CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

- Title of the project activity: “Production of blended cement with blast furnace slag at Cimento Mizu”

- Version number of the document: 1

- Date of the document: 28/december/2005

A.2. Description of the project activity:

The purpose of the project activity is the use of blast furnace slag, an alternative raw material, as substitute of clinker in the manufacturing of cement at Cimento Mizu. With the substitution of clinker, greenhouse gases emissions are reduced because of the decrease of emissions in the calcination of limestone and due to the reduction of fossil fuels consumption in the kiln.

Cement is made by heating limestone with small quantities of other materials, such as clay, to 1,450°C in a kiln. The resulting hard substance, called clinker, is then ground into a powder, in cement mills, with a small amount of gypsum to make the Ordinary Portland Cement (OPC). Other materials can be used in substitution of clinker in the grinding phase of the fabrication, producing the so-called blended cement. Blast furnace slag is one of these alternative materials, resulting in the production of the Portland Blast Furnace Slag cement (PBFS).

The blast furnace slag is a residue of pig iron production similar to sand, that has properties near to clinker and that can be used, under certain conditions, as clinker substitute. In the project activity the slag is used in the grinding phase of cement production chain, i.e. slag replaces clinker in the cement mills avoiding, then, clinker production in the kilns.

It is important to highlight that the cement industry plays a significant role in Climate Change. First because the cement manufacture is an energy intensive process, demanding large amounts of fuel and electricity in the whole process chain. In addition, the chemical process of producing clinker (calcination of limestone) produces non-renewable CO_2. These two factors results in that the cement industry is responsible for a significant portion of global man-made CO_2 emissions. It is estimated that 50% of the cement industry GHG emissions derive from the chemical process, and 40% from burning fuel. The remainder is split between electricity and transport uses.

Knowledgeable of that, back in 1999, worlwide cement industry launched the Cement Sustainability Initiative. Among other reasons, the Initiative was launched in response to international concerns about the role of the cement industry in Climate Change. The objective of the Initiative was to develop studies and to propose an agenda towards the sustainability of the cement industry. In the Climate Change chapter, the agenda proposed some important actions including: innovation in improving the energy efficiency of processes and equipment; switching to lower carbon fuels; using alternative raw materials to reduce limestone use; developing CO_2 capture and sequestration techniques; and taking advantage of market mechanisms such as emissions trading and voluntary initiatives. Cimento Mizu is part of Votorantim Cimentos which is signatory of the Cement Industry Initiative.

The project activity contributes to sustainable development in the following manners:

- Project activity contributes to the reduction of energy consumption in the cement manufacture chain and consequently to the conservation of energy resources. The increase in the use of blast furnace slag in the place of clinker reduces energy demand in cement manufacture and mining of limestone.

- The reduction of fossil fuel consumption also results in the reduction of local air pollution.

- The reduced use of clinker helps in the conservation of non-renewable reserves of limestone.

- Because less limestone is used, limestone mining activities are reduced. It results in important local environmental benefits, such as, mitigation of local air pollution, reduction of biodiversity loss, and soil and landscaping conservation at mining sites.

- Blast furnace slag is an important industrial residue that requires adequate final disposal. The use of this residue as raw material helps mitigating this problem, reducing the risks of soil and water contamination due to inadequate landfilling of slag.

- The project activity also helps mitigating Climate Change because of the significant reductions of direct and indirect greenhouse gases emissions.

A.3. Project participants:

Table 1 - Parties involved in the project activity

Name of Party involved (*) ((host) indicates host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Cimento Mizu (private entity)	NO
	Ecoinvest Carbon (private entity)	

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

Note: When the PDD is filled in support of a proposed new methodology (forms CDM-NBM and CDM-NMM), at least the host Party(ies) and any known project participant (e.g. those proposing a new methodology) shall be identified.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

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

Three plants are included in the project, located in the States of São Paulo, Espírito Santo and Sergipe.

A.4.1.3. City/Town/Community etc:

Three plants are included in the project, located in the cities of Mogi das Cruzes, Vitória and Pacatuba.

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

Mizu headquarters is located at:
Rua Sinke Ferreira, 500
Curitiba – PR
Zip 81530-340

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

The project activity belongs to Sectoral Scope 4 (Manufacturing industries).

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

Blast furnace slag is a residue of pig iron production similar to sand. It has chemical properties that allows it to be used, under certain conditions, as clinker substitute. In the project activity the slag is used in the grinding phase of cement production, replacing clinker in the cement mills, avoiding the production of clinker and resulting greenhouse gases emissions in the kilns due to calcination and fossil fuel combustion.

The project activity is the construction and operation of a new cement plant dedicated to the production of Portland Blast Furnace Slag Cement (CPIII). The plant obtains slag from Cosipa and CST, and clinker from Votorantim-Santa Helena. The slag is brought to the plant by trucks, it is dried and then ground with clinker to produce CPIII.

With the project implementation the supplying of slag, both in quantity and quality, needed to be regularized and secured for the operation of the plant, in order to meet slag proportion use in the production of blended cement.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

The project activity is the use of blast furnace slag share in the production of cement, resulting in the reduction of the amount of clinker per tonne of blended cement and corresponding emissions reductions. Two major components reduces greenhouse gase emissions:

(1) Reduction of energy consumption in the production of clinker.

(2) Reduction of CO_2 emissions derived from the calcination of limestone.

As explained before, it is estimated that these two factors results in around 90% of cement industry greenhouse gases emissions (50% of the emissions derive from the chemical process, and 40% from burning fuel).

The project activity accounts only for greenhouse gases emission reductions associated with the increased level of blending. Other measures such as energy efficiency improvements do not affect the calculations of emissions reductions.

In order to estimate emission reductions in a conservative manner and to reflect the endogenous trends in the level of blending in the region, a benchmark approach is used to calculate emission reductions. The benchmark is defined in Section B.2.

The CDM incentives helped in the implementation of the project activity. If project was not implemented, the emissions would be greater because the cement would be produced with a higher share of clinker, instead of the use of blast furnace slag. The additionality assessment conducted in Section B.3 presents with further details the additionality of the project.

There are no national and/or sectoral policies and circumstances that influence the decisions or impose obligations to the proposed project activity:

- The share of clinker and use of slag are regulated by Brazilian technical standards, as explained after in this PDD. The standards, however, allow the manufacturers to produce cement within a broad range of clinker and additives shares, from 1% to 70% of slag. This means that the use of slag is virtually not restricted nor demanded by the standards.

- Also, no sectoral policies incentive the use of slag and other additives or desincentive the use clinker. Therefore, no sectoral policies and circumstances would make the project activity preferred, rather than the baseline scenario. The only national circumstance that foments the project activity is the participation of Brasil in the Kyoto Protocol, which allows the project to benefit from the CDM incentives.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

The estimated amount of emissions reduction based on the forecasted blended cement production, for the first crediting period of 7 years, starting in 1/1/2005 is presented in the table below.

Table 3 - Estimated emission reductions for the first crediting period

Years	Annual estimation of emission reductions [tCO_2]
2005	21,963
2006	20,712
2007	30,415
2008	28,900
2009	32,884
2010	31,418
2011	36,841
Total estimated reductions (tonnes of CO_2eq)	203,133
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2eq)	29,019

A.4.5. Public funding of the project activity:

There is no public funding involved in the project activity.

SECTION B. Application of a baseline methodology

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

ACM0005 – "Consolidated Baseline Methodology for Increasing the Blend in Cement Production" – Version 2.

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

ACM0005 is applicable to projects that increase the share of additives (i.e. reduce the share of clinker) in the production of cement types beyond current practices in the country. Additives are defined as materials blended with clinker to produce blended cement types and include fly ash, gypsum, slag, etc.

In the case of Mizu project, the increase in the share of additives and corresponding reduction in the share of clinker in the production of cement types occurs due to the use of blast furnace slag beyond current practices in the country.

The methodology is applicable to this project activity because it meets the applicability conditions:

- There is no shortage of additives related to the lack of blending materials. Project participants should demonstrate that there is no alternative allocation or use for the additional amount of additives used in the project activity.

  Blast furnace slag is produced in large amounts by the steel and iron industry in the region of the project activity (São Paulo, Minas Gerais and Rio de Janeiro States) and if the slag was not used as additive in cement manufacture, it would likely be disposed in landfills. Mizu has long term purchase agreements with slag suppliers. Therefore, the shortage of slag is very unlikely and the alternative allocation for it would be landfilling.

- ACM0005 is applicable to domestically sold output of the project activity plant and excludes export of blended cement.

  The production of the plants included in the project activity is sold domestically, therefore no export of blended cement is included. In the event that some part of the production is exported in the future, then, this amount will be discounted from emissions reductions calculations.

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

  Two associations can provide reliable and publicly available information about the cement industry in Brazil: ABCP – Associação Brasileira de Cimento Portland (Brazilian Association of Portland Cement) and SNIC – Sindicato Nacional da Indústria do Cimento (National Association of the Cement Industry).

B.2. Description of how the methodology is applied in the context of the project activity:

The following steps are followed to determine emissions reductions in the context of the project activity:

Step 1 – Identification of the baseline scenario

The baseline scenario is the most plausible scenario among all realistic and credible alternative production scenarios for the relevant cement type that are consistent with current rules and regulations. Project proponents identify the baseline scenario in Sectio B.3 through the use of "Step 3 – Barrier Analysis" of the latest approved version of the "Tool for the determination and assessment of additionality". Please, refer to Section B.3 for detailed analysis.

Step 2 – Additionality

The additionality of the project activity is demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality". Please, refer to Sectio B.3 for detailed analysis.

Step 3 – Definition of cement type

According to ACM0005, blended cement type (BC) is defined as distinct products with different uses, additives and additive to clinker ratios. In this project activity blended cement type is Portland Blast Furnace Slag cement (PBFS). This definition, however, needs to be further detailed taking into consideration two points:

- In Brazil, ABNT[1] (Associação Brasileira de Normas Técnicas – Brazilian Association of Technical Standards) defines cement types, including additives used and additive to clinker ratios, as described in Table 4.

