Summary of emissions from oil, natural gas, coal, cement production, and flaring

Richard Heede
Climate Accountability Institute
2-Dec-14

	1751-1789	1790s										1800s					
	Sum 1751-1789	1790	1791	1792	1793	1794	1795	1796	1797	1798	1799	1800	1801	1802	1803	1804	1805
Oil & NGL																	
Annual and cumulative Carbon Majors (MtCO2)																	
Annual and cumulative Carbon Majors (MtC)																	
Annual and cumulative global oil emissions (MtCO2)																	
Annual and cumulative global oil emissions (MtC)	none																
Percent of annual CDIAC oil emissions identified																	
Global cumulative to date oil emissions (MtCO2)																	
Global cumulative to date oil emissions (percent)																	
Natural Gas																	
Annual and cumulative Carbon Majors (MtCO2)																	
Annual and cumulative Carbon Majors (MtC)																	
Annual and cumulative global nat gas emissions (MtCO2)																	
Annual and cumulative global nat gas emissions (MtC)	none																
Percent of annual CDIAC gas emissions identified																	
Global cumulative to date nat gas emissions (MtCO2)																	
Global cumulative to date nat gas emissions (percent)																	
Coal																	
Annual and cumulative Carbon Majors (MtCO2)																	
Annual and cumulative Carbon Majors (MtC)																	
Annual and cumulative global coal emissions (MtCO2)	531	18	22	22	22	22	22	22	26	26	26	29	29	37	33	33	33
	sum 1751-1789																
Annual and cumulative global coal emissions (MtC)	145	5	6	6	6	6	6	6	7	7	7	8	8	10	9	9	9
Percent Carbon Majors of global coal emissions																	
Global cumulative to date coal emissions (MtCO2)		150	156	162	168	174	180	186	193	200	207	215	223	233	242	251	260
Global cumulative to date coal emissions (percent)		0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Cement																	
Annual and cumulative Carbon Majors (MtCO2)																	
Annual and cumulative Carbon Majors (MtC)																	
Annual and cumulative global cement emissions (MtCO2)																	
Annual and cumulative global cement emissions (MtC)	none																
Percent Carbon Majors of global cement emissions																	
Flaring																	
Annual and cumulative Carbon Majors (MtCO2)																	
Annual and cumulative Carbon Majors (MtC)																	
Annual and cumulative global flaring (MtCO2)																	
Annual and cumulative global flaring (MtC)	CDIAC estimates flaring emissions from 1950 to 2010																
Percent Carbon Majors of global flaring emissions																	
Total																	
Annual and cumulative Carbon Majors (MtCO2)																	
Annual and cumulative Carbon Majors (MtC)	4,595																
Annual and cumulative global 1751-2013 (MtCO2)	531	18	22	22	22	22	22	22	26	26	26	29	29	37	33	33	33
Annual and cumulative global 1751-2013 (MtC)	145	5	6	6	6	6	6	6	7	7	7	8	8	10	9	9	9
Percent Carbon Majors of global CO2 1751-2013	1,254																
Cumulative																	
Annual Carbon Majors 1854-2013																	
Total Carbon Majors 1854-2013																	
Percent Carbon Majors of global CO2 1751-2013																	
Annual global CO2 1751-2013	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.9	0.9	0.9	1.0
Cumulative global CO2 1751-2013	145	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443
Percent Carbon Majors of global CO2 1751-2013		0.04%	0.04%	0.04%	0.04%	0.04%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.06%	0.06%	0.06%	0.06%	0.07%
	Sum 1751-1769	1790	1791	1792	1793	1794	1795	1796	1797	1798	1799	1800	1801	1802	1803	1804	1805

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	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX
9	1800s				1810s										1820s										1830s					
10	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	1833	1834	1835
47	37	37	37	37	37	40	40	40	40	44	48	51	51	51	51	51	55	59	59	62	62	66	66	66	88	84	84	88	88	92
49	10	10	10	10	10	11	11	11	11	12	13	14	14	14	14	14	15	16	16	17	17	18	18	18	24	23	23	24	24	25
52	270	280	290	300	310	321	332	343	354	366	379	393	407	421	435	449	464	480	496	513	530	548	566	584	608	631	654	678	702	727
53	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%
89	37	37	37	37	37	40	40	40	40	44	48	51	51	51	51	51	55	59	59	62	62	66	66	66	88	84	84	88	88	92
91	10	10	10	10	10	11	11	11	11	12	13	14	14	14	14	14	15	16	16	17	17	18	18	18	24	23	23	24	24	25
105	**1.0**	**1.0**	**1.1**	**1.1**	**1.1**	**1.2**	**1.2**	**1.3**	**1.3**	**1.3**	**1.4**	**1.4**	**1.5**	**1.5**	**1.6**	**1.6**	**1.7**	**1.8**	**1.8**	**1.9**	**1.9**	**2.0**	**2.1**	**2.1**	**2.2**	**2.3**	**2.4**	**2.5**	**2.6**	**2.7**
107	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443
109	0.07%	0.07%	0.07%	0.08%	0.08%	0.08%	0.08%	0.09%	0.09%	0.09%	0.10%	0.10%	0.10%	0.11%	0.11%	0.11%	0.12%	0.12%	0.13%	0.13%	0.13%	0.14%	0.14%	0.15%	0.15%	0.16%	0.17%	0.2%	0.2%	0.2%
111	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	1833	1834	1835

