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

CONTENTS

A. General description of project activity

B. Application of a baseline methodology

C. Duration of the project activity / Crediting period

D. Application of a monitoring methodology and plan

E. Estimation of GHG emissions by sources

F. Environmental impacts

G. Stakeholders' comments

Annexes

Annex 1: Contact information on participants in the project activity

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

SECTION A. General description of project activity

A.1 Title of the project activity:

Indocement Alternative Fuels Project (Version 1).
November 4, 2005.

A.2. Description of the project activity:

The purpose of this project is to reduce CO_2 emissions through use of alternative fuels in clinker burning. Coal, oil, and natural gas are the traditional fuel inputs into the cement production process. The project aims at introducing alternative fuels to substitute the fossil fuels, predominantly coal, that currently are consumed during clinker burning at Indocement's production plants. Indocement aims at utilizing biomass and other alternative fuel types such as rice husks, saw dust, plastics, paper, textiles, used tires, waste oil, industrial liquid, and solid waste.

The CO2 emission reductions from this project are due to bio-fuels which are regarded as CO2-neutral fuels. The CO2 emissions from alternative fuels which are not bio-fuels are included in the project emissions.

The project is implemented at the three Indocement production sites located at Citeureup and Cirebon, both West Java, and Tarjun South, Kalimantan. Taken together, Indocement operates twelve cement kilns at three plants.

With respect to the contribution to Indonesia's sustainable development, the project will deliver several environmental improvements and socio-economic benefits as follows:

- *Provide an alternative solution to Indonesia's waste disposal problem*

The infrastructure for waste collection, treatment and final disposal is underdeveloped in Indonesia compared to western practices. Burning of various alternative fuels in the cement kilns will help addressing the growing waste disposal problem, particularly at the manufacturing sites located on the densely populated island of Java (Citeureup and Cirebon).

- *Provide employment opportunities for alternative supply chain*

The use of alternative fuels creates an opportunity for employment generation. Collecting, transporting, sorting and processing of alternative fuels are labor intensive and thus creates a source of employment for skilled and unskilled workers.

A.3. Project participants

Name of Party involved ((host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Indonesia (host)	**PT. Indocement Tunggal Prakarsa**	**To be determined**
To be determined	**The International Bank for Reconstruction and Development (IBRD) acting as Trustee for the Prototype Carbon Fund ("PCF")**	**Yes**

Project proponent: PT. Indocement Tunggal Perkasa (herein after called "Indocement") Tbk. (Majority shares owned by Heidelberg Cement Group). Contact: Mr. Oivind Hoidalen, oivind.hoidalen@indocement.co.id.

Other project participants: World Bank Prototype Carbon Fund (PCF). Contact: Odin Knudsen, Fund Manager, Carbon Finance Business. PCF is the main contact for the proposed project activity.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Republic of Indonesia

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

West Java and South Kalimantan.

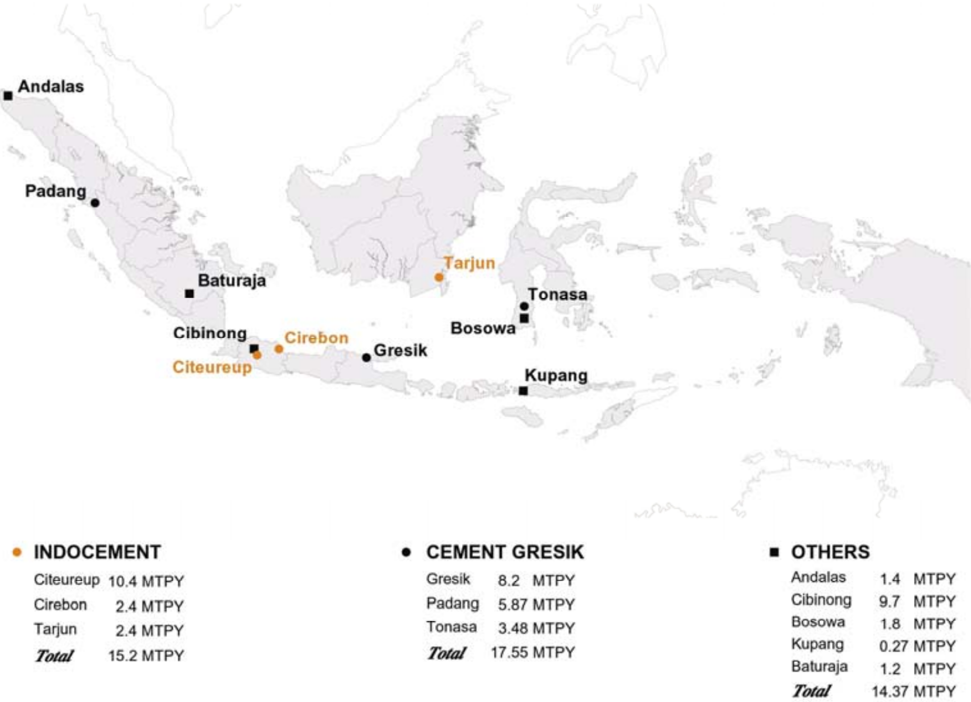
A.4.1.3. City/Town/Community etc:

Citeureup and Cirebon (West Java) and Tarjun (South Kalimantan).

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

The figure below indicates the site locations of Indocement and other Indonesian cement manufacturers.

Figure 1: Location of Indocement Plants in Indonesia.



Brief description of Indocement sites:

Citeureup. With its nine kilns (P1-P8 and P11), the Citeureup cement factory is the biggest of the three factories, with a total installed capacity of about 10.4 million tons of clinker per year (MTPY). The nearly self-contained facility operates limestone and clay quarries, a 300 MW power station, and a paper sack factory (capacity about 200 million bags per year). The Citeureup cement factory produces OPC Type I, Type II, Type V, Portland Pozzolanic Cement (PPC), and oil well and white cement.

Cirebon. The Cirebon cement factory is a fully integrated cement factory with two kilns (P9 and P10). The total production capacity is about 2.4 MTPY of clinker. The facility operates its own limestone and clay quarries. Electricity is purchased from the national grid. The factory produces OPC Type I and PPC. (PCC introduced since 2005).

Tarjun. The Tarjun cement factory is a fully integrated cement factory with a single kiln (P12). The annual production capacity is about 2.4 MTPY of clinker. The cement plant operates a coal-fired power plant and port facilities. The factory produces OPC Type I. (PCC introduced since 2005).

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

Sectoral scope 4: manufacturing industries.

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

The proposed project is intended to introduce alternative fuels without compromising the clinker quality and without introducing adverse environmental impacts. As a consequence this project addresses the following issues:

Additional equipment and installations:

The systems and equipments which are installed mainly include alternative fuel storage, waste transportation and collection systems, and fuel feeding and burning systems.

Equipment needs depend on types of alternative fuels:

- *Tyres*: It is intended to store whole waste tires in the plant vicinity and deliver these to the feed point floor via a modified belt conveyor or similar. The tires are fed to the kiln riser duct via a double damper system to ensure minimum air leakage. Tire feeding rate is determined by the kiln control system depending on preset conditions and the individual weight of tires measured on an automated weigh scale adjacent to the feeding point. The same feeding point can be used for other “bulky” alternative fuel items, such as wood.

- Textiles, plastics, papers, shredded tyres, rice husks, saw dust: Fluffy material such as shredded textiles, shredded tyres, plastic and paper fractions, rice husks and saw dust are delivered from ground level storage by pneumatic means or by bucket elevator into an intermediate storage bin above the feed point level. From this intermediate storage point the waste fuel is metered and delivered to the pre-calciner through a rotary airlock.

- Liquid alternative fuels: For liquid alternative fuels, a receiving and storage tank system with pumping, metering and valve train is being established. The kiln main burner is modified to allow for the inclusion of a special liquid alternative fuels burner.

Environmental controls:

- Environmental controls cover the alternative fuels supply chain from source to final combustion. This would include specialized collection systems, secured storage facilities and other fuel specific handling systems.
- For emission measurements, continuous measuring equipment is installed for selected pollutants. For specific pollutants such as dioxin and furans, specialized equipment is purchased by Indocement and operated by independent Indonesian Institutes such as Institute of Technology in Bandung (ITB) associated with other international institutions (European Cement Research Academy, ECRA).

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:

At present, this project aims to contribute alternative fuel to up to about 15% of Indocement’s total heat requirements from alternative fuels. This may increase in the future and the actual emission reductions will be based on the actual heat contributed by the biomass fuel. The greenhouse gas reduction is generated from reduction of fossil fuel consumption.

Clinker burning in the Indonesian cement industry is presently based almost entirely on coal. Use of alternative fuels is clearly not common practice and is not an attractive option for several reasons:

- Coal is locally available in abundance at a competitive price.
- The infrastructure for collection and treatment of wastes as potential alternative fuel candidates is underdeveloped.
- Current practice is to open burn or decay (dumping) the waste, a practice that offers the cheapest, but not an environmentally-friendly, option.

As a consequence, the use of alternative fuels is financially unattractive. The main rationale for Indocement to undertake this project is the opportunity to sell the resultant CO_2 emission reductions. Carbon finance would mean a reasonable improvement of the financial return on this project.

The project started in January 2004 and is expected to generate about 2 million tCO_2e during 2005-2025 (i.e., 3x7 years). Emissions from alternative fuels which are of non-biomass carbon (tyres, plastics and textiles) are included in the project emissions because incineration of these fuels is not the dominant practice in the region. Emissions from biomass burning are considered CO_2-neutral.

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

The estimated emission reductions of project are given in the following Table.

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
2005	8364
2006	52975
2007	105566
2008	126169
2009	109026
2010	104459
2011	108063
2012	117021
2013	124624
2014	134422
2015	134422
2016	134422
2017	134422
2018	134422
2019	134422
2020	134422
2021	134422
2022	134422
2023	134422
2024	134422
2025	134422
Total estimated reductions (tonnes of CO2e)	2469337
Total number of crediting years	21

Annual average over the crediting period of estimated reductions (tonnes of CO2e)	117587

A.4.5. Public funding of the project activity:

No public funding in this project.

SECTION B. Application of a baseline methodology

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

Approved baseline methodology ACM 0003 “Emissions reduction through partial substitution of fossil fuels with alternative fuels in cement manufacture”

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

The methodology is applicable to project because

A. The proposed project aims to partly replace fossil fuels by alternative fuels

B. CO_2 emissions reduction relates to CO_2 emissions generated from fuel burning only and are not related to the CO_2 emissions from decarbonisation of raw materials (i.e. $CaCO_3$ and $MgCO_3$ bearing minerals)

C. The methodology is applicable only for installed capacity (expressed in tonnes clinker/year) that exists by the time of validation of the project activity, which is about 15.2 million Tonnes per year.