  From ABNT definition PBFS cement includes cement types CP I – S, CP II – E and CP III, because these are the ones which allows addition of blast furnace slag, in different proportions.

- It is reasonable to define blended cement type based on the final use of the cement. This is because the final effect of the sales increase of a certain type of cement is the substitution of an equivalent cement type, which depends on its final use.

  In terms of final uses, ABCP[2] (Associação Brasileira de Cimento Portland – Brazilian Association of Portland Cement) indicates 21 applications for portland cements. In 13 of those applications, including the most significant ones, cement types CP I – S, CP II – E and CP III can be used interchangeably, confirming the definition PBFS in this particular project.

[1] Associação Brasileira de Normas Técnicas, ABNT. Brazilian Technical Standards Numbers 5732, 11578, 5735, 5736, 5733. Cited by ABCP, Associação Brasileira de Cimento Portland in Boletim Técnico 106 – Guia Básico de Utilização do Cimento Portland, 2002.

[2] Associação Brasileira de Cimento Portland, ABCP (Brazilian Association of Portland Cement). Boletim Técnico 106 – Guia Básico de Utilização do Cimento Portland, 2002. Available at www.abcp.org.br.

Table 4 – Cement types in Brazil

<table>
<tr><th colspan="2" rowspan="2">Type of Portland cement</th><th colspan="4">Composition (% mass)</th></tr>
<tr><th>Clinker + Gypsum</th><th>Blast Furnace Slag</th><th>Pozzolanic Materials</th><th>Carbonatic Materials</th></tr>
<tr><td rowspan="2">Ordinary</td><td>CP I</td><td>100</td><td colspan="3">0</td></tr>
<tr><td>CP I - S</td><td>99 - 95</td><td colspan="3">1 - 5</td></tr>
<tr><td rowspan="3">Blended</td><td>CP II - E</td><td>94 - 56</td><td>6 - 34</td><td>-</td><td>0 - 10</td></tr>
<tr><td>CP II - Z</td><td>94 - 76</td><td>-</td><td>6 - 14</td><td>0 - 10</td></tr>
<tr><td>CP II - F</td><td>94 - 90</td><td>-</td><td>-</td><td>6 - 10</td></tr>
<tr><td>Blast Furnace</td><td>CP III</td><td>65 - 25</td><td>35 - 70</td><td>-</td><td>0 - 5</td></tr>
<tr><td>Pozzolanic</td><td>CP IV</td><td>85 - 45</td><td>-</td><td>15 - 50</td><td>0 - 5</td></tr>
<tr><td>High Initial Resistence</td><td>CP V - ARI</td><td>100 - 95</td><td>-</td><td>-</td><td>0 - 5</td></tr>
<tr><td>Structural White Cement</td><td>CP B Estrut</td><td>100 - 75</td><td>-</td><td>-</td><td>0 - 25</td></tr>
<tr><td>Non structural White Cement</td><td>CP B</td><td>74 - 50</td><td>-</td><td>-</td><td>26 - 50</td></tr>
</table>

Therefore, considering the definition of cement types by ABNT and the applications by ABCP, blended cement type in this project activity is Portland Blast Furnace Slag cement (PBFS) including ABNT categories CP I – S, CP II – E and CP III.

Step 4 – Emission Reductions

Emissions reductions in year y of the project activity are calculated from equation 4, described below.

Equation (4)

$$ER_y = \left[\left(BE_{BC,y} - PE_{BC,y}\right) \cdot BC_y \cdot 1000 + L_y\right] \cdot \left(1 - \alpha_y\right) \quad tCO_2 \quad (4)$$

$BE_{BC,y}$	Baseline emissions of CO_2 per tonne of BC in year y of the project activity. Calculated from equation (1).	$tCO_2/t(BC)$
$PE_{BC,y}$	Project emissions of CO_2 per tonne of BC in year y of the project activity. Calculated from equation (5).	$tCO_2/t(BC)$
BC_y	Production of blended cement in year y of the project activity. Monitored by project proponents.	kt(BC)
L_y	Leakage due to transport of additives. Calculated from equation (2.1).	tCO_2
α_y	Proportion of additives that are not surplus. Calculated from equation (3).	Non-dimensional

Step 5 – Baseline emissions

Baseline emissions per tonne of blended cement produced are calculated from equation 1, described below:

Equation (1)

$$BE_{BC,y} = \left\lfloor BE_{clinker} \cdot B_{Blend,y} \right\rfloor + BE_{ele\_ADD\_BC} \quad tCO_2/t(BC) \quad (1)$$

$BE_{BC,y}$	Baseline emissions per tonne of blended cement type.	$tCO_2/t(BC)$
$BE_{clinker}$	Baseline emissions per tonne of clinker in the project activity plant. Calculated from equation (1.1).	$tCO_2/t(clinker)$
$B_{Blend,y}$	Baseline benchmark of share of clinker per tonne of BC updated for year y. Defined from Benchmark Analysis.	t(clinker)/t(BC)
$BE_{ele\_ADD\_BC}$	Baseline electricity emissions for BC grinding and preparation of additives. Calculated from equation (1.2).	$tCO_2/t(BC)$

Equations (1.1), (1.1.1), (1.1.2), (1.1.3) and (1.1.4)

$$BE_{clinker} = BE_{calcin} + BE_{fossil\_fuel} + BE_{ele\_grid\_CLNK} + BE_{ele\_sg\_CLNK} \quad tCO_2/t(clinker) \quad (1.1)$$

BE_{calcin}	Baseline emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate. Calculated from equation (1.1.1) below:	tCO_2/t(clinker)
	$$BE_{calcin} = \frac{0.785 \cdot (OutCaO - InCaO) + 1.092 \cdot (OutMgO - InMgO)}{1000 \cdot CLNK_{BSL}} \quad tCO_2/t(clinker) \quad (1.1.1)$$	
BE_{fossil_fuel}	Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production. Calculated from equation (1.1.2) below:	tCO_2/t(clinker)
	$$BE_{fossil\_fuel} = \frac{\sum (FF_{i\_BSL} \cdot EFF_i)}{1000 \cdot CLNK_{BSL}} \quad tCO_2/t(clinker) \quad (1.1.2)$$	
$BE_{ele\_grid\_CLNK}$	Baseline grid electricity emissions for clinker production per tonne of clinker. Calculated from equation (1.1.3) below:	tCO_2/t(clinker)
	$$BE_{ele\_grid\_CLNK} = \frac{BELE_{grid\_CLNK} \cdot EF_{grid\_BSL}}{1000 \cdot CLNK_{BSL}} \quad tCO_2/t(clinker) \quad (1.1.3)$$	
$BE_{ele\_sg\_CLNK}$	Baseline emissions from self generated electricity for clinker production per tonne of clinker. Calculated from equation (1.1.4) below:	tCO_2/t(clinker)
	$$BE_{ele\_sg\_CLNK} = \frac{BELE_{sg\_CLNK} \cdot EF_{sg\_BSL}}{1000 \cdot CLNK_{BSL}} \quad tCO_2/t(clinker) \quad (1.1.4)$$	

Equation (1.2), (1.2.1), (1.2.2), (1.2.3) and (1.2.4)

$$BE_{ele\_ADD\_BC} = BE_{ele\_grid\_BC} + BE_{ele\_sg\_BC} + BE_{ele\_grid\_ADD} + BE_{ele\_sg\_ADD} \quad tCO_2/t(BC) \quad (1.2)$$

$BE_{ele\_grid\_BC}$	Baseline grid electricity emissions for grinding BC. Calculated from equation (1.2.1) below: $$BE_{ele\_grid\_BC} = \frac{BELE_{grid\_BC} \cdot EF_{grid\_BSL}}{1000 \cdot BC_{BSL}} \quad tCO_2/t(BC) \quad (1.2.1)$$	$tCO_2/t(BC)$
$BE_{ele\_sg\_BC}$	Baseline self generated electricity emissions for grinding BC. Calculated from equation (1.2.2) below: $$BE_{ele\_sg\_BC} = \frac{BELE_{sg\_BC} \cdot EF_{sg\_BSL}}{1000 \cdot BC_{BSL}} \quad tCO_2/t(BC) \quad (1.2.2)$$	$tCO_2/t(BC)$
$BE_{ele\_grid\_ADD}$	Baseline grid electricity emissions for preparation of additives. Calculated from equation (1.2.3) below: $$BE_{ele\_grid\_ADD} = \frac{BELE_{grid\_ADD} \cdot EF_{grid\_BSL}}{1000 \cdot BC_{BSL}} \quad tCO_2/t(BC) \quad (1.2.3)$$	$tCO_2/t(BC)$
$BE_{ele\_sg\_ADD}$	Baseline self generated electricity emissions for preparation of additives. Calculated from equation (1.2.4) below: $$BE_{ele\_sg\_ADD} = \frac{BELE_{sg\_ADD} \cdot EF_{sg\_BSL}}{1000 \cdot BC_{BSL}} \quad tCO_2/t(BC) \quad (1.2.4)$$	$tCO_2/t(BC)$

Definition of $BE_{clinker}$:

$BE_{clinker}$ is primarily defined from equation (1.1). However, considering that ACM0005 is restricted to increase in percentage of blend only and not to efficiency improvements or fuel switching, the methodology states that in each year of the crediting period $BE_{clinker}$ needs to verified and redefined as described below:

If project emissions per tonne of clinker are less than baseline emissions in year y of the crediting period: $PE_{clinker,y} < BE_{clinker}$, $BE_{clinker}$ shall be substituted by the $PE_{clinker,y}$ in year y.

If project emissions per tonne of clinker are equal to baseline emissions in year y of the crediting period: $PE_{clinker,y} = BE_{clinker}$, $BE_{clinker}$ shall be maintained as calculated by equation (1.1).

If project emissions per tonne of clinker are greater than baseline emissions in year y of the crediting period: $PE_{clinker,y} > BE_{clinker}$, $BE_{clinker}$ shall be maintained as calculated by equation (1.1). In this case, there is a possibility that project activity emissions exceed the baseline emissions and the project does not get new credits for emissions reduction till the net balance for the project is positive.

$PE_{clinker,y}$ is calculated from equation (5.1).

