



Workshop CDM in Industrial Processes

Example CDM Project in the Cement Industry

Indocement's Sustainable Cement Production Project

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Indocement's Sustainable Cement Production Project

PROJECT DESIGN DOCUMENT (CDM-PDD)

B. Baseline methodology

Project Component 1: Reasoning on Additionality

- **The proposed project applies two new baseline methodologies to its two interrelated but distinct project components.**
- **For Project Component 1, the suggested name of the applied new baseline methodology is: A. Methodology for barrier testing, baseline scenario and emission reduction calculation for project activities that substitute Ordinary Portland Cement (OPC) with blended cement.**
- **For Project Component 2, the suggested name of the applied new baseline methodology is: B. Baseline methodology for project activities that substitute fossil fuels with alternative fuels in cement kilns.**
- **Those two new methodologies are reported separately in “Annex 3A: Blended Cement Component” and “Annex 3B: Alternative Fuel Component” attached to the PDD.**

Project Component 1: Justification of choice of methodology

The methodology is applicable to Indocement's Sustainable Cement Production Project because:

- **A. The Indonesian cement sector is dominated by conventional OPC-grade cement.**
- **B. The project will increase the share of blended cement in Indonesia and will substitute conventional OPC-grade cement that would be available otherwise in the market. The boundaries for the project can be clearly identified and information on the characteristics of the process is available.**
- **C. Sufficient information exists to document in a transparent and conservative manner that the proposed project component is not common practice at the present time.**
- **D. Sufficient information exists to document in a transparent and conservative manner that this project component is subject to prohibitive barriers, and its registration as a CDM project would enable it to overcome those barriers.**
- **E. There is sufficient evidence to document that Indonesian consumers are adverse towards blended cement as such, not just towards the blended cement product to be introduced by Indocement.**
- **F. The market share of OPC in Indonesia is about 82% whereas the market share of the PPC and masonry cement accounts for 18%. This strongly indicates that there is a significant potential market demand for blended cement with properties comparable to those of OPC.**

Project Component 2: Justification of choice of methodology

The methodology is applicable to Indocement's Sustainable Cement Production Project because:

- A. The proposed project aims to partly replace fossil fuels by alternative fuels.
- B. Sufficient information exists to document that using alternative fuels is more costly than traditional fossil fuels.
- C. The use of alternative fuels in clinker burning is not required under Indonesian legislation.

Indocement's Sustainable Cement Production Project

Application of the baseline methodology (NM0047-
rev) to Component 1 (Blended cement) of the
project activity

Part I
Additionality Test

Project Component 1 - Step I.1: Project eligibility test

Indocement's Sustainable Cement Production Project consists of two project components one of which is concerned with manufacturing and introduction of blended cement into the cement market in Indonesia. The Indonesian cement market is heavily dominated by OPC. The project therefore is eligible to use the methodology proposed in Annex 3A.

Project Component 1 – Step I.2: Market share of blended cement and common practice threshold

Sub-step I.2.1: Determine market shares of OPC and blended cement

- **According to Indonesian cement standards, companies can produce and sell four different types of cement: OPC, Portland Pozzolan Cement (PPC), masonry and blended cement. Indocement furthermore produces about 100,000 tons of white cement, about 40,000 tons of oil-well cement and about 20,000 tons of ASTM type II/V annually. These types of cement are excluded from the project scope. As shown in the Table, the cement market in Indonesia is heavily dominated by OPC, which captured about 82% of the market in 2002. PPC and masonry cements accounted for around 18% that year. Since 1999, the share of blended cement in Indonesia's market has been equal to zero.**

Types of cement	1999 (%)	2000 (%)	2001 (%)	2002 (%)
OPC	74.8	77.2	77.7	81.9
PPC + Masonry	25.2	22.8	22.3	18.1
Blended	0	0	0	0

Source: Indonesia Cement Association, 2002.

