0 is used to determine the most plausible baseline scenario as follows.

The Additionality tool states "Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity." In this regard, the project plant owner and operator is a private entity. Alternatives available to private plant owners in the host country before the start date are included for assessment.

Moreover the tool states "If the proposed CDM project activity includes several different facilities, technologies, outputs or services, alternative scenarios for each of them should be identified separately."

The project produces different output (blended cement types) using different input raw materials (Additives) by increasing clinker share in existing cement types (CEMII/B-P) as well as producing new cement types (CEM II/B-L and CEM IV / B) with respective additive types and/or reduced clinker share without exceeding the lowest allowable clinker threshold. Hence separate identification of alternative scenarios is essential for the project activity cement types.

[10]Source: official government documents and data collected by Government Authorities from cement plants, annexed

The following alternatives are established based on similar input/raw materials (Additive) and similar economic circumstances (private plants) that are consistent with all applicable mandatory laws and regulations are identified for the relevant cement types, each separately;

I. Output 1: Blended Cement Type CEM II / B-P

Alternative a; the project activity undertaken without being registered as a CDM project activity

Alternative b; Other realistic and credible alternative scenarios (s) to the proposed CDM project activity scenario that deliver this output or cement of comparable quality i.e import or production of Portland cement

Alternative c; Continuation of the current production practice of this type of cement in manufacturing plants of other private cement project developers i.e. the continuation of production as per the current blending / clinker share practice of this cement type in other private cement plants in the host country; The weighted average Clinker share calculated as per the guidance in Step 2.1 of the methodology for CEM II/B-P from those using similar raw materials and produced by plants in similar circumstances is 87.81%.

II. Output 2,3 respectively: Blended Cement Types CEM II/B-L and CEM IV / B

Alternative a; the project activity undertaken without being registered as a CDM project activity

Alternative b; other realistic and credible alternative scenarios (s) to the proposed CDM project activity scenario that deliver this output or cement of comparable quality i.e

In case of CEM IV/B: This is produced using Pumice as additive. Alternatives considered are production of CEM II/B-P or production of Portland cement (CEM I) or import of Portland cement (CEM I). Both CEM II/B-P and CEM IV/B need to use *Pumice* as Additive (raw material). Moreover all CEM I, CEM II/B-P and CEM IV/B fulfill the minimum quality requirement of the Ethiopian cement standard shown in Table 001a above. The lowest clinker share of Portland cement (CEM I) allowed by the national standard for production or import is 95%. The weighted average Clinker share calculated as per the guidance in Step 2.1 of the methodology for CEM II/B-P produced in similar circumstances is 87.81%. The scenario that gives the lowest baseline emission among these will be the baseline scenario.

In case of CEM II/B-L: This is cement type produced using Limestone as Additive. There is no plant producing this type of cement. There is not also any plant in host country producing cement using *Limestone* as Additive. Producing CEM II/B-P is not an alternative since it uses *Pumic*e and *not Limestone* as Additive. Hence import or production of Portland cement (CEM I) is the only alternative. Moreover all CEM I fulfill the minimum quality requirements of the Ethiopian cement standard shown in Table 001a above. The lowest clinker share of Portland cement (CEM I) allowed by the national standard for production or import certification is 95%. However as this was flagged in the request for review comment; PP's very conservatively included [11]production of Limestone cement but at the benchmark clinker share of CEM II/B-P i.e 87.81% as one of the alternatives. The scenario that gives the lowest baseline emission among these alternatives will be the baseline scenario.

The following table shows that the gap between cement demand and supply is being met by import of OPC cement.

[11] This is equivalent to producing CEM II/A-L which is the upper segment under Limestone cement that covers clinker range between 80% and 94% as per Ethiopian standard. The entire Limestone cement family covers clinker share between 65% and 94% shared between CEM II/B-L and CEM II/A-L brands.

No	Cement type	Annual Imported Volume (tons)	% share from total import
1	Ordinary Portland cement	621,029	100%
2	Other type	0	0%

[12]Table007: annual volume of cement import into host country for year 2008

Alternative c; Continuation of the current production practice of this type of cement in manufacturing plants of other private cement project developers i.e. the continuation of production as per the current blending / clinker share practice of this cement type in other private cement plants in the host country

Alternative (c) is not available, as there is no plant in the host country producing these outputs is in the host country and hence eliminated. Alternatives (a) and (b) are available alternatives for these types.

The baseline scenarios for each type of output i.e which are not prevented by barriers are as follows:

III. Output 1: Blended Cement Type CEM II / B-P

As per the tool, if more than one alternative exists, the alternative resulting in the lowest baseline emission among the possible alternatives scenarios is the baseline scenario. Alternative (b) import or production of Portland cement would mean higher (>95%) clinker share and therefore resulting in higher baseline emission.

Alternative c; Continuation of the current production practice of this type of cement in manufacturing plants of other private cement project developers i.e. the continuation of production as per the current blending / clinker share practice of this cement type in other private cement plants the host country is the baseline scenario for this type of output. The weighted average Clinker share calculated as per the least value among option (a) and Option (b) under the guidance in Step 2.1 of the methodology taking imports into consideration as one virtual plant and from those using similar raw materials and produced by plants in similar circumstances is 87.81%. Option (c) is not applicable since the project activity plant is a Greenfield.

IV. Output 2,3 respectively: Blended Cement Types CEM II/B-L and CEM IV / B

Alternative b; other realistic and credible alternative scenarios (s) to the proposed CDM project activity scenario that deliver this output or cement of comparable quality i.e

In case of CEM IV/B: production of CEM II/B-P or production of Portland cement (CEM I) or import of Portland cement (CEM I), are the only remaining alternatives. Both CEM II/B-P and CEM IV/B need to use *Pumice* as Additive (raw material). Moreover all CEM I, CEM II/B-P and CEM IV/B fulfill the minimum quality requirement of the Ethiopian cement standard shown in Table 001a above. The lowest clinker share of Portland cement (CEM I) allowed by the national standard for production or import is 95%. The weighted average Clinker share calculated as per the guidance in Step 2.1 of the methodology for CEM II/B-P produced in similar circumstances is 87.81%. Hence the Baseline Scenario is production of CEM II/B-P at 87.81% clinker share since it gives lower baseline emission than CEM I.

In case of CEM II/B-L: This is cement type produced using Limestone as Additive. There is no plant producing this type of cement. There is not also any plant in host country producing cement using

[12]Source: Ethiopian Quality and Standard Authority, annexed

Limestone as Additive. Producing CEM II/B-P is not an alternative since it uses Pumice and doesn't use Limestone as Additive. Hence import or production of Portland cement (CEM I) is the only alternative historically practiced in the country and hence should have been the baseline scenario. CEM I fulfill the quality requirements of the Ethiopian cement standard shown in Table 001a above and the lowest clinker share of Portland cement (CEM I) allowed by the national standard for production or import certification is 95%. However as this was flagged in the request for review comment; PP's very conservatively chose the [13]baseline scenario to be production of Limestone cement but at the benchmark clinker share of CEM II/B-P i.e 87.81%. This benchmark provides the lowest baseline emission among the available alternatives considered.

The complete assessment using the latest tool is shown as part of Additionality Demonstration in B.5.

B.5. Demonstration of Additionality

i. The Additionality of the project activity will be demonstrated and assessed using the latest version of the"Tool for the demonstration and assessment of Additionality"

ii. Barrier analysis will be used including First of its Kind

<u>Demonstration of Additionality</u>

Step 1: identification of alternative scenarios to the proposed CDM project activity those are consistent with current laws and regulations

The Additionality tool states "Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity."

In this regard, the project developer is a private entity. Alternatives available to private project developers in the host country at the start date are included for assessment.

Moreover the tool states "If the proposed CDM project activity includes several different facilities, technologies, outputs or services, alternative scenarios for each of them should be identified separately."
In this regard, the project produces different output (distinct cement types) using different additive types i.e CEM II/B-P, CEMII/B-L and CEM IV/B cement types. Hence separate identification of alternative scenarios is essential for the outputs.

Hence the following alternatives are identified for the relevant cement types, each separately;

I. Output 1: Blended Cement Type CEM II / B-P

Alternative a; the project activity undertaken without being registered as a CDM project activity

Alternative b; Other realistic and credible alternative scenarios (s) to the proposed CDM project activity scenario that deliver this output or cement of comparable quality i.e import or production of Portland cement
Alternative c; Continuation of the current production practice of this type of cement in manufacturing plants of other private cement project developers i.e. the continuation of production as per the current blending / clinker share practice of this cement type in other private cement plants in the host country;

[13] This is equivalent to producing CEM II/A-L which is a type of Limestone cement that should be produced with clinker share between 80% and 94% as per Ethiopian standard.

The weighted average Clinker share calculated as per the guidance in Step 2.1 of the methodology from those using similar raw materials and produced by plants in similar circumstances is 87.81%.

The above three alternatives are consistent with all applicable mandatory laws and regulations.

II. Output 2,3 respectively: Blended Cement Types CEM II/B-L and CEM IV / B

Alternative a; the project activity undertaken without being registered as a CDM project activity

Alternative b; other realistic and credible alternative scenarios (s) to the proposed CDM project activity scenario that deliver this output or cement of comparable quality i.e

In case of CEM IV/B: production of CEM II/B-P or production of Portland cement (CEM I) or import of Portland cement (CEM I). Both CEM II/B-P and CEM IV/B need to use *Pumice* as Additive (raw material). Moreover all CEM I, CEM II/B-P and CEM IV/B fulfill the minimum quality requirement of the Ethiopian cement standard shown in Table 001a above. The lowest clinker share of Portland cement (CEM I) allowed by the national standard for production or import is 95%. The weighted average Clinker share calculated as per the guidance in Step 2.1 of the methodology for CEM II/B-P produced in similar circumstances is 87.81%.

In case of CEM II/B-L: This is cement type produced using Limestone as Additive. There is no plant producing this type of cement. There is not also any plant in host country producing cement using *Limestone* as Additive. Producing CEM II/B-P is not an alternative since it doesn't use Limestone as Additive. Hence import or production of Portland cement (CEM I) is the only alternative. Moreover all CEM I fulfill the minimum quality requirements of the Ethiopian cement standard shown in Table 001a above. The lowest clinker share of Portland cement (CEM I) allowed by the national standard for production or import certification is 95%. However as this was flagged in the request for review comment; PP's very conservatively included [14]production of this cement type at the benchmark clinker share of CEM II/B-P i.e 87.81% as one of the alternatives.

Alternative c; Continuation of the current production practice of this type of cement in manufacturing plants of other private cement project developers i.e. the continuation of production as per the current blending / clinker share practice of this cement type in other private cement plants in the host country
Alternative (c) is not available, as there is no plant in the host country producing these outputs in the host country and hence eliminated.

Alternatives (a) and (b) are consistent with all applicable mandatory laws and regulations.

Step3: Barrier analysis

Sub step 3a. Identify barriers that would prevent the implementation of the proposed CDM project activity;

The project plant is implementing blended cement for the first time. Hence the following are established allowable list of barriers, and would prevent alternative scenarios in the absence of CDM;

[14] This is equivalent to producing CEM II/A-L which is a type of Limestone cement that should be produced with clinker share between 80% and 94% as per Ethiopian standard.

a. Investment barriers

LDC Barriers: The host country is an LDC where "GUIDELINES FOR OBJECTIVE DEMONSTRATION AND ASSESSMENT OF BARRIERS" (Version 01) "Guideline 7 is clearly applicable. Guideline 7 reads;-

"For projects in Least Developed Countries, it is sufficient to transparently describe the relevant barriers, as less stringency is needed with regards to data availability in the actual demonstration of barrier, as compared to the projects in other countries. Projects in Least Developed Countries are not bound by the provisions in this guideline and may use other approaches that are more adapted to the local circumstances." It further gives the rational as follows:-

"Rationale: Projects in Least Developed Countries can be assumed in general to face significant barriers to their implementation. At the same time, data availability in these countries is considerably limited which complicates the demonstration of Additionality and therefore further increases transaction costs. "

- [15]Access to Finance/Capital: There is no private domestic capital market. Accessing finance from International market is related to rating of a host country by global rating agencies. i.e there has never been Moody's, S&P or Fitch rating for the host country.

Blending requires integrated plants. Establishing an integrated cement plant entailing high capital expenditure and operation costs would require a source of finance. In the absence of a capital market it will always prove that private PPs face significant hurdle or even impossibility to raise the required Finance/Capital. The proposed project is from LDC. The guideline relieves the requirement of showing supporting evidence for claimed barriers (due to understood difficulty of data availability) for LDC Projects. However, PP's have proven the presence of barrier by the footnoted international source of information;

b. Technology barriers

- **Technology barrier due to [16]Scale**: The project activity scale is at least twice the production scale of the largest plant in the host country. There is no domestic experience whatsoever of implementing and operating cement factory in such a scale of production as well as technical complexity and hence an operation risk barrier.

- **[17]Technology Barrier due to technical complexity**: The plant feasibility as well as implementation supervision was performed by a foreign entity. The plant design, manufacturing as well as erection were made by foreign entities including for maintenance & operation of the plant for further duration. This implies that the technology is new to the plant owner exposing him to significant technology risk.

c. Manpower barriers

- **[18]Skilled manpower barrier**: There is significant shortage of skilled cement manpower in the host country as demonstrated by hiring of foreign consultants for operation management as well as training interns entirely new to the cement market. So far four hundred medium skill and sixteen engineers are hired fresh from school and are being trained by the foreign consultants along with

[15]Country Brief on Ethiopia dated march 24th, 2008 published by eStandardForum
[16]As observed from table 009 and the project production plan under Appendix 4
[17] Contract documents with Technology supplier and Feasibility consultant

[18]Information from Project office

plant commissioning. The remaining two local employees employed so far were recently working for other plants, showing that skilled cement sector manpower is severely short in the domestic market. This otherwise leads to an unacceptably high risk of equipment disrepair and malfunctioning or other underperformance

CDM revenue would critically serve as source of hard currency expenditure for foreign experts, [19]which is not always available in least developed countries commonly characterized by foreign trade deficit (i.e export earning falls short off import expenditure). The CDM revenue would also at least cover some cost of training towards cultivating skilled manpower for the complex technology.

d. Barriers due to prevailing practice, "first of its kind"

As per "GUIDELINES ON ADDITIONALITY OF FIRST-OF-ITS-KIND PROJECT ACTIVITIES (Version 01.0)" Para 5; A proposed project activity is the First-of-its-kind in the applicable geographical area if:

(a)The project is the first in the applicable geographical area that applies a technology that is different from any other technologies able to deliver the same output and that have started commercial operation in the applicable geographical area before the start date of the project; and

(b)Project participants selected a crediting period for the project activity that is a maximum of 10 years with no option of renewal;

The project activity is FOIK as illustrated below:-

Measure: the project activity is blending and hence 'feedstock switch'

- [20] **Different (FOIK) technology (by Scale)**: According to paragraph 8(c) of the tool, the technology can be FOIK based on size of installation is different.

The total volume of cement (output) produced by the project activity, would be twice larger (>+100%) than the production capacity of the biggest plant in the host country. Hence the project activity is Largest Scale and therefore first of its kind.

- **Different (FOIK) technology (by feedstock):** According to paragraph 8(b) of the tool, the technology can be FOIK based on feedstock

The project plant produces type CEMII/B-L and CEMIV/B for the first time in the host country. It will also produce type CEMII/B-P at an additive share level for the first time in the host country.

Hence the project activity is First of Its Kind by technology (i.e scale & feedstock).

Further to this the methodology meets the FOIK requirements of the specific Methodology as described below;

- **No Blending on the plant before:** "Only projects implementing blended cement projects for the first time are allowed to claim this barrier (i.e. project participants which are increasing the

[19]http://www.addisfortune.com/Vol_13_No_647_Archive/agenda.htm

http://www.addisfortune.com/Vol%2010%20No%20489%20Archive/ecconomic_commentary.htm

[20]Production plan compared with statistics in table 009

percentage of additives from a historical value to a higher value are not allowed to use this barrier).

The project plant is Greenfield and hence implements Blended cement for the first time (is not increasing clinker share from historical value).

- **Diffusion of technology:**5% threshold in the methodology page 5/36

As per the provision of the Methodology on page 5/36, FOIK can only be claimed if the market share for blended cement in the host country is below 5%. “The market share shall be calculated as the percentage of the amount of blended cement in the total amount of all cement types produced in the host country (tons blended cement/total tons cement production x 100%) during the last three years prior to: (a) the start date of the CDM project activity; or (b) the start of validation, whatever is earlier. The Start date of the project activity was August 14, 2009 while the start of Validation is November 2011. Hence the start date is earlier.

[21]The plant operator is a private entity. Data on private plants producing blended cements has been collected and compared with the total production of cement in the host country. Statistical data on cement types produced in each year (if any) from 2006 to 2007 has been acquired. There was no private cement plant operating in the host country in 2006 and hence the share of cement produced by private plants in 2006 is automatically [22]zero.

As shown on table 08,[23]the percentage of blended cement produced by all private plant owners in the host country in 2007 was less than 1% and in 2008 was 3.66%of the total cement produced in the host country, as shown in table 008b below and therefore first of its kind as per the provision of the further guidance on page 6/36 under the methodology. Furthermore;-

- Diffusion of CEMII/B-L and CEMIV/B cement types which are new to the host country is 0%.

