

Explanatory notes

- 1) The data for 2006, 2012-2015 is not available as explained in the PDD reason being that the PDD was developed in 2006 using the 2003-2005 baseline figures and LMCB does not have the market forecast yet for the production of cement from 2012-2014
- 2) The cells with the value 0 and #Div/0 are cells which does not have any relevance in the calculation due to no available data for 2006 and 2012-2015

Detailed Questionnaire EcoSecurities - Cement project (ACM0005)

Fill in one sheet for each type of cement produced in the plant

Please fill in the yellow boxes

For the estimation of the project data: fill in the last box "Future (project)" in column F (blue cells)

1. If unknown: write "unknown"
2. If expected to be the same as 2004 (or as the average 2002-3-4), write "same as 2004" (or "same as average")
3. If x % increase/decrease compared to the current situation (or compared to the previous year), write "x % decrease/increase compared to now (or yearly)"
4. If the estimations of one parameter are detailed for each future year of operation, please start a new line at the bottom of the page for each parameter
5. In any other case, please describe the relevant situation in column G

LMCB - Kanthan Works (KW)

Historical data (measured/calculated)

Project estimations

Data specific to each cement type

Amount of clinker used		
1,771,602	1,835,581	1,712,944
407,477	431,160	534,785
154,398	159,581	137,426
TOTAL	2,333,477	2,426,321
	2,385,155	

LMCB - Kanthan Works (KW)

GENERAL PURPOSE CEMENT PRODUCTION

		2003	2004	2005	2006	2007	2008	2009	2010	2011
OPC										
Quantity of OPC produced	tonnes/yr	1,888,816	1,945,405	1,845,196		1,738,281	704,644	727,084	491,857	466,527
% clinker per ton of OPC produced	ton clinker/ton cement	93.79%	94.35%	92.83%		95.00%	95.00%	95.00%	95.00%	95.00%
PPC										
Quantity of PPC produced	tonnes/yr	513,235	585,346	692,317		771,224	1,770,311	1,814,625	2,142,800	2,256,644
% clinker per ton of PPC produced	ton clinker/ton cement	79.39%	73.66%	77.25%		69.80%	73.73%	73.78%	74.80%	74.96%
Masonry										
Quantity of Masonary produced	tonnes/yr	245,509	245,509	197,884		205,789	211,963	218,322	224,872	231,618
% clinker per ton of Masonary produced	ton clinker/ton cement	62.89%	65.00%	69.45%		69.00%	69.00%	69.00%	69.00%	69.00%
Quantity of raw material used for clinker production	tonnes/yr	4,334,490	4,620,712	4,408,465		3,743,344	3,405,141	3,500,141	3,572,628	3,683,736
CaO content of raw material	%	0.00%	0.00%	0.00%		0.00%	0.00%	0.00%	0.00%	0.00%
MgO content of raw material	%	0.00%	0.00%	0.00%		0.00%	0.00%	0.00%	0.00%	0.00%
Output										
Quantity of clinker produced	tonnes/yr	2,691,415	2,868,178	2,764,189	0	2,331,641	2,120,982	2,180,156	2,225,306	2,294,513
CaO content of clinker	%	65.69%	65.75%	65.15%		64-66%	64-66%	64-66%	64-66%	64-66%
MgO content of clinker	%	2.22%	2.25%	2.97%		2-3%	2-3%	2-3%	2-3%	2-3%

	2003	2004	2005
Masc	225400	392581	208358
Slagcrete	0	11724	2114
Walcrete	3267	245509	198245
PFA Addn	19%	19%	23%
L/stone Addn	32%		
PBFS			

Raw material to clinker ratio

	2003	2004	2005	Average
	1.6104874	1.61102693	1.59484934	1.60545456

1.61102693
1.59484934**FOSSIL FUEL USE FOR CLINKER PRODUCTION (KILN)**

Petrol coke	tons/yr	35,022	47,243	83,970	
Heavy oil	tons/yr	0	0	0	
Solvents	tons/yr	0	0	0	
Diesoline	tons/yr	4,314	3,477	4,081	
Coal	tons/yr	322,420	366,357	312,585	
Palm Kernel Shell	tons/yr	44,618	7,773	7,454	