Project Component 1 – Step I.2: Market share of blended cement and common practice threshold

Sub-step I.2.1: Determine market shares of OPC and blended cement

- **OPC is produced by using clinker, gypsum and minor amounts of additive material (up to around 4.5%). PPC and masonry cements are produced in Indonesia with variable amounts of natural pozzolan (trass), fly ash from coal-fired power plant and limestone. PPC is normally used in concrete structures requiring low heat of hydration. OPC is used for similar applications under strict condition of quality control. Following Indonesian standards, blended cement may contain various additive materials (artificial and natural pozzolan, limestone and others) at unspecified proportions. This type of cement is regarded as of inferior quality in Indonesia and, accordingly, the market share has remained at 0%.**
- **No cement producers in Indonesia are planning to produce and market blended cement because the demand risk is significant.¹ Leading global cement companies, such as Lafarge and Holcim, have stayed away from producing blended cement in Indonesia, although these companies produce blended cement in other countries.**

Project Component 1 – Step I.2: Market share of blended cement and common practice threshold – Sub-step I.2.2: Establish common practice threshold for blended cement

- **The market share of blended cement varies considerably across countries. To our knowledge, nowhere than in Indonesia is the market share of blended cement zero. For instance the market share of blended cement in India is around 47% and around 21% in Malaysia (2002). Blended cement is also sold, among other places, in Mexico and Costa Rica. In Japan, blended cement had a 26% market share in 2002, and around 50% of the cement is blended in Germany.**
- **Based on these figures, on the opinions of international experts consulted, and on Indocement's international experience, it appears that setting the common practice threshold for blended cement in Indonesia at 30% for the 10-year crediting period would be a justifiable and conservative figure. Given that blended cement currently is not sold in Indonesia – which is a remarkable situation indeed and a strong quantitative indicator of one or probably several prohibitive barriers – the proposed project meets this additionality criterion as it would be implemented in a host country where blended cement's market share is conservatively below the common practice threshold.**

Project Component 1 –

Step 1.3: Identify barriers relevant to the proposed project

- **Production of blended cement does not require significant investments in processing machines. In fact, production of blended cement requires less energy than OPC, and, depending upon the costs of additive materials, the long-term production cost of blended cement could be lower than for OPC. But despite this potential cost advantage, Indonesia's producers have stayed away from blended cement production because the demand risks by far outweigh the production benefits. Hence, this project component is not financially attractive given the current market situation.**
- **There are no legal barriers to blended cement production and marketing in the host country. A review of existing regulations in Indonesia showed that there are no production requirements or environmental regulations that specifically target blended cement.**
- **By ruling out financial and legal aspects of blended cement production as potential explanations of the low demand and lack of production in Indonesia, consumer reluctance becomes a plausible explanation for the situation regarding the market for blended cement in Indonesia.**
- **Actually, several factors convincingly explain why Indonesian consumers strongly prefer OPC over blended cement.**

Project Component 1 –

Step 1.3: Identify barriers relevant to the proposed project

- **History shows that structures that are built with OPC last long spans of time and endure changing natural and climatic exposures. OPC is the no-risk option for consumers.**
- **In the 1970s and 1980s, several structures built using poor quality blended cement had to be demolished. As a result, a perception was created that blended cement is low grade and this perception continues to dominate today.**
- **Indocement's attempt to market blended cement in 1996-1998 did not succeed in creating an impression that blended cement has a strength comparable to OPC. As mentioned, no blended cement is sold in Indonesia at present, a strong indicator that the perception of blended cement as an inferior type of cement persists.**
- **Marketing blended cement on the basis of its superior environmental features compared to OPC requires additional marketing effort. Awareness campaigns are expensive and take time before results are achieved.**
- **In European countries, where blended cement has achieved the highest market acceptance, producers must continue their marketing efforts in order to maintain blended market share against OPC.**
- **OPC continues to dominate the market for cement globally.**

Project Component 1 – Step I.4: Explain how only the approval and registration of the proposed project as a CDM activity would enable the project to overcome the identified barriers and thus be undertaken.

- **Experiences with blended cement's market growth in other countries show that it is possible to motivate consumers to buy blended cement. However, it is also evident that consumers do not readily embrace blended cement; this market segment grows only slowly. For instance, this has been the experience in Germany where consumers eventually have become favourably inclined towards environmental quality. International experiences show that a good marketing strategy is necessary in order to successfully introduce and sell blended cement.**
- **Approving the proposed project as a CDM project activity would enable it to use the income accrued from CO2 emission reductions sales to finance a critically important marketing effort that hopefully would motivate some early adopters to use blended cement. The cost of additional campaign and supporting measures in the marketing of the new blended cement to the Indonesian cement market is estimated at about US\$ 5-10 million during the first five years of introduction. Given clear evidence that the negative perception about blended cement remains very strong in Indonesia, it is very unlikely that any cement producer would invest in blended cement production and marketing without carbon financing.**

