Cement Production

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Climate Mitigation Services
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Holcim (also see LafargeHolcim)

www.holcim.com Zurich

yellow column indicates original reported units

Founded in 1912

Cement production & emissions data

Year	Cement Prod		Energy Use		CO2 emissions	
	Clinker ratio	Annual production	Gross consumption	Gross consumption	Emissions rate	Net emissions
	Million tons/yr	Million tonnes/yr	Billion Btu	Terajoules	kg CO2/tonne CO2	Million tonnes/yr CO2
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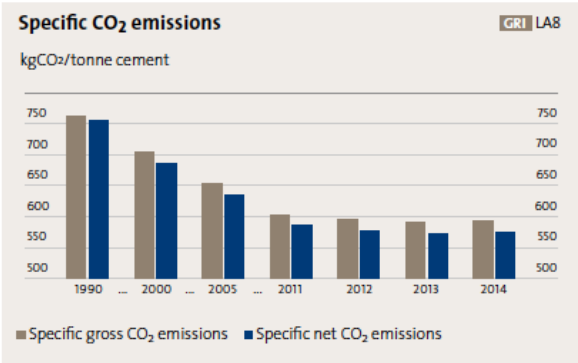
2014						
2015						
2016						
2017						
2018						
Total		2,476				2,036

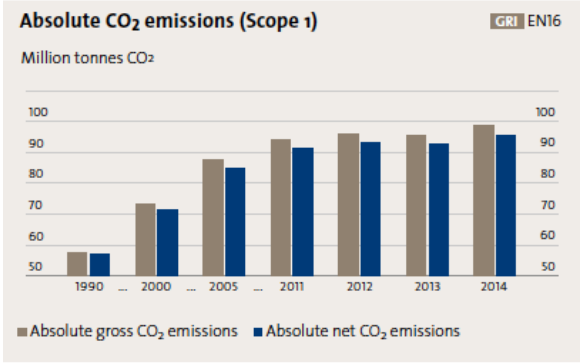
	2007 fuel mix
coal	52%
petroleum coke	20%
heavy oil	2%
natural gas	12%
shale & lignite	2%
alt fossil fuels	10%
alt biomass	2%

EN3, EN10, EN11, EN13, EN28	2005	2006 Cement	2007
Number of sites	127	150	148
Energy and CO_2			
Fuel consumption* (specific) MJ/t	3,176	3,057	3,039
Total MGJ/a	443	452	474
Power consumption* (specific) kWh/t	105	105	105
Total million kWh/a	14,600	15,500	16,250
Indirect CO_2 from purchased power (million tonnes)	5.7	6.1	6.6

Holcim CSR 2007, page 31.



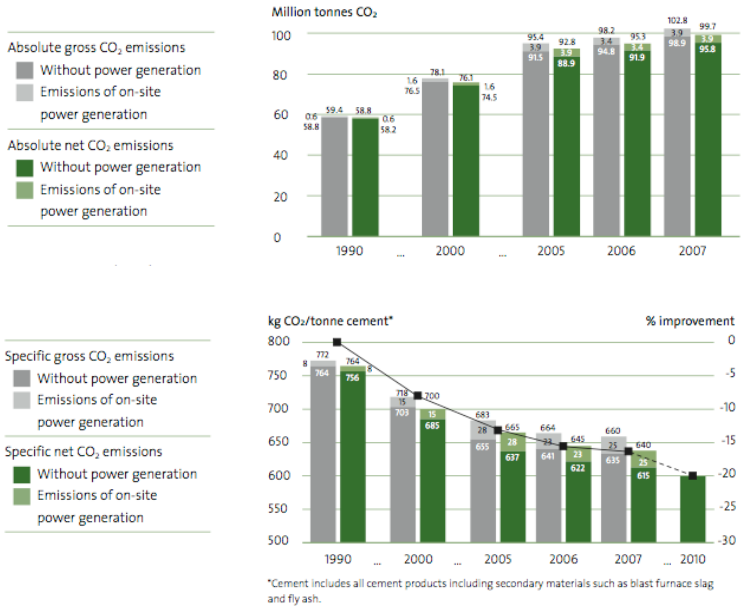
Holcim Sustainability Report 2014, page 23.