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dataset marker

Row	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV	BW	BX	BY	BZ	CA	CB
9	1830s				1840s										1850s										1860s					
10	1836	1837	1838	1839	1840	1841	1842	1843	1844	1845	1846	1847	1848	1849	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865
43																			0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4
45																			0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
47	106	106	110	114	121	125	132	136	143	158	158	169	172	183	198	198	209	216	253	260	278	282	286	304	333	348	352	377	410	436
49	29	29	30	31	33	34	36	37	39	43	43	46	47	50	54	54	57	59	69	71	76	77	78	83	91	95	96	103	112	119
50															linked to Coal emissions worksheet --->															
51																			0.03%	0.04%	0.05%	0.05%	0.06%	0.06%	0.07%	0.07%	0.07%	0.07%	0.09%	0.10%
52	756	785	815	846	879	913	949	986	1,025	1,068	1,111	1,157	1,204	1,254	1,308	1,362	1,419	1,478	1,547	1,618	1,694	1,771	1,849	1,932	2,023	2,118	2,214	2,317	2,429	2,548
53	0.4%	0.4%	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.6%	0.6%	0.6%	0.6%	0.7%	0.7%	0.7%	0.8%	0.8%	0.8%	0.9%	0.9%	0.9%	1.0%	1.0%	1.1%	1.1%	1.2%	1.2%	1.3%	1.4%
85																			0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4
87																			0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
89	106	106	110	114	121	125	132	136	143	158	158	169	172	183	198	198	209	216	253	260	278	282	286	304	333	348	352	377	410	436
91	29	29	30	31	33	34	36	37	39	43	43	46	47	50	54	54	57	59	69	71	76	77	78	83	91	95	96	103	112	119
93																			0.03%	0.04%	0.05%	0.05%	0.06%	0.06%	0.07%	0.07%	0.07%	0.07%	0.09%	0.10%
99																													0.000	0.001
101																													926	926
103																													0.0%	0.0%
105	2.8	2.9	3.0	3.1	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.7	5.9	6.2	6.5	6.8	7.1	7.4	7.8	8.1	8.5	8.9	9.3
107	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443
109	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.5%	0.5%	0.5%	0.5%	0.6%	0.6%	0.6%	0.6%
111	1836	1837	1838	1839	1840	1841	1842	1843	1844	1845	1846	1847	1848	1849	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865