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Part II

Define plausible scenario alternatives

Project Component 1 – Steps II.1-II.3: Define plausible scenario alternatives

- **Three future scenarios are identified which seem possible under certain conditions. The baseline scenario will be the most plausible scenario, given the key factors discussed below.**
- **Scenario Alternative 1: GHG reduction measures with minimum investment. Scenario Alternative 1 is a continuation of the current practice and assumes that measures to reduce CO₂ emissions are implemented without significant effort. It is consistent with Heidelberg Cement Group's current initiatives with regards to sustainable development. Increased use of additive materials commenced in 2001 as a trial test at Indocement facilities. Limestone and natural pozzolan are used as additive materials, but only in small fractions. Starting in 2002, Indocement has been gradually decreasing the clinker ratio to a level that does not require additional equipment or major investment, and is doing so without much difference compared with the current practice levels in the Indonesian cement industry (up to 3-4.5% additives for OPC).**

Project Component 1 – Steps II.1-II.3: Define plausible scenario alternatives

- **Scenario Alternative 2: GHG reduction and some investment in efficiency measures. This scenario is implementing the use of additive materials in the same manner as Scenario Alternative 1, but some short-term investments are made in addition in order to improve energy efficiency, particularly with regards to power and fuel consumption.**
- **Scenario Alternative 3: Significant efforts to reduce GHG emissions. Scenario 3 implies increased use of additive materials, resulting in the introduction of new types of cement (and the use of alternative fuels). The introduction of new types of cement will not only require substantial research and development efforts, but will also require substantial marketing efforts.**

Project Component 1 – Steps II.4-II.6: Select baseline scenario

- **The likelihood of the occurrence of a scenario is determined by the constraints and barriers that would prevent the scenario from being realized. Constraints are concerned with key factors, as illustrated in the next slide.**
- **In order to select the most plausible and conservative scenario, all three alternatives are assessed against a common set of key issues, as examined in the following two slides. “Not applicable” indicates that the issue is irrelevant for the scenario. “Applicable” indicates that, unless additional measures are taken to overcome the issue, the issue prevents the implementation of the scenario. Single and double plus signs illustrate the level of importance, with a double plus sign indicating the existence of a stringent barrier.**

Project Component 1 – Steps II.4-II.6: Select baseline scenario - Key issues for the proposed project

Key Issues	Impact on Blended Cement
<p><i>Investment Climate</i></p> <ul style="list-style-type: none"> • Uncertain economic growth • Current Indonesian cement market 	<p><i>Investment Issues</i></p> <p>Country risk and uncertain economic growth will hinder investment in any industrial sector, including the cement industry</p>
<p><i>Quality Assurance</i></p> <ul style="list-style-type: none"> • Need for high clinker quality to introduce new types of cement 	<p><i>Technology Issues</i></p> <p>Investments in the installation of new equipment and process modifications needed to offset the impact on cement quality due to increased use of additive materials.</p>
<p><i>Market Acceptance</i></p> <ul style="list-style-type: none"> • Consumer behaviour with regards to lower clinker to cement ratio, cement colour, and use of fly-ash as additive material • Price sensitivity • Environmental and social impacts 	<p><i>Market Issues</i></p> <p>Introducing new types of cement is difficult, considering the current negative perception regarding quality of cement with lower clinker content, darker colour and produced using waste fly ash as additive materials. Production costs may increase medium-term due to additional technical and marketing efforts, while consumers prefer competitive prices and risk averse choice of OPC.</p>
<p><i>Sector Policies/ Frameworks</i></p> <ul style="list-style-type: none"> • Lack of active green energy policy 	<p><i>Regulatory Issues</i></p> <p>No restrictive regulations regarding Blended Cement production.</p>

Project Component 1 – Steps II.4-II.6: Select baseline scenario – Assessment of Impact of Key Issues on Selected Scenarios