D. Biomass fuels, i.e., rice husk, palm kernel shells, waste wood, papers, and sawdust, are available in abundance in Indonesia. As a consequence, the use of such alternative fuels by Indocement will not result in other users being forced to use other fossil fuels. Documentation on the availability of biomass fuels is shown in (Annex 6)

E. The emissions from non-biomass fuels, i.e., waste tyres, plastics, textiles, waste oils and solvent, etc., are not regarded as CO_2-neutral and are therefore counted in the emissions calculation

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

Project activity

The project activity is utilization of alternative fuels for clinker burning in cement production.

Approach

The baseline approach is based on paragraph 48 of the CDM modalities and procedures “Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment.”

Baseline scenario selection

1. : Define alternative scenario for the fuel mix

Baseline scenario 1- Continuation of current activities, i.e., utilization of fossil fuel with limited amount of alternative fuels

Current technology deployed in Indocement facilities allows using certain amount of alternative fuels without substantive amount of investment. During 2003 - 2004, Indocement has initiated the use of waste tyres, palm kernel shells and sawdust for clinker burning. However, the technology used in this initial trial phase has limitations to use only minor amounts of alternative fuels.

Table 1 illustrates the Indocement fuel composition mix in 2003-2004.

Table 1. Fuel mix composition 2003-2004

	2003	2004
Natural gas	0.07%	N/A
Fine coal	97.3%	96.4%
IDO	2.5%	3%
MFO	N/A	N/A
Waste/scrap tyres	0.04%	0.15%
Palm kernel shells	N/A	0.19%
Saw dust	N/A	0.26%
Waste fuel	N/A	0.08%

Note: IDO = Industrial Diesel Oil
MFO= Medium Fuel oil

There are no regulations in Indonesia which require to burn wastes as alternative fuels in cement kiln. Coal in Indonesia is available locally at attractive price levels compared with other type of fuels which encourages cement industry using coal as the major fuel for clinker burning. Table 2 provides fluctuation of fuel price during 2002-2005. Coal is always the cheapest fuel. Since natural gas is bought by foreign currency (in US$ dollars), this fuel price in local currency is fluctuating. Moreover, natural gas is limited in supply.

Table 2. Fossil fuel prices 2002-2005

	Rp/Mcal			
Fuel type	**2002**	**2003**	**2004**	**2005**
Coal	N/A	67	75	100
IDO	153.6	169	186.3	220.3
Natural Gas	83	100	144	138

The first baseline scenario is then continuation of current activities without any significant investment incurred, which is utilization of fossil fuels with only 1% of alternative fuels. Use of limited amount of alternative fuel is one option since the technology allows this practice.

Table 3 gives the projection of fuel consumption of scenario 1 during the project period (3 x 7 years). The estimation is based on the latest data on lower heating value of each type of fuel provided by the test using calorimeter. Documentation on heating value data is available for validation purpose.

Table 3. Projection of fuel composition mix for clinker burning, baseline scenario 1

Year	Coal		IDO		Natural Gas		Waste tyres	
	Tonnes	Tcal	Kilolitres	Tcal	MSCF	Tcal	Tonnes	Tcal
2005	1463734	7985	18974.3	166	540160.9	83	12383.34	83
2006	1543057	8417	20002.5	175	569433.6	88	13054.42	88
2007	1565406	8539	20292.2	178	577680.8	89	13243.49	89
2008	1596720	8710	20698.1	181	589236.8	91	13508.42	91
2009	1643525	8965	21304.9	187	606509.1	93	13904.39	93
2010	1696557	9255	21992.3	193	626079.6	96	14353.05	96
2011	1761027	9606	22828.0	200	649870.6	100	14898.46	100
2012	1827033	9966	23683.7	208	674228.8	104	15456.88	104
2013	1904210	10387	24684.1	216	702709.5	108	16109.81	108
2014	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2015	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2016	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2017	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2018	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2019	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2020	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2021	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2022	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2023	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2024	2014395	10989	26112.4	229	743371.2	114	17041.99	114
2025	2014395	10989	26112.4	229	743371.2	114	17041.99	114

Baseline scenario 2- Continuing utilization of fossil fuels only, i.e., coal and IDO

Using a mix of fossil fuels (mainly coal) is the common practice for clinker burning in Indonesia. At the time when this project was initiated (the PDD with two new methodologies was submitted in January 2004), almost all cement manufacturing industries produced clinker using fossil fuel, mostly coal. Overall Indocement's fuel composition mix in the 1997-2002 period is shown in Table 4. During these years, the consumption of coal was always more than 95%. Natural gas is only used in the white cement kiln and Cirebon plants (P 9/10) and IDO is only used in limited amount during kiln start up.

Table 4. Indocement fuel composition mix, 1997-2002

	1997	1998	1999	2000	2001	2002
Natural Gas	2%	1%	1%	1%	1%	0.2%
Fine Coal	92%	89%	85%	92%	94%	97%
IDO	5%	9%	15%	7%	5%	3%

Continuing utilization of fossil fuel only for clinker burning is most likely to happen in the absence of the project. Cement facilities are not likely to change to alternative fuel for clinker production because it will only add to the cost of production. Thus, investment in alternative fuel is not attractive for cement companies in Indonesia. Since there are no legal obligations for cement companies to burn such fuels, companies are not likely to shift to alternative fuel use but will instead continue using fossil fuels as the only source for heat generation for clinker production. Taking into account the fuel prices shown in Table 2, it is likely that coal is always used as the main fuel for clinker burning.

Also, based on analysis of those cement companies in Europe that are significant users of alternative fuel, it is evident that considerable use of alternative fuels coincides with a well developed public and private infrastructure for waste management. Internationally, there are strict environmental regulations when burning wastes in cement kilns, such as the recently adopted European Union directive for waste incineration (EU directive 2000/76/EU). In the case of Indonesia, there is neither an adequate waste management infrastructure nor stringent, enforceable waste management regulations that could increase the supply of waste materials. Therefore, the assumption underlying the baseline scenario 2 for alternative fuel use in Indocement is that the share of alternative fuel use will remain zero during the project period.

Projection of the quantity of fossil fuel used during the project period (3 x 7 years) of baseline scenario 2 is illustrated in Table 5. The estimation is based on the latest data on lower heating value of each type of fuel provided by the test using calorimeter. Documentation on heating value data is available for validation purpose.

Table 5. Projection of fuel composition mix for clinker burning, baseline scenario 2

Year	Coal		IDO		Natural Gas	
	Tonnes	Tcal	Tonnes	Tcal	MSCF	Tcal
2005	1472242	8031	18887.8	166	537699.6	83
2006	1552059	8466	19911.8	175	566850.8	87
2007	1574512	8589	20199.8	177	575051.2	89
2008	1605970	8761	20603.4	181	586540.3	90
2009	1653038	9017	21207.3	186	603731	93
2010	1706363	9308	21891.4	192	623206.4	96
2011	1771233	9662	22723.6	199	646898.7	100
2012	1837646	10024	23575.7	207	671154.4	103
2013	1915336	10448	24572.4	215	699528.7	108
2014	2026275	11053	25995.6	228	740046.2	114
2015	2026275	11053	25995.6	228	740046.2	114
2016	2026275	11053	25995.6	228	740046.2	114
2017	2026275	11053	25995.6	228	740046.2	114
2018	2026275	11053	25995.6	228	740046.2	114
2019	2026275	11053	25995.6	228	740046.2	114
2020	2026275	11053	25995.6	228	740046.2	114
2021	2026275	11053	25995.6	228	740046.2	114
2022	2026275	11053	25995.6	228	740046.2	114
2023	2026275	11053	25995.6	228	740046.2	114
2024	2026275	11053	25995.6	228	740046.2	114
2025	2026275	11053	25995.6	228	740046.2	114

Baseline scenario 3- Gradual utilization of alternative fuels up to 15% of total heat required for clinker burning (i.e., the project scenario)

The third baseline scenario is the project, i.e. using alternative fuels to replace a certain amount of fossil fuels. With some investment, Indocement would introduce replacement of fossil fuels by alternative fuels, including the biomass fuels. The amount of alternative fuels that can be introduced is presently estimated to reach 15%.

This project can be regarded as Indocement voluntary initiative in reducing greenhouse gas emissions through utilization of alternative fuels by taking into account relevant policies and regulations as follows:

- The only policy related to use of alternative fuels in generating energy in Indonesia is the “Green Energy Policy 2003 (*Kebijakan energi hijau 2003*)”. This policy aims at encouraging utilization and development of renewable energy. However, further actions following this policy such as regulation that would provide incentives and investment policy for utilisation of renewable energy do not exist, and industries and manufacturing sector in Indonesia have not introduced renewable energy replacing fossil fuels although this policy is already in place.

- The removal of subsidy on petroleum fuels by the Indonesian government has encouraged utilization of coal since coal price is becoming more competitive than liquid fossil fuels and gas.
- The Presidential decree No. 10/2005 only calls the officials and regional government to implement energy conservation measures in respective government agencies and administrative regions. This Decree does not specify targeted sector and type of energy conservation measures required or preferred. There is no regulation which requires utilization of alternative fuels in cement kiln anywhere in Indonesia.
- Increase price of liquid fuels further discourages the utilization of alternative fuels (Lower specific weight of alternative fuels compared with coal) due to higher transportation cost.

The total value of the investment in the alternative fuel project is estimated at around US$ 12.7 million, as given in Table 6.

Table 6: Estimated Project Cost.

Kiln	Total MUSD	2004	2005	2006	2007	2008	2009
P6	1.7	0.6	1.1				
P7	1.8	0.6	0.8	0.4			
P8	1.4				1.4		
P9/10	3.5	0.3	1.2	1.2		0.6	0.2
P11	2.1	0.2	0.5	0.9		0.5	
P12	2.2	0.3		0.7	0.6	0.6	
Total	12.7	2	3.6	3.2	2	1.7	0.2

Projection of fossil fuel and alternative fuel proportion during the project period (3 x 7 years) of baseline scenario 3 is illustrated in Table 7. The estimation is based on the latest data on lower heating value of each type of fuel provided by the test using calorimeter. Documentation on heating value data is available for validation purpose.