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dataset marker

Row	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD
9	1860s				1870s										1880s										1890s			
10	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893
15																		[dataset marker]	0	0	0	0	0	0	0	1	1	1
17																		[dataset marker]	0	0	0	0	0	0	0	0	0	0
19				[dataset marker]	4	4	4	4	4	4	4	7	7	11	11	15	15	11	15	15	18	18	18	22	29	33	33	37
21				[dataset marker]	1	1	1	1	1	1	1	2	2	3	3	4	4	3	4	4	5	5	5	6	8	9	9	10
23																		[dataset marker]	0%	0%	1%	1%	1%	1%	1%	2%	2%	2%
24					1	2	3	4	5	6	7	9	11	14	17	21	25	28	32	36	41	46	51	57	65	74	83	93
25					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%
33																			[dataset marker]	4	7	11	18	11	11	7	7	7
34																				1885: first year of CDIAC gas								
35																			[dataset marker]	1	2	3	5	3	3	2	2	2
38																				1	3	6	11	14	17	19	21	23
39																				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
43	0.5	0.6	0.7	0.8	1.0	1.2	1.4	1.6	2	2	2	2	3	3	3	3	3	4	4	4	4	5	5	5	5	5	6	6
45	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
47	447	476	491	520	535	572	634	671	634	685	696	704	711	758	854	876	923	986	993	1,000	1,008	1,052	1,162	1,165	1,264	1,319	1,330	1,312
49	122	130	134	142	146	156	173	183	173	187	190	192	194	207	233	239	252	269	271	273	275	287	317	318	345	360	363	358
51	0.11%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
52	2,670	2,800	2,934	3,076	3,222	3,378	3,551	3,734	3,907	4,094	4,284	4,476	4,670	4,877	5,110	5,349	5,601	5,870	6,141	6,414	6,689	6,976	7,293	7,611	7,956	8,316	8,679	9,037
53	1.4%	1.5%	1.6%	1.6%	1.7%	1.8%	1.9%	2.0%	2.1%	2.2%	2.3%	2.4%	2.5%	2.6%	2.7%	2.8%	3.0%	3.1%	3.3%	3.4%	3.6%	3.7%	3.9%	4.1%	4.2%	4.4%	4.6%	4.8%
71																		[dataset marker]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73																		[dataset marker]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	0.5	0.6	0.7	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	5	5	5	6	6	6	7
87	0.1	0.2	0.2	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2
89	447	476	491	520	539	575	638	674	638	689	700	711	718	769	865	890	938	997	1,008	1,019	1,033	1,081	1,198	1,198	1,304	1,359	1,370	1,356
91	122	130	134	142	147	157	174	184	174	188	191	194	196	210	236	243	256	272	275	278	282	295	327	327	356	371	374	370
93	0.11%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.5%	0.5%
99	**0.001**	**0.002**	**0.003**	**0.003**	**0.004**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.02**	**0.02**	**0.02**	**0.03**	**0.03**	**0.03**	**0.04**	**0.04**	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
101	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**
103	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
105	**9.8**	**10**	**11**	**11**	**12**	**12**	**13**	**14**	**14**	**15**	**16**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**31**	**32**	**34**
107	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**
109	0.7%	0.7%	0.7%	0.8%	0.8%	0.9%	0.9%	0.9%	1.0%	1.0%	1.1%	1.1%	1.2%	1.2%	1.3%	1.4%	1.4%	1.5%	1.6%	1.6%	1.7%	1.8%	1.9%	2.0%	2.0%	2.1%	2.2%	2.3%
111	**1866**	**1867**	**1868**	**1869**	**1870**	**1871**	**1872**	**1873**	**1874**	**1875**	**1876**	**1877**	**1878**	**1879**	**1880**	**1881**	**1882**	**1883**	**1884**	**1885**	**1886**	**1887**	**1888**	**1889**	**1890**	**1891**	**1892**	**1893**

