Summary of gross emissions from identified cement production

dataset marker

Richard Heede
Climate Mitigation Services

21-May-12

Cement	Notes	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943
		1920s			1930s													
Cemex																		
China, PRC (cement prod'n, not gross CO2)			0.1	0.2	0.2	0.2	0.2	0.3	0.2	0.4	1.0	1.0	0.0	0.5	0.7	1.2	1.6	1.5
HeidelbergCement																		
Holcim																		
Italcementi																		
Lafarge																		
Taiheiyo																		
Emissions from identified cement prod'n (MtCO2/yr)																		
Carbon in identified cement prod'n (MtC/yr)																		
CDIAC cement emissions (Million tonnes of CO2/yr)			37	37	37	29	26	26	29	33	40	40	44	48	40	44	40	37
			1928: first year CDIAC cement data															
CDIAC cement emissions (Million tonnes of carbon/yr)			10	10	10	8	7	7	8	9	11	11	12	13	11	12	11	10
Percent of total CDIAC cement emissions identified																		

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	1940s						1950s										1960s							
	1944	**1945**	**1946**	**1947**	**1948**	**1949**	**1950**	**1951**	**1952**	**1953**	**1954**	**1955**	**1956**	**1957**	**1958**	**1959**	**1960**	**1961**	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**
	1.2	0.0	0.2	0.4	0.2	0.4	0.8	1	3	4	5	4	6	7	9	12	13	8	8	10	10	11	11	8
	26	26	37	44	51	59	66	73	81	88	99	110	117	125	132	147	158	165	180	187	209	216	231	238
	7	7	10	12	14	16	18	20	22	24	27	30	32	34	36	40	43	45	49	51	57	59	63	65

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	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS
								1970s					1980s										1990s			
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
																							42	42	42	42
	9	10	10	23	23	25	25	30	49	55	65	74	80	84	94	108	121	142	161	179	209	206	209	252	307	367
																							55	54	52	51
																							59	60	62	64
																							37	37	36	36
																							73	74	74	75
								17	18	21	23	24	23	22	21	21	20	18	17	18	18	19	21	21	22	22
								47	**67**	**76**	**88**	**98**	**102**	**106**	**115**	**128**	**141**	**160**	**178**	**197**	**227**	**225**	**496**	**539**	**597**	**657**
								13	18	21	24	27	28	29	31	35	38	44	49	54	62	61	135	147	163	179
	256	271	286	308	326	348	352	348	377	396	425	436	440	443	443	458	469	480	502	524	557	571	575	590	612	645
	70	74	78	84	89	95	96	95	103	108	116	119	120	121	121	125	128	131	137	143	152	156	157	161	167	176
								13.5%	17.8%	19.3%	20.7%	22.4%	23.2%	23.9%	25.9%	28.0%	30.0%	33.4%	35.5%	37.6%	40.8%	39.4%	86.3%	91.4%	97.5%	101.9%

Summary of gross emissions from identified cement production

Coefficient: 0.8660 tonnes CO2 per tonne cement (WBCSD average, 2006)

