**CLEAN DEVELOPMENT MECHANISM**
**PROJECT DESIGN DOCUMENT FORM (CDM-PDD)**
**Version 03 - in effect as of: 28 July 2006**

**CONTENTS**



**Annexes**

## SECTION A. General description of project activity

### A.1. Title of the project activity:

**Emission reductions in the cement production facilities of Holcim Ecuador S.A.**
Version number of the document: 1
Date: 1st of April, 2009

### A.2. Description of the project activity:

**Summary**
The emission reductions of this CDM project in the cement production facilities of Holcim Ecuador S.A., hereafter referred to as the project, are the result of the implementation of multiple measures in the clinker and cement production processes.

The first measure is a partial replacement of fossil fuel with biomass residues. Currently, mainly pet coke is used as fuel in the clinker kiln. The clinker kiln, where the raw material is heated to a temperature that leads to the decalcination of limestone and key mineralogical processes that form clinker, requires the largest amount of heat in the total cement manufacturing process. In the project, fossil fuels will be partially replaced by multiple biomass residues such as rice husk.

The second measure concerns the improvement of the specific energy consumption of the production processes; this will have an effect on both the thermal and electric energy efficiency. This will include amongst others a reduction of the frequency of kiln stops, training of the personnel on operation and stability of the process. An upgrade of equipment such as fans, motors may also be included; furthermore the kilns and mills control systems will be upgraded.

The third measure concerns the increased use of clinker substitutes in composite cement production. The clinker factor is the percentage of clinker in cement. Clinker can be substituted by other materials (mineral components). Lowering the clinker factor proportionally reduces all $CO_2$ emission related to clinker production, per ton of cement produced, because the amount of clinker (the most energy intensive step in the production process of cement) is reduced. Currently feasibility studies are executed to find the potential to further reduce the clinker factor.

**Contribution to sustainable development**
Apart from reducing GHG emissions the proposed project contributes to sustainable development in the following ways:

- The project will directly create business and employment opportunities through the biomass residues supply chain. Biomass residues collection and transportation are labour intensive as both are mainly manual jobs. Since the biomass will have value it creates paid services.
- The project will establish a direct payment system for local biomass suppliers (transporters, millers and farmers) and therefore improve their economic status and social well-being.
- The project will use biomass residues in the cement manufacturing process, which otherwise would be burnt in open air causing local pollution, such as suspended particles, carbon monoxide, sulphur dioxide, volatile compounds. Therefore, air quality in the biomass supply site

will be improved. Additionally, when biomass residues are not burnt in open air, but stocked and piled, when anaerobic conditions occur methane is released. However, these emissions are not taken into account while calculating total emissions reduction of the proposed project.

- The improvement of thermal and electric power energy efficiency will contribute to the reduction of pollutants such as sulphur dioxide, nitrogen oxides and particles resulting from the combustion of fossil fuels.

**A.3. Project participants:**

| Name of Party involved | Private and/or public entity (ies) project participants (as applicable) | Kindly indicate if the Party involved wishes to be considered as a project participant |
|---|---|---|
| Ecuador (host) | Holcim Ecuador S.A. (private entity) | No |
| Switzerland | Holcim Group Support Ltd (private entity) | No |

**A.4. Technical description of the project activity:**

**A.4.1. Location of the project activity:**

**A.4.1.1. Host Party(ies):**

Ecuador

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

Guayas Province (cement plant)
Cotopaxi Province (grinding station)

**A.4.1.3. City/Town/Community etc.:**

Guayaquil city
Latacunga city

**A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):**

This CDM project involves measures to be implemented at two production sites of Holcim Ecuador S.A., the clinker and cement production plant and the cement grinding station, jointly called "the cement facility" throughout this PDD. Wherever throughout this PDD "the cement facility" or the "project's facility" is used, this refers to both sites.

The clinker and cement production plant is located in Guayas Province, approximately 18 km west from Guayaquil city. The coordinates of the project are: 2°10'41.84" S, 80°02'24.04" W.

The grinding station is located in Cotopaxi Province, in Molienda Latacunga Barrio San Rafael. The coordinates of the project are: 0°56'00" S, 78°51'00" W.

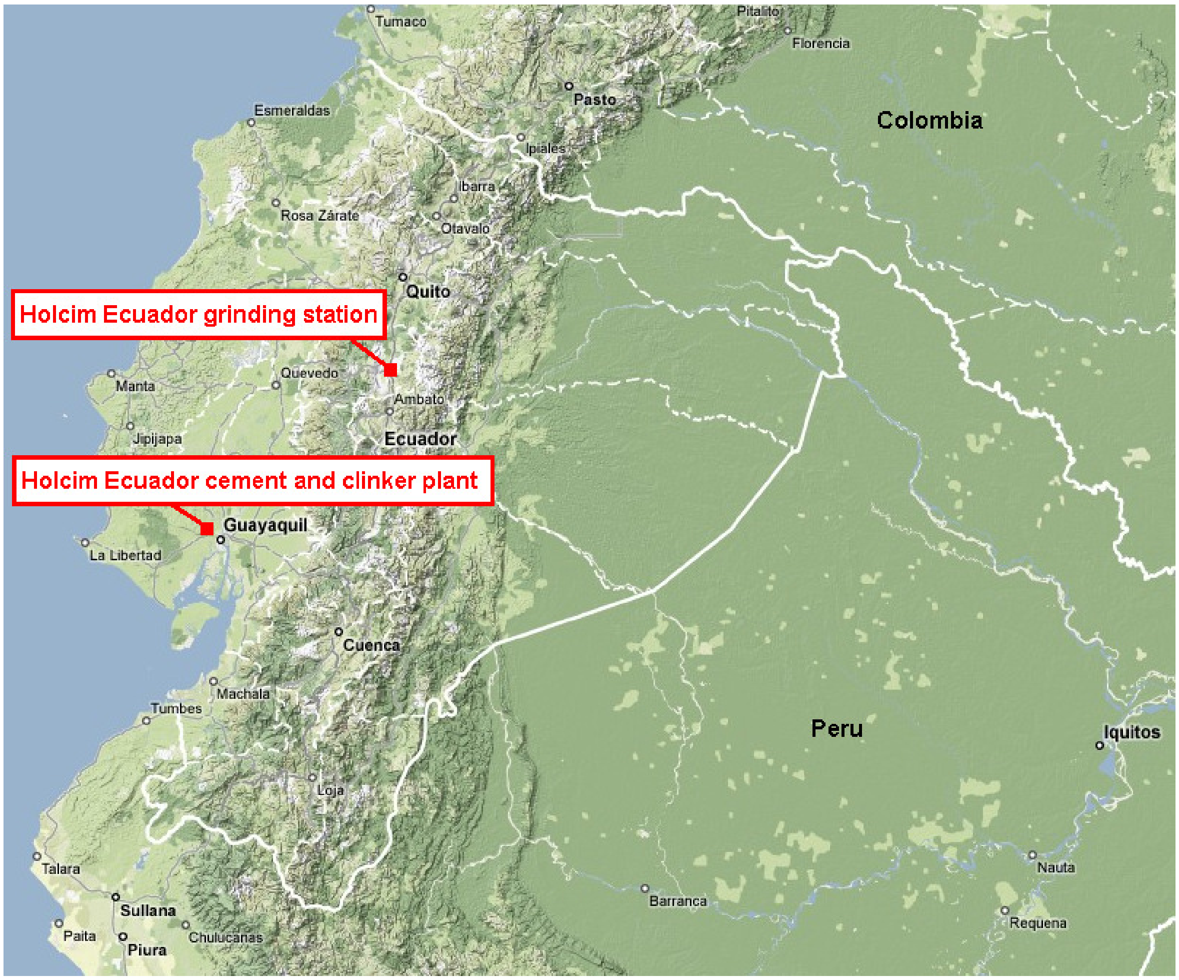


**Figure 1. Map of Ecuador and location of the project (Source: Google Maps)**

**A.4.2. Category(ies) of project activity:**

4 - Manufacturing industries

**A.4.3. Technology to be employed by the project activity:**

The project participant intends to introduce multiple measures to the cement production processes to achieve GHG emissions reduction. This requires technological modifications as described below.