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dataset marker

	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE
9	1890s						1900s										1910s										
10	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
15	1	1	2	3	2	2	2	2	2	3	3	3	5	6	6	6	8	8	14	19	13	13	24	25	21	28	38
17	0	0	0	1	1	0	0	1	1	1	1	1	1	2	2	2	2	2	4	5	4	3	7	7	6	8	10
19	33	40	44	48	48	51	59	66	70	73	84	84	84	103	110	117	125	132	136	150	154	165	176	198	194	224	286
21	9	11	12	13	13	14	16	18	19	20	23	23	23	28	30	32	34	36	37	41	42	45	48	54	53	61	78
23	4%	3%	4%	5%	5%	3%	3%	3%	3%	4%	3%	4%	6%	6%	5%	5%	6%	6%	10%	13%	9%	8%	14%	13%	11%	13%	13%
24	102	113	125	138	151	165	181	199	218	238	261	284	307	335	365	397	431	467	504	545	587	632	680	734	787	848	926
25	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	0.5%	0.5%	0.5%	0.6%	0.6%	0.7%
29							0	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
31							0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
33	7	7	7	7	7	11	11	15	15	15	15	18	18	18	18	22	26	26	29	29	29	33	37	40	37	37	40
35	2	2	2	2	2	3	3	4	4	4	4	5	5	5	5	6	7	7	8	8	8	9	10	11	10	10	11
37							4.5%	4.8%	5.4%	6.3%	6.8%	6.8%	8.2%	8.6%	8.5%	8.5%	7.7%	7.7%	7.4%	7.7%	7.8%	7.4%	8.0%	7.6%	7.6%	7.9%	7.8%
38	25	27	29	31	33	36	39	43	47	51	55	60	65	70	75	81	88	95	103	111	119	128	138	149	159	169	180
39	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.3%
43	6	6	6	7	7	7	42	46	49	52	52	51	50	50	49	49	49	49	48	109	107	106	104	103	102	100	99
45	2	2	2	2	2	2	12	12	13	14	14	14	14	14	13	13	13	13	13	30	29	29	29	28	28	27	27
47	1,363	1,440	1,484	1,557	1,645	1,799	1,887	1,946	1,990	2,173	2,188	2,330	2,492	2,748	2,616	2,737	2,851	2,902	3,056	3,279	2,931	2,873	3,085	3,265	3,199	2,693	3,089
49	372	393	405	425	449	491	515	531	543	593	597	636	680	750	714	747	778	792	834	895	800	784	842	891	873	735	843
51	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	2.2%	2.3%	2.5%	2.4%	2.4%	2.2%	2.0%	1.8%	1.9%	1.8%	1.7%	1.7%	1.6%	3.3%	3.7%	3.7%	3.4%	3.2%	3.2%	3.7%	3.2%
52	9,409	9,802	10,207	10,632	11,081	11,572	12,087	12,618	13,161	13,754	14,351	14,987	15,667	16,417	17,131	17,878	18,656	19,448	20,282	21,177	21,977	22,761	23,603	24,494	25,367	26,102	26,945
53	5.0%	5.2%	5.4%	5.7%	5.9%	6.2%	6.4%	6.7%	7.0%	7.3%	7.6%	8.0%	8.3%	8.7%	9.1%	9.5%	9.9%	10.4%	10.8%	11.3%	11.7%	12.1%	12.6%	13.0%	13.5%	13.9%	14.3%
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.4	0.4	0	0	1
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
85	7	8	8	9	9	9	44	48	52	56	55	55	57	57	57	58	59	59	64	130	123	121	132	132	125	132	141
87	2	2	2	3	3	2	12	13	14	15	15	15	15	16	15	16	16	16	18	36	34	33	36	36	34	36	39
89	1,403	1,488	1,535	1,612	1,700	1,861	1,957	2,026	2,074	2,261	2,286	2,433	2,594	2,869	2,744	2,876	3,001	3,060	3,221	3,459	3,115	3,071	3,298	3,503	3,430	2,953	3,415
91	383	406	419	440	464	508	534	553	566	617	624	664	708	783	749	785	819	835	879	944	850	838	900	956	936	806	932
93	0.5%	0.5%	0.5%	0.6%	0.5%	0.5%	2.3%	2.4%	2.5%	2.5%	2.4%	2.3%	2.2%	2.0%	2.1%	2.0%	2.0%	1.9%	2.0%	3.8%	3.9%	3.9%	4.0%	3.8%	3.7%	4.5%	4.1%
99	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.2**	**0.3**	**0.3**	**0.4**	**0.4**	**0.5**	**0.6**	**0.6**	**0.7**	**0.7**	**0.8**	**0.9**	**1.0**	**1.1**	**1.2**	**1.4**	**1.5**	**1.6**	**1.8**	**1.9**
101	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**
103	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%
105	**35**	**36**	**38**	**40**	**41**	**43**	**45**	**47**	**49**	**51**	**54**	**56**	**59**	**62**	**64**	**67**	**70**	**73**	**77**	**80**	**83**	**86**	**89**	**93**	**96**	**99**	**103**
107	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**
109	2.4%	2.5%	2.6%	2.7%	2.9%	3.0%	3.1%	3.3%	3.4%	3.6%	3.7%	3.9%	4.1%	4.3%	4.5%	4.7%	4.9%	5.1%	5.3%	5.5%	5.8%	6.0%	6.2%	6.4%	6.7%	6.9%	7.1%
111	**1894**	**1895**	**1896**	**1897**	**1898**	**1899**	**1900**	**1901**	**1902**	**1903**	**1904**	**1905**	**1906**	**1907**	**1908**	**1909**	**1910**	**1911**	**1912**	**1913**	**1914**	**1915**	**1916**	**1917**	**1918**	**1919**	**1920**