Definition of $B_{Blend,y}$ from benchmark analysis:

The baseline benchmark of share of clinker per tonne of BC, $B_{Blend,y}$, is defined as the:

- Average mass percentage of clinker (production weighted) in the top 20% in terms of share of additives of the total production of the blended cement type in the region. Project proponents chose to incorporate a fixed 2% increase trend in the share of additives in blended cement type, specified ex-ante.

Since Mizu plant is new, there is not a historical trend in the share of additives for this specific plant. Therefore, 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 is not available.

As of the development of the PDD, data for the 5 highest blend cement brands was not available in Brazil. Therefore it was not possible to calculate the average mass percentage of clinker (production weighted) for the 5 highest blend cement brands, for the relevant cement type in the region. In the other two cases, data is available and possible to be verified and validated. Hence, these data are used.

According to ACM0005, at the renewal of the crediting period, the benchmark shall be recalculated. The basis (between the 3 options) of the benchmark may change from the option selected during the first crediting period.

In the determination of the benchmark, information obtained from SNIC[3] and ABCP[4] are used. These two external sources are reliable, verifiable and updated annually.

Only domestically sold output is considered and any export of cement produced by the project activity is excluded in the calculation of emission reductions. Actually, the plants included in the project activity produces cement for the local market only.

Project proponents chooses the national market as the region for the project activity. As indicated by ACM0005, the national market is the default region to be used.

Detailed information and calculation can be found in Section E.

[3] Sindicato Nacional da Indústria do Cimento, SNIC (National Association of the Portland Cement Industry). Annual Report – 2004. Available at www.snic.com.br.

[4] Associação Brasileira de Cimento Portland, ABCP (Brazilian Association of Portland Cement). Boletim Técnico 106 – Guia Básico de Utilização do Cimento Portland, 2002. Available at www.abcp.org.br.

Monitored and fixed parameters for baseline emissions calculations

0.785	Stoichiometric emission factor for CaO. Fixed parameter defined by ACM0005..	$tCO_2/t(CaO)$
1.092	Stoichiometric emission factor for MgO. Fixed parameter defined by ACM0005.	$tCO_2/t(MgO)$
BC_{BSL}	Production of blended cement in the baseline year. Monitored by project proponents, for one year previously to project implementation, in the project site.	kt(BC)
$CLNK_{BSL}$	Production of clinker in the baseline year. Monitored by project proponents, for one year previously to project implementation, in the project site.	kt(clinker)
ADD_{BSL}	Consumption of additives in the baseline. Monitored by project proponents, for one year previously to project implementation, in the project site.	kt(slag)
InCaO	CaO content (%) of the raw material * raw material quantity. Monitored by project proponents, for one year previously to project implementation, in the project site.	t(CaO)
OutCaO	CaO content (%) of the clinker * clinker produced. Monitored by project proponents, for one year previously to project implementation, in the project site.	t(CaO)
InMgO	MgO content (%) of the raw material * raw material quantity. Monitored by project proponents, for one year previously to project implementation, in the project site.	t(MgO)
OutMgO	MgO content (%) of the clinker * clinker produced. Monitored by project proponents, for one year previously to project implementation, in the project site.	t(MgO)
FF_{i_BSL}	Consumption of fossil fuel of type i for clinker production in the baseline. Monitored by project proponents, for one year previously to project implementation, in the project site.	t(fuel)
$BELE_{grid\_CLNK}$	Consumption of grid electricity for clinker production in the baseline. Monitored by project proponents, for one year previously to project implementation, in the project site.	MWh
$BELE_{sg\_CLNK}$	Consumption of self generation of electricity for clinker production in the baseline. Monitored by project proponents, for one year previously to project implementation, at the project site.	MWh
$BELE_{grid\_BC}$	Consumption of grid electricity for grinding BC in the baseline. Monitored by project proponents, for one year previously to project implementation, in the project site.	MWh
$BELE_{sg\_BC}$	Consumption of self generated electricity for grinding BC in the baseline. Monitored by project proponents, for one year previously to project implementation, in the project site.	MWh
$BELE_{grid\_ADD}$	Consumption of grid electricity for grinding additives in the baseline. Monitored by project proponents, for one year previously to project implementation, in the project site.	MWh
$BELE_{sg\_ADD}$	Consumption of self generated electricity for grinding additives in the baseline. Monitored by project proponents, for one year previously to project implementation, in the project site.	MWh
EF_{grid_BSL}	Baseline grid electricity emission factor. Calculated according to methodology ACM0002.	tCO_2/MWh
EF_{sg_BSL}	Baseline self generation electricity emission factor. Calculated from equation (6).	tCO_2/MWh
EFF_i	Emission factor for fossil fuel i. , obtainedf from the IPCC. Calculated from equation (7).	$tCO_2/t(fuel)$

Step 6 – Project Activity Emissions

Project activity emissions per tonne of blended cement produced are calculated from equation 5, described below:

Equation (5)

$$PE_{BC,y} = \left[PE_{clinker,y} \cdot P_{blend,y} \right] + PE_{ele\_ADD\_BC,y} \quad tCO_2/t(BC) \quad (5)$$

$PE_{BC,y}$	Project emissions per tonne of blended cement type, in year y of the crediting period.	$tCO_2/t(BC)$
$PE_{clinker,y}$	Project emissions per tonne of clinker, in year y of the crediting period. Calculated from equation (5.1) in the following pages.	$tCO_2/t(clinker)$
$P_{Blend,y}$	Project share of clinker per tonne of BC in year y. Monitored by project proponents, during the crediting period, in the project site. $P_{blend,y} = \frac{CLNK_y}{BC_y}$ $tCO_2/t(clinker)$	t(clinker)/t(BC)
$PE_{ele\_ADD\_BC,y}$	Project electricity emissions for BC grinding and preparation of additives, in year y of the crediting period. Calculated from equation (5.2) in the following pages.	$tCO_2/t(BC)$

Equations (5.1), (5.1.1), (5.1.2), (5.1.3) and (5.1.4)

$$PE_{clinker,y} = PE_{calcin,y} + PE_{fossil\_fuel,y} + PE_{ele\_grid\_CLNK,y} + PE_{ele\_sg\_CLNK,y} \quad tCO_2/t(clinker) \quad (5.1)$$

$PE_{calcin,y}$	Project emissions per tonne of clinker due to calcination of calcium carbonate and magnesium carbonate. Calculated from equation (5.1.1) below:	tCO_2/t(clinker)

$$PE_{calcin,y} = \frac{0.785 \cdot \left(OutCaO_y - InCaO_y\right) + 1.092 \cdot \left(OutMgO_y - InMgO_y\right)}{1000 \cdot CLNK_y} \quad tCO_2/t(clinker) \ (5.1.1)$$

$PE_{fossil\_fuel,y}$	Project emissions per tonne of clinker due to combustion of fossil fuels for clinker production. Calculated from equation (5.1.2) below:	tCO_2/t(clinker)

$$PE_{fossil\_fuel,y} = \frac{\sum\left(FF_{i\_y} \cdot EFF_i\right)}{1000 \cdot CLNK_y} \quad tCO_2/t(clinker) \quad (5.1.2)$$

$PE_{ele\_grid\_CLNK,y}$	Project emissions from grid electricity for clinker production per tonne of clinker. Calculated from equation (5.1.3) below:	tCO_2/t(clinker)

$$PE_{ele\_grid\_CLNK,y} = \frac{PELE_{grid\_CLNK,y} \cdot EF_{grid\_y}}{1000 \cdot CLNK_y} \quad tCO_2/t(clinker) \quad (5.1.3)$$

$PE_{ele\_sg\_CLNK,y}$	Project emissions from self generated electricity for clinker production per tonne of clinker. Calculated from equation (5.1.4) below:	tCO_2/t(clinker)

$$PE_{ele\_sg\_CLNK,y} = \frac{PELE_{sg\_CLNK,y} \cdot EF_{sg\_y}}{1000 \cdot CLNK_y} \quad tCO_2/t(clinker) \quad (5.1.4)$$

Equations (5.2), (5.2.1), (5.2.2), (5.2.3) and (5.2.4)

$$PE_{ele\_ADD\_BC,y} = PE_{ele\_grid\_BC,y} + PE_{ele\_sg\_BC,y} + PE_{ele\_grid\_ADD,y} + PE_{ele\_sg\_ADD,y} \quad \text{tCO}_2\text{/t(BC)} \quad (5.2)$$

$PE_{ele\_grid\_BC,y}$	Project grid electricity emissions for BC grinding. Calculated from equation (5.2.1) below: $$PE_{ele\_grid\_BC,y} = \frac{PELE_{grid\_BC,y} \cdot EF_{grid\_y}}{BC_y} \quad \text{tCO}_2\text{/t(BC)} \quad (5.2.1)$$	$tCO_2/t(BC)$
$PE_{ele\_sg\_BC,y}$	Project self generated electricity emissions for BC grinding. Calculated from equation (5.2.2) below: $$PE_{ele\_sg\_BC,y} = \frac{PELE_{sg\_BC,y} \cdot EF_{sg\_y}}{BC_y} \quad \text{tCO}_2\text{/t(BC)} \quad (5.2.2)$$	$tCO_2/t(BC)$
$PE_{ele\_grid\_ADD,y}$	Project grid electricity emissions for additive preparation. Calculated from equation (5.2.3) below: $$PE_{ele\_grid\_ADD,y} = \frac{PELE_{grid\_ADD,y} \cdot EF_{grid\_y}}{BC_y} \quad \text{tCO}_2\text{/t(BC)} \quad (5.2.3)$$	$tCO_2/t(BC)$
$PE_{ele\_sg\_ADD,y}$	Project self generated electricity emissions for additive preparation. Calculated from equation (5.2.4) below: $$PE_{ele\_sg\_ADD,y} = \frac{PELE_{sg\_ADD,y} \cdot EF_{sg\_y}}{BC_y} \quad \text{tCO}_2\text{/t(BC)} \quad (5.2.4)$$	$tCO_2/t(BC)$