**Partial replacement of pet coke with biomass residues**

The technologies to be employed in order to co-process the biomass residues are under development by Holcim Ecuador with the support of experts from the corporate technical centre of Holcim Group Support Ltd. in Switzerland. In a first phase, Holcim Ecuador will co-process the biomass residues, by mixing the biomass with the pet coke. The mix will then be fed through the pet coke mill and fired at the main burner. Later on, the biomass may be mixed through a hopper and rotary feeder to the pet coke in order to have a stable caloric mixed fuel. In a later stage, the biomass may be fed directly to the calciner burner.

**Improvement of the energy efficiency of the production processes**

Process optimisation measures will be implemented, such as a reduction of the frequency of kiln stops, training of the personnel on operation and stability of the process. An upgrade of equipment such as fans, motors may also be part of this group of measures; furthermore the kilns and mills control systems will be upgraded.

**Decrease of clinker factor**

Holcim Ecuador S.A. currently uses puzzolanic materials to partially substitute clinker. Feasibility studies are executed to further reduce the clinker factor with puzzolanic and other mineral components.

### A.4.4. Estimated amount of emission reductions over the chosen crediting period:

| Years | Annual estimation of emission reductions (tonnes of $CO_2$-eq) |
|---|---|
| 2008 | 27,087 |
| 2009 | 31,049 |
| 2010 | 38,887 |
| 2011 | 46,733 |
| 2012 | 54,586 |
| 2013 | 57,141 |
| 2014 | 56,477 |
| 2015 | 54,829 |
| 2016 | 53,187 |
| 2017 | 51,553 |
| Total emission reductions (tonnes of $CO_2$-eq) | **471,530** |
| Total number of crediting years | 10 |
| Annual average over the crediting period of estimated reductions (tonnes of $CO_2$-eq) | **47,153** |

### A.4.5. Public funding of the project activity:

The project does not obtain public funding.

## SECTION B. Application of a baseline and monitoring methodology

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

No approved CDM methodology exists for this project. The project participant proposes a new methodology with this PDD, entitled "CDM methodology for cement and clinker production facilities based on benchmarking".

### B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The proposed new methodology applies to four types of projects:
Paragraph 3[1]:

a) Project type 1a - projects aiming to reduce GHG emissions from the production of clinker at existing clinker production facilities;
b) Project type 1b - Project aiming to reduce GHG emissions from the production of clinker at new clinker production facilities;
c) Project type 2a - Projects aiming to reduce GHG emission from the production of cement at existing cement production facilities;
d) Project type 2b - Projects aiming to reduce GHG emission from the production of cement at new cement production facilities.

The CDM project subject of this PDD is a project type 2a : projects aiming to reduce GHG emissions from the production of cement at existing cement production facilities.

The proposed project activity fulfils the following conditions of the methodology:
Paragraph 4:

- The project's facility monitors and reports its emissions using the Cement Sustainable Initiative (CSI) Protocol and follows the quality assurance requirements of the CSI Protocol;
- The information from the project's facility is included in the CSI 'Getting the Numbers Right' (GNR) database and is available for the validation and verification;
- The project's facility will perform a validation on site including the data for the year before the project implementation and will perform verification through the project duration;
- The capacity of the project's facility is over 500 tonnes of clinker per day;
- No emission reduction, part of the proposed project, have already been registered or submitted for registration or uploaded for public comments.

### B.3. Description of the sources and gases included in the project boundary:

[1] The paragraph number refers to the paragraph number in the new methodology.

The physical project boundary covers all production processes related to cement production. This includes emissions from the calcination of raw materials, fossil fuel consumption and electricity consumption at both sites of the project's facility.

According to the proposed new methodology (paragraph 7), emission reductions outside the project boundary, as a conservative approach, are not taken into account. Leakage emissions on the other hand, such as increased transportation, are taken into account using a default of 5% of the difference between baseline and project emissions.

| | Source | Gas | Included? | Justification / Explanation |
|---|---|---|---|---|
| Baseline | Calcination of raw materials | $CO_2$ | Yes | Main emission source |
| | | $CH_4$ | No | Minor source, excluded for simplification |
| | | $N_2O$ | No | Minor source, excluded for simplification |
| | Fossil fuel combustion from direct and indirect energy sources | $CO_2$ | Yes | Main emission source |
| | | $CH_4$ | No | Minor source, excluded for simplification |
| | | $N_2O$ | No | Minor source, excluded for simplification |
| Project activity | Calcination of raw materials | $CO_2$ | Yes | Main emission source |
| | | $CH_4$ | No | Minor source, excluded for simplification |
| | | $N_2O$ | No | Minor source, excluded for simplification |
| | Fossil fuel combustion from direct and indirect energy sources | $CO_2$ | Yes | Main emission source |
| | | $CH_4$ | No | Minor source, excluded for simplification |
| | | $N_2O$ | No | Minor source, excluded for simplification |

**B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:**

According to the proposed new methodology, the project participants shall apply two steps to identify the baseline scenario.

Paragraph 9 to 11:

**Step 1. Identify plausible alternative scenarios**

**i)** Continuation of the current practice

The continuation of the current practice is the historical emission intensity of the clinker or cement production at the project's facility before the implementation of the project activity, including improvements in emission intensity which would happen under Business As Usual (BAU) scenario. The historical emission intensity of the project's facility is based on site specific data and combined data. The BAU improvement ratio is based on the CSI GNR database and is published in the CSI GNR booklet.

**ii)** Common practice of the region (benchmark)

The common practice of the region is based on a benchmark of the cement production in the region. The benchmark is corrected for BAU improvements. The benchmark and the BAU improvement ratio are based on the CSI GNR database and published in the CSI GNR booklet.

In the case of the proposed project's facility which is located in Ecuador, the region which enables the publication of representative statistical information and meaningful benchmarking is "South America excluding Brazil".

| |
|---|
| The CSI GNR booklet will be published by the World Business Council for Sustainable Development – Cement Sustainability Initiative on a bi-yearly basis. For this project the benchmark data for various regions have been directly obtained from the GNR database. |

**Box 1: The CSI GNR booklet**

**Step 2. Select scenario yielding the lowest emissions**

For existing production facilities, both alternative i) and ii) are realistic alternatives. As a conservative approach, the scenario yielding the lowest baseline emissions should be used. Determination of the lowest baseline emissions is described in section B.6 of this PDD.

**B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):**

The additionality of the project is demonstrated by using an emission intensity benchmark of cement production in the region. In the case of the proposed project, the region which enables the publication of representative statistical information and meaningful benchmarking is "South America excluding Brazil". The following steps have to be applied to demonstrate the additionality of the proposed project.