Scenario Issue-area	Scenario 1	Scenario 2	Scenario 3 (CDM project)
Investment	<i>Not applicable; no investment is needed.</i>	<i>Applicable (+)</i> Certain investments are required to improve energy efficiency, but with limited project financing risk.	<i>Applicable (++)</i> Significant investments are required. Country risk and economic uncertainties increase risks in project financing.
Technology	<i>Not applicable; prevailing equipment and technology adequate to ensure QA with increase in additive materials up to the current practice level.</i>	<i>Not applicable; as prevailing equipment and technology is adequate to ensure QA with increase in additive materials up to the current practice level.</i>	<i>Applicable (++)</i> Investment is needed to install new equipment, modify existing facilities, and introduce new QA measures.
Market	<i>Not applicable; the cement with a proportion of additive materials up to the current practice level is still within existing OPC standards and acceptable to the market.</i>	<i>Not applicable; the cement with a proportion of additive material up to the current practice level is still within existing OPC standards and acceptable to the market.</i>	<i>Applicable (++)</i> Significant marketing efforts and investment are needed to overcome negative consumer perception and to introduce new types of cement. Production costs will increase, while new products need competitive pricing.
Regulations	<i>Not applicable; the current practices are within the regulations.</i>	<i>Not applicable; the current practices are within the regulations.</i>	<i>Not applicable; blended cement is allowed under current regulations.</i>

Project Component 1 – Steps II.4-II.6: Select baseline scenario

The assessment of the three possible scenario alternatives yields the following conclusions:

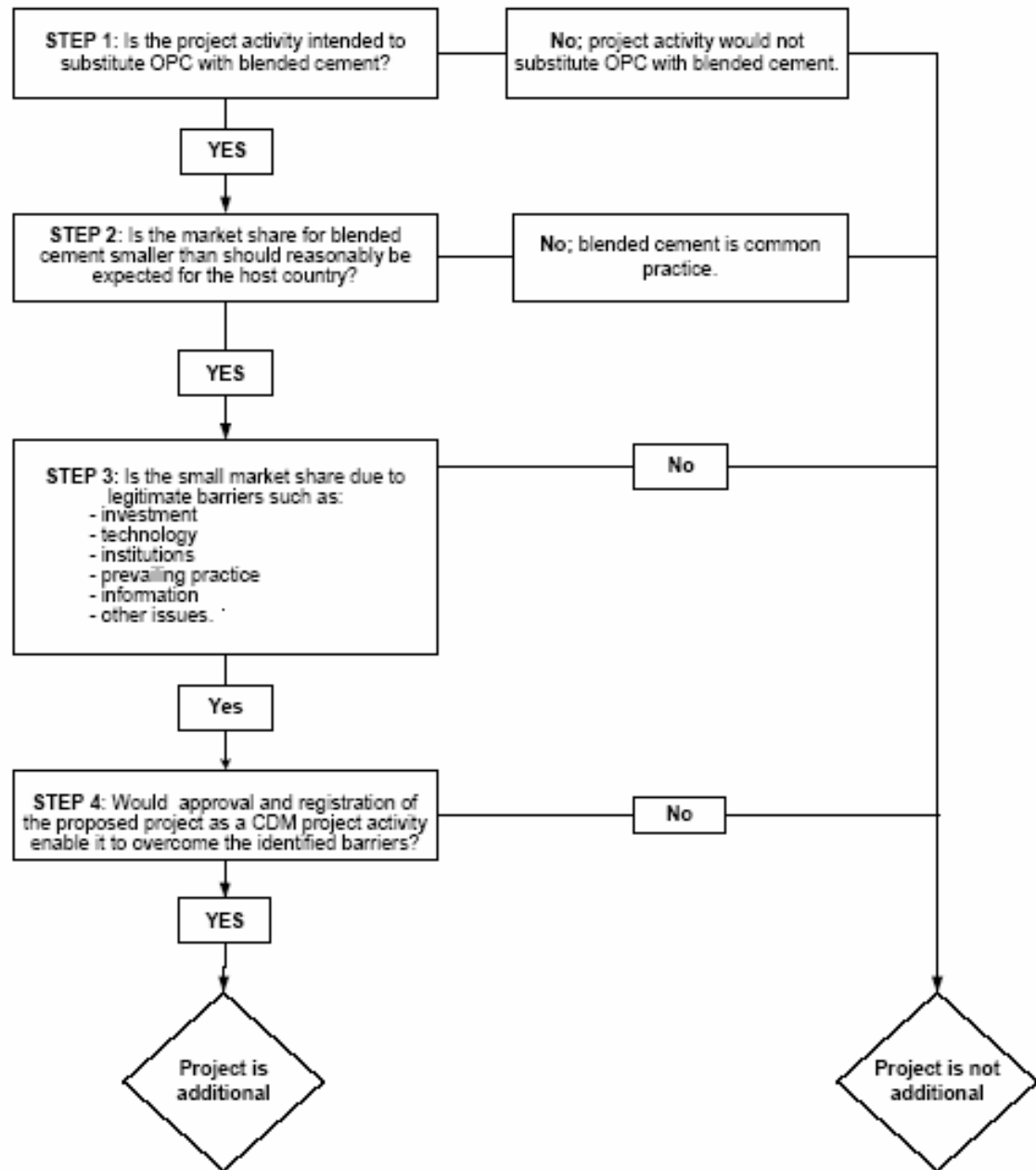
- **Clearly, Scenario Alternative 1 is likely to occur, since no barriers are applicable to the scenario. Activities in this scenario are almost similar to the current practice, and no significant additional efforts are needed.**
- **Scenario Alternative 2 is fundamentally similar to Scenario 1 but is more environmentally conservative. It is in Heidelberg Cement Group's interest to invest in certain low risk measures to optimise the efficiency and profitability of the Indocement operations, so it would be reasonable to conclude that this scenario could be pursued and achieved as a business model for Indocement without the incentives provided by the CDM.**
- **Scenario Alternative 3 is unlikely to occur within the time frame of the proposed CDM project, i.e. within the next 21 years, unless extra efforts to overcome the barriers are carried out.**