		Produced and imported (tons)	
	Type of cement	2007	2008
1	CEM I cement produced in the host country	110,408.00	18,636.00
2	CEMII/B-P cement produced by private plants	12,547.20	89,820.00
3	CEMII/B-P cement produced and Imported by other plants	2,334,279.8	2,341,130.94
4	Cement CEM II/A-L produced and imported	0	0
5	CEM IV/B-P produced and imported	0	0
	Total	2,457,235	2,451,581

Table 008a: cement types produced/imported into host country before the start date

[21]The “Tool for the Demonstration and assessment of Additionality” version 07.0.0 under Para 20 footnote 5, describes the relevance of taking the identity of the project developer (investor) into account when establishing alternative scenarios of delivering a product, towards assessing Additionality.

[22]National cement privatized in 2006 started production in 2007 after renovation, as shown on supporting document

[23]Table 0.08a supported by the statistical data from plants in the Host Country submitted for validation to DOE

	% Share of each type of privately produced blended cement in national market,2007	% Share of each type of privately produced blended cement in national market,2008	Average of last three years	Remark
CEM I	-	-	-	not a blended cement
CEM II/B-L	0	0	0	< 5%
CEM II / B-P	0.01	3.45	2	< 5%
CEM IV / B	0	0	0	< 5%

Table 008b: % of penetration of blended cement types

Choice of crediting period: FOIK if PPs selected 'a maximum of 10 years with no option of renewal'.

- PPs have selected 10 years crediting period and hence FOIK.

As per the latest version of "Tool for the demonstration and assessment of Additionality" V06.0.0; if a measure is FOIK, sub step 3b does not apply and the project activity is *Additional*.

Step 4: Common practice analysis

The project activity fulfills "first of its kind" barrier. Hence no common practice test is required

No	[24]Name of cement plant in the host country before start date	Ownership/operation	Year plant commissioned	Average Annual Production statistics (tons)		
				CEM I	CEM II/B-P	CEMII/B-L, CEM IV/B
1	Mugher Cement	Federal Government Owned	1984		662,278.0	0
2	Mosobo cement	Regional government/	1999		798,963.0	0
3	[25]Dire Dawa/National cement	80% Privatized	2006	7,913.00	89,820.62	0
4	Abyssinia Cement	Private	2008	33,684.02		0
5	Jema Cement	Private	2008	26,966.90		0
6	Dejen(Dashen) Cement	Private	2008	10,723.02		0
7	Imported	Virtual plant	2008	621,029		
	Total Average annual(each), t			700,315.94	1,551,061.6	0
	Total average annual, t			2,251,377.54		0

[26]Table 009: Year 2008 annual production and import of cement types in other manufacturing plants in host country

[24]All of these cement plants contain clinker kiln and grinding equipment
[25] This plant is privatised in 2006 and started production in 2007 after renovation of a 70 year old plant
[26] Data obtained from Government Authorities as shown in Appendix 4

Conclusion:

The project activity is **Additional**.

Prior CDM consideration and continuous pursuit of carbon financing

The Start date of the project activity is August 14, 2008, which is after 2nd August 2008. PP's have notified prior CDM consideration to UNFCCC and DNA on November 9, 2009 and acknowledged by UNFCCC on November 17, 2009. Moreover, in complying with para 5 of annex 13 of EB 62, PPs informed the UNFCCC secretariat on November 17, 2011 (within two years of the initial notification) regarding its progress.

The following chronology of CDM events are recorded and documented showing early CDM consideration.

Time	Key Event	Importance	Documentation
January 2006	First feasibility completed for 5000tpd	Preliminary Cement Project study	Available
January 2007	Signed with a Technology supplier on Turnkey basis	Project office established at Addis Ababa	Design in parallel with feasibility study
June07, 2007	2% Advance to CNBM	to start design Equipment and civil structures in consultation with TEFR consultant	Receipt confirmation letter by CNBM
May 2007	Decided to apply for loan and financier requested revision of feasibility	TEFR revision and EIA preparation	Indicted on Final TEFR
June 17,2007	Initial comment on EIA from EPA		Letter from EPA
October 10, 2007	Initial letter of engagement of Ethan Bio-Fuels Ltd with MIDROC group for CDM projects identification	CDM promoted, Awareness created, Introduction of CDM project manager and CDM project development services	Letter with CEO of MIDROC Group and subsequent meetings
October 2007	Final Feasibility (TEFR) report completed for 5600 tpd capacity and estimated preliminary CO_2 emission from clinker production estimated	Shows the project technology, unit cost of raw materials, sources, availability and project equipment	Shown on final TEFR,
December 2007	EIA study completed,	Carbon Finance considered on section 6.2.1.1	Final EIA
January 17, 2008	Power transmission line Design and supervision contract signed with EEPCO	Design of Grid Power transmission line	Agreement

Time	Key Event	Importance	Documentation
January 27, 2008	letter for commercial agreement between EBF and Derba MIDROC for up scaling CDM	Further CDM awareness campaign to Derba, Scope of the envisaged CDM project activities and pre agreement negotiation meeting	Letter with Executive Director of Derba MIDROC
February 28, 2008	CDM project activities enhanced study document	Presentation of potentials, product possibilities , scope of abatement potential	CDM technical, feasibility & pre-implementation document
March 7,2008	Full advance to CNBM	Speed up plant design	Invoice
March 20, 2008	Derba CDM product (output) variety and plan	Assessment of abatement potential	Summary table
May 27,2008	Mining License	Concession for raw materials	License
May 28, 2008	Further Agreement between EBF and Derba MIDROC for up scaling CDM	Further scale up for baseline documentation, PDD development, CDM management and marketing	Letter with Executive Director of Derba MIDROC for NDA
June 14, 2008	Marketing efforts and networking	To secure buyers	Emails
June 23, 2008	Signing of Loan agreement with four banks for project financing	Financing agreement made but equity precondition to be fulfilled by Derba before actual disbursement.	Financiers' websites Agreement signing pages
June 30, 2008	NDA signed	Further Formalization	Agreement signing pages
October 8, 2008	Further agreement between EBF and Derba MIDROC for joint project development/up scaling	Baseline establishment and PDD writing started based on methodology	Agreement signing pages
October 21, 2008	Final EIA approval obtained	Federal clearance to enter site for any actual construction to start	Letter from EPA (14/02/2001 Ethiopian Calendar)
Ongoing from October	Marketing of CDM projects started	To engage Annex I buyer	Several Email Exchanges
November 12, 2008	Letter of No Objection	Host country endorsement	Letter from DNA (old project name)
January 9, 2009	First notice to the sponsor to effect EPC equipment payment	First Notice towards decision to invest on major equipment	Letter from Derba Executive to the sponsor
March 27,2009	EB ordered Methodology ACM 0005 on hold	Further Development of PDD and marketing kept on hold	Email alert news from UNFCCC
August 6,2009	Final notice to the sponsor to meet preconditions of debt finance	Final Notice to request for decision to invest on supply of major equipment	Letter from Derba Executive to the sponsor (**Board decision**)

Time	Key Event	Importance	Documentation
August 14, 2009	Derba fulfilled its equity contributionand reached its "point of no return"	Critical investment decision by settling major payment for equipments (**starting date of project activity**)	Two successive Bank transfers to CNBM
August 28, 2009	Visa requested for CNBM workers to enter the country	For starting to supply, erect and commission	Letter from Derba to Embassy of Ethiopia in Peoples Republic of China
September, 2009	Pumice extraction agreement with regional Authorities	Additive source acquisition through long term concession	Agreement signed
October 12, 2009	LOA requested	PDD (Version 1)	Letter to DNA
October 30, 2009	Revised Methodology ACM 005,V5 released	Further development of PDD	www.unfccc.int, EB 50
November 09, 2009	F-CDM-Prior consideration form filled/ dispatched	Prior consideration justification	www.unfccc.int, Email to UNFCCC and Letter to DNA office
November 17,2009	Notification of Prior consideration acknowledged by UNFCCC		Email response from UNFCCC CDM team
November 26, 2009	LOA obtained	Host Country Approval	Letter from DNA Ethiopia
December 2009	Start of Equipment import and erection	-	Maritime transit documents
December 23, 2010	Bank Loan Disbursement	Full scale implementation	Financiers' websites
Dec 2010 – May 2011	Marketing to engage Annex I participant and also waiting CDM loan scheme	To cover validation, registration, verification costs (not successful)	Emails Ex: email on 20/05/2010
May 2011 to August 2011	Validation DOE & cost assessment	To asses cost of engaging validation DOE	Emails Ex: email on 23/11/2011
September 2011	New FOIK and common practice guidance	PDD adjustment required	Annex to EB 62 report
November 17, 2011	Notification of extension of Prior Consideration notice	compliance of para 5 of annex 13 of EB 62	Email to and from UNFCCC
November 25, 2011	Methodology revised to ACM 0005 V6	PDD finalized to Version 2	Report of EB 65
November 28, 2011	Recent production plan	guide for production/output	Summary table
November 30, 2011	PP's signed DOE contract for validation	Validation kick start	Agreement
March 2012	Commissioning starts	Testing plant & equipment	Plan/newspaper
March 15, 2013	Final acceptance of plant	Full commissioning to start commercial production	Plan

Table 010; Prior CDM consideration and continued action chronology table

B.6. Emission reductions
B.6.1. Explanation of methodological choices

According to ACM0005 V07.1.0, the emissions reductions of the project activity during a given year "y" is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y). The project activity reduces CO_2 emissions through substitution of clinker in cement types by using blending materials.

Baseline Emission

The baseline emissions are a function of two factors:

- The benchmark of share of clinker in the blended cement types produced in the host country; and
- the CO_2 emissions per ton of clinker in the base year, which in turn depends on
  - Quantity and carbon intensity of the fuels used in clinker making;
  - Quantity and carbon intensity of electricity
  - CO_2 emissions from calcinations.

The methodology requires data from the base year to calculate the baseline emissions (Co_2 emissions per ton of clinker in the base year, i.e. $BE_{Clinker,BSL}$. Since the project plant is Greenfield, the base year is the first year of operation.

Since the project plant is new, ex-ante estimation for the preparation of PDD adapted data are obtained from

- technology supplier information,
- quarry test results,
- latest feasibility study used for plant procurement and
- Latest production plan.

Emission per ton of each blended cement type (BC) is determined using monitored values during each crediting year.

$$BE_y = BC_y*(BE_{clinker,y} * B_{Blend,y} + BE_{ele\_ADD\_BC}) \quad \textbf{(1)}$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2)
BC_y	=	Blended Cement produced and sold in the domestic market in year *y* (t BC)
$BE_{clinker,y}$	=	CO_2 emissions per tonne of clinker in year y (t CO_2/t clinker)
$B_{Blend,y}$	=	Baseline benchmark of share of clinker per tonne of BC updated for year *y* (t of clinker/t of BC)
$BE_{ele\_ADD\_BC}$	=	Baseline electricity emissions for BC grinding and preparation of additives (tCO_2/t of BC)

CO_2 emissions per tonne of clinker in year y (t CO_2/tonne clinker),is calculated as:

Step 1: Determination of $BE_{clinker,y}$

$$BE_{clinker,y} = \min(BE_{clinker,BSL}, PE_{Clinker,y}) \quad \textbf{(2)}$$

Where:

$BE_{clinker,y}$ = CO_2 emissions per tonne of clinker in year y (tCO_2/t clinker)
$BE_{clinker,BSL}$ = CO_2 emissions per tonne of clinker in the base year (tCO_2/t clinker)
$PE_{clinker,y}$ = CO_2 emissions per tonne of clinker in the project activity plant in year *y* (tCO_2/t clinker) (See project emission section below)

CO_2 emissions per tonne of clinker in the base year ($BE_{clinker,BSL}$) is calculated as:

Step 1.1: Determination of $BE_{clinker,BSL}$

$$BE_{clinker,BSL} = BE_{calcin} + BE_{fossil\ fuel} + BE_{ele,grid,CLNK} + BE_{ele,sg,CLNK} \quad \textbf{(3)}$$

Where:

$BE_{clinker,BSL}$ = CO_2 emissions per tonne of clinker in the base year (tCO_2/t clinker)
BE_{calcin} = Baseline emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate (tCO_2/t clinker)
$BE_{fossil\ fuel}$ = Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production (tCO_2/t clinker)
$BE_{ele,grid,CLNK}$ = Baseline grid electricity emissions for clinker production per tonne of clinker (tCO_2/t clinker)
$BE_{ele,sg,CLNK}$ = Baseline emissions from self-generated electricity for clinker production per tonne of clinker (tCO_2/t clinker)

Step 1.1.1: Determination of BE_{calcin}

Baseline emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate (BE_{calcin}) are calculated as:

$$\mathbf{BE_{Calcin} = [0.785*(OutCaO - InCaO) + 1.092*(OutMgO - InMgO)] / [CLNK_{BSL}]} \quad \textbf{(4)}$$

BE_{Calcin}= Emissions from the calcinations of limestone (tCO_2/t clinker)
0.785 = Stoichiometric emission factor for CaO (tCO_2/t CaO)
1.092 = Stoichiometric emission factor for MgO (tCO_2/t MgO)
InCaO = Baseline non-carbonated CaO content of the raw material (tCaO)
OutCaO = Baseline CaO content of the clinker in tCaO
InMgO = Baseline non-carbonated MgO content of the raw material (tMgO)
OutMgO = Baseline MgO content of the clinker (tMgO)
$CLNK_{BSL}$ = Annual production of clinker in the base year (t clinker)

Step 1.1.2: Determination of $BE_{fossil\ fuel}$

$$\mathbf{BE_{Fossil\_fuel} = [\ \Sigma FF_{i\_BSL} * EFF_i] / [CLNK_{BSL}]} \quad \textbf{(5)}$$

Where:

$BE_{fossilfuel}$= Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production (t CO_2/t clinker)
$FF_{i,BSL}$= Fossil fuel of type i consumed for clinker production in the base year (tfuel*i*)
EFF_i= Emission factor for fossil fuel i (t CO_2/t fuel)
$CLNK_{BSL}$ = Annual production of clinker in the base year (t clinker)

Step 1.1.3: Determination of $BE_{ele,grid,CLNK}$

$BE_{ele,grid,CLNK}$= [$BELE_{grid,CLNK}$* $EF_{grid,BSL}$] /$CLNK_{BSL}$ (6)
Where:

$BE_{ele,grid,CLNK}$= Baseline grid electricity emissions for clinker production per tonne of clinker ($t\ CO_2$/t clinker)
$BELE_{grid,CLNK}$= grid electricity consumed for clinker production in base year (MWh)
$EF_{grid,BSL}$= Baseline grid emission factor ($t\ CO_2$/MWh)
$CLNK_{BSL}$ = Annual production of clinker in the base year (t of clinker)

$EF_{grid,BSL}$ is the Ex-ante combined margin emission factor at the base year. The Ex-ante combined margin emission factor estimated in 2008 was0.00591tCO_2/MWh) and hence this value is neglegible.Hence$BE_{ele,grid,CLNK}$~0for ex-ante calculation only**.** However it will be [27]estimated on base year and included during the estimation of the crediting year.

Step 1.1.4: Determination of $BE_{ele,sg,CLNK}$

$BE_{elec,sg,CLNK}$= [$BELE_{sg,CLNK}$* $EF_{sg,BSL}$] /[$CLNK_{BSL}$] **(7)**

Where:

$BE_{elec,sg,CLNK}$= Baseline emissions from self-generated electricity for clinker production per tonne of clinker ($t\ CO_2$/tonne clinker)
$BELE_{sg,CLNK}$= self-generation of electricity consumed for clinker production in base year (MWh)
$EF_{sg,BSL}$= Baseline electricity self-generation emission factor ($t\ CO_2$/MWh)
$CLNK_{BSL}$ = Annual production of clinker in the base year (t of clinker)

The project activity plant doesn't have a captive power plant. Only in case of emergency, it will run an emergency 1701KW self-generated power currently installed. Since there is barely any incidence of interruption since commissioning, the ex-ante emissions reduction will consider zero electricity consumption from self generated electricity. However for the actual monitored value in base year will be used in calculating baseline emission in crediting period. i.e. the value $BELE_{sg,CLNK}$ is assumed zero. Hence$BE_{elec_sg_CLNK}$=0.

Step 2: Determination of $B_{Blend,y}$

The region for this project activity is defined as the host country.

***Step 2.1:* Determination of baseline benchmark of share of clinker per tonne of BC at the start of the project activity ($B_{Blend,1}$)**

Data concerning average blending ratio, annual production and import of the relevant cement type(s) in the region shall be collected for one year prior to the start date of CDM project activity. These relevant data for year 2008 has been collected and documented.

Bench mark has been set using the lowest value among (a) and (b) taking the national statistical data for year 2008 and taking into consideration the guidance in the methodology on consideration of imported cement. The national market has been taken as default. Since plant is Greenfield, option c is not considered.

As per the applied methodology page 19/34;

[27]Alternatively, the latest available Grid Emission Factor from DNA office will be used

"In case the project activity consists of production of more than one cement type, the emission reduction shall be calculated above for each cement type *i* produced." Hence benchmark has been calculated for each cement type of the project activity.

As per "Determination of baseline benchmark of share of clinker per tonne of BC at the start of project activity ($B_{Blend,1}$)" of the methodology, benchmark of each relevant cement type which shall be used in the calculation of the first year of each crediting period is determined as the lowest value among the following procedure,

a. average (weighted by production) mass percentage of clinker for the 5 plants producing cement with the highest share of additives of the relevant cement type in the region

    - Identify the amount of the relevant cement type produced for each plant in the region.
    - Determine average (weighted by production) mass fraction of clinker for the 5 plants producing cement with the highest share of additives of the relevant cement type in the region

b. Production weighted average mass percentage of clinker in the top 20% (in terms of share of additives) of the total production of the blended cement type in the region.