Paragraph 24 to 27:

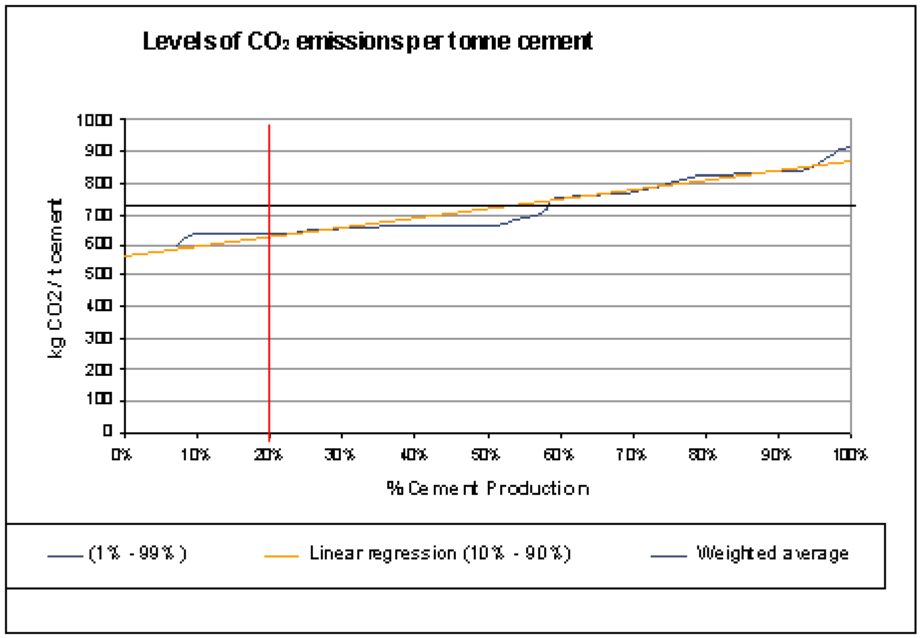
**Step 1. Calculate additionality benchmark emission intensity**

For existing facilities, the additionality emission intensity benchmark ($AEF_{cement,EP}$) is the specific $CO_2$ emissions of the 20[th] percentile of cement production in the region (weighted by cumulative cement production). This emission intensity is based on the benchmarks published in the CSI GNR booklet. The results are plotted on a frequency-distribution curve as function of the cumulative cement production (see Box 1).For the proposed project, the 2006 benchmark value will be used for the additionality test. Apart from the direct emissions, the total emission intensity of a cement production facility also includes indirect $CO_2$ emissions from electric consumption. The grid electricity factor has been calculated according to the 'tool to calculate the emission factor for an electricity system as 0.561 t $CO_2$ / MWh.

**Table 1. Determination of the additionality benchmark emission intensity**

| Percentile | 10 | **20** | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|---|---|
| $AEF_{cement,EP}$ [$tCO_2$/t cement] | 0.590 | **0.620** | 0.650 | 0.680 | 0.710 | 0.740 | 0.770 | 0.800 | 0.830 |

The additionality emission intensity benchmark for the region "South America excluding Brazil" equals $AEF_{cement,EP}$ = 0.620 $tCO_2$/t cement.




Benchmark data obtained from the CSI database. The graph shows the $CO_2$ emissions per tonne cement versus the cumulated cement production volume in the region "South America excluding Brazil". The 20% percentile is the additionality emission intensity level.

**Box 2 Establishment of the additionality emission intensity level, based on emission data obtained from the CSI GNR**

**Step 2. Calculate emission intensity of the project's facility in the years of implementation i**

The emission intensity of the project's facility in the years of implementation i is calculated using equation (11).

**Table 2. Project emission intensity**

| Year | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| $EF_{cement,PJ,i}$ [$tCO_2$/t cement] | 0.630 | 0.627 | 0.623 | 0.619 | 0.615 |

**Step 3. Additionality test**

For determination of the project additionality the following equation is applied:

$$EF_{cement,PJ,i} < AEF_{cement,EP} \qquad \textbf{(1)}$$

Where:

$EF_{cement,PJ,i}$ = Project emission intensity of the cement production in the year *i* ($tCO_2$/t cement)

$AEF_{cement,EP}$ = Additionality emission intensity benchmark for existing facilities in the region including the electricity emission factor ($tCO_2$/t cement)

With reference to the proposed new methodology, the project is additional if the emission intensity of the project's cement production in any of the years of implementation is lower than the additionality emission intensity benchmark, in other words if equation (1) is valid,.

The project emission intensity of the Holcim Ecuador project's facility calculated using equation (11) is presented in Table 2.

The most recent (using 2006 data) additionality emission intensity benchmark for existing facilities in the region "South America excluding Brazil" with the facility electricity emission factor in the last year before the project activity started (paragraph 25 of the methodology) has been obtained from CSI GNR booklet and equals $AEF_{cement,EP}$ = 0.620 $tCO_2$/t cement.

Taking into account equation (1), the values from Table 1 and the additionality emission intensity benchmark for existing facilities ($AEF_{cement,EP}$), the result of the additionality test is as follows:

**Table 2. Results of the additionality test**

| Year | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| $EF_{cement,PJ,i}$ [$tCO_2$/t cement] | 0.630 | 0.627 | 0.623 | 0.619 | 0.615 |
| $AEF_{cement,EP}$ [$tCO_2$/t cement] | 0.620 | | | | |
| Is the project additional? | $EF_{cement,PJ,i} < AEF_{cement,EP}$ | | | | |
| | **Not yet** | **Not yet** | **Not yet** | **Yes** | **Yes** |

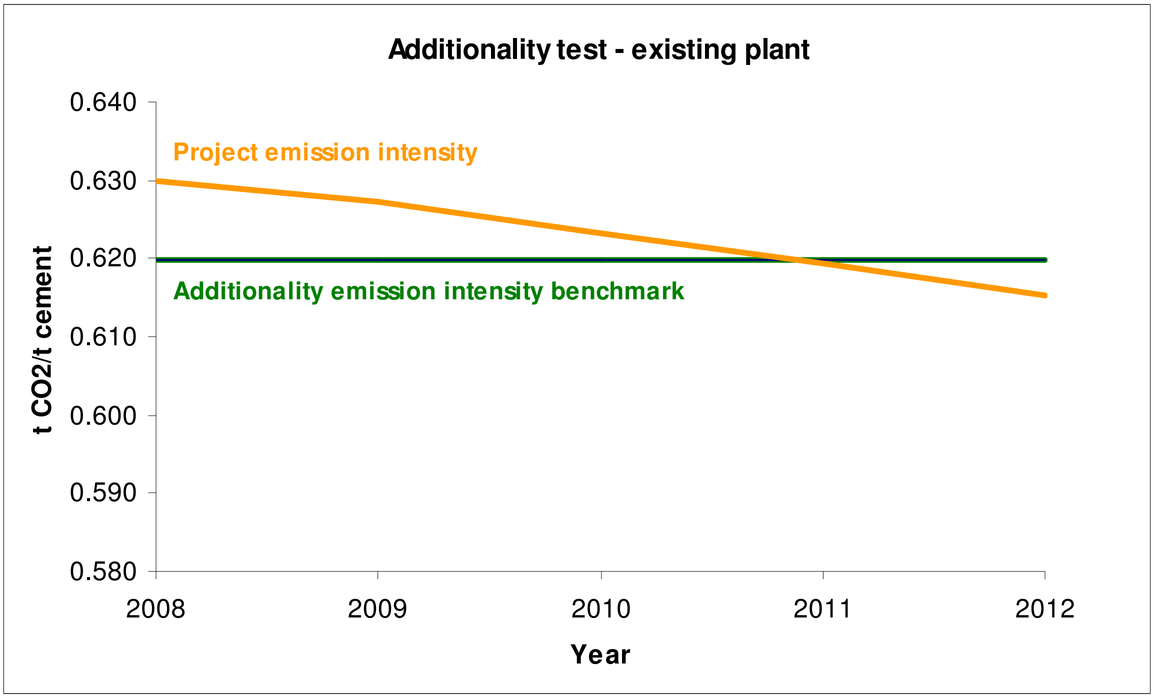



**Figure 3. Graphic presentation of the additionality test**

Taking into account the results of the additionality test, the proposed project is expected to demonstrate additionality from 2011 onwards.

| |
|---|
| For the other project types, the demonstration of additionality is described in paragraph 15-23 and 28 – 36 of the methodology |

**Box 3: Additionality in case of other project types**

**B.6. Emission reductions:**

**B.6.1. Explanation of methodological choices:**

All calculations presented in this PDD refer to the **project type 2a** – project aiming to reduce GHG emission from the production of cement at existing cement production facilities.