Table 7. Fossil fuel and alternative fuel proportion during the project period

Year	Coal	IDO	Natural Gas	Waste/Scrap tyres	Waste Plastic (Non Biomass)	Rice Husk (Biomass)	Palm Kernel Shell (Biomass)	Wastewood (Biomass)	Paper (Biomass)	Textile (Non Biomass)	Sawdust (Biomass)	Waste Fuel (Non Biomass)	Solvent (Non Biomass)	Portion of alternative fuel from total heat
2005	94.9%	3.5%	0.0%	0.7%		0.2%	0.6%				0.1%			1.6%
2006	91.0%	2.0%	2.0%	1.5%		0.5%	1.5%	0.5%	1.0%					5.0%
2007	89.0%	1.0%	2.0%	1.5%		1.5%	2.0%	1.5%	1.0%			0.5%		8.0%
2008	87.0%	1.0%	2.0%	1.5%		2.0%	2.5%	1.5%	1.0%			1.0%	0.5%	10.0%
2009	85.0%	1.0%	2.0%	2.0%	0.5%	2.0%	2.5%	1.5%	1.0%	0.5%		1.5%	0.5%	12.0%
2010	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2011	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2012	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2013	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2014	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2015	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2016	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2017	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2018	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2019	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2020	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2021	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2022	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2023	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2024	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%
2025	82.0%	1.0%	2.0%	3.0%	1.0%	2.0%	2.5%	1.5%	1.5%	1.0%		1.5%	1.0%	15.0%

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 following is the demonstration and assessment of the additionality of this project following the “Tool for demonstration and assessment of additionality”.

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

(a) This project is started in January 2004, which falls between January 2000 and the registration date of the first CDM activity. Documentation to prove the starting date of the project is available for validation purpose. Given the starting date of the project, it is eligible as a prompt start project

(b) Indocement management was convinced to go ahead with the project in 2003 because the Project PIN was accepted by the PCF in early 2003 and further discussion on carbon credit purchase was progressing. This shows that the incentive from CDM strongly influenced the decision to proceed with the alternative fuel project. Documentation to prove the starting date of the project is available for validation purpose.

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

Credible and realistic alternatives have been developed in step 1 of baseline scenario selection. The alternatives are:

1. Baseline scenario 1- Continuation of current activities, i.e., utilization of fossil fuel with limited amount of alternative fuels

2. Baseline scenario 2- Continuing utilization of fossil fuels only, i.e., coal and IDO

3. Baseline scenario 3- Gradual utilization of alternative fuels up to about 15% of total heat required for clinker burning (i.e., the project scenario)

Sub-step 1b. Enforcement of applicable laws and regulations
The regulatory framework which may be related to this project is the environmental regulations on quality of air emissions and this project has a complete documentation showing that it complies with this regulation.

Step 2: Investment analysis

Selection of the baseline scenario is conducted through the following financial test, which is also the demonstration of additionality with investment analysis. This is based on the methodology ACM0003 and the "tool for demonstration and assessment of additionality"[1]:

a. Baseline activity involves no investment activity (scenario 2) and with investment activities (Scenario 1 and 3). The appropriate investment analysis is "sub-step 2b-option III. Benchmark analysis" of the additionality tool. Since no new investment is involved in scenario 2, the weighted average capital cost (WACC) of 10% is used as the benchmark for comparison with scenario 1 and scenario 3. Documentation to demonstrate that this benchmark has been used consistently within the company is available for validation purpose.

b. The IRR of Scenario 1 and scenario 3 are calculated based on their associated cost and investment, and are summarized in Table 8a and 8b. These IRRs are compared with the weighted average capital cost (WACC). The incremental cash flow is derived from the cost saving using different type of alternative fuels.

c. Both scenario 1 (IRR: 2.1%) and 3 (IRR: 7.8%) are lower than the WACC. This suggest that the most likely scenario is the activity without investment, i.e., scenario 2, which is the continuation of using fossil fuels only for clinker burning.

d. Scenario 2 is selected as the baseline scenario.

[1] http:/cdm.unfccc.int/methodologies/PA methodologies/approved.html

Table 8.a IRR Calculation: Scenario 1

Year		Investment	Incremental cash flow	Depreciation	Taxable income	Tax	Net benefit	Cash flow
2004	0	0.3				30%		-0.30
2005	1		0.012	0.02	-0.008	0	0.012	0.012
2006	2		0.015	0.02	-0.005	0	0.015	0.015
2007	3		0.013	0.02	-0.007	0	0.013	0.013
2008	4		0.011	0.02	-0.009	0	0.011	0.011
2009	5		0.011	0.02	-0.009	0	0.011	0.011
2010	6		0.011	0.02	-0.009	0	0.011	0.011
2011	7		0.013	0.02	-0.007	0	0.013	0.013
2012	8		0.015	0.02	-0.005	0	0.015	0.015
2013	9		0.019	0.02	-0.001	0	0.019	0.019
2014	10		0.027	0.02	0.007	0.002	0.025	0.025
2015	11		0.027	0.02	0.007	0.002	0.025	0.025
2016	12		0.027	0.02	0.007	0.002	0.025	0.025
2017	13		0.027	0.02	0.007	0.002	0.025	0.025
2018	14		0.027	0.02	0.007	0.002	0.025	0.025
2019	15		0.027	0.02	0.007	0.002	0.025	0.025
2020	16		0.027	0	0.027	0.008	0.019	0.019
2021	17		0.027	0	0.027	0.008	0.019	0.019
2022	18		0.027	0	0.027	0.008	0.019	0.019
2023	19		0.027	0	0.027	0.008	0.019	0.019
2024	20		0.027	0	0.027	0.008	0.019	0.019
2025	21		0.027	0	0.027	0.008	0.019	0.019
IRR								**2.10%**

Table 8.b IRR Calculation: Scenario 3

Year		Investment	Incremental cash flow	Depreciation	Taxable income	Tax	Net benefit	Cash flow
2004	0	2						-2.20
2005	1	3.6	-14.4	0.15	-14.56	0	-14.4	-18.376
2006	2	3.2	-2.1	0.41	-2.52	0	-2.1	-5.630
2007	3	2	6.8	0.65	6.17	1.85	5.0	2.765
2008	4	1.7	5.6	0.79	4.84	1.45	4.2	2.310
2009	5	0.2	4.6	0.92	3.65	1.09	3.5	3.469
2010	6		3.0	0.92	2.10	0.63	2.4	2.385
2011	7		3.0	0.92	2.07	0.62	2.4	2.363
2012	8		3.5	0.92	2.63	0.79	2.8	2.759
2013	9		3.8	0.92	2.88	0.87	2.9	2.936
2014	10		4.1	0.92	3.16	0.95	3.1	3.128
2015	11		4.1	0.92	3.16	0.95	3.1	3.128
2016	12		4.1	0.92	3.16	0.95	3.1	3.128
2017	13		4.1	0.92	3.16	0.95	3.1	3.128
2018	14		4.1	0.92	3.16	0.95	3.1	3.128
2019	15		4.1	0.92	3.16	0.95	3.1	3.128
2020	16		4.1	0.77	3.31	0.99	3.1	3.084
2021	17		4.1	0.51	3.57	1.07	3.0	3.005
2022	18		4.1	0.27	3.80	1.14	2.9	2.935
2023	19		4.1	0.12	3.95	1.19	2.9	2.891
2024	20		4.1	0.00	4.08	1.22	2.9	2.853
2025	21		4.1	0.00	4.08	1.22	2.9	2.853
IRR								**7.80%**

Step 4: Common practice analysis

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

Based on discussions with the Indonesia Cement Association, it is evident that due to the financial barrier in place at present there is no incentive to use alternative fuels in the cement sector. Additionally, the poorly developed infrastructure for waste management creates serious supply risks. When Indocement started the project, there were no other cement companies using biomass fuels. Therefore, the proposed CDM activity is not common practice in the cement sector of Indonesia; in fact no similar projects are currently being implemented in Indonesia.

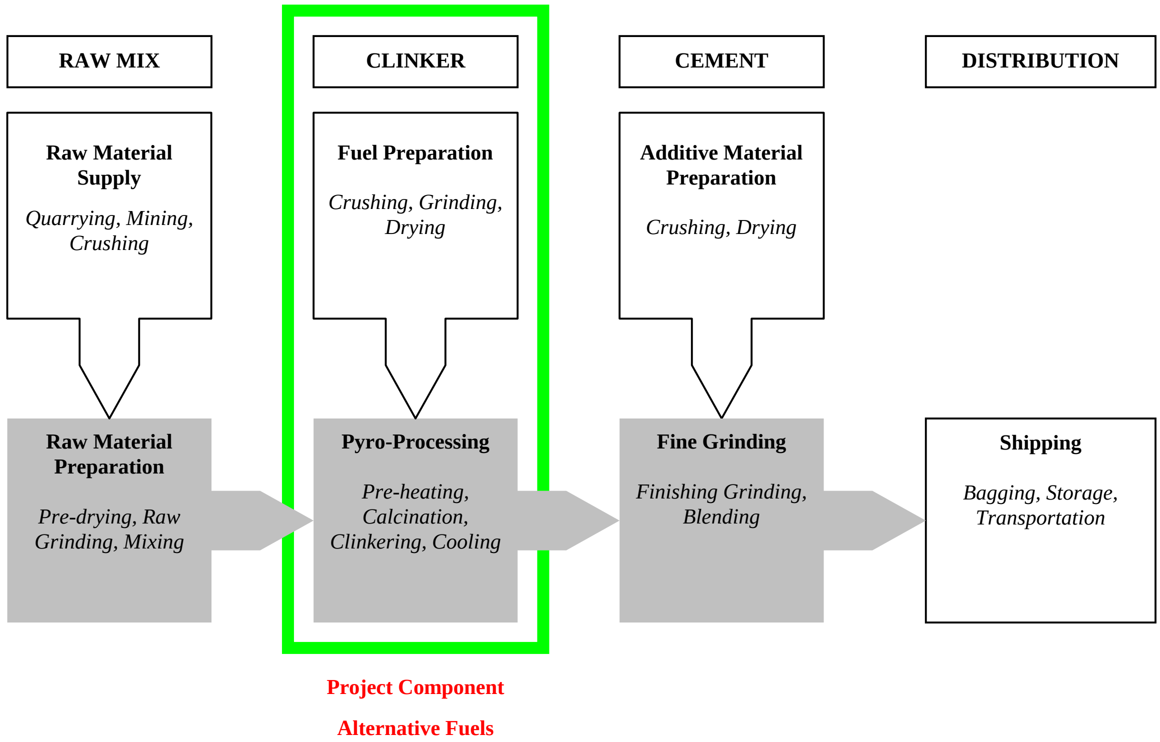
Step 5: Impact of CDM registration

Approving the proposed project as a CDM activity would provide an incentive to overcome the financial barrier demonstrated in step 2. The expected increase of IRR is from 7.8% without CER to 10.2% with CER price of 3.65 US$/ton CER. In addition, the project activity also results in environmental benefit by reducing the anthropogenic greenhouse gas emissions and by providing alternative solutions to waste problem.