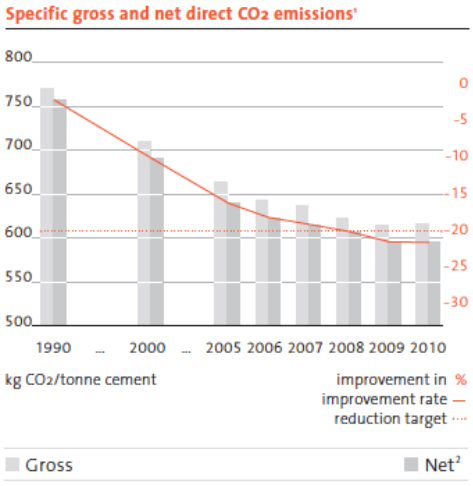
Holcim Sustainability Report 2014, page 23.

Year	Clinker factor percent clinker in ceme	Sales of cement million tonnes		Thermal mix percent alt fuels	Thermal efficiency MJ/tonne clinker	Net emissions rate kg CO2/t cementitiou	Net emissions million tonnes CO2		Process emissions Mt CO2 0.5 tCO2 per tonne	Process emissions Mt CO2 result from "Process Emissions" worksheet
1990	82.1%	55.2	inte	3.6%	4,566	756	58.5	Holcim data	27.6	32
1991		56.4	interpolated			765	60.4	interpolated	28.2	34
1992		59.3	interpolated			750	62.4	interpolated	29.7	35
1993		60.8	interpolated			755	64.3	interpolated	30.4	36
1994		64.8	interpolated			730	66.2	interpolated	32.4	38
1995		66.2	interpolated			735	68.2	interpolated	33.1	39
1996		69.0	interpolated			725	70.1	interpolated	34.5	40
1997		71.4	interpolated			720	72.0	interpolated	35.7	42
1998		68.4	excludes ready-mix			715	73.9	interpolated	34.2	43
1999		74.6	excludes ready-mix			710	75.9	interpolated	37.3	44
2000	79.9%	80.6	exc	9.0%	3,821	689	77.8	Holcim data	40.3	46
2001		84.3	excludes ready-mix			690	81.1	interpolated	42.2	48
2002		90.5	excludes ready-mix			675	84.3	interpolated	45.3	51
2003		94.3	excludes ready-mix			670	87.6	interpolated	47.2	53
2004		102.1	excludes ready-mix			670	90.8	interpolated	51.1	56
2005	75.2%	110.6	exc	10.8%	3,710	642	94.1	Holcim data	55.3	59
2006	73.6%	140.7	exc	11.0%	3,704	645	95.3	Holcim data	70.4	60
2007	72.6%	149.6	exc	11.1%	3,703	640	99.7	Holcim data	74.8	64
2008		143.3	exc	11.7%	3,661	608	97.7	Holcim data	71.7	64
2009		131.9	exc	12.1%	3,605	597	89.3	Holcim data	66.0	59
2010		136.7	exc	12.1%	3,555	599	94.0	Holcim data	68.4	63
2011		144.3			3,541	585	91.5	Holcim SustRpt 2013	72.2	
2012		142.3			3,499	578	93.2	Holcim SustRpt 2013	71.2	
2013		138.9			3,466	572	92.6	Holcim SustRpt 2013	69.5	
2014		140.3			3,469	575	95.6	Holcim SustRpt 2014		

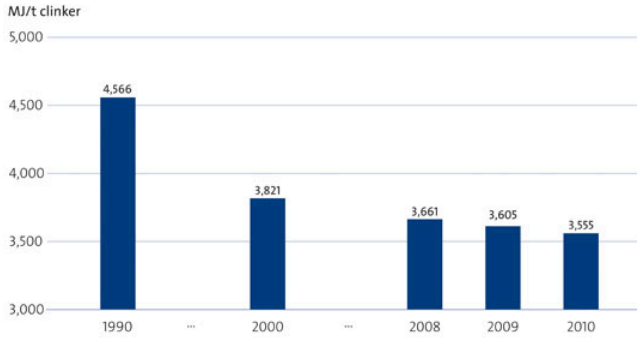
Merger of Lafarge and Holcim announced April 2014, completed in July

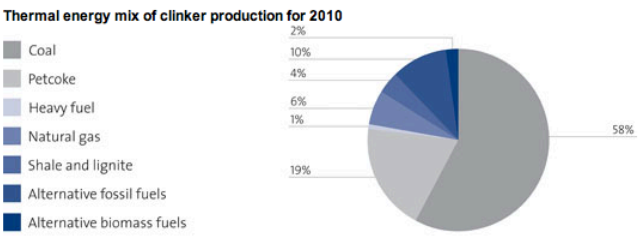


Holcim CSR 2007, page 28.