**<u>Baseline emissions</u>**

Paragraph 38:
The baseline emissions are calculated by multiplying the baseline emission intensity for existing production facilities with the selected production volume:

$$BE_y = BEF_{cement,EP,y} * CPROD_y \qquad \textbf{(2)}$$

Where:

$BE_y$ = Baseline emissions ($tCO_2$/year)

$BEF_{cement,EP,y}$ = Selected baseline cement emission intensity for existing facilities in the region ($tCO_2$/t cement)

$CPROD_{,y}$ = Selected production volume (t cement/year)

Baseline emissions are calculated using the following steps:

**Step 1. Determination of production volume**

Paragraph 41, 43 and 44:

The project's facility is a net exporter of clinker, i.e. the clinker consumed at the cement production facilities ($CLNKC_y$) is lower than the amount of clinker produced at the cement production facilities ($CLNKP_y$). Therefore, the following equation is applied:

$$CPROD_y = CEMP_y \qquad \textbf{(3)}$$

Where:

$CPROD_y$ = Selected cement production volume (t cement/year)

$CEMP_y$ = Cement production (t cement/year)

The methodological approach for existing facilities can be applied for a clinker production volume equal to the clinker production capacity before project implementation (based on the maximum annual production volume ever reached or any other verifiable information on installed capacity). For the surplus clinker production that may, due to various upgrades, increases during the project duration, the methodological approach for new facilities should be used.

The project's facility is producing more than the design installed capacity. Therefore the maximum annual clinker production volume ever reached has been selected.

It is expected that the clinker production volume will increase over the years. However the emission intensity forecast does not go below the additionality level for new facilities as required by the methodological approach (paragraph 44) and is therefore not considered for the estimation of the baseline emissions.

**Step 2. Determination of emission intensity of baseline scenario and choosing scenario with lowest intensity**

Paragraph 45:
According to the proposed new methodology, for existing facilities the emissions are calculated for the two alternatives:

- Scenario i: continuation of the current practice including BAU improvements;
- Scenario ii: common practice of the region "South America excluding Brazil" (benchmark) including BAU improvements.

The alternative yielding the lowest emissions is taken as baseline scenario. The emissions for each scenario are calculated as follows:

**Scenario i: continuation of the current practice including BAU improvements**

The emission intensity of the scenario i is determined as follows:.

Paragraph 57 to 62:
The historical emission intensity of the combined cement production facilities is calculated using the following equation:

$$BEF_{cement,EP,hist} = \frac{\left(EM_{total,hist} - EM_{electricity\_sg,hist}\right)}{CLNKP_{hist}} \cdot \frac{CLNKC_{hist}}{CEMP_{hist}} \frac{+ SPC_{hist} \cdot EF_{electricity,hist}}{1000000} \qquad \textbf{(4)}$$

Where:

| | | |
|---|---|---|
| $BEF_{cement,EP,hist}$ | = | Historical cement emission intensity of the existing facilities ($tCO_2$/t cement) |
| $EM_{total,hist}$ | = | Total historical emissions of the facilities ($tCO_2$/year) |
| $EM_{electricity\_sg,hist}$ | = | Historical emissions from on-site power generation ($tCO_2$/year) |
| $CLNKP_{hist}$ | = | Historical facilities clinker production (t clinker/year) |
| $CLNKC_{hist}$ | = | Historical clinker consumption at the facilities (t clinker/year) |
| $CEMP_{hist}$ | = | Historical cement production (t cement/year) |
| $SPC_{hist}$ | = | Historical specific power consumption (kWh/t cement) |
| $EF_{electricity,hist}$ | = | Historical electricity emission factor of the facility (kg $CO_2$/MWh) |

For the calculation of the emission factor of the consumed electricity supplied by the grid the following equation is applied:

$$EF_{electricity,y} = EF_{grid,y} \qquad \textbf{(5)}$$

Where:

| | | |
|---|---|---|
| $EF_{electricity,y}$ | = | Electricity emission factor of the consumed electricity ($kgCO_2$/MWh) |
| $EF_{grid,y}$ | = | Emission factor of the electricity purchased from the grid ($kgCO_2$/MWh) |

The proposed new methodology stipulates calculation of the electricity emission factor based on the "Tool to calculate the emission factor for an electrical system" or based on the data published by the Designated National Authority.

For this project, the electricity emission factor calculated by Deuman[2] and revised and supported by "CORDELIM" (The National CDM Promotion Office in Ecuador)[3] is applied. The procedure of emission factor calculations is consistent with the procedures laid in the "Tool to calculate the emission factor for an electrical system" (version 1)[4].

The calculated combined emission factor is 0.561 $tCO_2/MWh$.[5]

For the first implementation year of the project, the baseline emission factor based on continuation of current practice is calculated using the following equation:

$$BEF_{cement,EP,CC,y=1} = BEF_{cement,EP,hist} \qquad \textbf{(6)}$$

Where:

| | | |
|---|---|---|
| $BEF_{cement,EP,CC,y=}$ | = | Baseline cement emission intensity of the existing facility in the first implementation year of the project, based on continuation of the current practice ($tCO_2$/t cement) |
| $BEF_{cement,EP,hist}$ | = | Historical cement emission intensity of the existing facility ($tCO_2$/t cement) |

In the year following the publication of a new CSI GNR database, the baseline emission factor is updated with the most recent data with the aim to adjust the baseline emissions for BAU improvements in emission intensity that would have occurred in the absence of the project activity using the following equation:

$$BEF_{cement,EP,CC,y} = BEF_{cement,EP,CC,y-1} * \beta \qquad \textbf{(7)}$$

Where:

| | | |
|---|---|---|
| $BEF_{cement,EP,CC,y}$ | = | Baseline cement emission intensity of the existing facility based on continuation of the current practice in a project year y ($tCO_2$/t cement) |
| $BEF_{cement,EP,CC,y-1}$ | = | Baseline cement emission intensity of the existing facility based on continuation of the current practice in the previous year ($tCO_2$/t cement) |
| $\beta$ | = | BAU cement emission intensity improvement factor |

The BAU improvement factor β is calculated based on the last two published baseline emission intensities in the CSI GNR database, which are calculated in accordance with equation below:

$$\beta = MIN(1 \quad ; \quad \frac{BEF_{cement,EP,CP,y}}{BEF_{cement,EP,CP,latest}}) \qquad \textbf{(8)}$$

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[2] www.deuman.com (website accessed on 05.03.2009)

[3] www.cordelim.net (website accessed on 05.03.2009)

[4] http://cdm.unfccc.int/EB/035/eb35_repan12.pdf (website accessed on 05.03.2009)

[5] http://www.cordelim.net/cordelim.php?c=835 (website accessed on 05.03.2009)

Where:

| | | |
|---|---|---|
| $\beta$ | = | BAU cement emission intensity improvement factor in the region |
| $BEF_{cement,EP,CP,,y}$ | = | Common practice cement emission intensity benchmark in the region (with the facility electricity emission factor) in the latest CSI protocol available ($tCO_2$/t cement) |
| $BEF_{cement,EP,CP,latest}$ | = | Common practice cement emission intensity benchmark in the region (with the facility electricity emission factor) in the previous CSI publication ($tCO_2$/t cement) |

For the ex-ante calculation of emission reduction, a factor ($\beta_{ex-ante}$) of 0.998, based on the last two published values for the $BEF_{cement,EP,CP,y}$ has been used.

The values of the baseline emission intensity based on continuation of current practice including BAU improvements are presented in the Table 3 below. See section B.6.3 for detailed calculations.