    - Identify the amount of the relevant cement type produced for each plant in the region.
    - Determine the production weighted average mass percentage of clinker in the top 20% (in terms of share of additives) of the total production of the blended cement type in the region.
    - If 20% falls on part capacity of a plant, that plant is included in the calculations; or

c. The mass percentage of clinker in the relevant cement type produced in the proposed project activity plant before the implementation of the CDM project activity, if applicable (For Greenfield cement plant this option shall not be included in the analysis). Since the project activity plant is Greenfield, this option is not considered.

Note: In addition to the above, if the average annual amount of the relevant cement type imported by the host country is more than 10% of the total production volume in the region, the average mass percentage of clinker in the relevant cement type imported shall also be considered in the analysis under (a) and (b) above as if it would be produced in a virtual one plant.

Since the amount of imported cement in year 2008 is more than 10% of the total production in the host country, this option will also be considered. All of cement imported was Ordinary Portland cement as shown in table 007 above and needs to fulfill all requirements for Ordinary Portland cement (including the minimum clinker share of [28]95% of the national cement standard) to obtain certificate of approval as to whether its specification meets the national standard. The Quality and Standards authority ([29]now the Ethiopian standards Agency) issues this certificate and the statistics used in this PDD is obtained from this Authority through letter dated March 2009.

Methodology also states that, to determine the benchmark for option (a) and (b), "If reliable and up to date annual data are available from reputable and verifiable external sources (for example, industry manufacturers association or government agencies), these may be used to determine the benchmark."

Therefore, data for year 2008 obtained from [30]regulatory government institutions is used to determine the bench mark. The base year benchmark share of clinker ($B_{Blend,1}$) that is calculated in respect of each cement type using the above guidance is as follows:

[28] E1177-1:2005; Page 8; Table 1 -The 27 products in the family of common cements
[29] http://www.ethiostandards.org/ESA/CommonPage.aspx?Id=1
[30]Letter from Quality and standards Authority (regarding import), Statistics collected by EPA

- CEMII/B-L and CEMIV/B: Year 2008 data from manufacturing plants producing CEMII/B-P has been assessed including imports using the guidance. There is no plant producing types CEMII/B-L and CEMIV/B. [31]Year 2008 import data shows that all of the cement imported into the host country is Portland cement type (which should contain at least 95% clinker) and the import volume constitutes > 10% of the total domestic production. As there is no local production of Limestone Cement (CEM II/B-L or CEM II/A-L) the imported/produced OPC cement should have constituted the baseline benchmark. However considering the issue being raised in request for review, PP's conservatively chose the baseline scenario to be production at the benchmark clinker share of CEM II/B-P and take the benchmark as 87.81%.

- Similarly in case of CEM IV/B, although it has not been produced locally before and imported OPC is the available alternative with comparative quality (meeting all the requirements of the standard), a conservative choice of alternative has been made, and taking cement with similar type of Additive (i.e Pumice) that has been produced locally. Hence the weighted average clinker share (87.81%) calculated as per the guidance in Step 2.1 of the methodology for CEM II/B-P produced in similar circumstances has been used as baseline benchmark.

- CEMII/B-P: Year 2008 data from manufacturing plants producing CEMII/B-P has been assessed including imports using the guidance in Step 2.1 of the methodology. As per step 2.1 of the methodology the weighted average clinker share of plants in similar economic/financial environment with project plant (i.e private plants) calculated is 87.81%. In line with the same, the following summary table shows the bench mark for each type obtained after the weighted average analysis. The spreadsheet showing full analysis is attached with PDD.

SN	Cement type	Benchmark Clinker share	Remark
1	CEM I	>95%	Not blended cement
2	CEM II/B-P	87.81%	CDM activity output
3	CEM II/B-L	87.81%	CDM activity output
4	CEM IV/B	87.81%	CDM activity output

Table 011: bench marks for cement types relevant to the project activity

Step 2.2: Updating of baseline benchmark of share of clinker per tonne of BC for year y within the Crediting period

The project participants shall recalculate the benchmark value for each crediting year y within the crediting period, starting from second year.

Baseline benchmark of share of clinker per tonne of BC updated for year y ($B_{Blend,y}$) is determined as Follows:-

The methodology states; 'For approaches (a) and (b) above, the project participants shall choose between two options to update the benchmark of share of clinker per tonne of BC',

The project participants have chosen to apply Option 2. Option 2 states:-

'Update the benchmark annually based on 2% default increase in the share of additives (i.e. decreasing share of clinker) up to the limit of the regulatory/product norm in the region/national market.'
As there is no accurate data regarding annual trend of increase in additives, project baseline benchmark update adapts option (2) with 2% annual increase in additives share, for the baseline. The annexed table

[31]Year 2006,2007, 2009,2010, 2011 import information also tells the same holds true

shows the benchmark updating trend and updated baseline blend level annually for each relevant cement type.

Example: For type CEMII/B-P; the initial year clinker share obtained through step 2.1 is, $B_{blend,\ 1}$ is 87.81%, and this means the additives share is 12.19% (i.e 100% -87.81%). On year 2, a 2% autonomous increase in additive share results in 12.19+2% (12.19%) = 12.43%. The clinker share therefore becomes 100-12.43%=87.57% and so on until it reaches 65% within the crediting period, which is the regulatory norm limit for this type of blended cement. The annual baseline clinker share for each of the project activity cement types should have been calculated like this for each crediting year.

The formula used in the Methodology (i.e $B_{Blend,y}=B_{Blend,1} \times (1-0.02)^{y}$) is not consistent with the respective text. While the text requires update through "2% increase in Additive share", the formula gives 86.05% clinker share in the second year, which is a 4 to 6% increase in additive share every year.

But since the issue was flagged twice in the registration process, we have adapted the formula in this revised version to avoid any more registration delay even though it is over conservative and is not consistent with the text. The effect of the formula is that it significantly decreased the baseline of the project activity every crediting year.

Where the benchmark for a specific blended cement type reaches the lowest allowable clinker share of the national standard before the end of crediting period, there would be no emission reduction from the specific blended cement type thereafter.

Step 2.3: Updating of baseline benchmark of share of clinker per tonne of BC at the renewal of the Crediting period

Since there is only one fixed crediting period, no renewal of benchmarks is required at end of the fixed crediting period.

Step 3: Determination of $BE_{ele,ADD,BC}$

$$BE_{ele,ADD,BC}= BE_{ele,grid,BC}+ BE_{ele,sg,BC}+ BE_{ele,grid,ADD}+ BE_{ele,sg,ADD} \quad \textbf{(8)}$$

Where:

$BE_{ele,ADD,BC}$= Baseline electricity emissions for BC grinding and preparation of additives (tCO2/tonne of BC)
$BE_{ele,grid,BC}$= Baseline grid electricity emissions for BC grinding (tCO2/tonne of BC)
$BE_{ele,sg,BC}$= Baseline self-generated electricity emissions for BC grinding (tCO2/tonne of BC)
$BE_{ele,grid,ADD}$= Baseline grid electricity emissions for additive preparation (tCO2/tonne of BC)
$BE_{ele,sg,ADD}$= Baseline self-generated electricity emissions for additive preparation (tCO2/tonne of BC)

- $EF_{grid,BSL}$ is the Ex-ante combined margin emission factor at the base year. The Ex-ante combined margin emission factor in 2008 was 0.00591tCO_2/MWh) and hence this value is negligible. Hence $BE_{ele,grid,BC}$ =$BE_{ele,grid,ADD}$= ~0 for ex-ante calculation only.However it will be monitored (estimated) on Base Year and included during the estimation of the crediting year.

- TEFR shows that the project requires 45 MVA power capacity that would be entirely met from Grid. The project activity plant doesn't have a captive power plant. Only in case of emergency, it will run an emergency 1701KW self-generated power currently installed. Since there is barely any incidence of interruption since commissioning, the ex-ante emissions reduction will consider a zero electricity consumption from self generated electricity. However for the actual monitored

value in base year will be used in calculating baseline emission in crediting period. i.e the value $BELE_{sg,CLNK}$ is assumed zero. Hence $BELE_{sg,BC}$ = $BELE_{sg,ADD}$ =0.

- Hence $BE_{ele,ADD,BC}$~0 for ex-ante CERs estimation purpose only. It will be calculated from the monitored value of the Base Year during the crediting period.

- Equations 9 to 12 are covered here

Project Emission

PE_{BC}, y are estimated as below. In the project activity plant emissions are determined per unit of clinker or per unit of BC accounting for:-

(i) Emissions from calcinations of limestone;

(ii) Emissions from combustion of fossil fuel and electricity for clinker production and processing of raw material;

(iii) Emissions from electricity used for additives preparation and grinding of cement.

$$PE_y = BC_y*(PE_{clinker,y} * P_{Blend,y} + PE_{ele,ADD,BC,y}) \quad \textbf{(13)}$$

Where:

PE_y = Project emissions in year *y* (tCO_2)

BC_y = Blended Cement produced and sold in the domestic market in year *y* (t BC)

$PE_{clinker,y}$ = CO_2 emissions per tonne of clinker in the project activity plant in year *y* (tCO_2/t clinker)

$P_{Blend,y}$ = Share of clinker per tonne of BC in year *y* (t clinker/t BC)

$PE_{ele,ADD,BC,y}$ = Electricity emissions for BC grinding and preparation of additives in year *y* (tCO_2/t BC)

CO_2 emissions per tonne of clinker in the project activity plant in year *y*, is calculated as below:

CO_2 per tonne of clinker in the project activity plant in year *y* is calculated as below:

Step 4: Determination of $PE_{clinker,y}$

$$PE_{clinker,y}= PE_{calcin,y}+ PE_{fossil\_fuel,y}+ PE_{ele\_grid\_CLNK,y}+ PE_{ele\_sg\_CLNK,y} \quad \textbf{(14)}$$

Where:

$PE_{clinker,y}$= Emissions of CO_2 per tonne of clinker in the project activity plant in year *y* (t CO_2/t clinker)
$PE_{calcin,y}$= Emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate in year *y* (t CO_2/t clinker)
$PE_{fossil,fuel,y}$= Emissions per tonne of clinker due to combustion of fossil fuels for clinker production in year *y* (t CO_2/t clinker)
$Pe_{ele,grid,CLNK,y}$= Grid electricity emissions for clinker production per tonne of clinker in year *y* (t CO_2/t clinker)
$Pe_{ele,sg,CLNK,y}$= Emissions from self-generated electricity per tonne of clinker production in year *y* (t CO_2/t clinker)

Step 4.1: Determination of $PE_{calcin,y}$

$PE_{calcin,y}$= 0.785*($OutCaO_y$- $InCaO_y$) + 1.092*($OutMgO_y$- $InMgO_y$) / [$CLNK_y$] **(15)**

Where:

$PE_{calcin,y}$= Emissions from the calcinations of limestone (tCO2/t clinker)
0.785 = Stoichiometric emission factor for CaO (tCO2/t CaO)
1.092 = Stoichiometric emission factor for MgO (tCO2/t MgO)
$InCaO_{,y}$= Non-carbonated CaO content of the raw material (tCaO)
$OutCaO_{,y}$= CaO content of the clinker (tCaO)
$InMgO_{,y}$= Non-carbonated MgO content of the raw material (tMgO)
$OutMgO_{,y}$= MgO content of the clinker (tMgO)
CLNKy = Clinker production in year y (t clinker)

Step 4.2: Determination of $PE_{fossilfuel,y}$

$PE_{fossil,fuel,\ y}$ = [$\Sigma FF_{i,,y}$* EFF_i] /$CLNK_{,y}$ **(16)**

Where:
$PE_{fossil,fuel,y}$= Emissions per tonne of clinker due to combustion of fossil fuels for clinker production in year *y* (t CO_2/t clinker)
$FF_{i,,y}$= Fossil fuel of type i consumed for clinker production in year *y* (t fuel *i*)
EFF_i= Emission factor for fossil fuel i (tCO_2/t fuel)
$CLNK_y$= Annual production of clinker in year *y* (t clinker)

Step 4.3: Determination of $PE_{ele,grid,CLNK,y}$

$PE_{ele,grid,CLNK,y}$= [$PELE_{grid,CLNK,y}$* $EF_{grid,y}$] / [$CLNK_y$] **(17)**

Where:

$PE_{ele,grid,CLNK,y}$= Grid electricity emissions for clinker production per tonne of clinker in year *y* (t CO_2/tonne clinker)
$PELE_{grid,CLNK,y}$= Grid electricity for clinker production in year *y* (MWh)
$EF_{grid,y}$= Grid emission factor in year *y* (t CO_2/MWh)
$CLNK_y$= Annual production of clinker in year *y* (kilotonnes of clinker)

$EF_{grid,y}$will be the Ex-ante Combined Margin Emission factor for the crediting year. However for ex-ante CERs estimation only it is assumed to be the Ex-ante combined margin emission factor in 2008 was 0.00591tCO_2/MWh)

Step 4.4: Determination of $PE_{ele,sg,CLNK,y}$

$PE_{elec,sg,CLNK,y}$= [$PELE_{sg,CLNK\ ,y}$* EF_{sg_y}] /[$CLNK_y$] **(18)**

Where:

$PE_{elec,sg,CLNK,y}$= Emissions from self-generated electricity per tonne of clinker production in year *y* (t CO_2/tonne clinker)
$PELE_{sg,CLNK,y}$= Self generation of electricity for clinker production in year *y* (MWh)

EF_{sg_y}= Emission factor for self-generated electricity in year *y* (t CO_2/MWh)
$CLNK_y$= Annual production of clinker in year *y* (kilotonnes of clinker)

TEFR shows that the project requires 45 MVA power capacity that would be entirely met from Grid. The project activity plant doesn't have a captive power plant. Only in case of emergency, it will run an emergency 1701KW self-generated power currently installed. Since there is barely any incidence of interruption since commissioning, the ex-ante emissions reduction will consider a zero electricity consumption from self generated electricity. Hence $PELE_{sg,CLNK,y}$ =0.$PE_{elec\_sg\_CLNK,y}$=0. However the actual monitored value in each crediting year will be used in calculating project emission in crediting period. $EF_{sg,y}$, will also be determined in each crediting period.

Step 5: Determination of $PE_{ele,ADD,BC,y}$

$$PE_{ele,ADD,BC,y} = PE_{ele,grid,BC,y} + PE_{ele,sg,BC,y} + PE_{ele,grid,ADD,y} + PE_{ele,sg,ADD,y} \quad \textbf{(19)}$$

Where:

$Pe_{ele,ADD,BC,y}$= Electricity emissions for BC grinding and preparation of additives in year *y*(tCO2/tonne of BC)
$Pe_{ele,grid,BC,y}$= Grid electricity emissions for BC grinding in year *y* (tCO_2/tonne of BC)
$Pe_{ele,sg,BC,y}$= Emissions from self-generated electricity for BC grinding in year *y* (tCO_2/tone of BC)
$Pe_{ele,grid,ADD,y}$= Grid electricity emissions for additive preparation in year *y* (tCO_2/tonne of BC)
$Pe_{ele,sg,ADD,y}$= Emissions from self-generated electricity additive preparation in year *y*(tCO_2/tonne of BC)

Step 5.1: Determination of $PE_{ele,grid,BC,y}$

$$PE_{ele\_grid\_BC,y} = PELE_{grid\_BC,y} * EF_{grid,y} / BC_y \quad \textbf{(20)}$$

Where:
$PE_{ele\_grid\_BC,y}$= Grid electricity emissions for BC grinding in year *y* (tCO_2/tonne of BC)
$PELE_{grid\_BC,y}$= Baseline grid electricity for grinding BC (MWh)
EF_{grid_y}= Grid emission factor in year *y* (t CO_2/MWh)
BC_y= Blended Cement produced and sold in the domestic market in year *y* (t BC)

$EF_{grid,y}$ will be the Ex-ante Combined Margin Emission factor for the crediting year. However for ex-ante CERs estimation only it is assumed to be the Ex-ante combined margin emission factor in 2008, which was 0.00591tCO_2/MWh). Hence $PE_{ele\_grid\_BC,y}$ =0

Step 5.2: Determination of $PE_{ele,sg,BC,y}$

$$PE_{elec\_sg\_BC,y} = [PELE_{sg\_BC,y} * EF_{sg\_y}] / [BC_y] \quad \textbf{(21)}$$

Where:

$PE_{elec\_sg\_BC,y}$= Emissions from self-generated electricity for BC grinding in year *y* (tCO_2/tonne of BC)
$PELE_{sg\_BC,y}$= Self-generated electricity for grinding BC in year *y* (MWh)
EF_{sg_y}= Emission factor for self-generated electricity in year *y* (t CO_2/MWh)
BC_y= Blended Cement produced and sold in the domestic market in year *y* (t BC)

TEFR shows that the project requires 45 MVA power capacity that would be entirely met from Grid. The project activity plant doesn't have a captive power plant. Only in case of emergency, it will run an emergency 1701KW self-generated power currently installed. Since there is barely any incidence of interruption since commissioning, the ex-ante emissions reduction will consider a zero electricity consumption from self generated electricity. Hence $PELE_{sg,BC,y}$ =0, $PE_{elec\_sg\_BC,y}$=0. However the actual monitored value in each crediting year will be used in calculating project emission in crediting period. $EF_{sg,y}$, will also be determined in each crediting period.