Monitored and fixed parameters for project emissions calculations

BC_y	Production of blended cement. Monitored by project proponents, in year y of the crediting period, at the project site.	kt(BC)
$CLNK_y$	Production of clinker. Monitored by project proponents, in year y of the crediting period, at the project site.	kt(clinker)
ADD_y	Consumption of blast furnace slag. Monitored by project proponents, in year y of the crediting period, at the project site.	kt(slag)
$InCaO_y$	CaO content (%) of the raw material * raw material quantity. Monitored by project proponents, in year y of the crediting period, at the project site.	t(CaO)
$OutCaO_y$	CaO content (%) of the clinker * clinker produced. Monitored by project proponents, in year y of the crediting period, at the project site.	t(CaO)
$InMgO_y$	MgO content (%) of the raw material * raw material quantity. Monitored by project proponents, in year y of the crediting period, at the project site.	t(MgO)
$OutMgO_y$	MgO content (%) of the clinker * clinker produced. Monitored by project proponents, in year y of the crediting period, at the project site.	t(MgO)
FF_{i_y}	Consumption of fossil fuel of type i for clinker production. Monitored by project proponents, in year y of the crediting period, at the project site.	t(fuel)
$PELE_{grid\_CLNK,y}$	Consumption of grid electricity for clinker production. Monitored by project proponents, in year y of the crediting period, at the project site.	MWh
$PELE_{sg\_CLNK,y}$	Consumption of self generation of electricity for clinker production. Monitored by project proponents, in year y of the crediting period, at the project site.	MWh
$PELE_{grid\_BC,y}$	Consumption of grid electricity for grinding BC. Monitored by project proponents, in year y of the crediting period, at the project site.	MWh
$PELE_{sg\_BC,y}$	Consumption of self generated electricity for grinding BC. Monitored by project proponents, in year y of the crediting period, at the project site.	MWh
$PELE_{grid\_ADD,y}$	Consumption of grid electricity for grinding additives. Monitored by project proponents, in year y of the crediting period, at the project site.	MWh
$PELE_{sg\_ADD,y}$	Consumption of self generated electricity for grinding additives. Monitored by project proponents, in year y of the crediting period, at the project site.	MWh
EF_{grid_y}	Grid electricity emission factor. Calculated according to methodology ACM0002.	tCO_2/MWh
EF_{sg_y}	Project self generation electricity emission factor. Calculated from equation (6).	tCO_2/MWh
EFF_i	Emission factor for fossil fuel i. Calculated from equation (7).	tCO_2/t(fuel)

Step 7 – Leakage

Leakage 1: Emissions due to fuel use for the transport of raw materials and fuels from offsite locations to the project plant are likely to decrease due to the implementation of the project. Following ACM0005, in order to keep emissions reductions conservative, this change is not included.

Leakage 2: Emissions due to fuel use for the transport of additives from offsite locations to the project plant are likely to increase. These emissions are accounted as leakage, as per equations (2.1) and (2) below:

Equations (2.1) and (2)

$$L_y = L_{add\_trans} \cdot \left(A_{blend,y} - P_{blend,y}\right) \cdot BC_y \quad \mathrm{tCO_2} \quad (2.1)$$

$$L_{add\_trans} = \frac{\left(TF_{cons} \cdot D_{add\_source} \cdot TEF\right)}{1000 \cdot Q_{add}} + \frac{\left(ELE_{conveyor\_ADD} \cdot EF_{grid}\right)}{ADD_y} \quad \mathrm{tCO_2/t(additive)} \quad (2)$$

L_y	Leakage emissions for transport of additives.	tCO_2
$A_{blend,y}$	Baseline benchmark share of additives per tonne of BC updated for year y.	t(slag)/t)BC)
$P_{blend,y}$	Share of additives per tonne of BC updated for year y.*	t(additive)/t(BC)
L_{add_trans}	Transport related emissions per tonne of additives. Calculated from equation (2).	tCO_2/t(additive)
TF_{cons}	Fuel consumption for the vehicle per kilometre. Monitored by project proponents, in year y of the crediting period, in the project site.	kg(fuel)/km
D_{add_source}	Distance between the source of additive and the project activity plant. Monitored by project proponents, in year y of the crediting period, in the project site.	km
$ELE_{conveyor\_ADD}$	Annual electricity consumption for conveyor system for additives. Monitored by project proponents, in year y of the crediting period, in the project site.	MWh
Q_{add}	Quantity of additive carried in one trip per vehicle. Monitored by project proponents, in year y of the crediting period, in the project site.	t(slag)
TEF	Emission factor for transport fuel. Calculated from equation (7).	tCO_2/t(fuel)

EF_{grid}	Grid electricity emission factor. Calculated according to methodology ACM0002.	tCO_2/MWh

† - Note: The revised methodology ACM0005-Version 2 redefines $P_{blend,y}$ from share of clinker per tonne of BC to share of additives per tonne of BC. Notwithstanding, this new definition can be used only for leakage calculation, see ACM0005-Page 7-Equation 2.1. For project emissions calculations, the old definition needs to be maintained, see ACM0005-Version 2-Equation 5.

Leakage 3: The methodology defines that another possible leakage is due to the diversion of additives from existing uses. As the slag used is surplus, it is expected that this source of leakage will not affect calculations. Notwithstanding, α_y is calculated from equation (3) below:

$$\alpha_y = \frac{x \quad tonnes \quad of \quad additives \quad in \quad year \quad y \quad not \quad surplus}{total \quad additional \quad additives \quad used \quad in \quad year \quad y} \qquad (3)$$

Step 8 – Fuel and electricity emission factors

For the calculation of emissions from grid electricity (EF_{grid}) the approved consolidated baseline methodology ACM0002 is applied. Please refer to that methodology for further details.

For cement plants that self-generate electricity, the average annual emission factor of the self-generated electricity (EF_{sg}) is calculated from equation (6) below:

Equation (6) – Self-generated electricity emission factor

$$EF_{sg} = \frac{\sum_{i,j} F_{i,j} \cdot COEF_{i,j}}{\sum_{j} GEN_j} \quad tCO_2/MWh$$

$F_{i,j}$	Amount of fuel i consumed by relevant power sources j in year y of the crediting period, monitored by project proponents at the project site.	Mass or volume units
GEN_j	Electricity generated by the source j in year y of the crediting period, monitored by project proponents at the project site.	MWh

For fuel emission factors equation (7) is applied:

Equation (7) – Fuel emission factor

$$EFF = COEF = \frac{44}{12} \cdot NCV \cdot EF_C \cdot OXID \qquad tCO_2/t(fuel)$$

NCV	NCV is the net calorific value (lower heating value) of fuel i, obtained from project activity information.	TJ per mass or volume units of fuel
OXID	OXID is the oxidation factor of the fuel, obtained from IPCC	Non-dimensional
EF_C	Carbon emission factor per unit of energy of the fuel i, obtained from IPCC.	tC/TJ

B.3. 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:

The additionality of the project activity is demonstrated and assessed using the "Tool for the demonstration and assessment of additionality" – Version 2.

Step 3 of the Tool is used to identify the most plausible scenario among all realistic and credible alternatives(s) to the project activity, i.e. the baseline scenario.

Step 0. Preliminary screening based on the starting date of the project activity

Project participants wish to have the crediting period starting prior to the registration of the project activity. For this reasons it is provided below:

(a) Evidence that the starting date of the CDM project activity falls between 1 January 2000 and the date of the registration of a first CDM project activity

The implementation of the project activity started on 2004 with the construction of the plant and started operation in 2005. Evidence is available with project proponents at the project site.

(b) Evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity.

Mizu is part of Votorantim Cimentos which is signatory of the Cement Industry Initiative. Back in 1999 worldwide cement industry launched the Cement Sustainability Initiative. Among other reasons, the Initiative was launched in response to international concerns about the role of the cement industry in Sustainable Development and Climate Change. The objective of the Initiative was to develop studies and to propose a positive agenda towards the sustainability of the cement industry.

In the Climate Change chapter, the agenda proposed some important actions including: innovation in improving the energy efficiency of processes and equipment; switching to lower carbon fuels; using alternative raw materials to reduce limestone use; developing CO_2 capture and sequestration techniques; and taking advantage of market mechanisms such as emissions trading to meet the agenda. The implementation of this project activity is one of the efforts towards the reduction of conventional raw material and reduction of greenhouse gases emissions in the maufacturing process.

Further information on the Cement Sustainability Initiative can be found in the internet website www.wbcsdcement.org.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

Realistic and credible alternative(s) are production scenarios for the relevant cement type that are consistent with current rules and regulations available to the project participants or similar project developers. They include the proposed project activity, the existing practice of cement production and practices in other manufacturing plants in the region using similar input/raw materials and facing similar economic, market and technical circumstances:

- Alternative 1: the proposed project activity not undertaken as a CDM project activity. In this scenario Mizu uses blast furnace slag in the production of blended cement above the benchmark level, as in the project activity.

- Alternative 2: continuation of the current situation. In this scenario Mizu does not change the common practice production pattern and the use of blast furnace slag and/or other additives remains in the same level existing previously to the project implementation.

- Alternative 3: increase in additives use in some pre-defined rate. In this scenario Mizu increases the use of blast furnace slag and/or other additives in a pre-defined rate, lower than the project activity rate.

- Alternative 4: use of other additives different from blast furnace slag. In this scenario Mizu uses other additives, such as fly ash or pozzolanic materials, in the production of blended cement above the benchmark level.

- Alternative 5: development of a new product. In this scenario Mizu develops a new clinker-free product that replaces the ordinary portland cement and blended cement.

Sub-step 1b. Enforcement of applicable laws and regulations:

All the alternatives are in compliance with all applicable legal and regulatory requirements.

Step 2. Investment analysis

Investment analysis is not undertaken.

Step 3. Barrier analysis

As showed below, the proposed project activity faces barriers that prevent the implementation of this type of proposed project activity; and do not prevent the implementation of at least one of the alternatives.

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:

The following barriers would prevent the implementation of the proposed project activity:

- Barrier 1: Mizu had to develop substantial research effort to enable the increase in blending. Two aspects need to be highlighted: (i) adaptations in the process needed to be implemented and (ii) more stringent quality assurance and quality control procedures needed to be developed and implemented. New raw material and final product were included in the production chain with necessity of new quality tests, new controls and equipment.