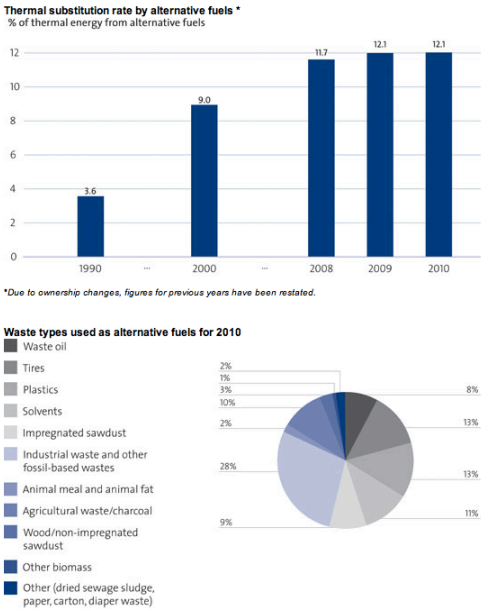


Holcim AnnRpt 2010, page 42.





Holcim webpage "Thermal energy efficiency."



Holcim webpage "Thermal substitution rate by alternative fuels."

Environmental performance

	CSI	GRI	2012	2013	2014
Reducing CO_2 emissions					
Cement					
Absolute gross CO_2 emissions (million tonnes) *Note 7*	✓	G4-EN15	95.9	95.4	98.7
Absolute net CO_2 emissions (million tonnes)	✓		93.2	92.6	95.6
Specific gross CO_2 emissions (kg CO_2/t cementitious materials) *Note 7*	✓	G4-EN18	595	590	594
Specific net CO_2 emissions (kg CO_2/t cementitious materials)	✓		578	572	575
Aggregates					
Absolute gross CO_2 emissions (million tonnes)		G4-EN15	0.3	0.2	0.2
Specific gross CO_2 emissions (kg CO_2/tonne of product)		G4-EN18	2.0	1.8	1.8
Ready-mix concrete					
Absolute gross CO_2 emissions (million tonnes)		G4-EN15	0.1	0.1	0.1
Specific gross CO_2 emissions (kg CO_2/m³)		G4-EN18	1.9	2.2	1.7
Total Scope 1 emissions (cement, aggregates, ready-mix and own power generation) (million tonnes) *Note 8*		G4-EN15	100.8	100.0	103.2
Total Scope 2 emissions (cement, aggregates and ready-mix) (million tonnes) *Note 8*		G4-EN16	6.8	6.4	6.9
Total Scope 3 emissions (cement, aggregates and ready-mix)(million tonnes) *Note 8*		G4-EN17	N/A	21.9	21.7

2015.

Holcim SustRpt 2014, page 33.

Cell: I9
Comment: Rick Heede:
"Holcim is a worldwide leading producer of cement and aggregates. Further activities include the provision of ready-mix concrete and asphalt as well as other services. The Group works in more than 70 countries and employs almost 90,000 people."
Holcim CSR 2007, back cover.

Cell: K11
Comment: Rick Heede:
Emissions from cement fabrication are of two main types: Calcining process of calcium carbonate into clinker liberates carbon dioxide, and emissions from the energy used in the manufacturing process. Typically not included in the emissions estimates are transportation energy, the burning of wastes, or plant construction.

Cell: E12
Comment: Rick Heede:
The industry calcination factor ranges from 525 to 900 kg CO2 per tonne of clinker (net), but of course varies from company to company, and will tend to decrease over time as process efficiencies improve.
WBCSD (2002) "Toward a Sustainable Cement Industry: Key Performance Indicators," by Joseph Fiksel, Battelle, for WBCSD. "Each tonne of Ordinary Portland Cement generates ~900 kg of net CO2 emissions ... and consumes roughly 3,000 MJ of total electrical and thermal energy," p. 8.