Summary of emissions from oil, natural gas, coal, cement production, and flaring

Richard Heede
Climate Accountability Institute
2-Dec-14

dataset marker

EF	EG	EH	EI	EJ	EK	EL	EM	EN	EO	EP	EQ	ER	ES	ET	EU	EV	EW	EX	EY	EZ	FA	FB	FC	FD	FE	FF
1920s									1930s										1940s							
1921	**1922**	**1923**	**1924**	**1925**	**1926**	**1927**	**1928**	**1929**	**1930**	**1931**	**1932**	**1933**	**1934**	**1935**	**1936**	**1937**	**1938**	**1939**	**1940**	**1941**	**1942**	**1943**	**1944**	**1945**	**1946**	**1947**
47	58	85	90	96	124	148	170	186	200	182	187	200	236	261	284	350	374	371	379	402	383	446	537	597	677	744
13	16	23	25	26	34	40	46	51	55	50	51	55	64	71	78	95	102	101	103	110	105	122	147	163	185	203
308	344	407	403	425	436	498	524	586	557	539	517	564	594	645	704	802	784	813	839	865	813	876	1,008	1,008	1,070	1,180
84	94	111	110	116	119	136	143	160	152	147	141	154	162	176	192	219	214	222	229	236	222	239	275	275	292	322
15%	17%	21%	22%	23%	28%	30%	32%	32%	36%	34%	36%	36%	40%	40%	40%	44%	48%	46%	45%	46%	47%	51%	53%	59%	63%	63%
1,010	1,104	1,215	1,325	1,441	1,560	1,696	1,839	1,999	2,151	2,298	2,439	2,593	2,755	2,931	3,123	3,342	3,556	3,778	4,007	4,243	4,465	4,704	4,979	5,254	5,546	5,868
0.7%	0.8%	0.9%	1.0%	1.0%	1.1%	1.2%	1.3%	1.4%	1.6%	1.7%	1.8%	1.9%	2.0%	2.1%	2.3%	2.4%	2.6%	2.7%	2.9%	3.1%	3.2%	3.4%	3.6%	3.8%	4.0%	4.2%
3	3	4	5	5	10	11	12	14	18	18	19	20	22	25	29	35	31	36	42	47	49	53	58	62	70	79
1	1	1	1	1	3	3	3	4	5	5	5	6	6	7	8	10	8	10	11	13	13	15	16	17	19	22
37	40	51	59	62	70	77	84	103	103	92	88	92	103	110	125	139	136	139	154	154	165	183	198	216	224	246
10	11	14	16	17	19	21	23	28	28	25	24	25	28	30	34	38	37	38	42	42	45	50	54	59	61	67
7.1%	7.5%	7.7%	7.7%	7.5%	14.6%	14.6%	14.5%	13.9%	17.2%	19.3%	21.6%	22.1%	21.9%	23.0%	23.6%	25.3%	22.8%	25.6%	27.3%	30.4%	29.6%	29.1%	29.5%	28.6%	31.5%	32.2%
190	201	215	231	248	267	288	311	339	367	392	416	441	469	499	533	571	608	646	688	730	775	825	879	938	999	1,066
0.4%	0.4%	0.4%	0.4%	0.5%	0.5%	0.5%	0.6%	0.6%	0.7%	0.7%	0.8%	0.8%	0.9%	0.9%	1.0%	1.1%	1.1%	1.2%	1.3%	1.4%	1.5%	1.5%	1.6%	1.8%	1.9%	2.0%
109	118	128	137	147	157	166	174	180	187	210	254	290	347	342	384	389	455	533	612	675	739	512	500	570	633	1,187
30	32	35	37	40	43	45	47	49	51	57	69	79	95	93	105	106	124	146	167	184	202	140	136	156	173	324
2,598	2,712	3,096	3,063	3,085	3,100	3,316	3,261	3,470	3,159	2,781	2,473	2,594	2,840	2,972	3,272	3,448	3,224	3,364	3,726	3,822	3,895	4,001	3,836	3,005	3,206	3,635
709	740	845	836	842	846	905	890	947	862	759	675	708	775	811	893	941	880	918	1,017	1,043	1,063	1,092	1,047	820	875	992
4.2%	4.4%	4.1%	4.5%	4.8%	5.1%	5.0%	5.3%	5.2%	5.9%	7.5%	10.3%	11.2%	12.2%	11.5%	11.7%	11.3%	14.1%	15.9%	16.4%	17.7%	19.0%	12.8%	13.0%	19.0%	19.7%	32.7%