ELECTRICITY USE

Grid electricity for clinker production	MWh/year	214,271	210,426	224,736	
Self generated electricity for clinker production	MWh/year	0	0	0	
Grid electricity for grinding for OPC	MWh/year	86,577	93,748	87,932	
Self-generated electricity for grinding for OPC	MWh/year	0	0	0	
Grid electricity for grinding for PPC	MWh/year	23,486	28,043	32,217	
Self-generated electricity for grinding for PPC	MWh/year	0	0	0	
Grid electricity for grinding for Masonary	MWh/year	15,756	20,672	18,765	
Self-generated electricity for grinding for Masonary	MWh/year	0	0	0	
Grid electricity for preparing additives for Slagcrete	MWh/year	1,846	574	106	
Self generated electricity for grinding additives for Slagcrete	MWh/year	0	0	0	

92.2	86.65	94.66
46.1	46.1	46.1
46.61	46.61	46.61
46.61	46.61	46.61

TRANSPORT OF ADDITIVES (if all additives are on-site: leave blank)

Fuel consumption for the vehicle	kg fuel/km	0.213			
Distance between the source of additives and the plant	km/vehicle trip	600	These 4 parameters are constant over the years		
Emission factor of the vehicle fuel	kg CO2/kg fuel				
Amount of additives carried per trip	ton/vehicle trip	25			
Electricity consumption of the conveyor system for additives	MWh/yr	0			

0.32

PROJECT ESTIMATION FOR EACH FUTURE YEAR OF OPERATION (IF ANY SUCH DETAILED PROJECTION IS AVAILABLE)

Parameter	Unit	2006	2007	2008	2009	2010	2011
Clinker Production	Tons/ yr	2,331,641	2,120,982	2,180,156	2,225,306	2,294,513	
General Purpose Cement Produced							
OPC Production	Tons/ yr	1,738,281	704,644	727,084	491,857	466,527	
PPC Production	Tons/ yr	771,224	1,770,311	1,814,625	2,142,800	2,256,644	
Masonary Cement Production	Tons/ yr	205,789	211,963	218,322	224,872	231,618	
Total General Purpose Cement Produced	Tons/ yr	2,715,295	2,686,918	2,760,031	2,859,529	2,954,789	

COLOR CODE
measured
3y average
calculated
cement type specific
default
general project specific data

Electricity consumption factor (MWh/t BC)	Av 3yrs	2003	2004	2005
Clinker (MWh/tClinker)	78.09	79.61	73.37	81.30
OPC	50.19	48.22	51.52	50.82
PPC	50.19	48.22	51.52	50.82
Masonry	50.19	48.22	51.52	50.82

[illegible]