**Table 3. Baseline emission intensity based on continuation of current practice including BAU improvements**

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| $BEF_{cement,EP,CC,y}$ [$tCO_2$/t cement] | 0.639 | 0.638 | 0.637 | 0.636 | 0.634 | 0.633 | 0.632 | 0.630 | 0.629 | 0.628 |

**<u>Scenario ii: </u>common practice of the region "South America excluding Brazil" (benchmark) including BAU improvements**

Paragraph 63:

According to the proposed new methodology, the common practice cement emission intensity benchmark ($BEF_{,cement,EP,CP,,y}$) is the specific $CO_2$ emissions of the 45$^{th}$ percentile of the cement production in the region (weighted by cement production). This level is given in the CSI GNR database. The results are plotted on a frequency-distribution curve as function of the cumulative cement production (see Box 4). For the proposed project 2006 benchmark value has been taken into account.

Apart from the direct emissions, the total emission intensity of a cement production facility also includes indirect $CO_2$ emissions from electric consumption. The grid electricity factor has been calculated according to the ‘tool to calculate the emission factor for an electricity system as 0.561 t $CO_2$ / MWh. Based on the electricity emission factor the baseline emission benchmark levels have been obtained from the CSI database.

**Table 4. Determination of the baseline emission intensity benchmark**

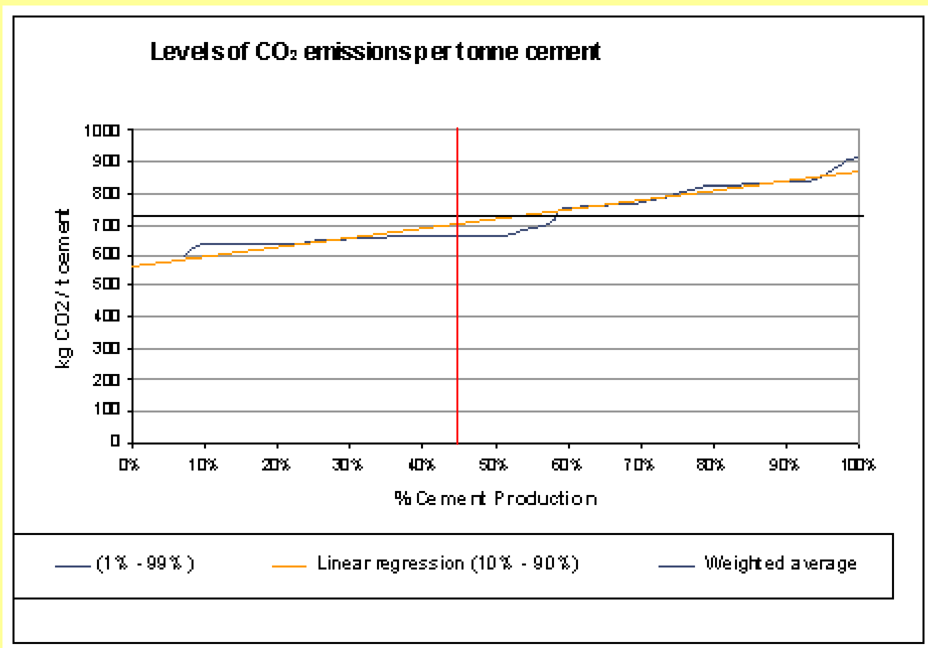
| Percentile | 10 | 20 | 30 | **45** | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|---|---|
| $BEF_{cement,EP,CP,y=1}$ [$tCO_2$/t cement] | 0.590 | 0.620 | 0.650 | **0.695** | 0.710 | 0.740 | 0.770 | 0.800 | 0.830 |

The baseline emission intensity benchmark for the region "South America excluding Brazil" equals $BEF_{cement,EP,CP,y=1}$ = 0.695 $tCO_2$/t cement.

The values of the common practice of the region (benchmark) including BAU improvements are presented in the Table 5 below. See section B.6.3 for detailed calculations.

**Table 5. Baseline emission intensity based on common practice of the region including BAU improvements**

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| $BEF_{cement,EP,CP,y}$ [$tCO_2$/t cement] | 0.695 | 0.693 | 0.692 | 0.691 | 0.689 | 0.688 | 0.686 | 0.685 | 0.684 | 0.682 |




Benchmark data obtained from the CSI database. The graph shows the $CO_2$ emissions per tonne cement versus the cumulated cement production in the region "South America excluding Brazil". The 45% indicates the baseline emission intensity level.

**Box 4: Establishment of the baseline intensity level, based on emission data obtained from the CSI GNR**

**<u>Determination of the alternative yielding the lowest emissions</u>**

The emission intensity to be used as the alternative yielding the lowest emissions is calculated as follows:

Paragraph 65:

$$BEF_{cement,EP,y} = MIN(BEF_{cement,EP,CC,y} \quad ; \quad BEF_{cement,EP,CP,y}) \qquad \textbf{(9)}$$

Where:

| | | |
|---|---|---|
| $BEF_{cement,EP,y}$ | = | Selected baseline cement emission intensity for an existing facility in the region ($tCO_2$/t cement) |
| $BEF_{cement,EP,CC,y}$ | = | Baseline cement emission intensity of the existing facility based on continuation of the current practice in a project year ($tCO_2$/t cement) |
| $BEF_{cement,EP,CP,y}$ | = | Common practice cement emission intensity benchmark in the region with the facility electricity emission factor ($tCO_2$/t cement) |

To determine the alternative yielding the lowest emissions values from Table 3 and Table 5 are considered. The results are presented in the Figure 4 below.

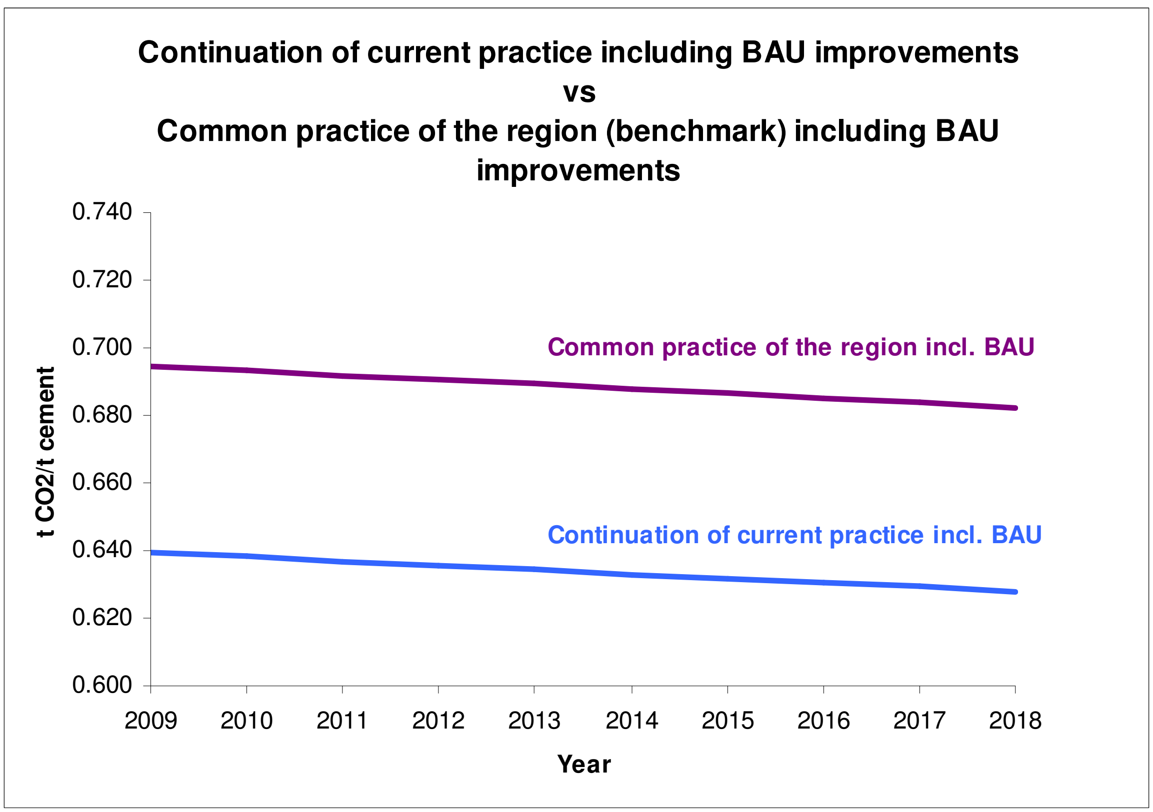



**Figure 4. Determination of the alternative yielding the lowest emissions as baseline scenario**

Scenario i - continuation of the current practice including BAU improvements is the scenario yielding the lowest emissions. Therefore, scenario i has been selected as baseline scenario for the proposed project.