27,654	28,394	29,239	30,075	30,917	31,763	32,668	33,558	34,505	35,367	36,126	36,801	37,509	38,284	39,095	39,988	40,929	41,809	42,727	43,744	44,787	45,850	46,942	47,989	48,809	49,684	50,676
14.7%	15.1%	15.6%	16.0%	16.5%	16.9%	17.4%	17.9%	18.4%	18.8%	19.2%	19.6%	20.0%	20.4%	20.8%	21.3%	21.8%	22.3%	22.8%	23.3%	23.9%	24.4%	25.0%	25.6%	26.0%	26.5%	27.0%
							0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	1	0	0	0
							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
							37	37	37	29	26	26	29	33	40	40	44	48	40	44	40	37	26	26	37	44
							1928: first year CDIAC cement data																			
							10	10	10	8	7	7	8	9	11	11	12	13	11	12	11	10	7	7	10	12
1	1	1	1	2	2	2	3	3	3	3	3	3	4	4	5	6	6	6	6	6	6	7	9	10	11	12
0.2	0.3	0.4	0.4	0.4	0.5	0.7	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3
158	180	218	233	249	293	328	358	384	408	412	463	514	609	632	703	780	866	946	1,039	1,131	1,177	1,019	1,104	1,238	1,391	2,023
43	49	60	64	68	80	90	98	105	111	112	126	140	166	173	192	213	236	258	284	309	321	278	301	338	380	552
2,942	3,096	3,554	3,525	3,573	3,606	3,891	3,906	4,195	3,855	3,441	3,104	3,276	3,565	3,759	4,141	4,430	4,188	4,364	4,760	4,884	4,914	5,097	5,068	4,254	4,536	5,104
803	845	970	962	975	984	1,062	1,066	1,145	1,052	939	847	894	973	1,026	1,130	1,209	1,143	1,191	1,299	1,333	1,341	1,391	1,383	1,161	1,238	1,393
5.4%	5.8%	6.1%	6.6%	7.0%	8.1%	8.4%	9.2%	9.1%	10.6%	12.0%	14.9%	15.7%	17.1%	16.8%	17.0%	17.6%	20.7%	21.7%	21.8%	23.1%	24.0%	20.0%	21.8%	29.1%	30.7%	39.6%
2.1	**2.2**	**2.5**	**2.7**	**2.9**	**3.2**	**3.6**	**3.9**	**4.3**	**4.7**	**5.1**	**5.6**	**6.1**	**6.7**	**7.3**	**8.0**	**8.8**	**9.7**	**10.6**	**11.7**	**12.8**	**14**	**15**	**16**	**17**	**19**	**21**
926	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**
0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.5%	0.5%	0.6%	0.6%	0.7%	0.7%	0.8%	0.9%	1.0%	1.0%	1.1%	1.3%	1.4%	1.5%	1.6%	1.7%	1.9%	2.0%	2.2%
106	**109**	**112**	**116**	**119**	**123**	**127**	**131**	**135**	**139**	**142**	**145**	**149**	**152**	**156**	**160**	**165**	**169**	**173**	**178**	**183**	**188**	**193**	**198**	**202**	**207**	**212**
1,443	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**
7.3%	7.5%	7.8%	8.0%	8.3%	8.5%	8.8%	9.1%	9.4%	9.6%	9.9%	10.1%	10.3%	10.6%	10.8%	11.1%	11.4%	11.7%	12.0%	12.3%	12.7%	13.0%	13.4%	13.7%	14.0%	14.3%	14.7%
1921	**1922**	**1923**	**1924**	**1925**	**1926**	**1927**	**1928**	**1929**	**1930**	**1931**	**1932**	**1933**	**1934**	**1935**	**1936**	**1937**	**1938**	**1939**	**1940**	**1941**	**1942**	**1943**	**1944**	**1945**	**1946**	**1947**