- Barrier 2: development of logistics for additives supplying. The use of additives in a reliable and continuous manner required the development and control of a new supply chain in the process involving different sites and suppliers, as described in Section A.4.3

- Barrier 3: lack of infrastructure for implementation of the technology. The use of additives in a reliable and continuous manner also required that the new plant had to be installed.

- Barrier 4: despite the previous use of blended cement in the country, the perception that high additive blended cement is of inferior quality happened in the early stages of the project, when Mizu had to introduce the new product in the market. Mizu had to avercome this barrier and to inform and clarify the market about the quality of the high additive blended cement.

- Barrier 5: the use of slag increases the production costs of the blended cement because it adds news steps in the production chain, its availability and quality depends on third parties, the maintenance costs increase due to difference in equipment operations, and the performance of the installation decreases (productivity decreases).

Sub-step 3 b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

Table 5 shows how barriers affect each one of the alternative scenarios identified in Step 1.

Table 5 - Effect of barriers in each alternative scenario

	Alternative 1 **Proposed project activity**	**Alternative 2** **Continuation of the current situation**	**Alternative 3** **Use of additives in lower rate**	**Alternative 4** **Use of other additives**	**Alternative 5** **Development of a new product**
Barrier 1 **Research effort**	Prevents implementation	Does not prevent implementation	Does not prevent implementation	Prevents implementation	Strongly prevents implementation
Barrier 2 **Logistics for additives supplying**	Prevents implementation	Does not prevent implementation	Does not prevent implementation	Strongly prevents implementation	Does not prevent implementation
Barrier 3 **Lack of infrastructure**	Prevents implementation	Does not prevent implementation	Does not prevent implementation	Prevents implementation	Strongly prevents implementation
Barrier 4 **Market acceptability**	Prevents implementation	Does not prevent implementation	Does not prevent implementation	Prevents implementation	Strongly prevents implementation
Barrier 5 **Operational barriers**	Prevents implementation	Does not prevent implementation	Does not prevent implementation	Prevents implementation	Strongly prevents implementation
Result of the analysis	Project alternative is prevented by identified barriers, more than Alternatives 2 and 3.	Alternative 2 is not prevented by identified barriers and remains as baseline candidate	Alternative 3 is not prevented by identified barriers and remains as baseline candidate	Barriers strongly prevents Alternative 4. It is a very unlikely scenario, especially due to the lack of other additives in the region. This alternative is eliminated from consideration	Barriers strongly prevents Alternative 5. It is a very unlikely scenario because it represents the development of a new product. This alternative is eliminated from consideration

The barrier analysis shows that:

(i) Alternatives 4 and 5 are strongly prevented by identified barriers and for this reason are very unlikely scenarios. These alternastives are eliminated from further consideration.

(ii) Alternatives 2 and 3 are not prevented by the barriers. For this reason they remain as possible baseline candidates. ACM0005 states that: “where more than one credible and plausible alternative remains, project participants shall, as a conservative assumption, use the alternative baseline scenario that results in the lowest baseline emissions as the most likely baseline scenario". Therefore, following this guidance, Alternative 3 is chosen as the baseline scenario as it results in the lowest baseline emissions due to a pre-defined increase rate in slag use.

(iii) The project scenario (Alternative 1) remains as a possible additional scenario and Step 4 and 5 are undertaken in order to demonstrate additionality.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

Project proponents do not have access to information about any other activity implemented previously or currently underway that is similar to the proposed project activity.

Sub-step 4b. Discuss any similar options that are occurring:

Project proponents do not have access to information about any other activity implemented previously or currently underway that is similar to the proposed project activity.

Step 5. Impact of CDM registration

The approval and registration of the project activity as a CDM activity, and the benefits and incentives derived from the project activity, will alleviate the identified barriers (Step 3) and thus enable the project activity to be undertaken for the following reasons:

- The environmental aspect of Mizu Group's activities is important because of the public peception of its positive and negative impacts. The registration of this project activity in the CDM will add positive value to the company, especially considering that it also actuates in other countries, producing and selling goods.

- The registration of the project in the CDM may also result in financial benefits from the revenue obtained by selling CERs, what can help to reduce project costs.

As Step 5 is satisfied, the proposed CDM project activity is additional.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

Only CO_2 is considered in the calculations because changes in CH_4 and N_2O emissions from combustion processes and calcination are considered to be negligible and excluded because the differences in the baseline and project activity are not substantial. This assumption is conservative and in accordance with ACM0005.

The project boundary includes the cement production plant, any onsite power generation, and the power generation in the grid. Three emission sources are considered:

- Direct emissions at the cement plant due to fuel combustion for firing the kiln and on-site generation of electricity.

- Direct emissions due to calcination of limestone.

- Indirect emissions from fossil fuel combustion in power plants in the grid due to electricity use at the cement plant for: crushing and grinding the raw materials used for clinker production; driving the kiln and kiln fans; finish grinding of cement; and processing of additives.

Any transport related emissions for the delivery of additional additives will be included in the emissions related to the project activity as leakage.

Emissions reductions from transport of raw materials for clinker production are not taken into account as a conservative simplification.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

Date of baseline completion: 28/12/2005.

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SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/01/2004

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

30 years, 0 months.

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:

01/01/2005

C.2.1.2. Length of the first crediting period:

7 years, 0 months.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

ACM0005 - "Consolidated Monitoring Methodology for Increasing the Blend in Cement Production" – Version 2.

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

The conditions under which the monitoring methodology is applicable are the same as that required for the application of the baseline methodology. Please, refer to Section B.1.1 for detailed analysis.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1. $InCaO_y$	CaO content of the raw material used in clinker production	Plant records	%	M, C	Daily	100%	Electronic	Will be calculated/measured as part of normal operations
2. $OutCaO_y$	CaO content of the clinker	Plant records	%	M, C	Daily	100%	Electronic	Will be calculated/measured as part of normal operations
3. $InMgO_y$	MgO content of the raw material used in clinker production	Plant records	%	M, C	Daily	100%	Electronic	Will be calculated/measured as part of normal operations
4. $OutMgO_y$	MgO content of the clinker	Plant records	%	M, C	Daily	100%	Electronic	Will be calculated/measured as part of normal operations
5. Raw material	Quantity of raw material for clinker production	Plant records	kilo tonnes	M	Annually	100%	Electronic	-
6. $CLNK_y$	Production of clinker	Plant records	kilo tonnes	M	Annualy	100%	Electronic	-
7. FF_{i_y}	Consumption of fossil fuel of type i for clinker production	Project activity	tonnes	M	Annualy	100%	Electronic	-
8. EFF_i	Emission factor for fossil fuel	IPCC/Plant records	tCO_2/tonne fuel	C/M	Annually	100%	Electronic	IPCC factors for determining CO2 coefficient
9. $PELE_{grid\_CLNK,y}$	Consumption of grid	Plant records	MWh	M	Monthly	100%	Electronic	-

	electricity for clinker production							
10. EF_{grid_y}	Grid electricity emission factor	Follow guidance on ACM0002.	tCO_2/MWh	C	Annualy	100%	Electronic	Follow guidance on ACM0002.
11. $PELE_{sg\_CLNK,y}$	Consumption of self generation of electricity for clinker production	Plant records	MWh	M	Monthly	100%	Electronic	-
12. EF_{sg_y}	Emission factor for self generated electricity	Plant records/IPCC	tCO_2/MWh	C	Monthly	100%	Electronic	IPCC factors for determining CO2 coefficient
13. ADD_y	Consumption of blast furnace slag	Plant records	kilo tonnes	M	Monthly	100%	Electronic	-
14. $PELE_{grid\_BC,y}$	Consumption of grid electricity for grinding BC	Plant records	MWh	M	Monthly	100%	Electronic	-
15. $PELE_{sg\_BC,y}$	Consumption of self generated electricity for grinding BC	Plant records	MWh	M	Monthly	100%	Electronic	-
16. $PELE_{grid\_ADD,y}$	Consumption of grid electricity for grinding additives	Plant records	MWh	M	Monthly	100%	Electronic	-
17. $PELE_{sg\_ADD,y}$	Consumption of self generated electricity for grinding additives	Plant records	MWh	M	Monthly	100%	Electronic	-
18. $F_{i,j,k}$	Amount of fuel I consumed by power sources j for self generated electricity	Plant records	tonnes of fuel	M	Monthly	100%	Electronic and paper	-
19. $COEF_{i,j,k}$	CO_2 emission coefficient of fuel i	IPCC/Plant records	tCO_2/tonne of fuel	C/M	Annually	100%	Electronic	-
20. $GEN_{j,k}$	Electricity generated by power source j for project self generated electricity	Plant records	MWh	M	Annually	100%	Electronic	-

21. PE_{calcin}	Emissions due to calcinations	Plant records	tCO_2/tonne clinker	C	Annually	100%	Electronic	-
22. $PE_{fossil\_fuel,y}$	Emissions due to combustion of fossil fuel for clinker production	Plant records	tCO_2/tonne clinker	C	Annually	100%	Electronic	-
23. $PE_{ele\_grid\_CLNK,y}$	Grid electricity emission for clinker production	Plant records	tCO_2/tonne clinker	C	Annually	100%	Electronic	-
24. $PE_{ele\_sg\_CLNK,y}$	Self generated electricity emissions for clinker production	Plant records	tCO_2/tonne clinker	C	Annually	100%	Electronic	-
25. $PE_{ele\_grid\_BC,y}$	Grid electricity emissions for BC grinding	Plant records	tCO_2/tonne blended cement	C	Annually	100%	Electronic	-
26. $PE_{ele\_sg\_BC,y}$	Emissions from self generated electricity for BC grinding	Plant records	tCO_2/tonne blended cement	C	Annually	100%	Electronic	-
27. $PE_{ele\_grid\_ADD,y}$	Grid electricity emissions for additive preparation	Plant records	tCO_2/tonne blended cement	C	Annually	100%	Electronic	-
28. $PE_{ele\_sg\_ADD,y}$	Emissions from self generated electricity for additive preparation	Plant records	tCO_2/tonne blended cement	C	Annually	100%	Electronic	-
29. $P_{Blend,y}$	Share of clinker per tonne of BC	Plant records	tonne of clinker/tonne blended cement	C	Annually	100%	Electronic	-
30. BC_y	Production of blended cement	Plant records	kilo tonnes	M	Annualy	100%	Electronic	-
31. NCV	Net calorific value of fossil fuels	Brazilian Ministry of Mines and Energy	TJ/(mass or volume units)	E	Annualy	100%	Electronic	Value obtained from the Brazilian Ministry of Mines and Energy
32. OXID	Oxidation factor of fossil fuels	IPCC	Non dimensional	E	Annualy	100%	Electronic	Value obtained from the IPCC

								guidelines
33. EF_C	Carbon emission factor of fossil fuels	IPCC	tC/TJ	E	Annualy	100%	Electronic	Value obtained from the IPCC guidelines