Step 5.3: Determination of $PE_{ele,grid,ADD,y}$

$PE_{ele\_grid\_ADD,y}$= [$PELE_{grid\_ADD}$* EF_{grid_y}] /[BC_y] **(22)**

Where:

$PE_{ele\_grid\_ADD,y}$= Grid electricity emissions for additive preparation in year *y* (tCO_2/tonne of BC)
$BPELE_{grid\_ADD,y}$= Baseline grid electricity for grinding additives (MWh)
EF_{grid_y}= Grid emission factor in year *y* (t CO_2/MWh)
BC_y= Blended Cement produced and sold in the domestic market in year *y* (t BC)

$EF_{grid,y}$ will be the Ex-ante Combined Margin Emission factor for the crediting year which will be calculated at the base year. However for ex-ante CERs estimation only it is assumed to be the Ex-ante combined margin emission factor in 2008, which was 0.00591tCO_2/MWh). Hence $PE_{ele\_grid\_ADD,y}$ =0

Step 5.4: Determination of $PE_{ele,sg,ADD,y}$

$PE_{elec\_sg\_ADD,y}$= [$PELE_{sg\_ADD,y}$* EF_{sg_y}] / [BC_y] **(23)**

Where:

$PE_{elec\_sg\_ADD,y}$= Emissions from self-generated electricity additive preparation in year *y* (tCO_2/tonne of BC)
$PELE_{sg\_ADD,y}$= Baseline self-generation electricity for grinding additives (MWh)
EF_{sg_y}= Emission factor for self-generated electricity in year *y* (t CO_2/MWh)
BC_y= Blended Cement produced and sold in the domestic market in year *y* (t BC)

TEFR shows that the project requires 45 MVA power capacity that would be entirely met from Grid. The project activity plant doesn't have a captive power plant. Only in case of emergency, it will run an emergency 1701KW self-generated power currently installed. Since there is barely any incidence of interruption since commissioning, the ex-ante emissions reduction will consider zero electricity consumption from self generated electricity. Hence $PELE_{sg\_ADD,y}$=0.$PE_{elec\_sg\_ADD,y}$=0. However the actual monitored value in each crediting year will be used in calculating project emission in crediting period. $EF_{sg,y}$, will also be determined in each crediting period.

Therefore, after summation of the above zero values, $PE_{ele,ADD,BC,y}$= 0 for ex-ante CERs estimation only.

Leakage

Leakage emissions consist of:

- Leakage emissions due to transport of additional additives; and
- Leakage emissions due to the diversion of additives from existing uses.

$LE_y = LE_{TR,y} + LE_{ADD,y}$ **(28)**

Where:

LE_y = Leakage emissions in year y (t CO2)
$LE_{TR,y}$ = Leakage emissions due to transport of additional additives in year y (t CO2)
$LE_{ADD,y}$ = Leakage emissions due to the diversion of additives from existing uses in year y (t CO2)

***Step 7:* Determination of leakage emissions due to transport of additional additives**

Leakage emissions due to transport of additional additives in year y ($LE_{TR,y}$) are calculated applying the latest approved version of the methodological tool "Project and leakage emissions from road transportation of freight" where $LE_{TR,y}$ corresponds to $LE_{TR,m}$ in the tool, and $Q_{ADD,y}$ corresponds to $FR_{f,m}$ in the tool.

Step 7.1: Determination of $Q_{ADD,y}$

Determination of $Q_{ADD,y}$

$Q_{ADD,y} = (A_{PJ,blend,y} - A_{BSL,blend,y}) \times BC_y$ **(29)**

Where:

$Q_{ADD,y}$ = Quantify of additional additives transported in year y (t additives). This parameter shall be used instead of $FR_{f,m}$ in the tool 'Project and leakage emissions from road transportation of freight'"
BC_y = Blended cement produced and sold in the domestic market in year y(t BC)
$A_{PJ,blend,y}$ = Share of additives per tonne of BC in year y (t additives/t BC)
$A_{BSL,blend,y}$ = Baseline share of additives per tonne of BC updated for year y (t additives /t BC)

From the tool;

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

Where:
$PE_{TR,m}$= Project emissions from road transportation of freight monitoring period *m* (t CO_2)
$LE_{TR,m}$= Leakage emissions from road transportation of freight monitoring period *m* (t CO_2)
$D_{f,m}$= 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 CO_2 emission factor for freight transportation activity *f* (g CO_2 / t km)
f = Freight transportation activities conducted in the project activity in monitoring period *m*

A value of $D_{f,m}$(since a fixed source)and $EF_{CO2,f}$ (taking the default value in the tool) have been proposed ex-ante.

***Step 8:* Determination of leakage emissions due to the diversion of additives from existing uses**

As per the guidance in the methodology, L1; 'Demonstrate that at the sites from where the project activity is receiving additives, the additives have not been collected or utilized but have been dumped, land-filled, not excavated or burnt prior to the implementation of the project activity. Demonstrate that this practice would continue in the absence of the CDM project activity, e.g. by showing that in the monitored period

no market has emerged for the additives considered, no price has been allocated for the additives other than transport, excavation and/or processing or by showing that it would still not be feasible to utilize the additives for any purposes (e.g. due to the remote location where the additives are generated). At the renewal of crediting period, the project participants shall re-demonstrate this requirement. This approach is applicable to situations where project participants use only additives from specific sites and do not purchase additives from the market. During each verification, the DOE shall check that the additives are sourced from the same site as indicated in the PDD.'

Where project participants wish to use approach L1 and did not meet the above condition in L1, the leakage emissions due to the diversion of additives from existing uses in year *y* shall be calculated as Follows;

$LE_{ADD,y} = (BE_y - PE_y) \times \alpha_y$ **(30)**

Where:

$LE_{ADD,y}$= Leakage emissions due to the diversion of additives from existing uses in year *y* (t CO_2)
BE_y= Baseline emissions in year y (t CO_2)
PE_y= Project emissions in year y (t CO_2)

α_y= *Leakage penalty factor in year y (fraction)*

Step 8.1: Determination of α_y

$\alpha_y = ADD_{NS,y} / ADD_y$ **(31)**

Where:

α_y= Leakage penalty factor in year y (fraction)
$ADD_{NS,y}$= Amount of additives used for BC production in project plant for which the project participants could not substantiate that they are surplus in year *y* (t additives)
ADD_y= Amount of additives used for BC production in project plant in year *y* (t additives)

Where project participants wish to use approach L2 and did not meet the above condition in L2 in any of the crediting year, emission reductions for that crediting year shall be regarded as zero.

Emission Factor

Grid Emission Factor

As per step 6.1; "Baseline grid emission factor ($EF_{grid,BSL}$) and grid emission factor in year *y* ($EF_{grid,y}$) shall be calculated using the latest version of the [32]Tool to calculate the emission factor for an electricity system".[33]Grid emission factor will be calculated using ex-ante combined margin emission factor of the grid.

For the sake of Ex-ante CERs estimation only, the Ex-ante combined margin grid emission factor calculated in 2008 from three years data available by Ethiopian DNA supported by the Austrian

[32]Please refer to: <http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>.
[33]Alternatively latest available Grid Emission factor from host country DNA will be used

Government is 0.00591tCO_2/MWh. The full calculation document has been submitted to validating DOE. The value is negligible since the host country had a hydro dominated grid.

Emission Factor for Self Generated Power

The methodology reads; "For cement plants that self-generate power, the average annual emission factor of the self-generated power can be substituted by the emission factor calculated below."

Emission factor for self generated electricity in the base year ($EF_{sg,BSL}$) is calculated as the generation-weighted average emissions per electricity unit (t CO_2/MWh) of all self-generating sources in the project boundary serving the system in the base year.

$$EF_{sg,BSL} = \frac{\sum_{m,n} F_{m,n,BSL} \times COEF_m}{\sum_n GEN_{n,BSL}} \quad \textbf{(1)}$$

Where:

$EF_{sg,BSL}$	=	Emission factor for self generated electricity in the base year (t CO_2/MWh)
$F_{m,n,BSL}$	=	Amount of fuel *m* consumed by relevant power sources *n* in the base year(mass or volume unit)
n	=	On-sitepower sources
$COEF_m$	=	CO_2 emission coefficient of fuel *m*, taking into account the carbon content of the fuels used by relevant power sources *n* and the percent oxidation of the fuel in the base year (t CO_2/mass or volume unit)
$GEN_{n,BSL}$	=	Electricity generated by the source *n* in year *y* (MWh)

CO_2 emission coefficient of fuel *m* ($COEF_m$) is obtained as:

$$COEF_m = NCV_m \times EF_{CO2,m} \times OXID_m \quad \textbf{(2)}$$

Where:

$COEF_m$	=	CO_2 emission coefficient of fuel *m*, taking into account the carbon content of the fuels used by relevant power sources *n* and the percent oxidation of the fuel in the base year (t CO_2/mass or volume unit)
NCV_m	=	Net calorific value per mass or volume unit of a fuel *m* (GJ/ mass or volume unit)
$OXID_m$	=	Oxidation factor of the fuel *m*
$EF_{CO2,m}$	=	CO_2 emission factor per unit of energy of the fuel *m* (t CO_2/GJ)

The emission factor for self generated electricity in year *y* ($EF_{sg,y}$) is calculated as the generation-weighted average emissions per electricity unit (t CO_2/MWh) of all self-generating sources in the project boundary serving the system in year *y*.

$$EF_{sg,y} = \frac{\sum_{k,j} F_{k,j,y} \times COEF_k}{\sum_j GEN_{j,y}} \quad \textbf{(3)}$$

Where:

$EF_{sg,y}$	=	Emission factor for self generated electricity in year *y* (t CO_2/MWh)
$F_{k,j,y}$	=	Amount of fuel *k* consumed by relevant power sources *j* in year *y* (mass or volume unit)
j	=	On-sitepower sources
$COEF_k$	=	CO_2 emission coefficient of fuel *k*, taking into account the carbon content of the fuels

		used by relevant power sources *j* and the percent oxidation of the fuel in year *y* (t CO_2/mass or volume unit)
$GEN_{j,y}$	=	Electricity generated by the source *j* in year *y* (MWh)

CO_2 emission coefficient of fuel *k* ($COEF_k$) is obtained as:

$$COEF_k = NCV_k \times EF_{CO2,k} \times OXID_k \qquad \textbf{(4)}$$

Where:

$COEF_k$	=	CO_2 emission coefficient of fuel *k*, taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year *y* (t CO_2/mass or volume unit)
NCV_k	=	Net calorific value per mass or volume unit of a fuel *k* (GJ/ mass or volume unit)
$OXID_k$	=	Oxidation factor of the fuel *k* (see page 1.29 in the 1996 Revised IPCC Guidelines for default values)
$EF_{CO2,k}$	=	CO_2 emission factor per unit of energy of the fuel *k*(t CO_2/GJ)

Emission Reduction

$$ER_y = BE_y - PE_y - LE_y \qquad \textbf{(32)}$$

Where:

ER_y	=	Emissions reductions in year *y* due to project activity in year *y* (tCO_2)
BE_y	=	Baseline emissions in year *y* (tCO_2)
PE_y	=	Project emissions in year *y* (tCO_2)
LE_y	=	Leakage emissions due to transport of additives in year *y* (tCO_2)

Methodology includes guidance in case of negative emission reduction, i.e “In the case that overall negative emission reductions arise in a year, emission reductions are not issued to project participants for the year concerned and in subsequent years, until emission reductions from subsequent years have compensated the quantity of negative emission reductions from the year concerned. (For example: if negative emission reductions of 30 tCO_2e occur in the year t and positive emission reductions of 100 tCO_2e occur in the year t+1, 0 CERs are issued for year t and only 70 CERs are issued for the year t+1.)”

Moreover, for multiple types of cement (output), it says; “In case the project activity consists of production of more than one cement type, the emission reduction shall be calculated following equation 1 to 9 above for each cement type *i* produced. The total emission reduction from the project activity shall be calculated as the sum of emission reductions for all cement types *i* produced.”

B.6.2. Data and parameters fixed ex ante

Data / Parameter:	[34]EF_{grid_BSL}
unit:	tCO_2/MWh
Description:	Baseline grid Emission factor
Source of data:	Calculated using tool
Value(s) applied:	0.0
choice of data or measurement methods and procedures	The Ex ante Combined Margin grid emission factor for the grid calculated in year 2008 is 0.00591 tCO_2/MWh.
Purpose of data	Used in Equations 6 and 8

[34]Hence $BELE_{grid,ADD}$, $BELE_{grid,BC}$, $BELE_{grid,CLNK}$ data for the Base Year are not required for ex-ante CERs estimation

Any comment:	Assumption for Ex Ante CERs calculation only. It will be calculated at the Base Year using the latest version of the "Tool to calculate the emission factor for an electricity system" or will obtain latest value from DNA

Data / Parameter:	$EF_{grid\ y}$
unit:	tCO_2/MWh
Description:	Grid Emission factor in year y
Source of data:	Calculated using tool
Value(s) applied:	[35]0.0
choice of data or measurement methods and procedures	The Ex ante Combined Margin grid emission factor for the grid calculated in year 2008 is 0.00591 tCO_2/MWh.
Purpose of data	Used in Equations 6 and 8
Any comment:	Assumption for Ex Ante CERs calculation only. PPs will calculate using latest version of grid tool or take the latest available Grid emission factor at or after the base year for calculating Ex-Post emission reduction.
Data / Parameter:	$B_{Blend,y}$
unit:	%
Description:	Baseline benchmark of share of clinker per tonne of BC updated for year y
Source of data:	Calculated using the guidance in the methodology
Value(s) applied:	No / Type of Blended cement / $B_{Blend,1}$ / $B_{Blend,y}$: 1 / CEMII/B-P / 87.81% / Updated 2 / CEMII/B-L / 87.81% / Updated 3 / CEM IV/B / 87.81% / Updated
choice of data or measurement methods and procedures	Statistical data on other cement plants prior to start date i.e for year 2008 analysed
Purpose of data	Used in equation 1
Any comment:	updated every year with 2% decline in additive share as per the formula in the guidance

Data / Parameter:	EFF_{Coal}
unit:	tCO_2/t coal
Description:	Emission factor for coal
Source of data:	TEFR and IPCC default for Anthracite coal for stationary combustion
Value(s) applied:	2.57
choice of data or measurement methods and procedures	The type of coal used specified in feasibility study to be imported from south Africa is Anthracite coal with NCV of 6250 Kcal/Kg and hence used here as a basis of calculation.
Purpose of data	Used in equation 5
Any comment:	For Ex Ante CERs estimation only

Data / Parameter:	$FF_{i,BSL}$
unit:	t fuel
Description:	Fossil fuel of type i consumed for clinker production in the base year
Source of data:	TEFR
Value(s) applied:	218,064
choice of data or	

[35]Hence $PELE_{grid,ADD}$, $PELE_{grid,BC}$, $PELE_{grid,CLNK}$ data for year "y" are not required for ex-ante CERs estimation

measurement methods and procedures	TEFR suggests 0.118t/t clinker consumption is expected as per kiln design
Purpose of data	Used in equation 5
Any comment:	For Ex Ante CERs estimation only

Data / Parameter:	$F_{m,n,BSL}$
unit:	in a mass or volume unit
Description:	Amount of fuel *m* consumed by relevant power sources *n* in the base year
Source of data:	TEFR
Value(s) applied:	[36]0
choice of data or measurement methods and procedures	No fossil fuel captive power plant is installed by the project matching the power demand of 45 MVA. Only emergency diesel generator of 1701KW has been installed. It is assumed that no emergency fossil fuel will be consumed during the base year i.e $GEN_{n,BSL}$= 0
Purpose of data	Used in equations 7,10,12
Any comment:	Assumption for Ex Ante CERs calculation only and will be monitored for each crediting year.