Summary of emissions from oil, natural gas, coal, cement production, and flaring

Richard Heede
Climate Accountability Institute
2-Dec-14

dataset marker

Row	FG	FH	FI	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	FU	FV	FW	FX	FY	FZ	GA	GB	GC	GD	GE
9			1950s										1960s										1970s		
10	**1948**	**1949**	**1950**	**1951**	**1952**	**1953**	**1954**	**1955**	**1956**	**1957**	**1958**	**1959**	**1960**	**1961**	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**	**1968**	**1969**	**1970**	**1971**	**1972**
15	830	823	986	1,135	1,155	1,226	1,277	1,477	1,650	1,820	1,922	2,117	2,350	2,538	2,806	3,042	3,356	3,648	4,073	4,402	4,799	5,212	5,751	6,345	6,820
17	227	224	269	310	315	335	349	403	450	497	524	578	641	693	766	830	916	995	1,112	1,201	1,310	1,422	1,570	1,732	1,861
19	1,334	1,326	1,550	1,755	1,847	1,953	2,041	2,290	2,488	2,616	2,679	2,891	3,111	3,312	3,591	3,855	4,166	4,467	4,848	5,214	5,683	6,130	6,738	7,134	7,537
21	364	362	423	479	504	533	557	625	679	714	731	789	849	904	980	1,052	1,137	1,219	1,323	1,423	1,551	1,673	1,839	1,947	2,057
23	62%	62%	64%	65%	63%	63%	63%	64%	66%	70%	72%	73%	76%	77%	78%	79%	81%	82%	84%	84%	84%	85%	85%	89%	90%
24	6,232	6,594	7,017	7,496	8,000	8,533	9,090	9,715	10,394	11,108	11,839	12,628	13,477	14,381	15,361	16,413	17,550	18,769	20,092	21,515	23,066	24,739	26,578	28,525	30,582
25	4.5%	4.8%	5.1%	5.4%	5.8%	6.2%	6.6%	7.0%	7.5%	8.0%	8.5%	9.1%	9.7%	10.4%	11.1%	11.9%	12.7%	13.6%	14.5%	15.5%	16.7%	17.9%	19.2%	20.6%	22.1%
29	89	99	127	146	158	174	190	210	257	290	330	388	440	492	553	614	682	752	834	939	1,026	1,132	1,260	1,324	1,408
31	24	27	35	40	43	48	52	57	70	79	90	106	120	134	151	167	186	205	228	256	280	309	344	361	384
33	278	297	355	421	454	480	506	550	590	652	704	755	832	879	964	1,048	1,158	1,235	1,334	1,436	1,554	1,711	1,806	1,942	2,052
35	76	81	97	115	124	131	138	150	161	178	192	206	227	240	263	286	316	337	364	392	424	467	493	530	560
37	32.1%	33.4%	35.8%	34.7%	34.8%	36.3%	37.6%	38.2%	43.5%	44.5%	46.9%	51.5%	52.9%	55.9%	57.4%	58.6%	58.9%	60.9%	62.6%	65.4%	66.1%	66.1%	69.7%	68.2%	68.6%
38	1,142	1,223	1,320	1,435	1,559	1,690	1,828	1,978	2,139	2,317	2,509	2,715	2,942	3,182	3,445	3,731	4,047	4,384	4,748	5,140	5,564	6,031	6,524	7,054	7,614
39	2.1%	2.3%	2.5%	2.7%	2.9%	3.2%	3.4%	3.7%	4.0%	4.3%	4.7%	5.1%	5.5%	6.0%	6.4%	7.0%	7.6%	8.2%	8.9%	9.6%	10.4%	11.3%	12.2%	13.2%	14.2%
43	1,300	1,417	1,553	1,619	1,692	1,915	2,140	2,329	2,554	2,432	2,918	3,050	3,182	2,866	2,911	3,031	3,164	3,378	3,476	3,289	3,454	3,486	3,717	3,704	3,954
45	355	387	424	442	462	523	584	636	697	664	796	832	868	782	794	827	863	922	949	898	943	951	1,014	1,011	1,079
47	3,719	3,518	3,921	4,137	4,100	4,122	4,089	4,426	4,665	4,796	4,895	5,064	5,167	4,943	4,950	5,115	5,258	5,350	5,416	5,306	5,306	5,445	5,701	5,712	5,775
49	1,015	960	1,070	1,129	1,119	1,125	1,116	1,208	1,273	1,309	1,336	1,382	1,410	1,349	1,351	1,396	1,435	1,460	1,478	1,448	1,448	1,486	1,556	1,559	1,576
51	35.0%	40.3%	39.6%	39.1%	41.3%	46.5%	52.3%	52.6%	54.7%	50.7%	59.6%	60.2%	61.6%	58.0%	58.8%	59.3%	60.2%	63.1%	64.2%	62.0%	65.1%	64.0%	65.2%	64.8%	68.5%
52	51,691	52,651	53,721	54,850	55,969	57,094	58,210	59,418	60,691	62,000	63,336	64,718	66,128	67,477	68,828	70,224	71,659	73,119	74,597	76,045	77,493	78,979	80,535	82,094	83,670
53	27.5%	28.0%	28.6%	29.2%	29.8%	30.4%	31.0%	31.6%	32.3%	33.0%	33.7%	34.5%	35.2%	35.9%	36.7%	37.4%	38.2%	38.9%	39.7%	40.5%	41.3%	42.1%	42.9%	43.7%	44.6%