For the other project types, the calculation of baseline emissions is described in paragraph 37, 40, 46-56 and 66-72 of the methodology.

**Box 5: Baseline emissions in case of other project types**

## Project emissions

Paragraph 74:
The project emissions are calculated by multiplying the project's emission intensity of the combined cement production facilities i with the project's cement production volume:

$$PE_y = EF_{cement,PJ,y} \cdot CPROD_y \qquad \textbf{(10)}$$

Where:

| | | |
|---|---|---|
| $PE_y$ | = | Project emissions ($tCO_2$/year) |
| $EF_{cement,PJ,y}$ | = | Project cement emission intensity in the year *y* ($tCO_2$/t cement) |
| $CPROD_{,y}$ | = | Selected production volume (t cement/year) |

Project emissions are calculated using the following steps:

**Step 1. Determination of production volume**

Paragraph 77:
The cement production volume in project scenario is calculated based on the equation (3) used for determination of production volume in baseline scenario.

**Step 2. Determination of project emission intensity**

Paragraph 79:
Project emissions intensity of the combined cement production facilities i is calculated with the following equation:

$$EF_{cement,y} = \frac{\left(EM_{total,y} - EM_{electrcity\_sg,y}\right)}{CLNKP_y} \cdot \frac{CLNKC_y}{CEMP_y} + SPC_y \cdot EF_{electricity,y} \qquad \textbf{(11)}$$

Where:

| | | |
|---|---|---|
| $EF_{cement,,y}$ | = | Cement emission intensity in the year y ($tCO_2$/t cement) |
| $EM_{total,hist}$ | = | Total emissions of the facility ($tCO_2$/year) |
| $EM_{electricity\_sg,y}$ | = | Emissions from on-site power generation ($tCO_2$/year) |
| $CLNKP_y$ | = | Facility clinker production (t clinker/year) |
| $CLNKC_y$ | = | Clinker consumption at the facility (t clinker/year) |
| $CEMP_y$ | = | Cement produced (t cement/year) |
| $SPC_y$ | = | Specific power consumption (kWh/t cement) |

$EF_{electricity,y}$ = Electricity emission factor of the consumed electricity ($kgCO_2/MWh$)

The project cement plant uses no on-site power generation. Therefore $EM_{electricity\_sg,y} = 0$.

The emission factor of the consumed electricity supplied by the grid equals 0.561 $tCO_2/MWh$.

| |
|---|
| For the other project types, the calculation of project emissions is described in paragraph 73, 76 and 78 of the methodology |

**Box 6: Project emissions in case of other project types**

**Leakage**

Paragraph 84 to 85:
According to the proposed new methodology leakage related to projects implemented at an existing facility are calculated according to the following equation:

$$LE_y = 0.05 \cdot (BE_y - PE_y) \qquad \textbf{(12)}$$

Where:
$LE_y$ = Project leakages in year *y* ($tCO_2$/year)
$BE_y$ = Baseline emissions in year *y* ($tCO_2$/year)
$PE_{y,methane}$ = Project emissions in year *y* ($tCO_2$/year)

**Emission reductions**

Paragraph 86:
Total emission reductions of the project are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \qquad \textbf{(13)}$$

Where:
$ER_y$ = Emission reductions in year *y* ($tCO_2$/year)
$BE_y$ = Baseline emissions in year *y* ($tCO_2$/year)
$PE_y$ = Project emissions in year *y* ($tCO_2$/year)
$LE_y$ = Leakage emissions in year *y* ($tCO_2$/year)

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

| **Data / Parameter:** | **ID.1 / $AEF_{cement,EP}$** |
|---|---|
| Data unit: | $tCO_2$/t cement |
| Description: | Additionality emission intensity benchmark for cement production, existing plants of the region "South America excluding Brazil" |
| Source of data used: | Published by the CSI in the GNR |
| Value applied: | 0.620 |

| | |
|---|---|
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | Published in steps of 200 kg $CO_2$ / MWh |

| **Data / Parameter:** | **ID.2 / $\beta_{ex\text{-}ante}$** |
|---|---|
| Data unit: | - |
| Description: | BAU improvement factor of the region "South America excluding Brazil" |
| Source of data used: | Published by the CSI in the GNR |
| Value applied: | 0.998 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

| **Data / Parameter:** | **ID.3 / $BEF_{cement,EP,CP,ex\text{-}ante}$** |
|---|---|
| Data unit: | $tCO_2$/t cement |
| Description: | Baseline cement emission intensity in year y, continuation of current practice of the region "South America excluding Brazil" (benchmark), existing plants |
| Source of data used: | Published by the CSI in the GNR |
| Value applied: | 0.695 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

| **Data / Parameter:** | **ID.4 / $CLNKP_{hist}$** |
|---|---|
| Data unit: | t clinker/year |
| Description: | Historical clinker production |
| Source of data used: | Holcim data (CSI protocol) |
| Value applied: | 2,047,838 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |

| | |
|---|---|
| Any comment: | |

| **Data / Parameter:** | **ID.5 / $CEMP_{hist}$** |
|---|---|
| Data unit: | t cement/year |
| Description: | Historical cement production of the project' facility |
| Source of data used: | Holcim data (CSI protocol) |
| Value applied: | 3,030,718 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | 2007 data submitted to the CSI protocol by Holcim |
| Any comment: | |

| **Data / Parameter:** | **ID.6 / $EM_{total,hist}$** |
|---|---|
| Data unit: | t $CO_2$/year |
| Description: | Total historical $CO_2$ emissions of the project' facility |
| Source of data used: | Holcim data (CSI protocol) |
| Value applied: | 1,784,460 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | 2007 data submitted to the CSI protocol by Holcim |
| Any comment: | |

| **Data / Parameter:** | **ID.7 / $SPC_{hist}$** |
|---|---|
| Data unit: | kWh/t cement |
| Description: | Historical specific power consumption of the project' facility |
| Source of data used: | Holcim data (CSI protocol) |
| Value applied: | 91 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | 2007 data submitted to the CSI protocol by Holcim |
| Any comment: | |

| **Data / Parameter:** | **ID.8 / $EF_{electricity, hist}$** |
|---|---|
| Data unit: | kg $CO_2$/MWh |
| Description: | Emission factor for electricity |
| Source of data used: | CORDELIM |
| Value applied: | 561 |

| | |
|---|---|
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The electricity emission factor was calculated by Deuman and revised and supported by "CORDELIM" (The National CDM Promotion Office in Ecuador) and 2005-2007 period. Therefore, it can be deemed as an official source. |
| Any comment: | |

### B.6.3. Ex-ante calculation of emission reductions:

The total emission reductions of the project activity are calculated on the basis of the equations and parameters presented and explained in section B.6.1 of this document.