Parameter	Unit	Average	2003	2004	2005	1 2006	2 2007	3 2008	4 2009	5 2010	6 2011	7 2012	8 2013	9 2014
Baseline CO2 emissions from calcination process - Summary														
BE - calcin	tCO2/tonne clinker p	0.5414921	0.5399089	0.5407075	0.5438599	#DIV/0!	0.5414921	0.5414921	0.5414921	0.5414921	0.5414921	#DIV/0!	#DIV/0!	#DIV/0!
Main assumptions and input														
Stoichiometric EF CaO	tCO2/tCaO	0.785												
Stoichiometric EF MgO	tCO2/tCaO	1.092												
Details of calculations:														
Input of raw materials														
Quantity of raw material used for clinker production	tonnes/yr	4,454,556	4,334,490	4,620,712	4,408,465	0	3,743,344	3,405,141	3,500,141	3,572,628	3,683,736	0	0	0
CaO content of raw material	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MgO content of raw material	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
InCaO	tonnes CaO	0	0	0	0	0	0	0	0	0	0	0	0	0
InMgO	tonnes MgO	0	0	0	0	0	0	0	0	0	0	0	0	0
Output of clinker														
Quantity of clinker produced	tonnes/yr	2,774,594	2,691,415	2,868,178	2,764,189	0	2,331,641	2,120,982	2,180,156	2,225,306	2,294,513	0	0	0
CaO content of clinker	%	65.53%	65.69%	65.75%	65.15%	65.53%	65.53%	65.53%	65.53%	65.53%	65.53%	65.53%	65.53%	65.53%
MgO content of clinker	%	2.48%	2.22%	2.25%	2.97%	2.48%	2.48%	2.48%	2.48%	2.48%	2.48%	2.48%	2.48%	2.48%
OutCaO	tonnes CaO	1,818,229	1,767,991	1,885,827	1,800,869	0	1,527,925	1,389,880	1,428,656	1,458,243	1,503,594	0	0	0
OutMgO	tonnes MgO	68,793	59,749	64,534	82,096	0	57,825	52,600	54,068	55,188	56,904	0	0	0
Baseline CO2 emissions from calcination process														
BE - calcin	tCO2/tonne clinker p	0.5414921	0.5399089	0.5407075	0.5438599	#DIV/0!	0.5414921	0.5414921	0.5414921	0.5414921	0.5414921	#DIV/0!	#DIV/0!	#DIV/0!

Parameter	Unit	Average	2003	2004	2005	1 2006	2 2007	3 2008	4 2009	5 2010	6 2011	7 2012	8 2013	9 2014
CO2 emissions due to fossil fuel use (total per tonne of clinker) - Summary														
BE - fossil_fuel	tCO2/tonne clinker	0.389	0.366	0.397	0.403	0.389	0.389	0.389	0.389	0.389	0.389	#DIV/0!	#DIV/0!	#DIV/0!
Main assumptions and input														
CLNK - BSL production of t tons/yr		2,774,594	2,691,415	2,868,178	2,764,189	2,774,594	2,774,594	2,774,594	2,774,594	2,774,594	2,774,594	0	0	0
Emission factors of:														
Petrol coke	tCO2/t fuel	3.17												
Heavy oil	tCO2/t fuel	3.126												
Solvents	tCO2/t fuel	0												
Diesoline	tCO2/t fuel	3.185												
Coal	tCO2/t fuel	2.668												
Palm Kernel Shell	tCO2/t fuel	0												
Details of caculations:														
Type/quantity of fuel used in kiln (per year)														
Petrol coke	tons/yr	55,412	35,022	47,243	83,970	55,412	55,412	55,412	55,412	55,412	55,412			
Heavy oil	tons/yr	0	0	0	0	0	0	0	0	0	0			
Solvents	tons/yr	0	0	0	0	0	0	0	0	0	0			
Diesoline	tons/yr	3,957	4,314	3,477	4,081	3,957	3,957	3,957	3,957	3,957	3,957			
Coal	tons/yr	333,787	322,420	366,357	312,585	333,787	333,787	333,787	333,787	333,787	333,787			
Palm Kernel Shell	tons/yr	19,948	44,618	7,773	7,454	19,948	19,948	19,948	19,948	19,948	19,948			
CO2 emissions due to fossil fuel use (total per year for each fuel)														
Petrol coke	tCO2/yr	175,655	111,020	149,760	266,185	175,655	175,655	175,655	175,655	175,655	175,655			
Heavy oil	tCO2/yr	0	0	0	0	0	0	0	0	0	0			
Solvents	tCO2/yr	0	0	0	0	0	0	0	0	0	0			
Diesoline	tCO2/yr	12,604	13,740	11,074	12,998	12,604	12,604	12,604	12,604	12,604	12,604			
Coal	tCO2/yr	890,545	860,217	977,440	833,977	890,545	890,545	890,545	890,545	890,545	890,545			
Palm Kernel Shell	tCO2/yr	0	0	0	0	0	0	0	0	0	0			
CO2 emissions due to fossil fuel use (total per tonne of clinker)														
BE - fossil_fuel	tCO2/tonne clinker	0.389	0.366	0.397	0.403	0.389	0.389	0.389	0.389	0.389	0.389	#DIV/0!	#DIV/0!	#DIV/0!