Data / Parameter:	$F_{k,j,y}$
unit:	in a mass or volume unit
Description:	Amount of fuel *k* consumed by relevant power sources *j* in year y
Source of data:	Assumption
Value(s) applied:	[37]0
choice of data or measurement methods and procedures	The plant is Greenfield and connected to national grid. No fossil fuel captive power plant has been installed matching the power demand of 45MVA planned to be sourced from Grid. Only emergency diesel generator of 1701KW has been installed. It is assumed for ex-ante purpose only that no emergency fossil fuel will be consumed during the crediting period i.e $GEN_{j,,y}$= 0
Purpose of data	Used in equations 7,10,12
Any comment:	Assumption for Ex Ante CERs only and will be monitored for each crediting year

Data / Parameter:	$CLNK_{BSL}$
unit:	t Clinker
Description:	Annual production of clinker in the base year
Source of data:	TEFR
Value(s) applied:	1,848,000
choice of data or measurement methods and procedures	daily clinker output (guaranteed design minimum) of kiln is 5600 tons and is planned to operate for 330 working days in a year.
Purpose of data	Used in equation 3
Any comment:	For Ex Ante CERs estimation only

Data / Parameter:	InCaO
unit:	tCaO
Description:	Base Year non-carbonated CaO content in the raw material
Source of data:	Assumption
Value(s) applied:	0.00

[36]Hence $BELE_{sg,ADD}$, $BELE_{sg,BC}$, $BELE_{sg,CLNK}$ data for the Base Year are not required for ex-ante CERs estimation
[37]Hence $PELE_{sg,ADD}$, $PELE_{sg,BC}$, $PELE_{sg,CLNK}$ data for the Base Year are not required for ex-ante CERs estimation

choice of data or measurement methods and procedures	This value is mass %CaO x Q_{rm}. It is assumed there would be no impurities in the raw material sources in raw mix. Hence %CaO contributed from raw materials (impurities) is assumed zero. Hence InCaO becomes zero.
Purpose of data	Used in equation 4
Any comment:	For Ex Ante CERs estimation only

Data / Parameter:	InMgO
unit:	t MgO
Description:	Base year non-carbonated MgO content in raw material
Source of data:	Assumption
Value(s) applied:	0.00
choice of data or measurement methods and procedures	This value is mass %MgO x Q_{rm}. It is assumed there would be no impurities in the raw material sources in raw mix. Hence %MgO contributed from raw materials (impurities) is assumed zero. Hence InMgO becomes zero.
Purpose of data	Used in equation 4
Any comment:	For Ex Ante CERs estimation only

Data / Parameter:	Q_{rm}
unit:	t raw material
Description:	Quantity of clinker raw materials in the base year
Source of data:	TEFR
Value(s) applied:	Not required
choice of data or measurement methods and procedures	As indicated in above tables, it is assumed no impurities or correctives contributing free lime are used and hence this value is multiplied by zero.
Purpose of data	Used in equation 4
Any comment:	For Ex Ante CERs estimation only

Data / Parameter:	OutMgO
unit:	tMgO
Description:	Baseline MgO content in Clinker
Source of data:	TEFR
Value(s) applied:	63,756
choice of data or measurement methods and procedures	This value is % MgO x $CLNK_{BSL.}$ The mass percentage of MgO in clinker (%): 3.45%
Purpose of data	Used in equation 4
Any comment:	For Ex Ante CERs estimation only

Data / Parameter:	OutCaO
unit:	tCaO
Description:	Base year CaO content in Clinker
Source of data:	TEFR
Value(s) applied:	1,183,644
choice of data or measurement methods and procedures	This value is % MgO x $CLNK_{BSL.}$ The mass percentage of CaO in clinker (%): 64.05%
Purpose of data	Used in equation 4
Any comment:	For Ex Ante CERs estimation only

Data / Parameter:	$BE_{ele\_ADD\_BC}$
unit:	tCO_2/t BC
Description:	Baseline electricity emissions for BC grinding and preparation of additives
Source of data:	Multiplication with zero
Value(s) applied:	0.00
choice of data or measurement methods and procedures	• EF_{grid_BSL}= $EF_{grid\ y}$ ~0.00 and • there is no and would not be any fossil fuel run self- generated electricity, except for short duration emergency i.e$GEN_{n,BSL}$=0
Purpose of data	Used in equation 1
Any comment:	For Ex Ante CERs estimation only

Data / Parameter:	$D_{f,m}$
unit:	Km
Description:	Return trip road distance between the origin and destination of freight transportation activity *f* in monitoring period *m* (km)
Source of data:	TEFR
Value(s) applied:	250
choice of data or measurement methods and procedures	AlemTena, where the pumice is going to be transported from, is 125km from plant site.
Purpose of data	Calculation of Leakage using the tool
Any comment:	For Ex Ante CERs Estimation only

Data / Parameter:	$EF_{CO2,f}$
unit:	g CO_2 / t km
Description:	Default CO_2 emission factor for freight transportation activity *f* (g CO_2 / t km)
Source of data:	Default provided in the tool
Value(s) applied:	129
choice of data or measurement methods and procedures	Emission factor of Diesel. Diesel is the commonly used transport fuel in material freight trucks purchased by plant owner
Purpose of data	Calculation of Leakage using the tool
Any comment:	Fixed ex ante for the crediting period

Data / Parameter:	BC_y
unit:	t BC
Description:	BC produced and sold in the domestic market in year *y* (t BC)
Source of data:	Tentative Production plan
Value(s) applied:	Variable for each BC type
choice of data or measurement methods and procedures	The plant is Greenfield. For Ex ante CERs estimation, the tonnage of each type of blended cement as per production plan for the next ten years is taken (actual will be monitored during crediting period)
Purpose of data	Used in equation 1
Any comment:	For Ex Ante CERs Estimation only

Data / Parameter:	A_y
unit:	Km
Description:	Penalty factor
Source of data:	TEFR
Value(s) applied:	0
choice of data or measurement methods and procedures	Pumice quarry at AlemTena, where the pumice is going to be excavated and transported from, is held under concession by plant owner. There would be no diversion of pumice from existing use. Limestone quarry at the plant site, where limestone is going to be excavated and transported from is held under concession by plant owner. There would be no diversion of Limestone.
Purpose of data	To check if diversion from existing use exists
Any comment:	For Ex Ante CERs estimation only

B.6.3. Ex ante calculation of emission reductions

The complete summary of the Ex-ante calculation of emission reduction is shown in Annex 4. The calculation/estimation is also provided in reproducible spread sheet format as an annex to the PDD.

B.6.4. Summary of ex-ante estimates of emission reductions

The starting date of the first crediting year is expected after the date of registration.

Year	**Baseline Emissions (t CO_{2e}**	**Project Emissions (tonnes of CO_{2e})**	**Leakage Emissions (t CO_{2e}**	**Emissions Reductions (tCO_{2e})**
2013	**1,896,184.81**	**1,403,634.03**	**18,822.24**	**473,728.54**
2014	**1,894,319.71**	**1,403,634.03**	**18,750.97**	**471,934.72**
2015	**1,873,119.74**	**1,398,520.61**	**13,953.52**	**460,645.62**
2016	**1,863,753.31**	**1,388,038.09**	**14,318.22**	**461,397.00**
2017	**1,848,701.19**	**1,395,567.16**	**13,770.91**	**439,363.12**
2018	**1,823,189.54**	**1,403,634.03**	**12,797.04**	**406,758.47**
2019	**1,786,725.74**	**1,370,800.48**	**12,961.42**	**402,963.84**
2020	**1,799,179.18**	**1,377,150.37**	**13,491.71**	**408,537.11**
2021	**1,803,572.29**	**1,375,561.35**	**14,011.41**	**413,999.53**
2022	**1,812,121.38**	**1,383,724.32**	**14,311.45**	**414,085.60**
Total	**18,400,866.90**	**13,900,264.46**	**147,188.87**	**4,353,413.56**
Total number of crediting years				**10**
Annual average over the crediting period				**435,341.36**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter:	Q_{rm}
Unit:	t raw materials
Description:	Quantity of clinker raw material used in the base year
Source of data:	On-site measurements in plant records
Value(s) applied	
Measurement methods and procedures	Weight meters i.e. weigh feeder is used connected to CCR
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored daily will be compared with the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in base year
Additional comment	In case of greenfield cement plants, this parameter shall be determined based on the monitoring value of first operational year. i.e $Q_{rm,y,1}$=Q_{rm}. This parameter is used to calculate InCaO and InMgO

Data/Parameter:	$CLNK_{BSL}$
Unit:	t clinker
Description:	Annual production of clinker in the base year
Source of data:	On-site measurements in plant records
Value(s) applied	1,848,000
Measurement methods and procedures (if any):	Weight meters i.e. weighfeeder is used connected to CCR
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in base year
Additional comment	In case of greenfield cement plants this parameter shall be determined based on the monitoring value or calculation from data in first operational year. i.e$CLNK_{y,1}$=$CLNK_{BSL}$

Data/Parameter:	$FFi,_{BSL}$
Unit:	t fuel
Description:	Fossil fuel of type I consumed for production of clinker in the base year
Source of data:	On-site measurements in plant records
Value(s) applied	218,064
Measurement methods and procedures (if	Weight meters i.e. weighfeeder is used connected to CCR

any):	
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in base year
Additional comment	In case of greenfield cement plants this parameter shall be determined based on the monitoring value of first operational year. i.e $FFi_{y,1}=FFi_{BSL}$

Data/Parameter:	InCaO
Unit:	tCaO
Description:	Baseline non-carbonated CaO content in the raw material in the base year
Source of data:	On-site % non-carbonated CaO measurements in plant records and calculated as the non-carbonated CaO content (%) of the raw material times total raw material used to produce clinker (Q_{rm})
Value(s) applied	0
Measurement methods and procedures	X-ray Efflorescence connected to recording computer or using conventional lab test
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored daily will be compared with the records of the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in base year
Additional comment	In case of greenfield cement plants this parameter shall be determined based on the monitoring value of first operational year. i.e $InCaO_{y,1}=InCaO$

Data/Parameter:	InMgO
Unit:	tMgO
Description:	Baseline non-carbonated MgO content in the raw material in the base year
Source of data:	On-site % non-carbonated MgO measurements in plant records and calculated as the non-carbonated MgO content (%) of the raw material times total raw material used to produce clinker (Qrm)
Value(s) applied	0
Measurement methods and procedures (if any):	X-ray Efflorescence connected to recording computer or using conventional lab test
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored daily will be compared with the the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in base year
Additional	

comment	In case of greenfield cement plants this parameter shall be determined based on the monitoring value of first operational year. i.eInMgO$_{y,1}$=InMgO

Data/Parameter:	OutCaO
Unit:	tCaO
Description:	Baseline non-carbonated CaO content in Clinker in the base year
Source of data:	On-site % CaO measurements in plant records and calculated as the CaO content (%) of the clinker times clinker produced [$CLNK_{BSL}$]
Value(s) applied	1,183,644
Measurement methods and procedures (if any):	X-ray Efflorescence connected to recording computer or using conventional lab test
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored daily will be compared with the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in base year
Additional comment	In case of greenfield cement plants this parameter shall be determined based on the monitoring value of first operational year. i.eOutCaO$_{y,1}$ =OutCaO

Data/Parameter:	OutMgO
Unit:	tMgO
Description:	Baseline non-carbonated CaO content in Clinker in the base year
Source of data:	On-site %MgO measurements in plant records and calculated as the MgO content (%) of the clinker times clinker produced [CLNKBSL]
Value(s) applied	63,756
Measurement methods and procedures :	X-ray Efflorescence connected to recording computer or using conventional lab test
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored daily will be compared with the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in base year
Additional comment	In case of greenfield cement plants this parameter shall be determined based on the monitoring value of first operational year. i.eOutMgO$_{y,1}$ =OutMgO

Data/Parameter:	BC_{BSL}
Unit:	t BC
Description:	Blended Cement produced and sold in the domestic market in the base year (t BC)
Source of data:	On-site measurements in plant records
Value(s) applied	Production plan
Measurement methods and procedures (if any):	Weight meters i.e. weighfeeder is used connected to CCR and then cross checked with domestic sales and export record in respect of each type of cement classified as per the clinker share in the Ethiopian standard. The total cement produced under each type/brand in a given year reduced by the total cement exported under each type/brand in a given year, will give the cement domestically sold in each crediting

	year. Only the quantity of blended cement sold/utilized in the domestic market will be considered. (exported cement will be excluded/reduced from total)
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in base year
Additional comment	In case of greenfield cement plants this parameter shall be determined based on the monitoring value of first operational year.i.e.$BC_{i,y,1}$= BC_{BSL}

Data / Parameter:	BC_y
Unit:	t BC
Description:	Blended Cement produced and sold in the domestic market in year *y* (t BC)
Source of data:	Production plan
Value(s) applied	Since CDM project activity produces three types each cement type will be monitored and values applied
Measurement methods and procedures (if any):	Use weight meter i.e. weighfeeder is used and then cross checked with domestic sales record and export in respect of each type of cement classified as per the clinker share in the Ethiopian standard. The total cement produced under each type/brand in a given year reduced by the total cement exported under each type/brand in a given year, will give the cement domestically sold in each crediting year. Only the quantity of blended cement sold in the domestic market will be considered. (exported cement will be excluded)
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in equation 13
Additional comment	Actual quantity of each type of cement classified based on type of Additive and clinker share will be in used Ex-post calculation

Data / Parameter:	$P_{Blend,y}$
Unit:	t clinker/t BC
Description:	Share of clinker per tonne of BC in year *y*
Source of data:	On-site measurements in plant records
Value(s) applied	Production plan for ex-ante calculation
Measurement methods and procedures (if	Use weight meter i.e. weighfeeder is used

any):	
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in equation 13
Additional comment	All data from these meters will be displayed on computers in CCR. Actual values will be used in ex-post calculation

Data / Parameter:	$Q_{rm,y}$
Unit:	t raw materials
Description:	Quantity of clinker raw material used in year *y*
Source of data:	On-site measurements in plant records
Value(s) applied	
Measurement methods and procedures (if any):	Use weight meter i.e. weigh feeder is used
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored daily will be compared with the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Parameter required to calculate $InCaO_y$ and $InMgO_y$
Additional comment	All data from these meters will be displayed on computers in CCR

Data / Parameter:	$CLNK_y$
Unit:	t clinker
Description:	Clinker production in year *y*
Source of data:	On-site measurements in plant records
Value(s) applied	1,848,000
Measurement methods and procedures (if any):	Use weight meter i.e. weighfeeder is used
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in equation 15,16,17,18
Additional comment	All data from these meters may be displayed on computers in CCR

Data / Parameter:	$FF_{i,y}$
Unit:	t fuel
Description:	Fossil fuel of type i consumed for clinker production in year *y*
Source of data:	On-site measurements in plant records
Value(s) applied	218,064
Measurement	Use weight meter i.e. Weigh-feeders are used in case of solid fuels and flow meters

methods and procedures (if any):	in case of liquid fuels
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	Used in Equation 16
Additional comment	All data from these meters will be displayed on computers in CCR

Data / Parameter:	$EFF_{i,}$
Unit:	tCO2/t fuel
Description:	Emission factor of Fossil fuel of type i consumed for clinker production in year *y*
Source of data:	IPCC default
Value(s) applied	2.57
Measurement methods and procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	
Purpose of data	Used in Equation 16
Additional comment	

Data / Parameter:	$PELE_{grid,CLNK,y}$
Data unit:	MWh
Description:	Grid electricity for clinker production in year *y*
Source of data:	On-site measurements in plant records
Value(s) applied	
Measurement procedures (if any):	Use electricity meter
Monitoring frequency:	Monthly
QA/QC procedures:	Data monitored monthly will be compared with the records of the previous and the subsequent month. If reading is in average specific power consumption, KWh/t, it will be multiplied by the quantity of clinker ground in the period to find this value. Please see B7.3 for further details.
Purpose of data	
Additional comment:	Data will not be needed if $EF_{grid,y}$ ~0

Data / Parameter:	$PELE_{sg,CLNK,y}$
Data unit:	MWh
Description:	Self generation of electricity for clinker production in year *y*
Source of data:	On-site measurements in plant records
Value(s) applied	
Measurement procedures (if any):	Use electricity meter
Monitoring frequency:	Monthly
QA/QC procedures:	Data monitored monthly will be compared with the records of the previous and the subsequent month. If reading is in average specific power consumption, KWh/t, it will be multiplied by the quantity of clinker ground in the period to find this value. Please see B7.3 for further details.
Purpose of data	
Additional comment:	Data will not be needed if $F_{k,j,y}$is not material

Data / Parameter:	$ADD_{,y}$
Unit:	tAdditives
Description:	Amount of Additives used for BC production in project plant in year *y*
Source of data:	On-site measurements in plant records
Value(s) applied	Not required
Measurement methods and procedures (if any):	Use weight meter i.e. weigh feeders sending data to CCR
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	This parameter is used in calculation of $\alpha_y$for Leakage estimation using equation 31.
Additional comment	-

Data / Parameter:	$ADD_{NS,,y}$
Unit:	t Additives
Description:	Amount of Additives for which the project participants could not substantiate that they are surplus in year *y*
Source of data:	National data or data collected by project participants
Value(s) applied	$ADD_{NS,y}$=0, if L1 is demonstrated.
Measurement methods and procedures (if any):	Demonstrate using the L1 approach in step 8
Monitoring frequency:	-
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.