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

All formulae used to estimate project emissions were presented in Section B.2. Please, refer to this section.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1. $InCaO_{BSL}$	CaO content of the raw material used in clinker production in the baseline year	Plant records	%	M, C	Daily	100%	Electronic	Monitored in the year previous to project implementation
2. $OutCaO_{BSL}$	CaO content of the clinker in the baseline year	Plant records	%	M, C	Daily	100%	Electronic	Monitored in the year previous to project implementation
3. $InMgO_{BSL}$	MgO content of the raw material used in clinker production in the baseline year	Plant records	%	M, C	Daily	100%	Electronic	Monitored in the year previous to project implementation
4. $OutMgO_{BSL}$	MgO content of the clinker in the baseline year	Plant records	%	M, C	Daily	100%	Electronic	Monitored in the year previous to project implementation
5. Raw material	Quantity of raw material for clinker production	Plant records	kilo tonnes	M	Annually	100%	Electronic	Monitored in the year previous to project implementation

6. $CLNK_{BSL}$	Production of clinker in the baseline year	Plant records	kilo tonnes	M	Annually	100%	Electronic	Monitored in the year previous to project implementation
7. FF_{i_BSL}	Consumption of fossil fuel of type i for clinker production in the baseline	Plant records	tonnes	M	Annually	100%	Electronic	Monitored in the year previous to project implementation
8. EFF_i	Emission factor for fossil fuel	IPCC/Plant records	tCO_2/tonne fuel	C/M	Annually	100%	Electronic	IPCC factors for determining CO2 coefficient
9. $BELE_{grid\_CLNK,BSL}$	Consumption of grid electricity for clinker production in the baseline	Plant records	MWh	M	Annually	100%	Electronic and paper	Monitored in the year previous to project implementation
10. EF_{grid_BSL}	Grid electricity emission factor	Follow guidance on ACM0002.	tCO_2/MWh	C	Annualy	100%	Electronic	Follow guidance on ACM0002.
11. $BELE_{sg\_CLNK,BSL}$	Consumption of self generation of electricity for clinker production in the baseline	Lant records	MWh	M	Annually	100%	Electronic	Monitored in the year previously to project implementation
12. EF_{sg_BSL}	Emission factor for self generated electricity	Plant records	tCO_2/MWh	C	Annually	100%	Electronic	IPCC factors for determining CO2 coefficient
13. ADD_{BSL}	Consumption of blast furnace slag in the baseline year	Plant records	kilo tonnes	M	Annually	100%	Electronic	Monitored in the year previous to project implementation
14. $BELE_{grid\_BC,BSL}$	Consumption of grid electricity for grinding BC in the baseline	Plant records	MWh	M	Annually	100%	Electronic	Monitored in the year previous to project implementation
15. $BELE_{sg\_BC,BSL}$	Consumption of self generated electricity for grinding BC in the baseline	Plant records	MWh	M	Annually	100%	Electronic	Monitored in the year previous to project implementation
16. $BELE_{grid\_ADD,BSL}$	Consumption of grid electricity for grinding additives in the baseline	Plant records	MWh	M	Annually	100%	Electronic	Monitored in the year previous to project implementation

17. $BELE_{sg\_ADD,BSL}$	Consumption of self generated electricity for grinding additives in the baseline	Plant records	MWh	M	Annually	100%	Electronic	Monitored in the year previous to project implementation
18. $F_{i,j,BSL}$	Amount of fuel I consumed by power sources j for self generated electricity	Plant records	tonnes of fuel	M	Annually	100%	Electronic and paper	Monitored in the year previous to project implementation
19. $COEF_{i,j,BSL}$	CO_2 emission coefficient of fuel i	IPCC/Plant records	tCO_2/tonne of fuel	C/M	Annually	100%	Electronic	-
20. $GEN_{j,BSL}$	Electricity generated by power source j for project self generated electricity	Plant records	MWh	M	Annually	100%	Electronic	Monitored in the year previous to project implementation
21. $BE_{calcin,BSL}$	Emissions due to calcinations in the baseline	Plant records	tCO_2/tonne clinker	C	Annually	100%	Electronic	Calculated in the year previous to project implementation
22. $BE_{fossil\_fuel,y,BSL}$	Emissions due to combustion of fossil fuel for clinker production in the baseline	Plant records	tCO_2/tonne clinker	C	Annually	100%	Electronic	Calculated in the year previous to project implementation
23. $BE_{ele\_grid\_CLNK,BSL}$	Grid electricity emission for clinker production in the baseline	Plant records	tCO_2/tonne clinker	C	Annually	100%	Electronic	Calculated in the year previous to project implementation
24. $BE_{ele\_sg\_CLNK,BSL}$	Self generated electricity emissions for clinker production in the baseline	Plant records	tCO_2/tonne clinker	C	Annually	100%	Electronic	Calculated in the year previous to project implementation
25. $BE_{ele\_grid\_BC,BSL}$	Grid electricity emissions for BC grinding in the baseline	Plant records	tCO_2/tonne blended cement	C	Annually	100%	Electronic	Calculated in the year previous to project implementation
26. $BE_{ele\_sg\_BCBSL}$	Emissions from self generated electricity for BC grinding in the baseline	Plant records	tCO_2/tonne blended cement	C	Annually	100%	Electronic	Calculated in the year previous to project implementation

27. $BE_{ele\_grid\_ADD,BSL}$	Grid electricity emissions for additive preparation in the baseline	Plant records	tCO_2/tonne blended cement	C	Annually	100%	Electronic	Calculated in the year previous to project implementation
28. $BE_{ele\_sg\_ADD,BSL}$	Emissions from self generated electricity for additive preparation in the baseline	Plant records	tCO_2/tonne blended cement	C	Annually	100%	Electronic	Calculated in the year previous to project implementation
29. $B_{Blend,y}$	Share of clinker per tonne of BC in the baseline	Plant records	tonne of clinker/tonne blended cement	C	Annually	100%	Electronic	Calculated in the year previous to project implementation
29'. $A_{blend,y}$ †	Share of blast furnace slag per tonne of BC in year y	Plant records	tonne of slag/tonne of blended cement	C	Annually	100%	Electronic	This value is actually used for Leakage calculation.
30. BC_{BSL}	Production of blended cement in the baseline year	Project activity	tonnes	M	Annually	100%	Electronic	Monitored in the year previous to project implementation

† - Note: The revised methodology Version 2 requires that $B_{blend,y}$ (ID#29) is replaced by $A_{blend,y}$ (ID#29'). However, $B_{blend,y}$ cannot be eliminated from monitoring because this parameter is necessary for baseline emissions calculations, see ACM0005-Version 2-Page 5-Equation 1. Additionally, $A_{blend,y}$ should be identified under Table D.2.3.1, because this parameter is used for the calculation of leakage and not baseline emissions. See ACM0005-Version 2-Page 7-Equation 2.1.

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Please, refer to section Section B.2.

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
Not applicable	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*
Not applicable	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

Not applicable.

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1. TF_{cons}	Fuel consumption for the vehicles per kilometre	Plant records	kg/km	C	Annualy	100%	Electronic	-
2. D_{add_source}	Distance between the source of additive and the project activity plant	Plant records	km	M	Per trip	100%	Electronic	-
3. TEF	IPCC	IPCC	$kgCO_2$/kg of fuel	E	Annually	100%	Electronic	-
4. Q_{add}	Quantity of additive emission transported.	Plant records	tonnes of aditive/vehicle	M	Per trip	100%	Electronic	-
5. $ELE_{conveyor\_ADD}$	Electricity consumption for conveyor system for additives	Plant records	MWh	M	Monthly	100%	Electronic	-
6. EF_{grid}	Grid emissions factor	National grid/plant data	tonnes of CO_2/MWh	C	Annually	100%	Electronic	-
7. α_y	Percentage of additives that are not surplus	Plant records	tonnes of additives	M/C	Annually	100%	Electronic	-
8. $A_{blend,y}$ †	Baseline benchmark share of blast furnace slag per tonne of BC updated for year y	Plant records	tonne of slag/tonne of blended cement	C	Annually	100%	Electronic	-
9. $P_{blend,y}$ †	Share of blast furnace slag per tonne of BC in year y	Plant records	tonne of slag/tonne of blended cement	C	Annually	100%	Electronic	-

† - Note: The revised methodology Version 2 requires that $B_{blend,y}$ (ID#29) is replaced by $A_{blend,y}$ (ID#29'). However, $B_{blend,y}$ cannot be eliminated from monitoring because this parameter is necessary for baseline emissions calculations, see ACM0005-Version 2-Page 5-Equation 1. Additionally, $A_{blend,y}$ should be identified under Table D.2.3.1, because this parameter is used for the calculation of leakage and not baseline emissions. See ACM0005-Version 2-Page 7-Equation 2.1.

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Please, refer to section Section B.2.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Please, refer to section Section B.2.

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Table D.2.1.1 – ID numbers 1-33	*Low-Medium*	These data will be collected as part of normal plant level operations. QA/QC requirements consist of cross-checking these with other internal company reports. Local data and where applicable IPCC data will be used. Independent agency verification will also be used.
Table D.2.1.3 - – ID numbers 1-30	*Low-Medium*	These data will be collected as part of normal plant level operations. QA/QC requirements consist of cross-checking these with other internal company reports. Local data and where applicable IPCC data will be used. Indeppendent agency verification will also be used.
Table D.2.3.1 - – ID numbers 1-7	*Low*	Round trip distance will be cross-checked with evidence of origin and map references. Truck capacity and fuel consumption data will originate from vehicle manufacturers and transporters.