Parameter	Unit	Average	2003	2004	2005	1 2006	2 2007	3 2008	4 2009	5 2010	6 2011	7 2012	8 2013	9 2014
CO2 emissions from electricity use - Summary														
BE/PE - ele_grid_CLNK	tCO2/tonne clinker	0.049	0.050	0.046	0.051	#DIV/0!	0.049	0.049	0.049	0.049	0.049	#DIV/0!	#DIV/0!	#DIV/0!
BE/PE - ele_sg_CLNK	tCO2/tonne clinker	0.000	0.000	0.000	0.000	#DIV/0!	0.000	0.000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!
Baseline/project emissions due to elec for clinker	tCO2/tonne clinker	0.049	0.050	0.046	0.051	#DIV/0!	0.049	0.049	0.049	0.049	0.049	#DIV/0!	#DIV/0!	#DIV/0!
BE/PE - ele_grid_BC [general purpose cement]	tCO2/tonne BC	0.031	0.030	0.032	0.032	#DIV/0!	0.031	0.031	0.031	0.031	0.031	#DIV/0!	#DIV/0!	#DIV/0!
BE/PE - ele_sg_BC [general purpose cement]	tCO2/tonne BC	0.000	0.000	0.000	0.000	#DIV/0!	0.000	0.000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!
Baseline/project emissions due to elec for grinding [general purpose cement]	tCO2/tonne BC	0.031	0.030	0.032	0.032	#DIV/0!	0.031	0.031	0.031	0.031	0.031	#DIV/0!	#DIV/0!	#DIV/0!
BE/PE - ele_grid_ADD [general purpose cement]	tCO2/tonne BC	0.000	0.000	0.000	0.000	#DIV/0!	0.000	0.000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!
BE/PE - ele_sg_ADD [general purpose cement]	tCO2/tonne BC	0.000	0.000	0.000	0.000	#DIV/0!	0.000	0.000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!
Baseline/project emissions due to elec for additives [general purpose cement]	tCO2/tonne BC	0.000	0.000	0.000	0.000	#DIV/0!	0.000	0.000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!
Main assumptions and input														
CLNK - BSL / CLNK - y	tonne clinker/yr	2,774,594	2,691,415	2,868,178	2,764,189	0	2,331,641	2,120,982	2,180,156	2,225,306	2,294,513	0	0	0
BC - BSL / BCy for general purpose cement	tonne BC/yr	2,719,739	2,647,560	2,776,260	2,735,398	0	2,715,295	2,686,918	2,760,031	2,859,529	2,954,789	0	0	0
Grid electricity EF	tCO2/MWh	0.622												
Self generated electricity EF	tCO2/MWh	0												
Details of calculations:														
Grid electricity for clinker production														
BE/PELE - grid_CLNK	MWh/year	216,478	214,271	210,426	224,736	0	182,087	165,635	170,256	173,782	179,187	0	0	0
BE/PE - ele_grid_CLNK	tCO2/tonne clinker	0.049	0.050	0.046	0.051	#DIV/0!	0.049	0.049	0.049	0.049	0.049	#DIV/0!	#DIV/0!	#DIV/0!
Self generated electricity for clinker production														
BE/PELE - sg_CLNK	MWh/year	0	0	0	0	0	0	0	0	0	0	0	0	0
BE/PE - ele_sg_CLNK	tCO2/tonne clinker	0.000	0.000	0.000	0.000	#DIV/0!	0.000	0.000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!
Grid electricity for BC grinding														
BE/PELE - grid_BC for general purpose cement	MWh/year	136,574	127,665	143,037	139,019	0	136,350	134,926	138,597	143,593	148,377	0	0	0
BE/PE - ele_grid_BC for general purpose cement	tCO2/tonne BC	0.031	0.030	0.032	0.032	#DIV/0!	0.031	0.031	0.031	0.031	0.031	#DIV/0!	#DIV/0!	#DIV/0!
Self generated electricity for BC grinding														
BE/PELE - sg_BC for general purpose cement	MWh/year	0	0	0	0	0	0	0	0	0	0	0	0	0
BE/PE - ele_sg_BC for general purpose cement	tCO2/tonne BC	0.000	0.000	0.000	0.000	#DIV/0!	0.000	0.000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!
Grid electricity for preparing additives														
BE/PELE - grid_ADD for general purpose cement	MWh/year	0	0	0	0	0	0	0	0	0	0	0	0	0
BE/PE - ele_grid_ADD for general purpose cement	tCO2/tonne BC	0.000	0.000	0.000	0.000	#DIV/0!	0.000	0.000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!
Self generated electricity for preparing additives														
BE/PELE - sg_ADD for general purpose cement	MWh/year	0	0	0	0	0	0	0	0	0	0	0	0	0
BE/PE - ele_sg_ADD for general purpose cement	tCO2/tonne BC	0.000	0.000	0.000	0.000	#DIV/0!	0.000	0.000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!