Purpose of data	Calculation of α_y for Leakage estimation using equation 31
Additional comment	

Data / Parameter:	$PELE_{grid,BC,y}$
Data unit:	MWh
Description:	Grid electricity for grinding BC in year *y*
Source of data:	On-site measurements in plant records
Value(s) applied	
Measurement procedures (if any):	Use electricity meter
Monitoring frequency:	Monthly
QA/QC procedures:	Data monitored monthly will be compared with the records of the previous and the subsequent month. If reading is in average specific power consumption, KWh/t, it will be multiplied by the relevant quantity of cement ground in the period to find this value. Please see B7.3 for further details.
Purpose of data	
Additional comment:	Data will not be needed if $EF_{grid,y}$ ~0

Data / Parameter:	$PELE_{sg,BC,y}$
Data unit:	MWh
Description:	Self generated electricity for grinding BC in year *y*
Source of data:	On-site measurements in plant records
Value applied	
Measurement procedures (if any):	Use electricity meter
Monitoring frequency:	Monthly
QA/QC procedures:	Data monitored monthly will be compared with the records of the previous and the subsequent month. If reading is in average specific power consumption, KWh/t, it will be multiplied by the relevant quantity of cement ground in the period to find this value. Please see B7.3 for further details.
Purpose of data	
Any comment:	Data will not be needed if self generated electricity is not used or if $F_{k,j,y}$ is not material

Data / Parameter:	$PELE_{grid,ADD,y}$
Data unit:	MWh
Description:	Grid electricity for grinding additives in year *y*
Source of data:	On-site measurements in plant records
Value applied	
Measurement procedures (if any):	Use electricity meter
Monitoring frequency:	Monthly
QA/QC procedures:	Data monitored monthly will be compared with the records of the previous and the subsequent month. If reading is in average specific power consumption, KWh/t, it will be multiplied by the quantity of Additives ground in the period to find this value. Please see B7.3 for further details.
Purpose of data	
Any comment:	Data will not be needed if $EF_{grid,y}$ ~0

Data / Parameter:	$PELE_{sg,ADD,y}$
Data unit:	MWh
Description:	Self generation electricity for grinding additives in year *y*
Source of data:	On-site measurements in plant records
Value applied	
Measurement procedures (if any):	Use electricity meter
Monitoring frequency:	Monthly
QA/QC procedures:	Data monitored monthly will be compared with the records of the previous and the subsequent month. If reading is in average specific power consumption, KWh/t, it will be multiplied by the quantity of Additives ground to find this value. Please see B7.3 for further details.
Purpose of data	
Any comment:	Data will not be needed if self generation electricity is not used or $F_{k,j,y}$is not material

Data / Parameter:	$F_{k,j,y}$
Data unit:	mass or volume unit
Description:	Amount of fuel *k* consumed by relevant power sources *j* in year *y*
Source of data:	On-site measurements in plant records
Value applied	
Measurement procedures (if any):	Use weight or volume meter
Monitoring frequency:	Monthly
QA/QC procedures:	-
Purpose of data	
Any comment:	-

Data / Parameter:	NCV_k
Data unit:	GJ/mass or volume unit
Description:	Net calorific value per mass or volume unit of a fuel *k*
Source of data:	The following data sources may be used if the relevant conditions apply: <table><tr><td>Data source</td><td>Conditions for using the data source</td></tr><tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source if the carbon fraction of the fuel is not provided (Option A)</td></tr><tr><td>b) Measurements by the project participants</td><td>If a) is not available</td></tr><tr><td>c) Regional or national default values</td><td>If b) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances)</td></tr><tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If c) is not available</td></tr></table>
Value applied	
Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards
Purpose of data	
Any comment:	IPCC default value will be used

Data / Parameter:	$GEN_{j,y}$
Data unit:	MWh
Description:	Electricity generated by the source *j* in the year *y*
Source of data:	On-site measurements in plant records
Value applied	
Measurement procedures (if any):	Use electricity meter
Monitoring frequency:	Annually
QA/QC procedures:	Data calculated annually will be compared with the records of the previous year. Please see B7.3 for further details.
Purpose of data	
Any comment:	Data will not be needed if $F_{k,j,y}$is not material

Data / Parameter:	$A_{PJ,blend,y}$
Unit:	t additives/t BC
Description:	Share of additives per tonne of BC in year *y*
Source of data:	On-site measurements in plant records
Value(s) applied	Production plan
Measurement methods and procedures (if any):	Use weight meter i.weigh feeders sending data to CCR
Monitoring frequency:	- Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	For calculation of leakage estimation from Additive transport
Additional Comment	-

Data / Parameter:	$A_{BSL,blend,y}$
Unit:	t additives/t BC
Description:	Baseline Share of additives per tonne of BC updated for year *y*
Source of data:	On-site measurements in plant records
Value(s) applied	Benchmarks calculated, updated every year
Measurement methods and procedures (if any):	In case of Greenfield cement plants, the value of $A_{BL,blend,y}$is 1-$B_{Blend,y}$of equation (1)
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	For calculation of leakage estimation from Additive transport
Additional comment:	

Data / Parameter:	$Q_{ADD,y}$
Unit:	t additives
Description:	Quantify of additional additives transported in year *y* (t additives).
Source of data:	Calculated
Value(s) applied	2013: 583,635.37 2014: 581,425.37 2015: 432,667.28 2016: 443,975.68 2017: 427,004.90 2018: 396,807.39 2019: 401,904.51 2020: 418,347.47 2021: 434,462.32 2022: 443,765.80
Measurement methods and procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Please see B7.3 for further details.
Purpose of data	This parameter shall be used instead of $FR_{f,m}$in the tool "Project and leakage emissions from road transportation of freight." to calculate leakage.
Additional comment:	-

Data / Parameter:	$D_{f,m}$
Unit:	Km
Description:	Return trip road distance between the origin and destination of freight transportation activity *f* in monitoring period *m* (km)
Source of data:	Vehicle Odometer measurement
Value(s) applied	250
Measurement methods and procedures (if any):	AlemTena, where the pumice is going to be mined and transported from, is 125km from plant site.
Monitoring frequency:	Annually
QA/QC procedures:	Data monitored annually will be compared with the records of the previous year. In the absence of measurement, the ex ante value (125km) will be used as it barely changes. Please see B7.3 for further details.
Purpose of data	This parameter shall be used in the tool "Project and leakage emissions from road transportation of freight." to calculate leakage.
Additional comment:	-

B.7.2. Sampling plan

None of the parameters are determined by sampling approach.

B.7.3. Other elements of monitoring plan

Monitoring arrangement

The conventional monitoring of the cement operation will continue as it is. The relevant national standard, national sectorial norm or international sectorial norm will be followed. More emphasis from the norm will be the additional QA/QC emphasis given to monitoring parameters due to CDM and the additional CDM specific monitoring manpower allocation.

- *Instruments and meters*

Monitoring instruments (weigh bridges, weigh feeders, flow meters, meters and x-ray fluorescence room) are installed and always kept in acceptable working condition. Weigh feeders or flow meters are instruments fixed along the material flow which measure the amount of material transferred into the next processing stage. All materials/fuel that entered into the process line will be measure by weigh feeders and the reading transferred to CCR. Weighbridges are meters installed to measure the weight of truck load of materials/products. All raw materials transported on truck from outside or products exiting the premise will be weighed by weighbridges. X-ray fluorescence room is equipped with x-ray fluorescence equipment and attached computer. It measures the % share of different constituents of clinker raw material as well as Clinker itself and sends data to the adjacent computer. Electricity consumption meters are also installed which read either in absolute KWh for a period or average specific consumption KWh/t for a period, at each stage of relevant process.

Measuring instruments will be calibrated as per the calibration frequency requirement stated on the national standard, norm or at least the CDM monitoring table. The calibration programme will follow a combination of internal calibration and independent calibration. The former will happen more frequently while the later must happen at least once a year.

- *Reading frequency*

Most Monitoring parameters will be read from central control room (CCR) which collects all data measured by measuring instruments (weigh bridges, weigh feeders, meters and x-ray fluorescence). Parameters with default values will be obtained from the relevant source (i.e IPCC, ex ante calculated values etc). Reading will be practiced as per the reading frequency requirement of the plant norm or the CDM monitoring plan. The CCR displays hourly data and cumulative values on hourly data for almost all parameters. Most of the data are therefore hourly recorded on industry log sheet from the CCR. Further recording and aggregation or averaging of hourly or daily data into daily, monthly and annual values will be made on the CDM log sheet separately as required by the monitoring tables of the PDD.

- *Monitoring and aggregation moments*

Ethiopia follows a Gregorian calendar and its own counting of clock. However the plant will adopt the European calendar and clock. The following table shows the time of monitoring/aggregation as per each monitoring frequency of parameters:

Frequency	**Reading hour**	**coverage**
Daily values	24:00 PM or 12:00PM	00:00 to 23:59
Monthly values	Last day of month and 24:00PM	First day of month to last day of monitoring month
Annual values	Last day of year and 24:00PM	First day of year to last day of monitoring year

Table 012: Table of reading hours

When parameters are not the type that is normally obtainable from plant meters then the representative daily, monthly or annual value will be identified from the relevant source. Sum or average of hourly values give daily values while sum or average of daily or monthly values will give annual values.

- *Monitoring CDM log sheets*

In addition to the conventional Industry log sheet, CDM log sheets will be used. The log sheet for the CDM/EBF route will be comprehensive and subject to improvement based on further evolution of CDM.

Quality assurance and quality control (QA/QC) procedures;

The project activity will implement the standard industry QA/QC norm in cement sector except linked to the CDM specific requirements. Where relevant to the practice, all common and domestic relevant national standards and plant norms will be employed for monitoring quality and handling data.

a. Monitoring responsibility

The entire monitoring of parameters, reliability check and final authentication of values for the CDM monitoring purpose will be managed by Ethan Bio-Fuels PLC (EBF). However, the detailed institutional monitoring arrangement will be harmonized with the conventional cement operation management and monitoring system of the plant operated by Derba MIDROC cement PLC and its conventional organization.

b. The Monitoring routine

The %CaO and %MgO are the non-carbonated CaO and MgO components (if any) respectively, sourced from any non-carbonated material in the raw mix. Non carbonated materials are identified by exhibiting

no loss of mass on ignition (LOI ~0). For the base year and each crediting year, reading of %CaO and %MgO will be taken from the computer connected to the X-ray fluorescence (XRF) machine which is the equipment installed to analyse samples from raw material feeders continuously feeding into the clinker process. In case of XRF equipment failure, the average of values of XRF tests on the nearest day in the same calendar month will be taken. If data absence or the equipment failure occurs on the first day of the calendar month, average of values of tests on any one day which is the nearest among the previous or subsequent calendar months will be taken. Alternatively, conventional laboratory tests (titration) will be used in case the XRF equipment maintenance or replacement takes more than six months. Analysed data from any number of tests conducted daily on samples will be monitored and filled daily on log sheets by data clerks assigned by plant owner. These data will again be monitored and recorded by EBF CDM monitoring records clerks. In the absence of monitored data for any reason the default value of the methodology (2% for CaO) and the %MgO equal to that in clinker (conservative) will be applied.

The OutCaO and OutMgO are the components of CaO and MgO in the clinker produced respectively calculated from %CaO and %MgO. The reading for % CaO and % MgO in the clinker will be taken from the same computer connected to the X-ray fluorescence machine which is the equipment installed to analyse clinker samples from clinker weigh feeders. Analysed data from tests conducted daily on any number of samples will be monitored and filled daily on log sheets by data clerks assigned by plant owner. These data will again be monitored and recorded by EBF CDM monitoring records clerks. In the absence of monitored data or failure of XRF equipment, the average of values of XRF tests on the nearest day in the same calendar month will be taken. If data absence or the equipment failure occurs on the first day of the calendar month, average of values of tests on any one day which is the nearest among the previous or subsequent calendar months will be taken. Alternatively, conventional laboratory tests will be used in case of the XRF equipment maintenance or replacement takes more than six months.

Q_{rm} and CLNK are tonnage of raw material and clinker produced (in base year or/and crediting year). They are used to calculate InCaO, InMgO, OutCaO and OutMgO (in base year as well as crediting year). The central control room (CCR) is the room where the entire plant operating parameters are controlled and operating parameters may be monitored. Their reading will be taken from the computer in the relevant Central Control Rooms (CCR) connected to the weigh feeders installed where raw materials flow into the clinker process and clinker exits from the kiln system. The weigh feeders transfer data to the CCRs continuously. Data from the computers in the CCRs will be monitored and filled hourly on log sheets by data clerks assigned by plant owner. These data will again be monitored and recorded daily by EBF CDM monitoring records clerks. In the absence of monitored hourly data, daily data or failure of weigh feeder(s) equipment, the smallest of the daily record of the previous day or subsequent day where full hourly record exists is taken as the value for the day where hourly or daily data are missing. In case clinker quantity is not displayed, clinker conversion factor will alternatively be used to convert raw meal to clinker quantity.

If daily data are not available for more than a week in a calendar month, the smallest among the weekly values of a week in the same month, previous month or subsequent month where full hourly and daily data are available for the week is taken as value for the week where data are missing. If daily data are not available for a month, the smallest among the monthly values of the previous months or subsequent months in the crediting year where full hourly and daily data are available for the month, is taken as value for the months where data are missing. In case clinker is produced in excess and stored for future cement grinding in rainy season, the relevant quantity of clinker would be estimated from the cement type produced. The relevant parameters above related to the raw materials and clinker would be taken from the most recent month when the clinker was produced.

The reading for kiln fuel consumption for clinker making (FF_i) will be taken from the computer in the Central Control Room (CCR) connected to the weigh feeders (in case of solid fuels) or flow meters (in case of liquid fuels) installed where kiln fuel flows into the clinker process. The weigh feeders/flow meters transfer data to the CCR continuously.

Data from the computers in the CCR will be monitored and filled hourly on log sheets by data clerks assigned by plant owner. These data will again be monitored and recorded by EBF CDM monitoring records clerks. In the absence of monitored hourly data or failure of weigh feeder (s) equipment, the smallest fuel/clinker ratio (in energy terms) taken from the daily record of the previous day or subsequent day where full hourly record exists is taken to estimate the fuel consumption value (linear extrapolation) for the day where hourly data are missing. If hourly data are not available for more than a week in a calendar month, the smallest fuel/clinker ratio (in energy terms) among the weekly values of a week in the same month, previous month or subsequent month where full hourly and daily data are available for the week is taken to estimate the fuel consumption (linear extrapolation) for the week where data are missing. If hourly data are not available for a month, the smallest fuel/clinker ratio (in energy terms) among the monthly values of the previous months or subsequent months in the crediting year where full hourly and daily data are available for the month, is taken to estimate the fuel consumption value (linear extrapolation) for the months where data are missing.

In each crediting year, each cement type produced (BC_i) and share of clinker per tonne of each type of blended cement ($P_{Blend, y}$), share of additives utilized in each type of blended cement will be obtained from the computer in the Central Control Room (CCR) connected to the weigh feeders installed where additives and/or clinker flow into the cement grinding process and cement exits from the process. Cement types will be classified and recorded as per the national cement standard taking the clinker share and type of additive into consideration. The weigh feeders transfer data to the relevant CCR continuously. Data from the computers in the CCR will be monitored and filled hourly on log sheets by data clerks assigned by plant owner. These data will again be monitored and recorded daily or monthly by EBF's CDM monitoring records clerks. The record of sales on each type of blended cement will provide data on export and/or domestically sold cement types and quantity. The total cement produced under each type reduced by the total cement exported under each type will give the cement domestically sold/consumed.

In the absence of monitored daily data or failure of weigh feeder (s) equipment, the value of the daily average of the previous day or subsequent day where full hourly record exists is taken as the value for the day where daily data are missing. If daily data are not available for more than a week in a calendar month, the weekly average of a week in the same month, previous month or subsequent month where full daily data are available for the week is taken as value for the week where data are missing. If daily data are not available for a month or months, the monthly average value of the nearest previous or subsequent month in the crediting year where full hourly or daily data are available for the month, is taken as value for the months where data are missing. Share of clinker per tonne of each type of blended cement ($P_{blend,y}$) may alternatively be obtained from Monthly production of each cement type and the monthly average share of additive per tonne of each type of blended cement.

Electricity consumption (KWh) data will be monitored / recorded or calculated from average specific electricity consumption readings monthly and annually from electricity meters. Similarly fuel consumption for self generated electricity and/or Electricity generated by any power source in the project activity boundary will be monitored annually and recorded. As of now the self generated electricity comes from emergency diesel generator of less than 2MW capacity, sufficient only for preventing damage to kiln liners from abrupt kiln stoppage in event of grid power interruption.

The total quantity of additive used for blended cement production (ADD_y) will be the sum of values for different additives consumption recorded from weigh feeders installed where additives flow to cement grinding equipment. However the additional quantity of additives transported due to the project activity and contributing to leakage ($Q_{ADD,y}$) will be obtained from calculation.

The weigh feeders transfer additive consumption data to the CCR continuously. Data from the computers in the CCR will be monitored and filled hourly on log sheets by data clerks assigned by plant owner. These data will again be monitored and recorded by EBF's CDM monitoring records clerks. In the

absence of monitored hourly data or failure of weigh feeder (s) equipment, the value of the daily average of the previous day or subsequent day where full hourly record exists is taken as the value for the day where hourly data are missing. If hourly data are not available for more than a week in a calendar month, the weekly average of a week in the same month, previous month or subsequent month where full hourly and daily data are available for the week is taken as value for the week where data are missing. If hourly data are not available for a month, the monthly average value of the nearest previous or subsequent month in the crediting year where full hourly and daily data are available for the month, is taken as value for the month where data are missing. Alternatively, the total cement considered in a calendar month reduced by the total clinker and gypsum consumed in cement production in the same calendar month will be used as the value to the monthly additive quantity used in the cement type considered.

Fuel consumption for vehicle transporting additives per kilometre (TF) will be obtained from the specification of the trucks involved in the transporting of additives in case trucks not older than 10 years from year of manufacturing. In the absence of such specification or if any of the trucks involved are older than ten years from year of manufacturing, the fuel consumption of such truck with highest litres/ton-kilometre shall be used as a representative value for all. Such measurement will be done once in a year based on filling truck fuel tanker full level, driving and measuring the remaining fuel balance. After that the balance fuel will be divided by the distance travelled.

Baseline benchmark share of clinker per ton of blended cement type in the crediting year will be calculated from the benchmark set at the base year already calculated based on the procedure in the methodology and installed in PDD table 011. Baseline benchmark share of additives per ton of blended cement type updated for the crediting year ($A_{BSL,blend,y}$) will be calculated from total cement type in the crediting year reduced by baseline benchmark share of clinker in the blended cement type in the crediting year ($B_{Blend,y}$).