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	1990s						2000s													
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		Sum to 2010 Million tonnes CO2	Gross Cement emissions
Cemex	41	41	41	41	41	40	40	40	40	45	50	50	53	54	48	40	41	y	914	Cemex
China, PRC (cement prod'n, not gross CO2)	420	475	490	510	535	571	595	659	723	860	967	1,066	1,233	1,358	1,385	1,611	1,780	y	18,301	China, PRC (cement prod'n, not gross CO2)
HeidelbergCement	50	48	47	46	45	43	42	40	37	40	43	42	45	53	53	45	47	y	977	HeidelbergCement
Holcim	66	68	70	72	74	76	78	81	84	88	91	94	95	100	98	89	94	y	1,664	Holcim
Italcementi	36	35	35	35	34	34	33	33	33	33	35	40	45	45	43	36	37	y	768	Italcementi
Lafarge	76	76	77	78	78	79	80	80	81	80	84	87	92	96	104	92	92	y	1,728	Lafarge
Taiheiyo	23	23	24	22	20	18	18	18	18	17	16	17	17	16	15	14	15	y	694	Taiheiyo
Emissions from identified cement prod'n (MtCO2/yr)	711	767	784	803	826	862	886	951	1,016	1,162	1,286	1,396	1,581	1,722	1,745	1,927	2,105		20,744	Emissions from identified cement prod'n (MtCO2/yr)
Carbon in identified cement prod'n (MtC/yr)	194	209	214	219	225	235	242	260	277	317	351	381	431	470	476	526	575		5,661	Carbon in identified cement prod'n (MtC/yr)
CDIAC cement emissions (Million tonnes of CO2/yr)	681	722	744	766	766	795	828	868	923	1,011	1,092	1,172	1,301	1,399	1,414	1,508	1,637		29,366	CDIAC cement emissions (Million tonnes of CO2/yr)
CDIAC cement emissions (Million tonnes of carbon/yr)	186	197	203	209	209	217	226	237	252	276	298	320	355	382	386	412	447		8,016	CDIAC cement emissions (Million tonnes of carbon/yr)
Percent of total CDIAC cement emissions identified	104.4%	106.3%	105.4%	104.9%	107.9%	108.4%	107.0%	109.5%	110.0%	114.9%	117.8%	119.1%	121.5%	123.0%	123.4%				70.6%	Percent of total CDIAC cement emissions identified

Total emissions from identified cement production through 2010 (million tonnes CO2): 25,045

Cell: CN2
Comment: Rick Heede (Mar10):
WBCSD's Cement Sustainability Initiative reports average global gross emissions per tonne of clinker produced at 866 kg CO2 per tonne (declining from 914 kg CO2/tonne in 1990. See rpt for geographic, process (wet vs dry), or temporal variables, and entity reporting by region. Process emissions from calcining limestone into clinker is typically 540 kg CO2 per tonne of clinker.

WBCSD, Cement Sustainability Initiative (2009) Cement Industry Energy and CO2 Performance "Getting the Numbers Right", World Business Council for Sustainable Development, 44 pp., www.wbcsdcement.org

Cell: CN17
Comment: Rick Heede:
China cement production is inferred from CDIAC data on cement emissions for China, in which cement emissions total 2,496 MtC (9,151 MtCO2) for 1928-2010. An emission factor of 0.50 kg CO2 per kg cementitious product is used to estimate cement production: CDIAC emission estimation protocol asserts that "CO2 production (in metric tons of C) = 0.136 metric tons of C per metric ton cement * quantity of cement produced (metric tons)." 0.136 tC * 3.667 CO2/C = 0.499 tCO2 per tonne of cement produced; round to 0.5, or 2 tonnes cement production per tonne of CO2 (from column "N"). The mole calculation is as follows: (12.01 g C/mole CaCO3 ÷ 56.08 g CaØmole CaCO3) * 0.635 g CaØg cement = 0.136 g C/g cement. Boden, Marland, & Andres (1995).

Cell: CN34
Comment: Rick Heede:
CDIAC data in million tonnes of carbon converted to CO2, which is 3.664191 times Carbon if carbon and oxygen isotopes are accounted for, per Kevin Baumert May05, then at World Resources Institute: CO2 conversion is, precisely: C=12.0107 + O=15.9994 x 2 = 44.0095/12.0107 = 3.664191.

Cell: CN36
Comment: Rick Heede:
From the associated "Methods" paper: CDIAC's emissions methodology is not described.

Boden, T.A., G. Marland, and R.J. Andres. 2009. Global, Regional, and National Fossil-Fuel CO2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi 10.3334/CDIAC/00001.

Jan10: CMS added CDIAC extrapolations for gas emissions from their dataset "Preliminary 2007-08 Global & National Estimates by Extrapolation" (undated) to the main file cited above.

Cell: CN41
Comment: Rick Heede:

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Cell: CN42
Comment: Rick Heede:

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