Parameter	Unit	Average	2003	2004	2005	1 2006	2 2007	3 2008	4 2009	5 2010	6 2011	7 2012	8 2013	9 2014
Leakage factor - summary (for yearly leakage: see Emission Reductions)														
L - add_trans	tCO2/tonne additive		0.028	0.025	0.026	#DIV/0!	0.023	0.021	0.021	0.021	0.020	#DIV/0!	#DIV/0!	#DIV/0!
Main assumptions and input														
TF - cons	kg fuel/km	0.213												
D - add_source	km/vehicle trip	600												
Fuel used	type of fuel	Diesel												
EF - gasoline	tCO2/t fuel	3.074												
EF - diesel	tCO2/t fuel	3.185												
Q - add	tonne additive/vehicle trip	25												
ELE - conveyor_ADD	MWh/yr	4,412												
ADD - y [general purpose cement]	tonne additive/year	283,802	228,801	326,912	295,694	#DIV/0!	383,654	565,936	579,875	634,222	660,276	0	0	0
EF - grid	tCO2/MWh	0.622												
Details of calculations:														
Vehicle emissions														
TEF	kg CO2/kg fuel	3.185												
TF - cons * D - add_source * TEF / Q - tCO2 / tonne additive		0.016												
Conveyor emissions														
ELE - conveyor_ADD * EF - grid / ADDtCO2 / tonne additive			0.012	0.008	0.009	#DIV/0!	0.007	0.005	0.005	0.004	0.004	#DIV/0!	#DIV/0!	#DIV/0!