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

Project operator and manager is Cimento Mizu. The company has maintenance and operations procedures, which include the monitoring of process variables, instruments calibration and quality control, according to company policies, engineering best practices and ISO9000 certification. For this reason, no major changes in monitoring and QA/QC procedures will be required for the CDM project activity related variables and parameters.

All data necessary for the monitoring of the project activity is normally monitored as part of plants operations. Therefore, there are several existing reports from which the information will be obtained, depending on the area involved. Production data is obtained from the electronic control system that automatically monitors and control plant operations. The data is kept electronically in the system, with back-up available. Monthly reports are produced from these data. Transport data is obtained from the transport suppliers that transport slag.

The calculation of emissions reductions is made through a Microsoft Excel spreadsheet which contains formulae in accordance with the methodology. The data obtained from the consolodated reports shall be introduced in the spreadsheet and emissions reductions wil be calculated automatically.

All monitored data related with the project activity will be stored untill two years after the end of the crediting period.

D.5 Name of person/entity determining the monitoring methodology:

Date of baseline completion: 28/12/2005.

Contact information:

Ecoinvest Carbon
Rua Padre João Manoel, 222 – Cerqueira Cezar
São Paulo – SP
Zip 01411-000

Phone: +55 +11 3063-9068
Fax: +55 +11 3063-9069

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

Detailed estimate of project emissions is presented in Annex 3.

E.2. Estimated leakage:

Detailed estimate of leakage is presented in Annex 3.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

Detailed estimate of project emissions is presented in Annex 3.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

Detailed estimate of baseline emissions is presented in Annex 3.

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

Detailed estimate of emissions reductions is presented in Annex 3.

E.6. Table providing values obtained when applying formulae above:

Year	Estimation of project activity emissions [tCO_2]	Estimation of baseline emissions [tCO_2]	Estimation of leakage emissions [tCO_2]	Estimation of emissions reductions [tCO_2]
2005	54,929	77,372	480	21,963
2006	54,026	75,173	435	20,712
2007	45,268	76,539	855	30,415
2008	45,140	74,851	811	28,900
2009	41,726	75,555	945	32,884
2010	41,726	74,045	901	31,418
2011	36,838	74,741	1,062	36,841
Total	319,653	528,277	5,490	203,133

SECTION F. Environmental impacts

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

The project activity has been implemented in accordance with all the applicable environmental legislation in the Municipal, State and Federal levels.

The monitoring of environmental impacts is made according to the requirements of the environmental agency in the State. When requested by the environmental agencies, monitoring is provided. The verification of project atmospheric emissions, wastewater generation and solid residues final disposal was approved by the environmental agency as of the issuance of the license. Emergency plans and safety programs were developed and implemented, in accordance with Mizu current practices and environmental legislation.

F.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:

No significant environmental impacts are due to the project activity.

SECTION G. Stakeholders' comments

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

The Brazilian Designated National Authority for the CDM requires the compulsory invitation of selected stakeholders to comment the PDD sent to validation in order to provide the letter of approval. Mizu and Ecoinvest will invite the comments from local stakeholders when validation started.

The local stakeholders to be invited are listed below:

- City Hall
- Câmara de Vereadores
- State Environmental Agency
- Local Environmental Agency
- Local ONG
- State Public Attorney
- FBOMS (Representative of Brazilian Environmental ONGs)

Copies of the invitation letters and receipts (AR – *Avisos de Recebimento*) will be available with project proponents.

G.2. Summary of the comments received:

So far, no comments were received from local stakeholders.

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

So far, no comments were received from local stakeholders.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Cimento Mizu
Street/P.O.Box:	Rua Sinke Ferreira, 500
Building:	
City:	Curitiba
State/Region:	Paraná
Postfix/ZIP:	81530-340
Country:	Brazil
Telephone:	+55 +41 3355 1165
FAX:	
E-Mail:	roberto@mizuse.com.br
URL:	
Represented by:	Mr. Roberto Soares
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Organization:	Ecoinvest Carbon
Street/P.O.Box:	Rua Padre João Manoel, 222
Building:	
City:	São Paulo
State/Region:	São Paulo
Postfix/ZIP:	
Country:	Brazil
Telephone:	+55 +11 3063 9068
FAX:	
E-Mail:	cmm@ecoinvestcarbon.com
URL:	
Represented by:	Mr. Carlos de Mathias Martins
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the project activity.

Annex 3

BASELINE INFORMATION

In this annex the consolidated data for the six plants is presented.
All data is estimated and need to be verified after registration.
The benchmark analisys for B_{blend} determination and grid electricity emission factor is also presented.

Benchmark Analisys

Type of cement		Composition (mass %)			Total Brazilian Production (tonnes)
		Clinker	Gypsum	Additives	2004
Ordinary	CP I	0.97	0.03	0.00	682,881
	CP I - S	0.96	0.03	0.01	
Blended	CP II - E	0.91	0.03	0.06	23,829,155
	CP II - Z	0.91	0.03	0.06	
	CP II - F	0.91	0.03	0.06	
Blast Furnace	CP III	0.63	0.02	0.35	5,155,370
Pozzolanic	CP IV	0.82	0.03	0.15	2,793,614
High Initial Resistence	CP V - ARI	0.97	0.03	0.00	1,952,268
Structural White Cement	CP B	0.97	0.03	0.00	0
Non structural White Cement	CP B	0.72	0.02	0.26	

Total production of cement in the region		
	tonnes	34,413,288

20% of total production in the region		
	tonnes	6,882,658

Top 20% - higher blends		
CP III	tonnes	5,155,370
CP II	tonnes	1,727,288
CP I	tonnes	0

Benchmark	
t(clinker)/t(BC)	0.7011

Grid Electricity Emission Factor

Prepared by Ecoinvest, Econergy and Ecosecurities

Source: Operador Nacional do Sistema Elétrico, Centro Nacional de Operação do Sistema, Acompanhamento Diário da Operação do SIN, (daily reports from Jan. 1, 2002 to Dec. 31, 2004).

Emission factors for the Brazilian South-Southeast-Midwest interconnected grid					
Baseline (including imports)	EF_{OM} [tCO2/MWh]	**Load [MWh]**	**LCMR [GWh]**	**Imports [MWh]**
2002	0.8489	275,402,896	258,310	1,640,971
2003	0.9306	288,493,929	274,231	572,687
2004	0.8361	297,879,874	279,722	2,309,681
	Total (2001-2003) =	**861,776,699**	**532,541**	**2,213,658**
	$EF_{OM, simple-adjusted}$ [tCO2/MWh]	$EF_{BM,2004}$	**Lambda**	
	0.4384	0.1256	λ_{2002}	
	Alternative weights	**Default weights**	0.5002	
	w_{OM} = 0.75	w_{OM} = 0.5	λ_{2003}	
	w_{BM} = 0.25	w_{BM} = 0.5	0.5271	
	EF_{CM} [tCO2/MWh]	Default EF_{OM} [tCO2/MWh]	λ_{2004}	
	0.3602	0.2820	0.4608	

Complete database for grid electricity emissions, including plants, fuels and generation, is available with project participants.

MIZU – Estimated monitoring data and emissions reductions

Plant: Mizu	Blended Cement Type: CP III

			BASELINE			PROJECT ACTIVITY - FIRST CREDITING PERIOD						
Monitoring Data	**Description**	**Unit**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
$CLNK_{BSL}$ and $CLNK_y$	Clinker	kilo tonnes	-	-	1,349.01	66.09	66.09	54.86	54.86	50.71	50.71	44.77
BC_{BSL} and BC_y	Cement	kilo tonnes	-	-	1,847.10	136.57	136.57	140.67	140.67	144.89	144.89	149.23
ADD_{BSL} and ADD_y	Slag	kilo tonnes	-	-	261.00	62.89	62.89	83.73	83.73	92.73	92.73	102.97
x	Slag not surplus	kilo tonnes				0	0	0	0	0	0	0
InCaO and $InCaO_y$	CaO in the raw material	tonnes			135,933.11	6,683.55	6,675.56	5,522.68	5,566.48	5,145.43	5,145.43	4,542.68
	CaO content	%			41.65	41.80	41.75	41.61	41.94	41.94	41.94	41.94
	Quantity of raw material	tonnes			326,370.00	15,989.36	15,989.36	13,272.49	13,272.49	12,268.55	12,268.55	10,831.38
OutCaO and $OutCaO_y$	CaO in the clinker	tonnes			863,635.56	42,747.01	41,986.98	35,126.97	35,044.68	32,393.86	32,393.86	28,599.15
	CaO content	%			64.02	64.68	63.53	64.03	63.88	63.88	63.88	63.88
InMgO and $InMgO_y$	MgO in the raw material	tonnes			7,669.70	386.94	375.75	327.83	315.89	291.99	291.99	257.79
	MgO content	%			2.35	2.42	2.35	2.47	2.38	2.38	2.38	2.38
	Quantity of raw material	tonnes			326,370.00	15,989.36	15,989.36	13,272.49	13,272.49	12,268.55	12,268.55	10,831.38
OutMgO and $OutMgO_y$	MgO in the clinker	tonnes			46,136.11	2,372.63	2,075.23	1,914.62	1,876.22	1,734.30	1,734.30	1,531.14
	MgO content	%			3.42	3.59	3.14	3.49	3.42	3.42	3.42	3.42
FF_{i_BSL} and FF_{i_y}	Fossil fuel for clinker production											
FF_{1_BSL} and FF_{1_y}	Coke	tonnes			137,990.12	6,760.35	6,760.35	5,611.65	5,611.65	5,187.18	5,187.18	4,579.53
FF_{2_BSL} and FF_{2_y}	Fuel Oil	tonnes			4,806.60	235.48	235.48	195.47	195.47	180.68	180.68	159.52
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$BELE_{grid\_CLNK}$ and $PELE_{grid\_CLNK,y}$	Grid electricity for clinker production	MWh			364.86	17.88	17.88	14.84	14.84	13.72	13.72	12.11
$BELE_{sg\_CLNK}$ and $PELE_{sg\_CLNK,y}$	Self electricity for clinker	MWh			0	0	0	0	0	0	0	0
$BELE_{grid\_BC}$ and $PELE_{grid\_BC,y}$	Grid electricity for grinding BC	MWh			1,144.02	56.05	56.05	46.52	46.52	43.00	43.00	37.97
$BELE_{sg\_BC}$ and $PELE_{sg\_BC,y}$	Self electricity for grinding BC	MWh			0	0	0	0	0	0	0	0
$BELE_{grid\_ADD}$ and $PELE_{grid\_ADD,y}$	Grid electricity for grinding additives	MWh			0	0	0	0	0	0	0	0
$BELE_{sg\_ADD}$ and $PELE_{sg\_ADD,y}$	Self electricity for grinding additives	MWh			0	0	0	0	0	0	0	0
TF_{cons}	Fuel consumption in transportation											
	CUB/SH	kg/km				1.60	1.60	1.60	1.60	1.60	1.60	1.60
	VR/SH	kg/km				1.85	1.85	1.85	1.85	1.85	1.85	1.85
	---	kg/km				0.00	0.00	0.00	0.00	0.00	0.00	0.00
D_{add_source}	Distances											
	CUB/SH	km				130	130	130	130	130	130	130
	VR/SH	km				170	170	170	170	170	170	170
	---	km				0	0	0	0	0	0	0
$ELE_{conveyor\_ADD}$	Electricity transportation	MWh				0	0	0	0	0	0	0
Q_{add}	Quantity of additives											
	CUB/SH	tonnes				27	27	27	27	27	27	27
	VR/SH	tonnes				27	27	27	27	27	27	27
	---	tonnes				0	0	0	0	0	0	0
$F_{i,j}$	Fossil fuel for self electricity	tonnes			0	0	0	0	0	0	0	0
GEN_j	Self electricity	MWh			0	0	0	0	0	0	0	0