The source of Pumice (Alemtena locality) is 125 km from plant as revealed in feasibility study (TEFR). Distance between the source of additive (pumice) and the project activity plant (D_{f_m}) will be measured once in every crediting year using vehicle odometer of a representative truck or ordinary vehicle. In the absence of monitored data for a crediting year, the value for the previous year will be used unless the source of additive is already changed. Alternatively, a distance of 125km will be used which is reasonably fixed and the effect of mining on the distance between plant and pumice source is insignificant. Emission factor of the transport fuel has been identified as the default value provided in the tool“Project and leakage emissions from road transportation of freight”

Reduction factor (α_y), will not be measured and is zero as the source of each additive is a massive quarry held in concession agreement by plant owner and hence no diversion of additives from existing uses, as there is no other existing use. The concession licence will be made available always to the validating and verifying DOE.

The kiln fuel emission factor will be taken from the latest version of the IPCC default values available in the crediting year, for stationary combustion and type of kiln fuel.

c. *Monitoring data reliability check and authentication*

Data monitored hourly will be compared with the hourly records of the day, the previous day and the subsequent day. The weekly total will be compared with the previous and the subsequent week. Monthly monitored values will be compared with the previous and subsequent month. Moreover the amount of clinker produced will be counterchecked on a quarterly basis with the amount of raw material input into the clinker process. Similarly the amount of each type of cement produced will be counterchecked on a quarterly basis with the amount of Clinker, pumice and additives input into the cement grinding process.

The CDM monitoring engineer of EBF stationed on site is responsible for such comparison, authentication, and consolidation of hourly data into daily, weekly and monthly values in addition to also signing/approving and archiving of CDM specific log sheets at the site CDM data bank administered on site by EBF. He is responsible for overseeing or entering monitored data from hard copies to the spread sheet in the computer installed at the site CDM data bank. Additionally, he is also responsible for consolidating to monthly values (unless missing monitoring data are involved) and comparing with monthly reading (if any available). He shall then send the soft copy through email as well as weekly and monthly signed/approved hard copy log sheets (scanned or live) to the head office.

The EBF head office in Addis Ababa will be responsible for setting the relevant replacement values for any missing data as per the QA/QC procedure described for each or group of parameter(s) above and values (monthly and annual) relevant for calculation of emissions reduction in the crediting year. The officers at head office will cross check the amount of cement produced and monitored with the sales invoice on quarterly basis or with the letter report to the Ministry of Industry (or any other authority in case procedure changed) on annual basis.

d. Monitoring meter maintenance, replacement and calibration

Neither the selected methodology, nor the Board's guidance specifies any requirements for calibration frequency for measuring equipment. Hence project participants will ensure that equipment is calibrated either in accordance with the local/national standards or the plant QA/QC or as per the manufacturer's specifications. If for a specific meter local/national standards or plant QA/QC or the manufacturer's specifications are not available, international sector standards may be used.

Measurement equipment or meters will be calibrated periodically as governed by the relevant industry requirement for each type of equipment. Meters already calibrated but have not been used will be calibrated after the relevant duration counted from date they were put for use. Calibration information, including date of calibration and next schedule of calibration, will be posted by the side of each instrument. Failed or underperforming meters will be replaced as quickly as possible but taking into account the timeline required for importing replacement meters into the host country. However, purchase order will be placed within a month of identifying the relevant supplier. While the Independent calibration schedule governs the CDM monitoring compliance, calibration of meters will be made in two tracks. The first, the internal calibration, will be made either by technicians of plant owner or supplier of specific equipment on frequency required by the industry standard or supplier standard. This internal calibration will be applied more frequently.

The independent calibration will be implemented by either the national quality standard or an entity accredited nationally or internationally to perform calibration. Plants normally employ the Quality and Standards Authority of Ethiopia for this. The following table shows the expected accuracy of meters.

Meter type	**Meter Accuracy**	**Internal calibration (months)**	**Independent calibration (months)**
Weigh feeder for clinker rawmaterial	± 2 -5%	≤ 6 months	≤ 12 months
Weigh feeder for clinker	± 2 -5%	≤ 6 months	≤ 12 months
Weigh feeder for cement additive	± 2 -5%	≤ 6 months	≤ 12 months
Weigh feeder for solid kiln fuel	± 2 -5%	≤ 6 months	≤ 12 months
Flow meter for liquid kiln fuel	± 2 -5%	≤ 6 months	≤ 12 months
Weigh feeder for Additives	± 2 -5%	≤ 6 months	≤ 12 months
Weighbridge at gate of factory premise	± 2 -5%	≤ 6 months	≤ 12 months
XRF machine	± 2 -5%	≤ 1 months	≤ 12 months
Conventional lab equipment	± 2 -5%	≤ 6 months	≤ 24 months
Vehicle Odometer	± 2 -5%	≤ 24 months	

Table 013: calibration frequency and accuracy of meters

e. Calculation of Baseline emission, project emission, leakage and Emissions Reduction

The EBF officers at head (or project) office in Addis Ababa will be responsible for reviewing the accuracy of data between hard copy and soft copy of monitored data transferred from site, utilizing the correct data into the algorithms of the methodology, selecting default values from relevant documents and estimating the annual (or monthly) emissions reduction.

f. Data storage

All data collected as part of monitoring will be archived electronically and be kept at least for 2 years at head (or project) office in Addis Ababa, after the end of the crediting period (in this case only a fixed ten years)or the last issuance of CERs. All of the relevant parameters will be monitored unless otherwise substituted by default values. All measurements will be conducted with measurement equipment calibrated according to cement industry standards.

g. Monitoring organization chart

The chart below shows the CDM project monitoring management structure that the project participants will implement in order to monitor emissions, emissions reduction and any leakage effects generated by the project activity. For the avoidance of overlap of responsibilities and to render specialized attention to the CDM angle of the monitoring task without interfering with the traditional activities of the production process or other value chains of the plant, a project activity monitoring organization is designed and will be overseen by the relevant participant (Ethan Bio-Fuels PLC). Since Ethan Bio-Fuels PLC has originated the project idea as a Clean Development Mechanism and designed the PDD, emissions reduction estimates and monitoring plan, it will handle the monitoring as well. The entire CDM project data monitoring will be practiced in harmony with the conventional process.

The routine monitoring practice will be based on data collected from computers in CCR directly or plant log sheets. Data will be recorded both for the routine and CDM purpose but initially collected as part of the routine monitoring and QA/QC process. Office records will be maintained in three stages.

These are onsite data bank at site office, soft data at site office PC and finally at Addis Ababa (HO) CDM office in both hard and soft copy data bank. The documents and data at EBF CDM head office will be used as input for baseline, project and leakage emissions including ERs calculation. Emission Reductions calculation may be made more frequently(i.e weekly) for the first few months of operation and relaxed thereafter. Computer spread sheet will be established to calculate each sub-equation and major equations.

The routine monitoring practice will be based on data collected from plant log sheets. Data will be recorded both for the norm and CDM purpose but collected as part of the routine monitoring and QA/QC process. Office records will be maintained in three stages. These are onsite data bank at data clerk hand, soft data at site office PC and finally at Addis Ababa (HO) CDM office in both hard and soft copy data bank. The data at EBF CDM head office will be used as input for baseline, project and leakage emissions including ERs calculation. ERs calculation may be made more frequently(i.e weekly) for the first few months of operation and relaxed thereafter. Computer spread sheet will be established on site to enter daily records and at head office to calculate each sub-equation and major equations.

As for the monitoring log sheet, a specific log sheet format will be instituted for CDM specific data record (frequency) and archiving, in addition to the standard industry log sheets. Since the plant is Greenfield, the monitored values of the first year of operation of the project activity are essential as per the relevant guidance under the methodology for establishing emission intensity of clinker in base year. In

this regard the monitored values of one year counted from the date of the registration of the CDM project activity will be used to establish the parameters of the base year i.e first operational year of the project activity.

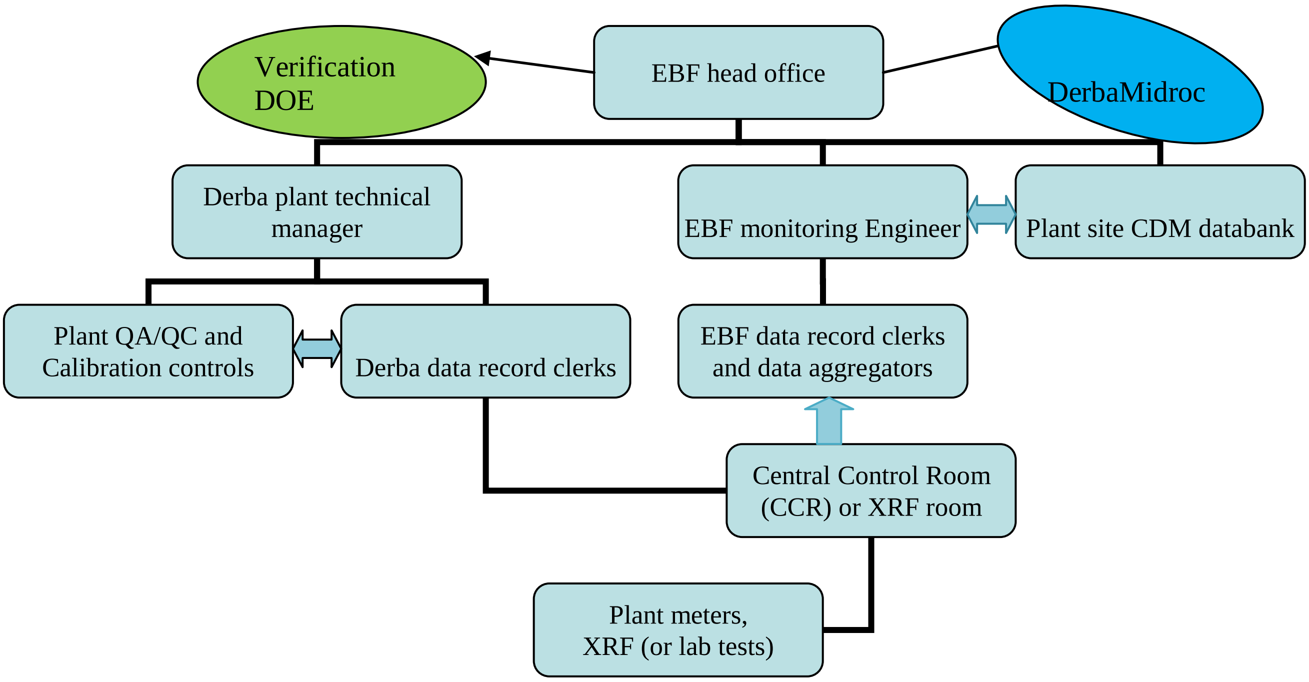


Diagram 04: Organization chart for monitoring, aggregation, archiving and CERs estimation

SECTION C. Duration and crediting period
C.1. Duration of project activity
C.1.1. Start date of project activity

The starting date of the project activity is 14/08/2009. This date reflects the date when the "point of no return" was reached following the placement of equity contribution of the plant owner in the hope of fulfilment of precondition for starting to receive debt finance disbursement.

C.1.2. Expected operational lifetime of project activity

[38]20 (twenty) years from the date of commissioning of the project activity

C.2. Crediting period of project activity
C.2.1. Type of crediting period

Fixed ten years crediting period

C.2.2. Start date of crediting period

The starting date of the crediting period is the latest of either 15/06/2013 or date of registration of the project activity.

C.2.3. Length of crediting period
Ten years non renewable

[38]Letters from plant design consultant and plant maintenance contractor

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts

Environmental clearance letter from Federal EPA is required to enter site for construction. The EIA process followed procedures mandatorily enforced under the host country and also other financing requirement of the project.

Environmental impact assessment study and corresponding recommendation of mitigation measures for anticipated impacts, was performed by hiring a consultant capable of harmonizing the EIA findings with the turnkey design exercise of the plant.

D.2. Environmental impact assessment

According to the Environmental Impact Assessment Report, environmental impacts possibly caused by the Project activity and mitigation measures to be adopted by the project owner are analyzed as follows:

Air pollution
The air pollutants of the project activity are mainly dust and soot. In order to reduce SO_2, NO_X, dust emission, and associated adverse impacts on local environment, the project focused on mitigating the emissions by means of closed transporting raw materials, sprinkling and increasing humidity, etc. Two stages of de-dusting are proposed with 25mg/NM3 dust emission control efficiency. The following table shows level of some of the major pollutants in comparison of national environmental requirement versus that project technology and operation targets to achieve.

Pollutant type	[39]National standard	Project design
Dust Emission, mg/NM3	50	20-50
SOx Emission, mg/NM3	400	200-400
NOx Emission, mg/NM3	800	600-800
Waste (BOD@25 degree c), mg/l	25	15-25
Noise (dB), Industrial	Day:75 and night: 70	60
Discharge water quality, TSS (mg/l)	50	10

Table 014: comparison between regulation and project design for some of the pollutants

Noise

The noise influence of the project activity comes from some operating equipments. In order to reduce the negative impact on passing by local residents or their pack animals, equipment with low noise will be used and measures to control the noise sources will be adopted. These countermeasures to reducing noise pollution are mainly including furnishing muffler, vibration absorption targeting the base of fans, and building closed sound insulation room.

Therefore, the project activity almost does not lead to any changes on the current noise level in the boundary of the project activity.

Waste water

Waste water will be generated by production and living activities during the construction and operation period. As pollutants in the waste water resulting from production activities are primarily inorganic

[39]EPA national draft standard of the FDRE

suspending particulates, the waste water will be discharged after collectively removing the suspending particulates by means of sedimentation tank. Waste water resulting from living activities will not be discharged until being treated by septic tank. Therefore, the project activity will not have any significant impact upon water environment.

Waste solids

The solid wastes generated in clinker/cement production are mainly dust collected by the dust collectors in various sections of the production processes. Such dust will be all returned to the production process without release to the environment. The wrapping packages will be sent to the reclamation company for recovery, and the municipal domestic refuse will be treated by sanitary department. Therefore, the treated solid wastes will not have any obvious impact on soil environment. Therefore there would be no trans-boundary impacts.

Greening

Derba Midroc plans to sponsor the planting of non CDM one million trees progressively around the project area over which local communities could participate as planting service givers. After finishing construction, the area surrounding clinker/cement production line will be greened and greening ratio targeted is about 20% of total areas.

In conclusion, any potential negative environmental impacts arising from the Project activity are small and are actively addressed by the project.

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from [40]local stakeholders

The Constitution of FDRE highlights the importance of Public Consultation in connection with Development projects. The national policy principles specifies: “People have the right to full consultation and to the expression of their views in the planning and implementation of environmental policies and projects that affect them directly.” The Environment Impact Assessment of the project which was being conducted during the local consultation period states in chapter 6.2.1.1 that blending CDM project will be pursued and Carbon finance will be sought. Hence substantial stakeholder was conducted regarding all aspects of the development project including the CDM. The full stakeholder consultation process, participants and photographs are documented under Chapter 7 of the EIA report has been annexed to the validating DOE.

In accordance with the same invitations were made to various stakeholder groups and consultations made as follows;

- Consecutive field trips were taken in month of August 2007 to these project and the neighboring areas in order to assess the views and comments of the community and concerned administrative units within and around the project areas. The details of stakeholders, actual dates of consultation and minutes of consultationare provided in table 7.1 and 7.2 of the stakeholder consultation report.

- Meetings were held on 11 and 12 July 2007 with the two Ministries.

- EIA was subsequently completed in December 2007 and TEFR completed in

The consultation included a total of about 1,250 stakeholders, including members of affected households and communities, local administration officials, and peasant association (village) leaders from the project-affected area. Discussions were held in two main languages: Amharic, the national language, and

[40]Full stakeholder consultation document submitted to DOE

Oromiffa, the local dialect spoken in the Mugher Valley area and in Oromia Region. [41]Based on the information in the EIA report and meetings with resettled households, village leaders, and local administration officials during a debt finance appraisal mission, the appraisal team believes that the project has achieved broad community support.

The stakeholder consultation has been conducted and is still being run as a holistic process running from the TEFR/ESIA study till this date in the commissioning process. The expropriation of the limestone site, the pumice site, the features of the plant itself and the products (which are all main features of the CDM project) were all discussed with local stakeholders as in the submitted stakeholder consultation document.

Comments from Local Stakeholders have been collected from the grass root local administrative area to the national scale as part of an examination of the entire investment's feasibility. Related documents open for validation show stakeholder consultation records. The following were considered Local Stakeholders:

- Federal Environment Protection Authority
- Regional Environment Protection Authority
- Ministry of water Resources, Ministry of Agriculture& Ministry of Mines
- Regional Government
- Woreda (grass root) administrative offices
- Local community comprising Elders, Women, children , Farmers and youth

In order to assess the communities' awareness and perception as well as attitudes about the project and its potential impacts, several meetings and discussions were held with a large number of community members and their leaders in the project area and from various Woreda sector offices. A number of household individuals (including gender represented) were consulted conveniently so that the people were given chance to express their views freely.

In General 40Woreda officials, 28 kebele peasant association council members, 223 community members consulted through community discussions, 956 individual household heads have been consulted.

E.2. Summary of comments received

Sufficient stakeholder comments were entertained through various consultations engaging participants over several stages. Just few pages of the entire process including collecting stakeholder comment are attached here below while the rest is available for the validating DOE. The following were among comments received from local stakeholders and perceived impacts.