Parameter	Symbol	Unit	Average	1 2006	2 2007	3 2008	4 2009	5 2010	6 2011	7 2012	8 2013	9 2014	9 2015
Emission reductions - summary													
Annual emission reductions [general purpose cement]	ER - y	CER/yr		#DIV/0!	4,602	175,972	172,168	203,020	206,813	198,919	191,026	183,132	175,238
Annual emission reductions [Total]	ER - y	CER/yr	#DIV/0!	#DIV/0!	4,602	175,972	172,168	203,020	206,813	198,919	191,026	183,132	175,238
Main assumptions and input													
Annual Increase in baseline blend		%	2.0%										
Baseline benchmark share of clinker [general purpose cement]	B - Blend	tonne clinker/tonne BC	86.35%										
Annual production of blended cement [general purpose cement]	BC - y	tonne BC/yr		0	2,715,295	2,686,918	2,760,031	2,859,529	2,954,789	2,954,789	2,954,789	2,954,789	2,954,789
Results common to both cement types													
BSL benchmark emissions due to clinker production		tCO2/tonne clinker	0.979										
Project emissions due to clinker production per tonne clinker	PE - clinker,y	tCO2/tonne clinker		#DIV/0!	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979
Adjusted BSL emissions due to clinker production per tonne clinker	BE - clinker	tCO2/tonne clinker		#DIV/0!	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979
Results for general purpose cement													
Blends (baseline and project)													
Project share of additives	1 - P - Blend,y	tonne additives/tonne BC		#DIV/0!	14.13%	21.06%	21.01%	22.18%	22.35%	22.35%	22.35%	22.35%	22.35%
Baseline updated share of additives	A - Blend	tonne additive/tonne BC		13.65%	13.92%	14.20%	14.47%	14.74%	15.02%	15.29%	15.56%	15.83%	16.11%
Additional share of additives in project	P - Blend,y - A - Blend	tonne additive/tonne BC		#DIV/0!	0.21%	6.87%	6.54%	7.44%	7.33%	7.06%	6.78%	6.51%	6.24%
Project share of clinker	P - Blend,y	tonne clinker/tonne BC		#DIV/0!	85.87%	78.94%	78.99%	77.82%	77.65%	77.65%	77.65%	77.65%	77.65%
Baseline updated share of clinker	B - Blend,y	tonne clinker/tonne BC		86.35%	86.08%	85.80%	85.53%	85.26%	84.99%	84.71%	84.44%	84.17%	83.89%
Baseline CO2 emissions per tonne of blended cement BC													
Total BSL emissions due to clinker production per tonne BC	(BE - clinker)*(B - Blend)	tCO2/tonne BC		#DIV/0!	0.842	0.840	0.837	0.834	0.832	0.829	0.826	0.824	0.821
BSL emissions due to elec for grinding		tCO2/tonne BC	0.031										
BSL emissions due to elec for additives		tCO2/tonne BC	0.000										
Total BSL emissions due to grinding and additives	BE - ele_ADD_BC	tCO2/tonne BC	0.031										
Total BSL CO2 emissions per tonne BC	BE - BC,y	tCO2/tonne BC		#DIV/0!	0.874	0.871	0.868	0.866	0.863	0.860	0.858	0.855	0.852
			17231951.38		2371943.46	2339976.98	2396275.58	2475020.82	2549578.18	2541684.39	2533790.6	2525896.82	2518003.03
Project CO2 emissions per tonne of blended cement BC													
Total Project emissions due to clinker production per tonne BC	(PE - clinker)*(1 - P)	tCO2/tonne BC		#DIV/0!	0.841	0.773	0.773	0.762	0.760	0.760	0.760	0.760	0.760
Project emissions due to elec for grinding		tCO2/tonne BC		#DIV/0!	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031
Project emissions due to elec for additives		tCO2/tonne BC		#DIV/0!	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Project emissions due to grinding and additives	PE - ele_ADD_BC,y	tCO2/tonne BC		#DIV/0!	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031
Total Project CO2 emissions per tonne BC	PE - BC,y	tCO2/tonne BC		#DIV/0!	0.872	0.804	0.804	0.793	0.791	0.791	0.791	0.791	0.791
			16030308.93		2367210.22	2160113.63	2220320.99	2267625.99	2338346.03	2338346.03	2338346.03	2338346.03	2338346.03
Emission reductions													
Emission reductions from change in blend		tCO2/yr		#DIV/0!	4,780	179,910	176,002	207,444	211,283	203,390	195,496	187,602	179,708
Emission reductions from change in elec use for grinding		tCO2/yr		#DIV/0!	1	1	1	1	1	1	1	1	1
Emission reductions from change in elec use for additives		tCO2/yr		#DIV/0!	0	0	0	0	0	0	0	0	0
Total emission reductions before leakage and α adjustment	[(BE - BC,y)-(PE - BC,y)]	tCO2/yr		#DIV/0!	4,733	179,863	175,955	207,395	211,232	203,338	195,445	187,551	179,657
Leakage	L - y	tCO2/yr		#DIV/0!	-131	-3,892	-3,787	-4,375	-4,419	-4,419	-4,419	-4,419	-4,419
Proportion of additional additives that are not in surplus	α - y	%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Net emission reductions (after leakage and α adjustment)	ER - y	CER/yr		#DIV/0!	4,602	175,972	172,168	203,020	206,813	198,919	191,026	183,132	175,238