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

Project Boundary
Figure 2 shows the cement manufacturing processes affected by the project component Alternative Fuels. Following the methodology, the physical boundary covers all production processes related to clinker production using alternative fuels. The specific production associated with GHG emissions that will define the project boundary primarily includes pyro-processing. In terms of emissions covered within the project boundary, only CO_2 emissions from the combustion of fuels are considered, because cement manufacturing involves high combustion temperatures and long residence times that would limit production of other GHG emissions.

Figure 2: Project Component Alternative Fuels



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:

The baseline has been determined by the following entities:

1) Indocement (also project participant).
2) Prototype Carbon Fund, World Bank, 1818 H Street, Washington Dc 20433. (contact Mr. L. Ringius, lringius@worldbank.org and vatur@worldbank.org). PCF is a project participant.

Date of completion of the baseline methodology: 1 November 2005

SECTION C. Duration of the project activity / Crediting period

Duration of the project activity:

C.1.1. Starting date of the project activity:

1/1/2004

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

The operational lifetime of the project activity is estimated at about 30 years

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

Project will use the renewable crediting period.

C.2.1. Renewable crediting period

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

1/1/2005

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

C.2.2.2. Length:

SECTION D. Application of a monitoring methodology and plan

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

Approved consolidated monitoring methodology ACM 0003 “Emissions reduction through partial substitution of fossil fuels with alternative fuels in cement manufacture.”

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

This monitoring methodology is applicable to the project activity because:

A. The proposed project aims to partly replace fossil fuels by alternative fuels.
B. CO_2 emissions reduction relates to CO_2 emissions generated from fuel burning only and is unrelated to the CO_2 emissions from decarbonisation of raw materials (i.e. $CaCO_3$ and $MgCO_3$ bearing minerals);
C. The methodology is applicable only for installed capacity (expressed in tonnes clinker/year) that exists by the time of validation of the project activity, which is about 15.2 million Tonnes per year.
D. Biomass fuels, i.e., rice husk, palm kernel shells, waste wood, papers, and sawdust, is available in abundance. This justifies that leakages in other uses of the biomass fuels will not occur. Documentation on the availability of biomass fuels is available in (Annex 6)
E. The amount of biomass fuels available is more than 1.5 times the amount required to meet the consumption of all users consuming the same alternative fuels, i.e. the project and other alternative fuel users (Annex 6)
F. The emissions from non-biomass fuels, i.e., waste tyres, plastics, textiles, waste oils and solvent, etc., are not regarded as CO_2-neutral and are therefore counted in the emissions calculation.

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

Project emissions

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	Data Type	Data Variable	Symbol	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)	For How Long is the Archived Data Kept?	Comment	instrument used to record
Monitoring of parameters related to clinker production											
1	Mass	Clinker production	C	Ton	m,c	Recorded/calculated and reported monthly	100%	electronic, paper	2 years after the end of the crediting period		Weighing feeders
Monitoring of emissions related to the use of alternative fuels in kilns during the crediting period (for each type of fuels-and each kiln independently											
2	Quantity	Fuel Type	Q_{AF}	Unit of mass or volume	m	Recorded daily and reported monthly and adjusted according to actual stock change	100%	Electronic, paper	2 years after the end of the crediting period		Scale
3	Heat value	Fuel heating value	HV_{AF}	TJ/tonne	m.c	monthly	100%	Electronic, paper	2 years after the end of the crediting period		Calorimeter
4	Heat	Alternative fuel heat input	HI_{AF}	TJ	c	Calculated and reported monthly	100%	electronic, paper	2 years after the end of the crediting period	For each kiln	
5	Emission factor	Emission factor	EF_{AF}	TCO2/TJ	IPCC default	fixed	100%	Electronic, paper	The entire crediting period		
6	Fraction	Share of heat input from alternative fuels	S_{AF}	%	calculated	Calculated monthly	100%	Electronic, paper	2 years after the crediting period		
7	Ratio	Moisture penalty	mp	MJ/tonne/% alternative fuel share	calculated	At start of the crediting period	100%	Electronic, paper	2 years after the end of the crediting period		
Monitoring of emissions related to on-site transportation and drying of alternative fuels											

8	Quantity	Transportation of fuel used on-site	OFv	Kg	m	Recorded and reported monthly	100%	Electronic, paper	2 years after the end of the crediting period		Fuel record
9	Emissions	Emissions Factor	VEF_{CO2}	G_{CO2}/kg	IPCC default	fixed	100%	Electronic, paper	The whole crediting period	Ref. Notes below	
10	Emissions	Emissions Factor	VEF_{CH4}	G_{CH4}/kg	IPCC default	fixed	100%	Electronic, paper	The whole crediting period	Ref. Notes below	
11	Emissions	Emissions Factor	VEF_{N2O}	G_{N2O}/kg	IPCC default	fixed	100%	Electronic, paper	The whole crediting period	Ref. Notes below	
12	Quantity	Fuel used for any drying of alternative fuels	FD	Kg	m	Recorded and reported monthly	100%	Electronic, paper	2 years after the end of the crediting period		Flowmeter, weigher
13	Heat	Heating value for fuel for drying alternative fuels	FD_HV	TJ/tonne	m, c	monthly	100%	Electronic, paper	2 years after the end of crediting period		Calorimeter
14	Emission factor	Emission factor for fuel used for dyring	VEF_D	tCO_2/TJ	IPCC default	fixed	100%	Electronic, paper	The whole crediting period	Ref notes below	
Monitoring of emissions reduction from reduction of on-site transport of fossil fuel											
15	Quantity	Fuel saving from on-site transportation of fossil fuel	OF_{FF}	kg	m	Measured monthly and reported monthly	100%	Electronic, paper	2 years after the end of thecrediting period		Fuel consumptio n records
16	Emission factor	Fuel emission factor	$EF_{T\ CO2e}$	$KgCO_2e$/kg of fuel	Default value		100%	Electronic, paper	2 years after the crediting period		N/A

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

The project emissions consist of:

- GHG emissions from the use of alternative fuels in kilns:

$AF_{GHG} = \Sigma(Q_{AF} * HV_{AF} * EF_{AF})$

Where:
AF_{GHG} = GHG emissions from alternative fuels (tCO_2e/yr)
Q_{AF} = Monitored alternative fuels input in clinker production (tonnes/yr).
HV_{AF} = Heating value(s) of the alternative fuel(s) used (TJ/tonne fuel).
EF_{AF} = Emission factor(s) of alternative fuel(s) used (tCO_{2e}/TJ).

- GHG emissions due to on-site transportation and drying of alternative fuels

OT_{GHG} = OF_{AF} * (VEF_CO_2 + VEF_CH_4 * GWP_CH_4/1000 + VEF_N_2O * GWP_N_2O/1000) + (FD * FD_HV * VEF_D)

Where:
OT_{GHG} = GHG emissions from on-site transport and drying of alternative fuels (tCO_{2e}/yr)
OF_{AF} = transportation fuel used for alternative fuels on-site during the year (t/yr),
VEF_CO_2 = CO_2 emission factor for the transportation fuel (tCO_2/tonne),
VEF_CH_4 = CH_4 emission factor for the transportation fuel (kg CH_4/tonne),
VEF_N_2O = N_2O emission factor for the transportation fuel (kg N_2O/tonne),
GWP_CH_4 = global warming potential for CH_4 (21),

- Emission savings from reduction of on-site transport of fossil fuels

OT_GHG_{FF} = OF_{FF}* $EF_{T\ CO2e}$

Where:
OT-GHG_{FF} = emissions from reduction of on-site transport of fossil fuels ($tCO2_e$)
OF_{FF} = fuel saving from on-site transportation of fossil fuels (t/yr)

$EF_{T\ CO2e}$ = emission factor of fuel used for transportation (tCO_{2e}/t fuel),

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	Data Type	Data Variable	Symbol	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)	For How Long is the Archived Data Kept?	Comment	instrument used to record
Monitoring of emissions related to the baseline GHG emissions from the fossil fuel(s) displaced by the alternative fuel(s)											
17	Quantity	Fuel type	QFF	Unit of mass or volume	measured	Recorded continuously and reported monthly and adjusted according to stock change	100%	Electronic, paper	2 years after the end of the crediting period	For each of the fossil fuels consumed: (i) in the year prior to the validation, (ii) during the project activiy, (iii) in the baseline scenario	
18	Heat value	Fuel heating value	HV_{FF}	TJ/tonne	m,c	monthly	100%	Electronic, paper	2 years after the end of the crediting period	For each of the fossil fuel consumed: (i) in the year prior to the validation, (ii) during the project activity, (iii) in the baseline scenario	
19	Emission Factor	Emission Factor	EF_{FF}	TCO2/TJ	IPCC default	fixed	100%	Electronic, paper	2 years after the end of crediting period	For each of the fossil fuels consumed: (i) in the year prior to the validation, (ii) during the project activity, (iii) in the baseline	

										scenario	

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

The formula is based on the Approved baseline methodology ACM 0003 with some modification to adjust to specific condition of the project.

Baseline emissions are the GHG emissions from the fossil fuel(s) displaced by the alternative fuel(s):

$FF_{GHG} = [(Q_{AF} * HV_{AF}) - MP_{total}] * EF_{FF}$

where:
FF_{GHG} = GHG emissions from fossil fuels displaced by the alternatives ($tCO_{2/yr}$)
$Q_{AF} * HV_{AF}$ = total actual heat provided by all alternative fuels (TJ/yr)
MP_{total} = total moisture penalty (TJ/yr)
EF_{FF} = emissions factor(s) for fossil fuel(s) displaced (tCO_2/TJ).