Cell: H12
Comment: Rick Heede:
Most cement companies will aggregate emissions from energy use with emissions from cement fabrication. This column is provided for companies that provide both data.

Cell: K12
Comment: Rick Heede:
Average CO2 emissions intensity have declined 16.5 percent from 1990 to 2009 -- from 758 net kg CO2 per tonne of cementitious product in 1990 to 633 kg CO2/t in 2009, according to WBCSD data.** This project estimates process emissions from calcining limestone and thus excludes emissions from fuel and electricity inputs inputs to cement manufacturing. The emission rates and net total company emissions both include process and energy-related emission; a subsequent worksheet (SumCement.xls) estimates process emions of CO2.
** World Business Council for Sustainable Development Cement Sustainability Initiative (2009) Cement Industry Energy and CO2 Performance: 'Getting the Numbers Right', wbcsdcement.org, 44 pp. See GNR Indicator 326, reproduced at the "Cement industry data" worksheet in this portfolio.

Cell: K17
Comment: Rick Heede:
Holcim CSR 2007, page 29.

Cell: E57
Comment: Rick Heede:
We do not have Holcim data on cement sales prior to 1998, and we interpolate production from published information of Holcim's net CO2 emissions from cement manufacture for 1990 and 2000, along with Holcim's net emissions rate in kg CO2 per tonne of cementitious production.
Note: CMS does not use cement production to estimate process emissions of CO2 from the calcination of limestone -- though this would be preferred -- for the simple reason that most companies do not report sales; more often production capacity is reported, or the cement production data is incomplete. Instead we use the net emissions from cement production, since large producers are also participants in the WBCSD Sustainable Cement Initiative and as such do report net emissions and net emissions rate for 1990 and 2000 and later years.

Cell: J57
Comment: Rick Heede:
www.holcim.com
Interpreted from a bar chart found at, Sustainable Development, CO2 Emissions Performance.

Cell: K57
Comment: Rick Heede:
www.holcim.com Holcim webpage on CO2 performance: "Absolute emissions" shows 1990, 2000, 2005, and 2008-2010 gross and net CO2 emissions. CMS interpolates between 1990 and 2000, and 2000 and 2005.

Cell: E65
Comment: Rick Heede:
Holcim AnnRpt 1999, page 3. Excludes sales of ready-mix (21.8 million m^3 in 1999, and 20.8 million m^3).

Cell: E67
Comment: Rick Heede:
www.holcim.com; interpreted from a chart found at Investor Relations, Key Indicators

Cell: D72
Comment: Rick Heede:
Hoclim CSR 2007, page 30, for 1990, 2000, 2005-2007. "In 2007, we consumed 194.4 million tonnes of natural raw materials (2006: 184.9) and 26.9 million tonnes of alternative raw materials (2006: 24.5) to produce 155.9 million tonnes of cement (2006: 147.8)."

Cell: G72
Comment: Rick Heede:
Hoclim CSR 2007, page 29, for 1990, 2000, 2005-2007.

Cell: E75
Comment: Rick Heede (Mar10):
Holcim 2009 operating results worksheet reports "Sales of cement": 143.4 million tonnes in 2008 (131.9 Mt in 2009). This does not equal clinker production, but will suffice until better data is available.

Cell: G75
Comment: Rick Heede:
Holcim CSR rpt 2007, Performance Summary, "Absolute net CO2 emission, in million tonnes" 2005-2007.

Cell: K75
Comment: Rick Heede:
Holcim website, "CO2 performance," shows Absolute emissions, gross and net (CMS lists net emissions). Chart reproduced on this page.

Cell: E76
Comment: Rick Heede:
Hoclim AnnRpt 2010 pg 6, sales of cement. Excludes sales of ready-mix concrete: 45.9 million m^3 in 2010, and 41.8 million m^3 in 2009.

Cell: K78
Comment: Rick Heede:
CSR 2010 online http://www.holcim.com/fileadmin/templates/CORP/doc/SD/Performance_data_2011.pdf

Cell: E79

Comment: Rick Heede:
Holcim Sustainability Report 2014, page 32. Sales of cement (Mt), 2012-2014 (140.3 Mt).

Cell: K81
Comment: Rick Heede:
Holcim Sustainability Report 2014, page 33. Net emissions 95.6 Mt, gross emissions 98.7 Mt.