Positive Impacts	**Negative Impacts**
Creation of jobs	Early employment, farm decline,
Access roads developed	Dust pollution, deforestation, wild disturbance
Development opportunity following access roads	Contagious diseases like HIV expansion
Opportunity of resource utilization for development	Sustainable utilization & landslides
Indirect assistance to local people	development of dependence by Local people
Cement for local development	Cement related pollution

Table 015: summary of EIA comments

[41]http://www.ifc.org/ifcext/spiwebsite1.nsf/0/E3F4305FC37F09AE852576BA000E2B4A

E.3. Report on consideration of comments received

All comments were addressed in the EIA, plant design and operation plans as follows:

- Measures were taken to include in the factory manual denial of all requests for child labour and encouragement of education prior to employment. In addition on job training in no hazardous areas will be made until age when they can legally apply for job.
- Plant design and technology transfer included dust removal systems, to enable extremely low levels of dust pollution by global standards
- Access roads will to the most practical extent be built with tarmac or the best pavement structure to avoid recurrent excavation, dust pollution and resource utilization. Measures will be taken to avoid forest land and wild life areas.
- HIV awareness, worker discipline and medical preparedness were included in the colony establishment guideline
- Quarries were identified with caution to avoid landslide suspect zones and local administration members were involved in stakeholder discussions regarding the procedure of opening quarries
- Project development included packages of water well development, electrical supply, school and health centres for the community. The community will be empowered to manage the utilities and avoid dependence on the factory.
- Cement plant's design parameters included consideration of all environmental and climatic hazards.

SECTION F. Approval and authorization

Letter of Approval and Authorization for the project activity and participation in respect of both Project Participants obtained from DNA of host country (Ethiopia) has been submitted to DOE.

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Appendix 1: Contact information of project participants

Organization:	Ethan Bio-Fuels Pvt Ltd Co (Authorized representative)
Street/P.O.Box:	*Registered street address*: Bole Sub-City,CMC Road, Kebele 14/15; *City Office street address*: Nani Building, eighth floor, room 12
Building:	*Registered office*: B42/11; *City Office*: Nani Building, eighth floor, room 12
City:	Addis Ababa
State/Region:	Addis Ababa (Capital)
Postcode/ZIP:	81210
Country:	Ethiopia
Telephone:	00251911218626
FAX:	00251116616400
E-Mail:	ethanbiofuelsltd@gmail.com,
URL:	www.ebfe.biz
Represented by:	Ambachew F.Admassie
Title:	Chairman, CDM projects originator, promoter, developer and manager
Salutation:	Engineer
Last name:	Admassie
Middle name:	Fekadeneh
First name:	Ambachew
Department:	CDM investments
Mobile:	00251911218626
Direct FAX:	00251116616400
Direct tel:	00251911220538
Personal e-mail:	Abi_Fek@yahoo.com

Organization:	[42]Derba MIDROC Cement Pvt Ltd Co
Street/P.O.Box:	Haile GebreSellassie street
Building:	Kale House
City:	Addis Ababa
State/Region:	Addis Ababa (Capital)
Postcode/ZIP:	23202/1000
Country:	Ethiopia
Telephone:	00251-115-510733
FAX:	00251-115-534958
E-Mail:	
URL:	
Represented by:	Ato Haile Assegde
Title:	Executive Director
Salutation:	Engineer
Last name:	Haile
Middle name:	Assegde
First name:	Haile
Department:	Executives
Mobile:	00251-911-252627
Direct FAX:	
Direct tel:	00251-115-538660
Personal e-mail:	ahaileahailew@yahoo.com

Appendix 2: Affirmation regarding public funding

Affirmation of no use of public or ODA funding is provided.

Appendix 3: Applicability of selected methodology

The selected methodology perfectly suits the proposed CDM project activity.

[42]Private Limited Company can be stated in short as Pvt Ltd Co or PLC in Ethiopia

Appendix 4: Further background information on ex ante calculation of emission reductions

A. The following data sources were utilized

- Official Letter from QSAE, (Government quality Authority);shows cement plants in host country and types of cement they produce and the confirmation letter regarding restriction of producing blended cement outside cement plants.
- Official Letter from Ministry of trade and Industry; shows cement plants operating in host country during 2006, 2007 & 2008 and types of cement they produce
- 2007, 2008, 2009 production and plant data from all plants in the region obtained from EPA: shows cement plants and annual volume and types of cement they produce for three previous years. Year 2008 data is taken for calculation as per the guidance on benchmark for base year in the methodology.
- Host country clinker/Cement standard (QSAE, formerly ESA); shows specifications for 27 cement types allowable under the standards and allowable lowest clinker share for each
- The TEFR & EIA studies of the project plant
- Recent production plan
- Most recent IPCC Default values
- Grid emission factor calculation document for year ending December 2008, done through assistance of the Government of by Austria to the DNA Ethiopia:
- Information on hydropower plants commissioned and joined grid in 2009 and 2010, www.eepco.gov.et
- Information on inflation rate before starting date of project activity obtained from various sources including local FI's
- Statistics on Annually imported cement obtained from Government Authority
- Website showing Status of establishment and ownership of Mugher Cement Factory (www.mughercement.com.et/)
- Website showing Status of establishment and ownership of Mosobo Cement Factory (http://www.effortgroup.org/messebo/index.htm)
- Website showing Status of establishment and ownership of National (Dire Dawa) cement factory http://www.eastafricanholding.com http://www.eastafricanholding.com/index.php?option=com_content&view=article&id=64&Itemid=62

- Information on recent import, production and demand for cement (year 2011),http://addisfortune.com/Vol_12_No_594_Archive/Under the heading "Gov't Imports More to Cement Need"
- Information "Investigation of Calcite and Volcanic Ash for Their Utilizations as Cement Filling and Additive Materials" Addis Ababa University Graduate studies, June 2010, Page 3, table 1.1:Cement productions in Ethiopia

B. Calculation of Ex-Ante CERs

I. **Baseline Emission**

$BE_y = BC_y*(BE_{clinker,y} * B_{Blend,y} + BE_{ele\_ADD\_BC})$

While; $BE_{clinker,y} = \min(BE_{clinker,BSL}, PE_{Clinker,y})$

$BE_{clinker\_BSL} = BE_{calcin} + BE_{fossil\_fuel} + BE_{ele\_grid\_CLNK} + BE_{ele\_sg\_CLNK} = 0.84$

$BE_{calcin} = [0.785*OutCaO + 1.092*OutMgO] / [CLNK_{BSL}] = 0.54$

	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
BEcalcin	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
OutCaO	1183644	1183644	1183644	1183644	1183644	1183644	1183644	1183644	1183644	1183644
OutMgO	63756	63756	63756	63756	63756	63756	63756	63756	63756	63756
InCaO	0	0	0	0	0	0	0	0	0	0
InMgO	0	0	0	0	0	0	0	0	0	0
$CLNK_{BSL}$	1848000	1848000	1848000	1848000	1848000	1848000	1848000	1848000	1848000	1848000

$BE_{fossil\_fuel} = [\ \Sigma FF_{i\_BSL} * EFFi] / [CLNK_{BSL}] = 0.30$

	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
BE_{fossil_fuel}	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
$FFi_{\_BSL}$	218064	218064	218064	218064	218064	218064	218064	218064	218064	218064
EFFi	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57

$BE_{ele\_grid\_CLNK}$ = [$BELE_{grid\_CLNK}$ * EF_{grid_BSL}] /$CLNK_{BSL}$= 0

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$BE_{ele\_grid\_CLNK}$	0	0	0	0	0	0	0	0	0	0
$BELE_{grid\_CLNK}$										
EF_{grid_BSL}	0	0	0	0	0	0	0	0	0	0

BEelec_sg_CLNK = [$BELE_{sg\_CLNK}$ * EF_{sg_BSL}] /[$CLNK_{BSL}$] = 0

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$BE_{elec\_sg\_CLNK}$	0	0	0	0	0	0	0	0	0	0
$BELE_{sg\_CLNK}$	0	0	0	0	0	0	0	0	0	0
EF_{sg_BSL}										

$BE_{ele\_ADD\_BC}$ = $BE_{ele\_grid\_BC}$ + $BE_{ele\_sg\_BC}$+ $BE_{ele\_grid\_ADD}$ + $BE_{ele\_sg\_ADD}$ = 0

$BE_{ele\_grid\_BC}$ = [$BELE_{grid\_BC}$ * EF_{grid_BSL}] /[BC_{BSL}] =0

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$BE_{ele\_grid\_BC}$	0	0	0	0	0	0	0	0	0	0
$BELE_{grid\_BC}$										
EF_{grid_BSL}	0	0	0	0	0	0	0	0	0	0

$BE_{elec\_sg\_BC}$ = [$BELE_{sg\_BC}$ * EF_{sg_BSL}] / [BC_{BSL}] =0

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$BE_{elec\_sg\_BC}$	0	0	0	0	0	0	0	0	0	0
$BELE_{sg\_BC}$	0	0	0	0	0	0	0	0	0	0
EF_{sg_BSL}	0	0	0	0	0	0	0	0	0	0

$BE_{ele\_grid\_ADD}$ = [$BELE_{grid\_ADD}$ * EF_{grid_BSL}] /[BC_{BSL}]=0

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$BE_{ele\_grid\_ADD}$	0	0	0	0	0	0	0	0	0	0
$BELE_{grid\_ADD}$										
EF_{grid_BSL}	0	0	0	0	0	0	0	0	0	0

$BE_{elec\_sg\_ADD}$ = [$BELE_{sg\_ADD}$ * EF_{sg_BSL}] / [BC_{BSL}]=0

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$BE_{elec\_sg\_ADD}$	0	0	0	0	0	0	0	0	0	0
$BELE_{sg\_ADD}$	0	0	0	0	0	0	0	0	0	0
EF_{sg_BSL}	0	0	0	0	0	0	0	0	0	0

$B_{Blend,y}$has been calculated for each BC type using the procedure in the methodology taking the least among (i) and (ii) and updating it with 2% additive increment annually. The detailed calculation is provided in the spreadsheet annexed. The tabular summary of finding is shown below for the years of the crediting period.

- Summary of values for annual $B_{Blend,y}$ is shown in table below for each BC type

BC type	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
CEMII/B-P	87.81	86.05	84.33	82.65	80.99	79.37	77.79	76.23	74.70	73.21
CEMII/B-L			87.81	86.05	84.33	82.65	80.99	79.37	77.79	76.23
CEM IV/B	87.81	86.05	84.33	82.65	80.99	79.37	77.79	76.23	74.70	73.21

- Summary of ex- ante values for annual BC_{BSL} = BC_y is shown for each type in table below in Killo tons

BC type	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
CEMII/B-P	2558.8	1990.2	1421.5	1137.2	1137.2	1137.2	1137.2	1137.2	1137.2	1137.2
CEMII/B-L	-	-	568.6	568.6	568.6	568.6	568.6	568.6	568.6	568.6
CEM IV/B	-	821.3	821.3	1232	1232	1232	1232	1232	1232	1232

- Summary of values for annual BE_{BSLy} is shown in table below

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$BE_y(tCO_{2e})$	1,896,184.81	1,894,319.71	1,873,119.74	1863753.309	1848701.195	1,823,189.54	1,786,725.74	1,799,179.18	1803572.287	1812121.375

II. Project Emission

$PE_y = BC_y*(PE_{clinker,y} * P_{Blend,y} + PE_{ele\_ADD\_BC})$

$PE_{clinker,y} = PE_{calcin,y} + PE_{fossil\_fuel,y} + PE_{ele\_grid\_CLNK,y} + PE_{ele\_sg\_CLNK,y} = 0.84$

PEcalcin = [0.785*OutCaO + 1.092*OutMgO] / [CLNKy] = 0.54

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
PEcalcin	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
OutCaO	1183644	1183644	1183644	1183644	1183644	1183644	1183644	1183644	1183644	1183644
OutMgO	63756	63756	63756	63756	63756	63756	63756	63756	63756	63756
InCaO	0	0	0	0	0	0	0	0	0	0
InMgO	0	0	0	0	0	0	0	0	0	0
CLNKy	1848000	1848000	1848000	1848000	1848000	1848000	1848000	1848000	1848000	1848000

$PE_{fossil\_fuel} = [\ \Sigma FF_{i\_BSL} * EFFi]\ /[CLNK_y] = 0.30$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
PE_{fossil_fuel}	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
$FFi_{\_y}$	218064	218064	218064	218064	218064	218064	218064	218064	218064	218064
EFFi	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57

$PE_{ele\_grid\_CLNK} = [\ PELE_{grid\_CLNK} * EF_{grid\_y}]\ /CLNK_y = 0$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$PE_{ele\_grid\_CLNK}$	0	0	0	0	0	0	0	0	0	0
$PELE_{grid\_CLNK}$										
EF_{grid_y}	0	0	0	0	0	0	0	0	0	0

PEelec_sg_CLNK = $[PELE_{sg\_CLNK} * EF_{sg\_y}]\ /[CLNK_y] = 0$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$PE_{elec\_sg\_CLNK}$	0	0	0	0	0	0	0	0	0	0
$PELE_{sg\_CLNK}$	0	0	0	0	0	0	0	0	0	0
EF_{sg_y}										

$PE_{ele\_ADD\_BC} = PE_{ele\_grid\_BC} + PE_{ele\_sg\_BC} + PE_{ele\_grid\_ADD} + PE_{ele\_sg\_ADD} = 0$

$PE_{ele\_grid\_BC} = [\ PELE_{grid\_BC} * EF_{grid\_y}]\ /[BC_y] = 0$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$PE_{ele\_grid\_BC}$	0	0	0	0	0	0	0	0	0	0
$PELE_{grid\_BC}$										
EF_{grid_y}	0	0	0	0	0	0	0	0	0	0

$PE_{elec\_sg\_BC} = [PELE_{sg\_BC} * EF_{sg\_y}]\ /\ [BC_y] = 0$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$PE_{elec\_sg\_BC}$	0	0	0	0	0	0	0	0	0	0
$PELE_{sg\_BC}$	0	0	0	0	0	0	0	0	0	0
EF_{sg_y}										

$PE_{ele\_grid\_ADD} = [\ PELE_{grid\_ADD} * EF_{grid\_y}]\ /[BC_y] = 0$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$PE_{ele\_grid\_ADD}$	0	0	0	0	0	0	0	0	0	0
$PELE_{grid\_ADD}$										
EF_{grid_y}	0	0	0	0	0	0	0	0	0	0

$PE_{elec\_sg\_ADD} = [PELE_{sg\_ADD} * EF_{sg\_y}] / [BC_y]=0$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$PE_{elec\_sg\_ADD}$	0	0	0	0	0	0	0	0	0	0
$PELE_{sg\_ADD}$	0	0	0	0	0	0	0	0	0	0
EF_{sg_y}										

$P_{Blend,y}$is planned for each BC type using the procedure in the methodology taking the least among (i) and (ii). The source (i.e Ethiopian cement standard) is available. The tabular summary of finding is shown below for the years of the crediting period.

- Summary of values for annual planned $P_{Blend,y}$ is shown in table below for each BC type

BC type	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
CEMII/B-P	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
CEMII/B-L	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
CEM IV/B	0.61	0.61	0.60	0.58	0.57	0.57	0.53	0.50	0.47	0.45

- Summary of values for annual PE_y is shown in table below

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
$PE_y(tCO_{2e})$	1,403,634.03	1403634.027	1,398,520.61	1388038.093	1395567.164	1,403,634.03	1,370,800.48	1,377,150.37	1375561.346	1383724.324

III. Leakage Emissions

Leakage from land transportation of additional Additives of the project activity is considered as shown below.

- ***Leakage due to transportation of additional additives*** *(LE_{trans})****:***

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
LE_y	18822.2407	18750.96814	13953.51978	14318.21578	13770.90817	12797.03839	12961.42036	13491.7058	14011.40992	14311.44701

- **leakage due to the diversion of additives from existing uses**

Pumice is quarried from volcanic mountains and limestone from quarries, both surplus and under concession of Proponent. There would be no need of diversion of additives from existing uses (if any).Moreover there is no significant other purpose requiring use of pumice and henceα_y=0. No discount applied to emissions reduction.

IV. Emissions Reduction

$ER_y = BE_y - PE_y - LE_y$

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
ER_y	473,728.54	471,934.72	460,645.62	461397.0005	439363.1223	406,758.47	402,963.84	408,537.11	413999.5307	414085.6038
BE_y	1,896,184.81	1,894,319.71	1,873,119.74	1863753.309	1848701.195	1,823,189.54	1,786,725.74	1,799,179.18	1803572.287	1812121.375
PE_y	1,403,634.03	1403634.027	1,398,520.61	1388038.093	1395567.164	1,403,634.03	1,370,800.48	1,377,150.37	1375561.346	1383724.324
LE_y	18822.24	18750.96	13953.51	14318.21	13770.90	12797.03	12961.42	13491.70	14011.40	14311.44

In the case that overall negative emission reductions arise in a year, emission reductions are not issued to project participants for the year concerned and in subsequent years, until emission reductions from subsequent years have compensated the quantity of negative emission reductions from the year concerned. (For example: if negative emission reductions of 30 tCO2e occur in the year t and positive emission reductions of 100 tCO2e occur in the year t+1, 0 CERs are issued for year t and only 70 CERs are issued for the year t+1.)"

Moreover, since the project activity consists of production of more than one cement type, the emission reduction shall continue to be calculated following equation 1 to 8 of the methodology for each cement type i produced. The total emission reduction from the project activity shall therefore be calculated as the sum of emission reductions for all cement types i produced.

Appendix 5: Further background information on monitoring plan

As in B7.3

Appendix 6: Summary of post registration changes

N/A

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	EB 66 13 March 2012	Revision required ensuring consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03	EB 25, Annex 15 26 July 2006	
02	EB 14, Annex 06b 14 June 2004	
01	EB 05, Paragraph 12 03 August 2002	Initial adoption.
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