Fixed parameter	Description	Unit	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
0.785	Stoichiometric emission factor for CaO	tCO2/t(CaO)			0.7850	0.7850	0.7850	0.7850	0.7850	0.7850	0.7850	0.7850
1.092	Stoichiometric emission factor for MgO	tCO2/t(MgO)			1.0920	1.0920	1.0920	1.0920	1.0920	1.0920	1.0920	1.0920
EF_{C1}	Carbon emission factor for coke	tC/TJ			27.5000	27.5000	27.5000	27.5000	27.5000	27.5000	27.5000	27.5000
EF_{C2}	Carbon emission factor for fuel oil	tC/TJ			21.1000	21.1000	21.1000	21.1000	21.1000	21.1000	21.1000	21.1000
EF_{C3}	Carbon emission factor for diesel	tC/TJ			20.2000	20.2000	20.2000	20.2000	20.2000	20.2000	20.2000	20.2000
NCV_1	Net calorific value for coke	TJ/t			0.0351	0.0351	0.0351	0.0351	0.0351	0.0351	0.0351	0.0351
NCV_2	Net calorific value for fuel oil	TJ/t			0.0402	0.0402	0.0402	0.0402	0.0402	0.0402	0.0402	0.0402
NCV_3	Net calorific value for diesel	TJ/t			0.0423	0.0423	0.0423	0.0423	0.0423	0.0423	0.0423	0.0423
$OXID_1$	Oxidation factor of coke	-			0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900
$OXID_2$	Oxidation factor of fuel oil	-			0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900
$OXID_3$	Oxidation factor of diesel	-			0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900

	Calculated data												
Eq.	**Emission factors**	**Description**	**Unit**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
ACM2	EF_{grid_BSL} and EF_{grid_y}	Grid electricity emission factor (calculated per A	tCO2/MWh			0.2820	0.2820	0.2820	0.2820	0.2820	0.2820	0.2820	0.2820
6	EF_{sg_BSL} and EF_{sg_y}	Self generated electricity emission factor	tCO2/MWh			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	EFF_1	CO_2 emission factor for coke	tCO2/t(coke)			3.5066	3.5066	3.5066	3.5066	3.5066	3.5066	3.5066	3.5066
7	EFF_2	CO_2 emission factor for fuel oil	tCO2/t(fuel oil)			3.0753	3.0753	3.0753	3.0753	3.0753	3.0753	3.0753	3.0753
7	TEF	Transport fuel (diesel) CO_2 emission factor	kgCO2/kg(diesel)			3.1007	3.1007	3.1007	3.1007	3.1007	3.1007	3.1007	3.1007

	Calculated data												
Eq.	**Project Emissions**	**Description**	**Unit**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
5.2.1	$PE_{ele\_grid\_BC}$	Grid electricity for BC grinding	tCO2/t(BC)				0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
5.2.2	$PE_{ele\_sg\_BC,y}$	Self electricity for BC grinding	tCO2/t(BC)				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5.2.3	$PE_{ele\_grid\_ADD,y}$	Grid electricity for additives	tCO2/t(BC)				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5.2.4	$PE_{ele\_sg\_ADD,y}$	Self electricity for additives	tCO2/t(BC)				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5.2	$PE_{ele\_ADD\_BC,y}$	Total electricity emissions (Project)	tCO2/t(BC)				0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
5.1.1	$PE_{calcin,y}$	Project emissions due to calcination	tCO2/t(clinker)				0.4612	0.4475	0.4552	0.4529	0.4529	0.4529	0.4529
5.1.2	$PE_{fossil\_fuel,y}$	Fossil fuel combustion for clinker	tCO2/t(clinker)				0.3696	0.3696	0.3696	0.3696	0.3696	0.3696	0.3696
5.1.3	$PE_{ele\_grid\_CLNK,y}$	Grid electricity for clinker production	tCO2/t(clinker)				0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
5.1.4	$PE_{ele\_sg\_CLNK,y}$	Self electricity for clinker production	tCO2/t(clinker)				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5.1	$PE_{clinker,y}$	Project emissions per tonne of clinker	tCO2/t(clinker)				0.8309	0.8172	0.8249	0.8226	0.8226	0.8226	0.8226
2.1	$P_{Blend,y}$	Project share of clinker per tonne of BC	t(clinker)/t(BC)				0.4839	0.4839	0.3900	0.3900	0.3500	0.3500	0.3000
5	$PE_{BC,y}$	Project emission per tonne of cement	tCO2/t(BC)				0.4022	0.3956	0.3218	0.3209	0.2880	0.2880	0.2468

Eq.	Calculated data Baseline Emissions	Description	Unit	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1.2.1	$BE_{ele\_grid\_BC}$	Grid electricity for BC grinding	tCO2/t(BC)			0.0002							
1.2.2	$BE_{ele\_sg\_BC}$	Self electricity for BC grinding	tCO2/t(BC)			0.0000							
1.2.3	$BE_{ele\_grid\_ADD}$	Grid electricity for additives	tCO2/t(BC)			0.0000							
1.2.4	$BE_{ele\_sg\_ADD}$	Self electricity for additives	tCO2/t(BC)			0.0000							
1.2	$BE_{ele\_ADD\_BC}$	Total electricity emissions (Baseline)	tCO2/t(BC)			0.0002							
1.1.1	BE_{calcin}	Baseline emissions due to calcination	tCO2/t(clinker)			0.4546							
1.1.2	BE_{fossil_fuel}	Fossil fuel combustion for clinker	tCO2/t(clinker)			0.3696							
1.1.3	$BE_{ele\_grid\_CLNK}$	Grid electricity for clinker production	tCO2/t(clinker)			0.0001							
1.1.4	$BE_{ele\_sg\_CLNK}$	Self electricity for clinker production	tCO2/t(clinker)			0.0000							
1.1		Baseline emissions per tonne of clinker	tCO2/t(clinker)			0.8243							
page 8	$BE_{clinker}$	Baseline emissions per tonne of clinker	tCO2/t(clinker)				0.8243	0.8172	0.8243	0.8226	0.8226	0.8226	0.8226
page 3		Share of clinker (market top 20%)	t(clinker)/t(BC)			0.7011	0.6871	0.6733	0.6599	0.6467	0.6337	0.6211	0.6086
page 3		Share of clinker (market 5 highest brands)	t(clinker)/t(BC)			-	-	-	-	-	-	-	-
page 3		Share of clinker (plant baseline)	t(clinker)/t(BC)	-	-	-	-	-	-	-	-	-	-
page 3	$B_{Blend,y}$	Share of clinker (lowest)	t(clinker)/t(BC)				0.6871	0.6733	0.6599	0.6467	0.6337	0.6211	0.6086
1	$BE_{BC,y}$	Baseline emission per tonne of cement	tCO2/t(BC)				0.5665	0.5504	0.5441	0.5321	0.5215	0.5111	0.5008

Eq.	Calculated data Leakage	Description	Unit	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
2	L_{add_trans}	Transport related emissions	tCO2/t(additive)				0.0238	0.0238	0.0238	0.0238	0.0238	0.0238	0.0238
page 7	$A_{blend,y}$	Benchmark share updated for year y	t(additive)/t(BC)				0.3129	0.3267	0.3401	0.3533	0.3663	0.3789	0.3914
page 7	$P_{blend,y}$	Share per tonne of BC in year y	t(additive)/t(BC)				0.4605	0.4605	0.5953	0.5953	0.6400	0.6400	0.6900
2.1	L_y	Leakage for transport of additives	tCO2				-480.21	-435.49	-855.10	-810.87	-945.01	-901.25	-1,061.91
3	α_y	Proportion of additives that is not surplus	-				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Eq.	Calculated data Emission Reductions	Description	Unit	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
4		Emission reductions	tCO2				21,963	20,712	30,415	28,900	32,884	31,418	36,841
page 8	ER_y	Emission reductions (net)	tCO2				21,963	20,712	30,415	28,900	32,884	31,418	36,841

Annex 4

MONITORING PLAN

Monitoring data is presented in Section D.

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