EF_{FF} is the estimated baseline value which is defined by the weighted average annual CO_2 emission factor for the fossil fuel(s) that would have been consumed according to the identified baseline scenario

To calculate MP_{total}, moisture penalty is calculated:

$mp = (HI_{AF} – HI_{FF})/S_{AF} * AF_{Share}$

Where:

HI_{AF} = $Q_{AF} * HV_{AF}$
HI_{FF} = Specific heat consumption using fossil fuels only (MJ/tonne clinker)
= $Q_{FF} * HV_{FF}$,
S_{AF} = alternative fuel heat input share of total baseline heat input
AF_{Share} = alternative fuel heat input share of total actual heat input

$MP_{total} = (S\ AF/AF_{share}) *C *mp$
where:
MP_{total} = total moisture penalty (TJ/yr)

Where:

C = total clinker production (tonnes/yr)
mp = moisture penalty (MJ/tonne- alternative fuel share of total heat input, %)

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

Not Applicable. There is no direct monitoring activities for this project

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

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

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

Monitoring of emissions due to burning of biomass in the field in the baseline scenario											
20	Quantity	Biomass fuel which would	$Q_{AF-D/B}$	Tonnes	e		100%	Electronic, paper	2 years after the end of the crediting period		
21	Fraction	Carbon fraction of the	BCF	Tonnes C per tonnes	IPCC default						

		biomass		biomass							
22	Fraction	Carbon released as CH_4 in open air burning	CH_4F		IPCC default						
Monitoring of emissions due to landfilling of biomass in the baseline scenario											
23	Quantity	Biomass fuel that would have been landfilled in the absence of the project	Q_{AF-L}	Tonnes	e		100%	Electronic, paper	2 years after the end of the crediting period		
24	Fraction	Methane conversion factor	MCF		IPCC default				2 years after the end of the crediting period	Default = 0.4 for unmanaged shallow waste sites under 5 m	
25	Fraction	Degradable organic carbon content of the biomass	DOC	TC/tonnes of biomass	IPCC default				2 years after the end of the crediting period	Default value is 0.3	
26	Fraction	Portion of DOC that is converted to landfill gas	DOC_F		IPCC default				2 years after the end of the crediting period	Default value is 0.77	
27	Fraction	CH_4 in landfill gas	F		IPCC default				2 years after the end of the crediting period	Default value is 0.5	
28	Fraction	CH_4 that is oxidized	OX		IPCC default				2 years after the end of the crediting period	Default value is 0	
29	Fraction	Landfill gas portion that is flared	NFL		IPCC default				2 years after the end of the crediting period	Default value is 0.5	
Monitoring of emissions due to off-site transport of fuels											
30	Quantity	Alternative fuels	Q_{AF}	Ton	m	Recorded continuously and reported monthly based on actual silo stock level changes	100%	Electronic, paper	2 years after the end of the crediting period		Weighing feeders

31	Specific quantity	Average truck capacity for transport of alternative fuels	CT_{AF}	Tonnes per truck	c	monthly	100%	Electronic, paper	2 years after the end of the crediting period	The quantity can be estimated based on additive material hauling distance and estimated fuel consumption per shipment	
32	Distance	Average distance for transport of alternative fuels	D_{AF}	Km/truck	c	monthly	100%	Electronic paper	2 years after the end of the crediting period	In certain cases other means of transportation which require that other formula be used	
33	Emission factors	Emission factors	EF_{CO2e}	Kg CO2eq per km or per kg of fuel	c	monthly	100%	Electronic, paper	2 years after the end of the crediting period	Ref. Notes below	
34	Quantity	Fossil fuels which is reduced due to consumption of alternative fuels	RQ_{FF}	Ton	c	Calculated monthly	100%	Electronic, paper	2 years after the end of the crediting period		
35	Quantity	Average truck capacity for transport of Q_{FF}	CT_{FF}	Km/truck	c	monthly	100%	Electronic, paper	2 years after the end of the crediting period		
36	Distance	Average distance for transport of Q_{FF}	D_{FF}								
Monitoring of alternative fuel reserves that may be used by other users (data to be completed for each type of fuel independently)											
37	Quantity	Alternative fuel used by other users		Ton	e	yearly	100%	Electronic, paper	2 years after the end of the crediting period	Track whether project activity reduces alternative fuel available to other users groups so that their GHG emissions will increase	Based on data from local, national, and/or international government institutions; industry associations; and other reliable sources of information
38	Quantity	Alternative fuel reserve available in the region		Ton	e	yearly	100%	Electronic, paper	2 years after the end of the crediting period		

Notes:

1. The estimation of biomass fuel that would have been landfilled without project and biomass fuel which would have been burnt in the absence of the project is based on literature and a survey conducted by Indocement
2. Emission factors to be used to calculate leakage from transportation emissions:

Transportation emissions from trucks	Truck capacity	To be measured
	Return trip distance	To be measured
	CO_2 emission factor[a]	1097 g/km 3172.31 g/kg
	CH_4 emission factor[a]	0.06 g/km 0.18 g/kg
	N_2O emission factor[a]	0.031 g/km 0.09 g/kg

[a]The emissions factors are based on IPCC default values for US heavy diesel vehicles, uncontrolled
Due to fuel sourcing from various locations even within a single fuel type (e.g. coal from 2 regions), distances for each source is measured, and any changes due to contract renewal also reflected.

3. If ships are used to deliver fuels, then assume that ship fuel is HFO 380 with a heat content of 41.868 GJ/tonne and emission factor of 77.4 kg CO2/GJ, as per IPCC default values. Ships are collecting another material close by and so fuel is for one-way trip.

4. ID-37-38. This monitoring task tracks whether the project activity may reduce the amount of biomass available to other users groups so that they might shift their productive or other activities in ways that would lead to increase GHG emissions. To demonstrate that there is an abundance of surplus biomass a proposed project activity should demonstrate that the amount of biomass for which there are no users/off-takers should be 1.5 times the amount required to meet the consumption of all users consuming the same biomass

5. Power system data and information: If available, data and information on generation, fuel types, fuel consumption, energy content and carbon emission factors from government ministries and agencies should be used. If unavailable, information from neighbouring countries may be used. If the latter is unavailable, international best practice data may be used together with IPCC default values and carbon emission factors.

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

Leakage consists of:

- CH_4 emissions due to biomass that would be burned in the absence of the project

BB_{CH4} = Q_{AF-B} * BCF * CH_4F * CH_4/C *GWP_CH_4

where:

BB_{CH4} = GHG emissions due to burning of biomass that is used as alternative fuel (tCO_{2e}/yr)
Q_{AF-B} = amount of biomass used as alternative fuel that would have been burned in the open field in the absence of the project (t/yr)
BCF = carbon fraction of the biomass fuel (tC/t biomass) estimated on basis of default values,
CH_4F = fraction of the carbon released as CH_4 in open air burning (expressed as a fraction),[6]
CH_4/C = mass conversion factor for carbon to methane (16 tCH_4/12 tC), and
GWP_CH_4 = global warming potential of methane (21).

- CH_4 emissions due to anaerobic decomposition of wastes in landfills

LW_{CH4} = Q_{AF-L} * DOC * DOC_F * MCF * F * C * (1-OX) * NFL* GWP_CH_4

Where:

LW_{CH4} = baseline GHG emissions due to anaerobic decomposition of biomass wastes in landfills (tCO_{2e}/yr)
Q_{AF-L} = amount of wastes (e.g. biomass) used as alternative fuel that would be landfilled in the absence of the project (t/yr)
DOC = degradable organic carbon content of the waste (%)
DOC_F = portion of DOC that is converted to landfill gas (0.77 default value)
MCF = methane conversion factor for landfill (%)
F = fraction of CH_4 in landfill gas (0.5 default value)
C = carbon to methane conversion factor (16/12)
OX = oxidation factor (fraction – default is 0)
NFL = non-flared portion of the landfill gas produced (%)
GWP_CH_4 = global warming potential of methane (21).

- Off-site transport of alternative and fossil fuels

LK_{AF} = (Q_{AF}/CT_{AF}) * D_{AF} * EF_{CO2e}/1000
LK_{FF} = (RQ_{FF}/CT_{FF}) * D_{FF} * EF_{CO2e}/1000

where:
LK_{trans} = leakage from transport of alternative fuel less leakage due to reduced transport of fossil fuels (tCO_2/yr)
LK_{AF} = leakage resulting from transport of alternative fuel (tCO_2/yr)
LK_{FF} = leakage due to reduced transport of fossil fuels (tCO_2/yr)
Q_{AF} = quantity of alternative fuels (tonnes)
CT_{AF} = average truck or ship capacity (tonnes/truck or ship)
D_{AF} = average round-trip distance between the alternative fuels supply sites and the cement plant sites (km/truck or ship)
RQ_{FF} = quantity of fossil fuel (tonnes) that is reduced due to consumption of alternative fuels

estimated as:
CT_{FF} = average truck or ship capacity (tonnes/truck or ship)
D_{FF} = average round-trip distance between the fossil fuels supply sites and the cement plant sites (km/truck or ship)
EF_{CO2e} = emission factor from fuel use due to transportation (kg CO_{2e}/km) estimated as:
$EF_{CO2e} = EF_{T\,CO2} + (EF_{T\,CH4} * 21)+(EF_{T\,N2O} * 310)$

where:
$EF_{T\,CO2}$ = emission factor of CO_2 in transport (kg CO_2/km)
$EF_{T\,CH4}$ = emission factor of CH_4 in transport (kg CH_4/km)
$EF_{T\,N2O}$ = emission factor of N_2O in transport (kg N_2O/km)
21 and 310 are the Global Warming Potential (GWP) of CH_4 and N_2O respectively

In this project, off-site preparation of alternative fuels does not exist and will never be carried out. Therefore, there are no emissions generated from this activity.

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.)

Total Emission Reductions, $AF_{ER} = FF_{GHG} – AF_{GHG} – OT_{GHG} – LK_{trans} + OT\_GHG_{FF} + BB_{CH4} + LW_{CH4} – GHG_{PAFO}$

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

Data *(Indicate table and ID number e.g. D.4-1; D.4-2.)*	Uncertainty level of data *(High/Medium/Low)*	Are QA/QC procedures planned for these data?	Outline explanation why QA/QC procedures are or are not being planned.
1-3, 8, 12-13, 15	*Low*	*Yes – According to ISO 9000 or similar quality systems*	
20-23, 29	*Medium*	*No*	*Fraction of biomass that would have been decayed/burnt and/or landfilled will be estimated*
5, 19, 9-11, 14,16,21-22, 24-28	*Low*	*No*	*While IPCC fractions are reliable defaults, the project proponent will validate these default values*
Other leakage data	*Medium*	*No*	*An independent expert will validate the data quality*

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

The CDM project operation is integrated in the normal plant management structure. All monitoring equipment will be installed by experts and regularly calibrated to the highest standards by project staff. An executive responsible for all data monitoring / acquisition and recording for CDM purposes is appointed by the Plant General Managers of Citeureup, Cirebon and Tarjun.

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

1) Indocement (also project participant): tc_yang@indocement.co.id
2) Architrandi Priambodo, consultant.
3) Prototype Carbon Fund, World Bank, 1818 H Street, Washington Dc 20433. (contact Mr. Lasse Ringius, lringius@ worldbank.org, and V. Atur, vatur@worldbank.org). The PCF is a project participant.

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

All formulae used to estimate the anthropogenic emissions of the project activity within the project boundary are taken from the approved methodology ACM 0003. The emissions resulting from the project activity consist of:

- The emissions due to burning of alternative fuels in cement kiln, AF GHG.
- The GHG emissions due to on-site transportation and drying of alternative fuels, OT GHG
- The Emissions savings from reduction of on-site transport of fossil fuel. In this project, these savings is estimated to be zero.

Spreadsheet of the detailed calculation is available for validation purpose. The estimated emissions of the project activity are given in Table 9.