**Baseline emissions**

**1.** Calculation of the historical emission intensity of the project's facility

| **Input data** |
|---|
| $EM_{total,hist}$ = 1,784,460 $tCO_2$/year |
| $EM_{electricity\_sg,hist}$ = 0 |
| $CLNKP_{hist}$ = 2,047,838 t clinker/year |
| $CEMP_{hist}$ = 3,030,718 t cement/year |
| $CLNKC_{hist}$ = 2,045,953 t clinker/year |
| $SPC_{hist}$ = 91 kWh/t cement |
| $EF_{electricity,hist}$ = 561 kg $CO_2$/MWh |
| **Calculations** |
| Equation (4): $BEF_{cement,EP,hist} = \frac{(EM_{total,hist} - EM_{electricity\_sg,hist})}{CLNKP_{hist}} \cdot \frac{CLNKC_{hist}}{CEMP_{hist}} + \frac{SPC_{hist} \cdot EF_{electricity,hist}}{1000000}$ |
| **Results** |
| $BEF_{cement,EP,hist}$ = 0.639 $tCO_2$/t cement |

**2.** Calculation of the baseline emission factor based on continuation of current practice for the first implementation year of the project

| **Input data** |
|---|
| $BEF_{cement,EP,hist}$ = 0.639 $tCO_2$/t cement |
| **Calculations** |
| Equation (6): $BEF_{cement,EP,CC,y=1} = BEF_{cement,EP,hist}$ |
| **Results** |
| $BEF_{cement,EP,CC,y=1}$ = 0.639 $tCO_2$/t cement |

**3.** Calculation of the baseline cement emission intensity of the existing project's facility based on continuation of the current practice. The cement production is based on the maximum clinker production and on the forecasted clinker factor.

| **Input data** |
|---|
| $BEF_{cement,EP,CC,y=1}$ = 0.639 $tCO_2$/t cement |
| $\beta$ = 0.998 |
| **Calculations** |
| Equation (6): $BEF_{cement,EP,CC,y} = BEF_{cement,EP,CC,y-1} * \beta$ |
| **Results** |
| Table 3. Baseline cement emission intensity of existing project's facility based on continuation of the current practice |

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| $BEF_{cement,EP,CC,y}$ [$tCO_2$/t cement] | 0.639 | 0.638 | 0.637 | 0.636 | 0.634 | 0.633 | 0.632 | 0.630 | 0.629 | 0.628 |

**4.** Calculation of the common practice emission intensity of the region "South America excluding Brazil" (benchmark) including BAU improvements

| **Input data** |
|---|
| $BEF_{cement,EP,CP,y=1}$ = 0. 695 $tCO_2$/t cement |
| $\beta$ = 0.998 |
| **Calculations** |
| Equation (6): $BEF_{cement,EP,CP,y} = BEF_{cement,EP,CP,y-1} * \beta$ |
| **Results** |
| Table 4. Common practice emission intensity of the region (benchmark) including BAU improvements |

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| $BEF_{cement,EP,CP,y}$ [$tCO_2$/t cement] | 0.695 | 0.693 | 0.692 | 0.691 | 0.689 | 0.688 | 0.686 | 0.685 | 0.684 | 0.682 |

**5.** Determination of the alternative yielding the lowest emissions

| **Input data** |
|---|
| Table 3. Baseline cement emission intensity of existing project's facility based on continuation of the current practice |
| Table 4. Common practice emission intensity of the region "South America excluding Brazil" (benchmark) including BAU improvements |
| **Calculations** |
| Equation (9): $BEF_{cement,EP,y} = MIN(BEF_{cement,EP,CC,y} \quad ; \quad BEF_{cement,EP,CP,y})$ |

| **Results** |
|---|
| Table 5. Baseline cement emission intensity of existing project's facility based on continuation of the current practice |

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| $BEF_{cement,EP,CC,y}$ [$tCO_2$/t cement] | 0.639 | 0.638 | 0.637 | 0.636 | 0.634 | 0.633 | 0.632 | 0.630 | 0.629 | 0.628 |

**6.** Calculation of baseline emissions

| **Input data** |
|---|
| Table 5. Baseline cement emission intensity of existing project's facility based on continuation of the current practice |
| $CPROD_y$ = 3,026,570 t cement/year (adjusted based on maximum clinker production before project implementation and forecasted clinker factor) |
| **Calculations** |
| Equation (10): $BE_y = BEF_{cement,EP,y} * CPROD_y$ |
| **Results** |
| Table 6. Baseline emissions |

| Year | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| $BE_y$ [$tCO_2$/year] | 1,935,065 | 1,931,195 | 1,927,333 | 1,923,478 | 1,919,631 |

| Year | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| $BE_y$ [$tCO_2$/year] | 1,915,792 | 1,911,960 | 1,908,136 | 1,904,320 | 1,900,511 |

**Project emissions**

**7.** Calculation of project emissions intensity for existing project's facility

| **Input data** |
|---|
| Table 7. Total emissions of the project's facility |

| Year | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| $EM_{total,y}$ [$tCO_2$/year] | 1,852,149 | 1,844,229 | 1,831,469 | 1,818,709 | 1,805,949 |

| Year | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| $EM_{total,y}$ [$tCO_2$/year] | 1,802,649 | 1,799,349 | 1,797,149 | 1,794,949 | 1,792,749 |

| |
|---|
| $EM_{electricity\_sg,y} = 0$ |
| $CLNKP_y$ = 2,157,125 t clinker/year |
| $CLNKC_y$ = 2,245,560 t clinker/year |
| $CEMP_y$ = 3,318,790 t cement/year |
| Table 8. Specific power consumption |

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| $SPC_y$ [kWh/t cement] | 87 | 87 | 87 | 87 | 87 | 85 | 85 | 85 | 85 | 85 |

$EF_{electricity,y}$ = 561 kg $CO_2$/MWh

**Calculations**

Equation (11): $$EF_{cement,y} = \frac{(EM_{total,y} - EM_{electrcity\_sg,y})}{CLNKP_y} \cdot \frac{CLNKC_y}{CEMP_y} + SPC_y \cdot EF_{electricity,y}$$

**Results**

Table 9. Project emission intensity

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| $EF_{cement,y}$ [t$CO_2$/t cement] | 0.630 | 0.627 | 0.623 | 0.619 | 0.615 | 0.613 | 0.612 | 0.611 | 0.611 | 0.610 |

**8.** Calculation of the project emissions

**Input data**

Table 9. Project emission intensity

$CPROD_y$ = 3,026,570 t cement/year

**Calculations**

Equation (10): $PE_y = EF_{cement,PJ,y} * CPROD_y$

**Results**

Table 10. Project emissions

| Year | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| $PE_y$ [t$CO_2$/year] | 1,906,553 | 1,898,512 | 1,886,399 | 1,874,285 | 1,862,172 |

| Year | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| $PE_y$ [t$CO_2$/year] | 1,855,643 | 1,852,510 | 1,850,422 | 1,848,333 | 1,846,245 |

**Leakage**

**9.** Calculation of leakage

**Input data**

Table 10. Project emissions

Table 6. Baseline emissions

**Calculations**

Equation (12): $LE_y = 0.05 \cdot (BE_y - PE_y)$

**Results**

Table 11. Leakage

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| $LE_y$ [$tCO_2$/year] | 1426 | 1634 | 2047 | 2460 | 2873 | 3007 | 2972 | 2886 | 2799 | 2713 |

**<u>Emission reductions</u>**

**10.** Calculation of emission reductions

**Input data**

Table 10. Project emissions

Table 6. Baseline emissions

Table 11. Leakage

**Calculations**

Equation (12): $ER_y = BE_y - PE_y - LE_y$

**Results**

Table 12. Emission reductions

| Year | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| $ER_y$ [$tCO_2$/year] | 27,087 | 31,049 | 38,887 | 46,733 | 54,586 |

| Year | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| $ER_y$ [$tCO_2$/year] | 57,141 | 56,477 | 54,829 | 53,187 | 51,553 |