Project Component 1 – Steps II.4-II.6: Select baseline scenario

Hence, after eliminating alternative scenarios 1 and 3, Scenario Alternative 2 is selected as the baseline scenario, taking into account the expected transfer of technology following the recent acquisition of Indocement by Heidelberg, and considering the Indonesian cement market condition. This scenario is considered to be that which results in the emission reductions level that could reasonably be achieved, given the barriers identified.

It is recognized that different types of cement are widely used in Europe, USA, and other developed regions and countries. It is also recognized that the use of alternative materials has been introduced some decades ago in Europe and the USA and is now considered common industry practice in many developed countries. Eventually the use of additive materials will gradually find its way into the Indonesian cement industry. The existing barriers will, however, prevent this measure from taking place within the CDM crediting period without the incentives provided by the CDM. The project will only occur in the project time period if significant additional efforts are implemented to remove the market barrier and other barriers described. Hence the project is additional.

Project Component 1
 –
 Schematic Diagram of
 Additionality
 Methodology.



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Part III

Compute emission rate for
baseline scenario and project

Project Component 1 – Compute emission rate for baseline scenario and project – Basic Assumptions

Baseline assumptions:

- a) Indonesian domestic cement market growth with 2% in 2004 compared with 2003. After 2004, the market is expected to grow by 6% for 2005-2006 followed by a market growth of 5%.
- b) Indocement market share is estimated at 30% in 2004, 31% in 2005 and 32% in the years to come up to 2013.
- c) It is assumed that the total clinker to cement ratio for OPC remains at 0.925 throughout the crediting period, which is regarded as the baseline for the clinker to cement ratio of the blended cement.
- d) The heat consumption in the baseline is expected to be reduced slightly in the first years because of continuous improvements and operation of the most efficient kilns. Later, the heat consumption is increasing slightly due to the operation of kilns with higher heat consumption (P1 and P2). It is not economically attractive to convert these kilns to higher efficiency kilns.

Project Component 1 – Compute emission rate for baseline scenario and project – Basic Assumptions

Baseline assumptions (continued):

- e) The heat consumption in the project activity is assumed to be equal to that of the baseline.
- f) The power consumption/ton of clinker of the clinker production is estimated at 65 kwh/ton of clinker for the baseline. The power consumption/ton of cement for cement production (grinding and packing) is estimated at 44 kwh/ton of clinker. This is based on the historical performance. The power consumption of the CDM project is estimated on an ex-ante basis, but the real value will be based on the actual performance based on the influence of use of additive materials in cement grinding.

Project Component 1 – Compute emission rate for baseline scenario and project

Based on the conservatively selected baseline scenario, and using the formulae and steps detailed in Part III of the methodology proposed for the blended cement component, the baseline and project emission rates for the project period of Project Component 1 are shown in the Table.

Year	CO ₂ _{Baseline}	CO ₂ _{CDM}	CO ₂ emission reduction
2004	9442857	9305166	137692
2005	10063764	9843997	219767
2006	10779731	10429045	350686
2007	11185120	10628296	556824
2008	11606121	10901287	704835
2009	12017301	11203876	813425
2010	12501232	11605481	895751
2011	13008736	12022391	986345
2012	13549229	12462531	1086699
2013	14123084	12925353	1197731
Total	118277177	111327423	6949754