Table 9. Estimated emissions of the project activity, tonnes of CO2

Year	AF GHG	OTGHG
2005	21062	9
2006	48061	31
2007	64043	54
2008	95397	66
2009	161829	74
2010	249893	92
2011	260864	95
2012	266658	96
2013	278179	101
2014	297359	107
2015	297359	107
2016	297359	107
2017	297359	107
2018	297359	107
2019	297359	107
2020	297359	107
2021	297359	107
2022	297359	107
2023	297359	107
2024	297359	107
2025	297359	107
Total	5014293	1898
Total project emissions		5016190

E.2. Estimated leakage:

The sources of leakage in the project are methane emissions due to biomass that would be burned or decomposed anaerobically in landfills in the absence of the project, as well as CO2 emissions from off-site transport of fuels to the cement plant. All calculations of emissions due to leakage follow the formula given in baseline methodology ACM 0003. Based on anecdotal information, the share of biomass open burning is 95% while biomass landfill is only 5%. All landfilled gas is non-flared. Table 10 gives estimated GHG emissions due to:

a. CH_4 emissions due to biomass open burning, BBCH4
b. CH_4 emissions due to anaerobic decomposition of wastes in landfills, LWCH4
c. Emissions from off-site transport of alternative and fossil fuels, LK trans

Table 10. Leakage emissions, tonnes of CO_2

Year	BBCH4	LW CH4	LKTrans
2005	1155	2064	-537
2006	4191	6830	-2075
2007	7915	11501	-3392
2008	9750	14911	-4578
2009	10028	15401	-6299
2010	11347	18037	-9069
2011	11731	18521	-9424
2012	11840	18634	-9667
2013	12442	19496	-10249
2014	13136	20538	-10989
2015	13136	20538	-10989
2016	13136	20538	-10989
2017	13136	20538	-10989
2018	13136	20538	-10989
2019	13136	20538	-10989
2020	13136	20538	-10989
2021	13136	20538	-10989
2022	13136	20538	-10989
2023	13136	20538	-10989
2024	13136	20538	-10989
2025	13136	20538	-10989

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

Not applicable

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

All formulae used to estimate the anthropogenic emissions of the baseline emissions within the project boundary are taken from the approved methodology ACM 0003. Table 11 provides estimation of baseline emissions, FF GHG.

Table 11 Baseline emissions, tones of CO_2

Year	FF GHG
2005	25679
2006	87972
2007	146856
2008	192393
2009	239201
2010	315990
2011	329346
2012	343634
2013	360716
2014	387224

2015	387224
2016	387224
2017	387224
2018	387224
2019	387224
2020	387224
2021	387224
2022	387224
2023	387224
2024	387224
2025	387224
Total	6688480

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

Reduction of GHG emissions, $AF_{ER}=FF_{GHG}-AF_{GHG}-OT_{GHG}-LK_{Trans}+BB_{CH4}+LW_{CH4}$

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

Table 12 gives the summary of the emission reduction form this Alternative Fuel project. Please note that in this Table the emissions reduction is estimated as follows:

Emissions reductions = Baseline emissions – project emissions+ Leakage

This is because the estimated leakage has positive input to the emission reductions because of avoided emission that would happen in the absence of the project.

Table 12. Emissions Reductions

Years	Estimation of project emissions (t CO2 e)	Estimation of baseline emissions (t of CO2 e)	Estimation of leakage (t of CO2 e)	Estimation of emissions reductions (t of CO2 e)
2005	21072	25679	3757	8364
2006	48092	87972	13095	52975
2007	64098	146856	22808	105566
2008	95463	192393	29239	126169
2009	161903	239201	31728	109026
2010	249985	315990	38454	104459
2011	260958	329346	39676	108063
2012	266755	343634	40141	117021
2013	278280	360716	42187	124624
2014	297465	387224	44664	134422
2015	297465	387224	44664	134422
2016	297465	387224	44664	134422
2017	297465	387224	44664	134422
2018	297465	387224	44664	134422
2019	297465	387224	44664	134422
2020	297465	387224	44664	134422
2021	297465	387224	44664	134422

2022	297465	387224	44664	134422
2023	297465	387224	44664	134422
2024	297465	387224	44664	134422
2025	297465	387224	44664	134422
Total				2469337

SECTION F. Environmental impacts

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

In order to accommodate incremental environmental impacts due to Indocement Alternative Fuel Project, new Environmental Management Plans (EMP) for each of the three factories have been developed. The EMPs include the following sections, and are available for validation purpose.

- Description of the cement factories including a summary of process changes related to the CDM project.
- Listing of applicable legislations and regulations.
- Summary of all anticipated significant adverse environmental impacts and methods and techniques to mitigate such impacts.
- Description of the area of influence focussing on social impacts.
- Environmental monitoring efforts including technical details such as equipment used, parameters to be measured, sampling location and frequency.
- Description of the institutional and administrative framework to implement the EMP including allocated financial and human resources.
- Public consultation and participation, and
- Community Development programs.

Incomplete combustion of alternative fuels such as used industrial solvents and other industrial waste may elevate emission of heavy metals, and potentially dioxin. However, negative environmental impacts due to the use of alternative fuels (predominantly biomass and waste tyres) are believed to be limited when well managed. Indocement has carried out trial test measurements of burning alternative fuels in the kilns according to the new European incineration directive 2000/76/EU. The result shows compliance with this directive and is available for validation purpose.

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:

N/A

SECTION G. Stakeholders' comments

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

The public disclosure and participation has been conducted at 12 villages in Citeureup, 6 villages in Cirebon and 10 villages in Tarjun. This project has been communicated and disclosed to the central government (Ministry of Environment and Department of Industry and Trade) as well as regional government (Bogor, Cirebon and Kotabaru regencies) .The list of participants is available.

To a larger extent, the project is communicated through Indocement website (http://www.indocement.co.id) and newspapers. Documentation on newspaper and website articles are available for validation purpose.

G.2. Summary of the comments received:

No specific objections or comments have been received.

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

N/A

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	PT INDOCEMENT TUNGGAL PRAKARSA Tbk.
Street/P.O.Box:	Jl. Jenderal Sudirman Kav. 70-71
Building:	Wisma Indocement
City:	Jakarta 12910
State/Region:	
Postfix/ZIP:	
Country:	Indonesia
Telephone:	+62 21 2512121
FAX:	+62 21 2510205
E-Mail:	oivind.hoidalen@indocement.co.id
URL:	www.indocement.co.id
Represented by:	
Title:	Technical Director
Salutation:	Mr.
Last Name:	Hoidalen
Middle Name:	
First Name:	Oivind
Department:	
Mobile:	+62811949219
Direct FAX:	+62 21 2510205
Direct tel:	+62215705836
Personal E-Mail:	oivind.hoidalen@indocement.co.id

Organization:	Prototype Carbon Fund – The World Bank
Street/P.O.Box:	1818 H Street, NW
Building:	
City:	Washington
State/Region:	District of Columbia
Postcode/ZIP:	20433
Country:	USA
Telephone:	+1 (202) 458 5118
FAX:	+1 (202) 522 7432
E-Mail:	
URL:	www.carbonfinance.org
Represented by:	
Title:	Senior Manager
Salutation:	Mr.
Last Name:	Knudsen
Middle Name:	
First Name:	Odin

Department:	Carbon Finance Business Unit
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	oknudsen@worldbank.org

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding in this project.

Annex 3

BASELINE INFORMATION

The baseline on emissions calculations information is available in a separate excel spreadsheet available for validation purposes (annex3-alternative fuel project.xls).

Annex 4

MONITORING PLAN

Emissions monitoring and calculation procedure are conducted following the organization structure given in Figure A-1 and the procedures are given in Table A-1. All data and calculation formula required to proceed is given in the section D of the PDD.

Monitoring Plan – Emissions Reductions Calculations Procedures

(Organizational Structure)

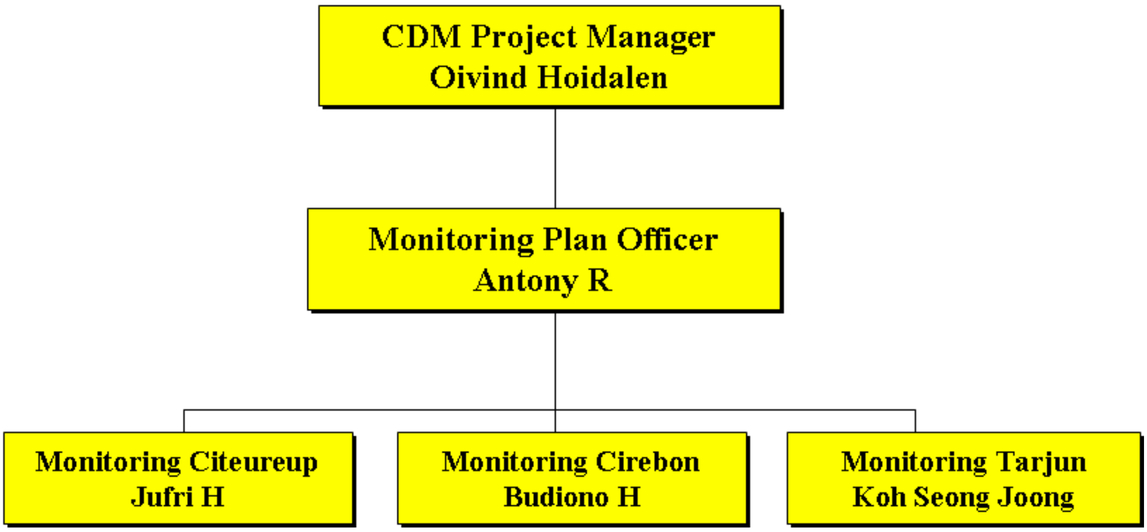
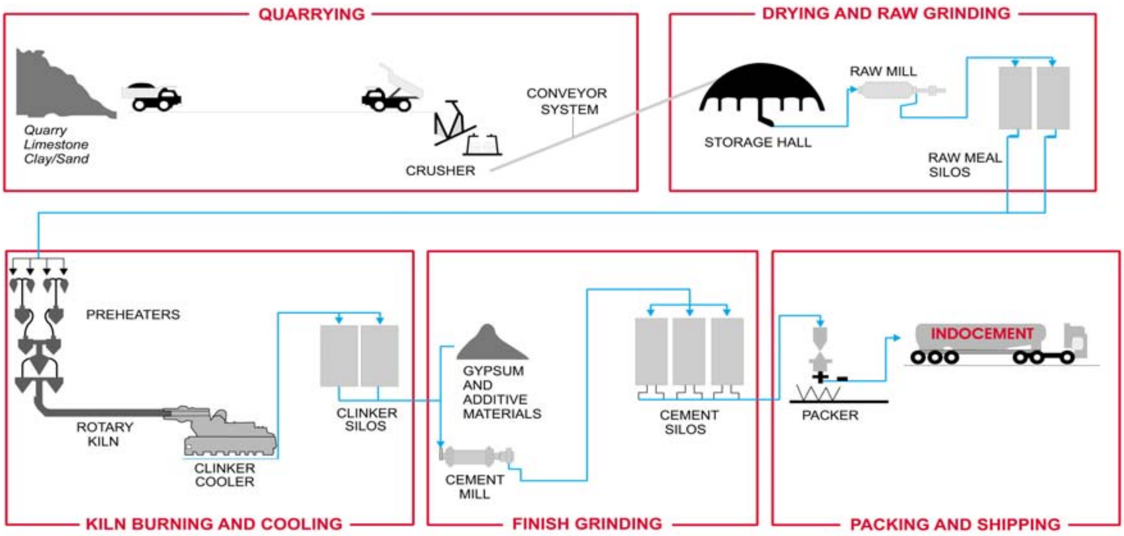