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

| Year | Estimation of project activity emissions (tCO2-eq) | Estimation on baseline emission (tCO2-eq) | Estimation of leakage (tCO2-eq) | Estimation of overall emission reduction (tCO2-eq)) |
|---|---|---|---|---|
| 2008 | 1,906,553 | 1,935,065 | 1,426 | 27,087 |
| 2009 | 1,898,512 | 1,931,195 | 1,634 | 31,049 |
| 2010 | 1,886,399 | 1,927,333 | 2,047 | 38,887 |
| 2011 | 1,874,285 | 1,923,478 | 2,460 | 46,733 |
| 2012 | 1,862,172 | 1,919,631 | 2,873 | 54,586 |
| 2013 | 1,855,643 | 1,915,792 | 3,007 | 57,141 |
| 2014 | 1,852,510 | 1,911,960 | 2,972 | 56,477 |
| 2015 | 1,850,422 | 1,908,136 | 2,886 | 54,829 |
| 2016 | 1,848,333 | 1,904,320 | 2,799 | 53,187 |
| 2017 | 1,846,245 | 1,900,511 | 2,713 | 51,553 |
| **Total** | **18,681,073** | **19,177,421** | **24,817** | **471,530** |

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

### B.7.1 Data and parameters monitored:

| Data / Parameter: | ID.9 / $CLNKP_y$ |
|---|---|
| Data unit: | t clinker/year |
| Description: | Facility clinker production in year *y* |
| Source of data to be used: | ex-ante estimations |
| Value of data | 2,047,838 |
| Description of measurement methods and procedures to be applied: | |
| QA/QC procedures to be applied: | |
| Any comment: | |

| Data / Parameter: | ID.10 / $CLNKC_y$ |
|---|---|
| Data unit: | t clinker/year |
| Description: | Total clinker consumed at the project's facility in year y |
| Source of data to be used: | CSI protocol line 11 (ex-ante estimations) |
| Value of data | 2,157,125 |
| Description of measurement methods and procedures to be applied: | |
| QA/QC procedures to be applied: | |
| Any comment: | |

| Data / Parameter: | ID.11 / $CEMP_y$ |
|---|---|
| Data unit: | t cement/year |
| Description: | Cement production at the project's facility in the year y |
| Source of data to be used: | CSI protocol line 21 (ex-ante estimations) |
| Value of data | 3,026,570 |
| Description of measurement methods and procedures to be applied: | |
| QA/QC procedures to be applied: | |
| Any comment: | |

| **Data / Parameter:** | **ID.12 / $EM_{total,y}$** |
|---|---|
| Data unit: | t $CO_2$/year |
| Description: | Total emissions of the project's facility |
| Source of data to be used: | ex-ante estimations |
| Value of data | Table 7 |
| Description of measurement methods and procedures to be applied: | |
| QA/QC procedures to be applied: | |
| Any comment: | |

| **Data / Parameter:** | **ID.13 / $SPC_y$** |
|---|---|
| Data unit: | kWh/t cement |
| Description: | Specific power consumption of the project's facility |
| Source of data to be used: | ex-ante estimations |
| Value of data | Table 8 |
| Description of measurement methods and procedures to be applied: | |
| QA/QC procedures to be applied: | |
| Any comment: | |

| **Data / Parameter:** | **ID.14 / $EF_{electricity,,y}$** |
|---|---|
| Data unit: | kg $CO_2$/MWh |
| Description: | Emission factor for electricity |
| Source of data to be used: | CORDELIM (ex-ante calculations for 2005-2007) |
| Value of data | 561 |
| Description of measurement methods and procedures to be applied: | |
| QA/QC procedures to be applied: | |
| Any comment: | |

| Data / Parameter: | ID.15 / $EC_{grid,y}$ |
|---|---|
| Data unit: | MWh |
| Description: | Consumption of power produced externally for the project's facility |
| Source of data to be used: | CSI protocol line 33c (ex-ante estimations) |
| Value of data | 289,755 |
| Description of measurement methods and procedures to be applied: | |
| QA/QC procedures to be applied: | |
| Any comment: | |

| Data / Parameter: | ID.16 / $\beta_{ex-post}$ |
|---|---|
| Data unit: | - |
| Description: | BAU improvement factor of the region "South America excluding Brazil" |
| Source of data to be used: | Published by the CSI in the GNR |
| Value of data | 0.998 |
| Description of measurement methods and procedures to be applied: | |
| QA/QC procedures to be applied: | |
| Any comment: | |

**B.7.2. Description of the monitoring plan:**

The monitoring plan of the project emission reductions in the project's facility of this Holcim Ecuador S.A. project is consistent with the proposed new methodology. All monitoring will be conducted with quality assurance requirements according to the CSI protocol.

The primary parameters are reported automatically into the computerized SAP system. Depending on the value, recording is done daily or monthly basis. At the end of the year the data are reported in the Annual Technical Report (ATR).

The data are compiled by the responsible of the ATR entries together with the $CO_2$/environmental coordinator. The data in the ATR are cross-checked to ensure that the generated and reported data is correct. Before the data is send to the corporate organization, the data is once more cross-checked by the responsible of the "plant sign off".

At corporate level, the ATR data are checked with customised software and are as well cross checked by an assigned team. In addition a specifically designated person is responsible to once more cross-check all the $CO_2$ related data. Any unusual or inconsistent value is listed and questions are sent back to the plant (historic available). Once each open question is closed/modified by the plant responsible, the data are approved and ATR as well as the $CO_2$ (and CDM) data are closed. Once the $CO_2$ inventory is completed, the relevant parameters and indicators are automatically extracted and sent to an independent consultant in order to be integrated in the CSI-GNR database.

The project's facilitiy management systems are ISO 9000 and 14000 certified. The quality control (QC) and quality assurance (QA) also includes cross checking data with other reports within the Holcim Group. The precision of the parameters depends on the equipments. The equipments are subject to regular calibration and maintenance that can be checked during the verification. The monitoring data will be kept for at least 2 years after the end of the crediting period.

Participation to the global WBCSD-CSI GNR database is subject to certain quality assurance requirements. To this purpose each participant to the GNR database is required to obtain third party assurance of its companies' Monitoring, Reporting and Verification systems at least every three years, including limited assurance of the data provided for all the years of the corresponding period. The data of all CDM projects, using this methodology, are also included in the GNR database and are third party verified for each year of the project duration. As such the WBCSD-CSI GNR database provides the most reliable source of benchmarking information for the industry.

The local staffs are trained on reporting of $CO_2$ (and CDM) data in line with the ATR and CSI-GNR database. In addition a designated $CO_2$/environemental coordinator is specifically trained regarding the $CO_2$ monitoring issues to be able to cross-check the generated data.

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

The final draft of this baseline section has been completed on 01/04/2009.

The baseline has been prepared by Ecofys Netherlands BV by Mr. Maarten Neelis, Mr. Janusz Mizerny and Mr. Edwin Dalenoord in consultation with Holcim Ecuador S.A. Ecofys Netherlands BV should not be considered as a project participant.

| | |
|---|---|
| Company name: | Ecofys Netherlands B.V. |
| Visiting Address: | Kanaalweg 16-G<br>3526 KL Utrecht<br>The Netherlands |
| Contact Person: | Mr. Edwin Dalenoord |
| Telephone number: | +31 (0)30 66 23 368 |
| Fax number: | +31 (0)6 4625 12 13 |
| e-mail: | e.dalenoord@ecofys.com |

## SECTION C. Duration of the project activity / crediting period

### C.1. Duration of the project activity:

#### C.1.1. Starting date of the project activity:

01/01/2008

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

20 years

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

#### C.2.1. Renewable crediting period:

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

N/A

##### C.2.1.2. Length of the first crediting period:

N/A

#### C.2.2. Fixed crediting period:

##### C.2.2.1. Starting date:

The latest between the starting date of the project activity and the registration of the project activity.

##### C.2.2.2. Length:

10 years

## SECTION D. Environmental impacts

### D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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

## SECTION E. Stakeholders' comments

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

### E.2. Summary of the comments received:

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

## Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| | |
|---|---|
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## Annex 2

## INFORMATION REGARDING PUBLIC FUNDING

**Annex 3**

**BASELINE INFORMATION**

**Annex 4**

**MONITORING INFORMATION**

**- - - - -**