Table A-1. Emissions Monitoring and Calculation Procedure			
Monitoring and calculation activities	**Citeureup**	**Cirebon**	**Tarjun**
Data Source and collection	Data is taken from the accounting section	Data is taken from the accounting section	Data is taken from the accounting section
	Most data is available and recorded according to ISO 9001 management system	Most data is available and recorded according to ISO 9001 management system	Most data is available and recorded according to ISO 9001 management system
	Frequency of data collection is based on Monitoring Tables given in section D of the PDD	Frequency of data collection is based on Monitoring Tables given in section D of the PDD	Frequency of data collection is based on Monitoring Tables given in section D of the PDD
	All data is reviewed and approved by Citeureup plant manager Mr. Jufri H	All data is reviewed and approved by Cirebon plant manager Mr. Budiono	All data is reviewed and approved by Tarjun plant manager Mr. Koh Seong Joong
Data compilation	All data is centralised at Citeureup for data processing		
	Data from Citeureup, Cirebon and Tarjun is transmitted to Monitoring officer, Mr. Antony R		
Emissions calculation	Emissions calculation is conducted on a yearly basis from data which is collected daily, monthly or annually, depending on the nature of the data. Frequency of data collection and recording is listed in section D of the monitoring section		
	All data is calculated by Monitoring officer, Mr. Antony using a comprehensive excel spreadsheet as shown in annex3a.xls and annex3b.xls		
Emissions data review and approval	Calculation is reviewed and approved by CDM project manager, Mr, Oivind Hoidalen		
Record Keeping	All data is recorded electronically and also kept manually in hard copy, the monitoring officer, Mr.Antomy is responsible for record keeping		

Annex 5: Cement manufacturing process and related GHG emissions

Cement is produced by burning a mixture of raw materials, comprised mainly of limestone and clay, in large rotary kilns at temperatures above 1450^o C. This process results in the formation of clinker, which together with gypsum and other materials upon grinding to high fineness, is transformed into cement (See Figure 3 below).

Overview of Cement Production Process



CO_2 emissions from cement manufacturing originate predominantly from:

- The de-carbonation of the limestone, which is the main component in the raw materials for the burning process ($CaCO_3 = CaO + CO_2$).
- The burning process, which requires flame temperatures above 2000^o C and where large quantities of fuels are burnt.
- Electricity consumption in the manufacturing process.

More than 50% of the CO_2 emissions from cement production originate from the calcination process. At present, about 0.88 ton CO_2 is emitted per ton of clinker produced at Indocement's plants.

ANNEX 6. Availability of biomass fuels in Indonesia

1. Biofuel Reserves for Indocement project

Indocement operates three cement factories. These are located at Citeureup, Cirebon and Tarjun. These facilities have 12 kilns in total, with an installed capacity of more than 15 MTPY clinker.

Cement manufacturing is highly energy intensive (see Table 1). For cement plants, the energy cost may represent up to 40% of total manufacturing cost. From an environmental view point, the use of fossil-based fuels presents a growing concern in particular, due to CO_2 emissions. Reducing energy consumption by energy conservation is consequently desirable to address both cost and environmental concerns.

Table 1. Average Annual Coal Consumption at Indocement Factories

Factory	Average Annual Coal Consumption (tones/year)
Citeureup	1,200,000
Cirebon	270,000
Tarjun	300,000

The two main factors that drive unit-based CO_2 emissions in the cement industry are the energy intensity and the clinker to cement ratios. The most effective measure to mitigate CO_2 emissions is lowering the clinker to cement ratio by the use of additive materials in cement grinding. A second measure to reduce fuel-related CO_2 emissions is to use alternative fuels.

Among the many types of alternative fuel candidates available in Indonesia, agricultural by-products and biomass are considered the most available reserves (see Table 2).

Table 2. Major biomass residues potential as energy resources in Indonesia (2000)

Biomass	Main Region	Production (million t/year)	Technical Energy Potential (million GJ/y)
Rubber wood	Sumatra, Kalimantan, Java	41 (replanting)	120
Lodging residues	Sumatra, Kalimantan	4.5	19
Sawn timber residues	Sumatra, Kalimantan	1.3	13
Plywood and veneer production residues	Sumatera, Kalimantan, Java, Irian Jaya, Maluku	1.5	16
Sugar residues	Java, Sumatra, South Kalimantan	Bagasse: 10 Cane tops: 4 Cane leaves: 9.6	78
Rice residues	Sumatera, Kalimantan, Java, Bali, Nusa Tenggara	Husk: 12 Bran: 2.5 Stalk : 2 Straw: 49	150
Coconut residues	Sumatra, Java, Sulawesi	Shell: 0.4 Husk: 0.7	7
Palm oil residues	Sumatera New areas: Kalimantan, Sulawesi, Maluku, Nusa Tenggara, Irian Jaya	EFB: 3.4 Fibres: 3.6 Palm shell: 1.2	67

Source: ZREU, CGI 2000

Biomass waste

Agricultural by-products are high-volume sources of carbon, and may serve as alternative fuels in the power and cement industry. Such by-products can be considered biomass, which refers to all matter (largely carbon) contained in organism, mostly vegetation. Any vegetation waste is a potential alternative fuel (see Table 2).

Due to its weigh rice husk should be sourced close to the cement works, possibly in combination with some bulky-density-improving means in order to reduce transportation cost. The main source will be rice mills and fields deposits in West Java in a not too far distance from Citeureup and Cirebon plant sites. Saw dust is typically delivered through brokers who source it from small and medium sized saw mills in West Java. Waste from palm oil industry is mostly available in Kalimantan (West Kalimantan) and lesser in Java. In Kalimantan the larger plantations already use some of its waste in their own boilers and combined heat and power plants.
In Kalimantan, the most production of oil palm is generated in West Kalimantan, the third biggest plantation area after Riau and North Sumatra. By now there are 17 oil palm mills operating in West Kalimantan with utilized capacity of 695 tones FFB/hour.

Table 3. Alternative Fuel (Biomass) Calorific Value with comparison to coal

Fuels	Quantity (tones) to produce energy equivalent to combustion of 1 ton of coal	Calorific Value (kJ/g-dry)
Coal	1	23
Rice husk	1.5	15.6
Rice straw	1.6	14.2
Palm shell	1.1	20.5
Rubber wood	1.2	19.2
Saw dust	1.3	18.0
Coconut shell	1.1	20.3
Bagasse	1.2	18.5

Source: http://www.

Citeureup

Location
Located in West Java, approximately 60km from Jakarta, Citeureup plant is the biggest factory of Indocement, operating 9 kilns with a total installed capacity of about 10.2 MTPY of clinker. Current capacity utilization is around 65% with Kilns P1, P2 and P8 not in operation.

Accessibility (supporting infrastructure)

Jalan Darat. From Jakarta, Citeureup plant can be accessed through Jagorawi Toll Road, exit Gunung Putri gate. In general the land infrastructure in West Java is in good and moderate condition. Access to Citeureup plant from each Regency, source of Rice Husk reserves, is mostly class 2 and 3, asphalted road.

Table 4. Length of Road by type of surface, condition and class of road in West Java

Description	State	Province	Regency	Municipality	Total
I. Type of Surface					
A. Aspal / Asphalted	966.90	2,103.22	14 877,18	2,736,69	20 683,18
B. Kerikil / Gravels	-	314.79	2 246,83	150,80	2 712,42
C. Tanah / Land	-	-	1 560,23	26,31	1 586,54
D. Unclassified	-	-	275,58	480,52	756,10
Jumlah / Total	**966.90**	**2,418.01**	**1,8961.82**	**3,394,32**	**25 740,25**
II. Road Condition					
A. Baik / Good	441.88	1 021,36	4 979,65	2 070,75	8 513,64

B. Sedang / Moderate	426.84	1 117,76	5 212,01	770,15	7 526,76
C. Rusak / Damage	91.87	192 62	5 378,58	412,12	6 075,19
D. Rusak Berat/	5.50	86,28	3 391,58	141,30	3 624,66
E. Seriously Damage					
Jumlah / Total	**966.90**	**2,418.01**	**1,8961.82**	**3 394,32**	**25 740,25**
III. Road Class					
A. Kelas I /Class I	-	-	22,96	-	22,96
B. Kelas II /Class II	966.90	-	90,65	545,97	1 602,71
C. Kelas III/Class III	-	2,418.01	2 590,98	481,95	5 490,95
D. Kelas IIIA/Class IIIA	-	-	1 894,74	52,40	1 947,14
E. Kelas IIIB/Class IIIB	-	-	3 814,73	176,94	3 991,67
F. Kelas IIIC/Class IIIC	-	-	2 602,59	187,18	2 789,77
G. **/Unclassified**	-	-	7 945,17	1 949,88	9 895,05
Total	**966.90**	**2,418.01**	**1,8961.82**	**3 394,32**	**25 740,25**

Jalan Udara. The closest airport is Bandara Soekarno-Hatta (international and domestic airport) in North Jakarta, located approximately 90km from Citerureup. Transportation available from airport to Citeureup is by road. The infrastructure from airport to Citeureup plant mostly is class 2 of state and province roads in good and moderate condition.

Sea transportation. Estimated distance from the nearest harbor, Tanjung Priok, is 90km. Estimated time to plant is around 3 hours during normal business hour. Tanjung Priok is an international harbour. The infrastructure from harbour to Citeureup plant mostly is class 2 of state and province roads in good and moderate condition.

Rice Husk as alternative fuel

The species of rice cultivated in West Java is *oryza sativa*. By year 2001 the production of rice husk in West Java reached 1.8 million tones. The rice husk is generated in the milling process represents about 20% of the rice casing. Maximum calorific value (15.8 kJ/g-dry) are similar to wood and others agricultural wastes. However the low density of the husk makes it difficult to store and increases the cost of transportation.

Around 1.8 million tones per year of rice husk are produced, which should provide 579 000 TOE (tones oil equivalent) per year of available energy. To make rice husk efficient for industrial use it should be processed into other form, commonly into briquette (dry and wet).

Table 5. Rice Husk reserves availability in the near area of Citeureup plant is (2002):

Wilayah	Rice Production (ton)	Rice Husk Production (ton)	Est. Distance (Km)		Area of Distribution	
			From Citeureup	From Palimanan	Citeureup	Palimanan
Kabupaten						
01 BOGOR	442,614	88,523	30	277	X	
02 SUKABUMI	591,412	118,282	109	366	X	
03 CIANJUR	571,175	114,235	82	173	X	
04 BANDUNG	560,651	112,130	146	109		X
05 GARUT	622,035	124,407	214	133		X
06TASIKMALAYA	545,142	109,028	252	145		X
07 CIAMIS	553,127	110,625	258	129		X
08 KUNINGAN	304,037	60,807	312	56		X
09 CIREBON	453,227	90,645	284	28		X
10 MAJALENGKA	502,959	100,592	324	47		X
11 SUMEDANG	395,608	79,122	191	64		X
12 INDRAMAYU	1,063,467	212,693	223	53		X

13 SUBANG	845,205	169,041	195	135		X
14 PURWAKARTA	165,342	33,068	130	160	X	
15 KARAWANG	959,489	191,898	92	164	X	
16 BEKASI	465,548	93,110	51	205	X	
Kotamadya						
71 BOGOR	2,104	421	30	277	X	
72 SUKABUMI	20,909	4,182	109	366	X	
73 BANDUNG	19,206	3,841	146	109		X
74 CIREBON	2,232	446	284	28		X
75 BEKASI	7,628	1,526	51	205	X	
76 DEPOK	9,310	1,862			X	
77 CIMAHI	1,518	304			X	
78 TASIKMALAYA	62,927	12,585	252	145		X
Propinsi	**9,166,872**	**1,833,374**			647,410	1,185,965

Source: Biro Pusat Statistik web site, http://www.bps.go.id

Cirebon

Location
Palimanan Plant located in the suburb of Cirebon, approximately 10 Km from city center. The Cirebon plant operates 2 kilns and a total production capacity of 2.4 MTPY of clinker. Capacity utilization is 100%.

Accessibility

Jalan darat. Cirebon, located 300 km from Jakarta, can be accessed in 4-5 hours during normal business hours by toll road. Road condition from Jakarta to Palimanan through Cirebon is generally good with status of country and province roads of class 2.
Jalan Laut. The nearest harbour from Palimanan Plant is Palimanan Harbour. It is a commercial harbour. Type of road from Cirebon to Palimanan is asphalted road class 2 in good condition. Required time from Cirebon to Palimanan is about 20 minutes during normal business hour.

Tarjun

Location
Tarjun factory is a fully integrated cement factory, not only does it operate its own limestone and clay quarries, it also operates a coal-fired power plant and port facilities.
Tarjun Plant is located in Desa Tarjun, Kecamatan Kelumpang Selatan, Kabupaten Kota Baru, Propinsi Kalimantan Selatan. Estimated distance from Banjarmasin, is 350 Km. Time required to reach the plant site by land transportation from Banjarmasin is around 7 hours.

Accessibility (Infrastructure to Kota Baru)
Tarjun plant site can be reached through Land Transportation (Trans Kalimantan) or River Transportation (Kota Baru Harbour).

Jalan Darat. The length and condition of roads in South Kalimantan is presented in the following table:

Table 5. Length of Road by type of surface, condition and class of road in South Kalimantan.

		State Roads	Province Roads	Total
I. Type of Surface	a. Asphalted	826.41	825.73	1,652.14
	b. Gravel	0.00	0.00	0.00
	c. Earth	37.66	128.50	166.16
	d. Others	0.00	0.00	0.00
	TOTAL	**864.07**	**954.23**	**1,818.30**
II. Condition of	a. Good	234.62	462.99	697.61
	b. Moderate	441.57	221.19	662.76

Roads	c. Damage	155.88	177.45	333.33
	d. Heavy Damage	32.00	92.60	124.60
	TOTAL	**864.07**	**954.23**	**1,818.30**
III. Class of Roads	a. I	0.00	0.00	0.00
	b. II	0.00	0.00	0.00
	c. III	0.00	0.00	0.00
	d. IIIA	864.07	211.19	1,075.26
	e. IIIB	0.00	473.26	473.26
	f. IIIC	0.00	269.78	269.78
	g. Not classified	0.00	0.00	0.00
	TOTAL	**864.07**	**954.23**	**1,818.30**

Jalan Laut. In the regency of Kota Baru, there are 5 harbours in operation. The first is Kota Baru Harbour, which is an export and import harbour. The second are industrial specific harbours (4 harbours). 3 harbours operate specifically for Coal industry shipping, they are IBT Harbour in Mekar Putih, Tanjung Pemancingan Harbour, and Satui Harbour. The last one is the harbor specially operates to support PT. Indoncement Tunggal Prakarsa (Tbk), located in the near of Tarjun plant site, in desa Tarjun.

Palm Shell as alternative fuel

Oil palm industries produces large amount of biomass waste either in the plantation or in the mill. The Biomass wastes generated in the palm oil mill include empty fruit bunches (EFB), mesocarp fibers, and palm kernel shell. For every ton of palm oil produced the amount of the wastes is: 1 ton of EFB, 0.6 ton of mesocarp fiber, and 0.4 ton of shell.

About Palm Shell Charcoal
The use of oil palm waste as a biofuel becomes increasingly important since it is 100% made from an environmentally friendly and renewable raw material (palm kernel shell).
Prior to use as a fuel, the palm kernel shell should be treated to ensure its characteristic. The most common form available in the market is Palm Shell Charcoal Briquettes and Tablets. It is produced through the carbonization of palm kernel shells. As fuel, the palm shell charcoal is hotter and last longer than ordinary charcoal (sawdust or any wood charcoal), making it an efficient energy heat source. It features a high calorific value and balanced volatile content (see calorific value table above), leading to high burn efficiency. Its combustion characteristic of low odour and emission and low smoke emission makes it a very suitable product for stringent domestic and industrial use.
Palm shell for industry use can be obtained directly from oil palm mills (in a form of raw palm kernel shell) or from palm shell charcoal industry (in a form of briquettes or tablets).
For industrial use, the palm kernel shell can be used as a source of fuel for the boilers. Unfortunately the shell contains silicates that form a scale in the boilers if too much shell is fed to the furnace, thus limiting the amount of shell that can be utilized in the boilers. Residual shell is disposed of as gravel and can be used for plantation roads maintenance. Some industries in Africa also buy the shells to use as fuel material in their casting and forging operations. Palm nut shell is also used in the preparation of pozzolana, a cement substitute material that has been developed by the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.
Source: FAO websites, http://www.fao.org/DOCREP/005/Y4355E/y4355e07.htm

Oil Palm Industry in Indonesia
In year 2004 Indonesia produces 12.2 million tones of CPO (Crude Palm Oil) and 2.4 million tones of Palm Kernel. Most of these products are exported with total value of not less than 4 billion US dollars.
Source: Makalah Lokakarya, Ir. Derom Bangun

Table 6. Palm Oil Production Indonesia 2002-2005

Year	Total Area (Ha)	CPO Production (ton)	PKO Production (ton)	Est. Total Palm Shell Production (ton)
2002	4,116,646	9,910,928	-	3,964,371
2003	5,239,171	11,795,045	2,583,728	4,718,018
2004	5,290,000	12,384,798	2,400,000	4,953,919

2005		13,600,000*	-	5,440,000*

Source: Makalah lokakarya, DR.Ir. Delilma Azahari, MS * estimated production

Using the above mentioned calculation, the total amount of palm shell produced in Indonesia in 2002 is:
= Total CPO Production 2002 x 0.4 ton
= 9,910,928 ton x 0.4
= 3,964,371 ton

By year 2002, there are as many as 18 centers of oil palm plantation estates in Indonesia, with South Kalimantan lays as the tenth most productive area, 3.9% of total area (see Table 7).

Table 7. Oil Palm Estates Distribution in Indonesia (2002)

Province	Total Area (Ha)	Percentage Area (%)*
Nangroe Aceh Darussalam	222,389	5.40
North Sumatera	654,511	15.90
West Sumatera	193,765	4.71
Riau	803,951	19.53
Jambi	320,047	7.77
South Sumatera	370,160	8.99
Bangka Belitung	112,762	2.74
Bengkulu	78,799	1.91
Lampung	108,120	2.63
Banten	3,747	0.09
West Jawa	17,375	0.42
West Kalimantan	411,261	9.99
Central Kalimantan	298,095	7.24
South Kalimantan	160,376	3.90
East Kalimantan	187,629	4.56
Central Sulawesi	43,032	1.05
South Sulawesi	72,133	1.75
South East Sulawesi	1,102	0.03
Irian Jaya	57,392	1.39
Indonesia	**4,116,646**	**100.00**

Source: Direktorat Jenderal Bina Produksi Perkebunan.

With total planting areas 3.9% of total area in Indonesia, quantity of palm shell produced in South Kalimantan by 2002 is:
= 3.9% x total CPO production 2002 x 0.4
= 3.9% x 9,910,928 ton x 0.4
= 154,610 ton

Table 8. Estimated Palm Shell Reserves in Kalimantan (2002)

Province	Percentage of Total Production (%)	Est. Palm Shell Reserve (ton)
West Kalimantan	9.99	396,041
Central Kalimantan	7.24	287,020
South Kalimantan	3.90	154,610
East Kalimantan	4.56	180,775
TOTAL	25.69	**1,018,447**

CONCLUSIONS

The total availability of rice husk and palm kernel shells suitable for use in cement kilns at Citeureup, Cirebon and Tarjun has been estimated at

- Rice husk ~ 1,8 million tons per year

- Palm kernel shells ~ 5,1 million tons per year

The total annual generation is thus estimated at about 7 million tons. Furthermore, Indocement envisage utilizing certain waste woods as well as selected, pre-treated municipal wastes containing various amounts of biomass fuels in its production. (Note that the amount of municipal wastes generated in Jakarta is estimated at 2,5 to 3 million tons per year).

Whilst municipal wastes in Indonesia are mostly land-filled, it is difficult to get accurate figures as to present usage of biomass fuels. It is however assumed that the majority of these large quantities are land-filled or open air burnt.

Assuming that Indocement would substitute ~10% of its energy requirements with biomass fuels, a total of about 300,000 tons of such fuels would be required per year. This corresponds to less than 5% of total yearly generation of such alternative fuels for use in Indocement's plants..

The use of such alternative fuels by Indocement would therefore not lead to other users being forced to utilize fossil fuels.