57	0	0	0	1	1	2	2	2	3	3	5	6	7	4	4	5	5	5	5	4	4	5	5	11	11
59	0	0	0	0	0	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	3	3
61	51	59	66	73	81	88	99	110	117	125	132	147	158	165	180	187	209	216	231	238	256	271	286	308	326
63	14	16	18	20	22	24	27	30	32	34	36	40	43	45	49	51	57	59	63	65	70	74	78	84	89
71	13	13	16	18	19	20	21	24	27	30	31	34	38	41	46	50	55	59	66	72	78	85	94	103	111
73	4	4	4	5	5	5	6	7	7	8	9	9	10	11	12	14	15	16	18	20	21	23	26	28	30
75			84	88	95	99	99	114	117	128	128	132	143	154	161	172	187	202	220	242	267	293	319	322	344
77			23	24	26	27	27	31	32	35	35	36	39	42	44	47	51	55	60	66	73	80	87	88	94
79			18.9%	20.9%	19.6%	20.1%	20.9%	21.1%	22.8%	23.0%	24.3%	26.1%	26.8%	26.9%	28.3%	28.8%	29.3%	29.5%	30.2%	29.7%	29.3%	29.0%	29.5%	32.1%	32.3%
85	2,233	2,352	2,683	2,920	3,026	3,337	3,631	4,043	4,490	4,575	5,205	5,596	6,017	5,942	6,320	6,741	7,261	7,843	8,455	8,706	9,362	9,920	10,826	11,488	12,305
87	609	642	732	797	826	911	991	1,103	1,225	1,249	1,420	1,527	1,642	1,622	1,725	1,840	1,982	2,140	2,307	2,376	2,555	2,707	2,955	3,135	3,358
89	5,383	5,199	5,976	6,475	6,577	6,742	6,834	7,490	7,977	8,318	8,538	8,988	9,410	9,454	9,846	10,377	10,978	11,469	12,048	12,436	13,067	13,851	14,851	15,419	16,034
91	1,469	1,419	1,631	1,767	1,795	1,840	1,865	2,044	2,177	2,270	2,330	2,453	2,568	2,580	2,687	2,832	2,996	3,130	3,288	3,394	3,566	3,780	4,053	4,208	4,376
93	41.5%	45.2%	44.9%	45.1%	46.0%	49.5%	53.1%	54.0%	56.3%	55.0%	61.0%	62.3%	63.9%	62.9%	64.2%	65.0%	66.1%	68.4%	70.2%	70.0%	71.6%	71.6%	72.9%	74.5%	76.7%
99	**23**	**25**	**28**	**31**	**34**	**37**	**41**	**45**	**49**	**54**	**59**	**65**	**71**	**77**	**83**	**90**	**97**	**105**	113	122	131	141	152	164	176
101	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	**926**	926	926	926	926	926	926	926
103	2.5%	2.7%	3.0%	3.3%	3.7%	4.0%	4.4%	4.9%	5.3%	5.8%	6.4%	7.0%	7.7%	8.3%	9.0%	9.7%	10.5%	11.3%	12.3%	13.2%	14.2%	15.3%	16.4%	17.7%	19.0%
105	**217**	**222**	**228**	**235**	**241**	**248**	**255**	**262**	**270**	**279**	**287**	**296**	**306**	**315**	**325**	**335**	**346**	**358**	370	382	395	409	424	440	456
107	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	**1,443**	1,443	1,443	1,443	1,443	1,443	1,443	1,443
109	15.1%	15.4%	15.8%	16.3%	16.7%	17.2%	17.7%	18.2%	18.7%	19.3%	19.9%	20.5%	21.2%	21.8%	22.5%	23.2%	24.0%	24.8%	25.6%	26.5%	27.4%	28.4%	29.4%	30.5%	31.6%
111	**1948**	**1949**	**1950**	**1951**	**1952**	**1953**	**1954**	**1955**	**1956**	**1957**	**1958**	**1959**	**1960**	**1961**	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**	**1968**	**1969**	**1970**	**1971**	**1972**

Summary of emissions from oil, natural gas, coal, cement production, and flaring

Richard Heede
Climate Accountability Institute
2-Dec-14

dataset marker

GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT	GU	GV	GW	GX	GY	GZ	HA	HB	HC	HD	HE
1970s							1980s										1990s							1990s	
1973	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
																	[SumOil.xls]Oil Emissions'!DW122								
7,366	7,719	6,819	7,826	8,049	8,020	8,150	7,661	7,021	6,381	6,127	5,994	5,888	6,273	6,389	6,800	7,349	7,783	7,824	6,445	6,575	6,872	7,012	7,306	7,538	7,775
2,010	2,107	1,861	2,136	2,197	2,189	2,224	2,091	1,916	1,742	1,672	1,636	1,607	1,712	1,744	1,856	2,006	2,124	2,135	1,759	1,794	1,875	1,914	1,994	2,057	2,122
8,211	8,226	7,812	8,479	8,787	8,765	9,322	8,875	8,387	8,047	7,973	8,058	8,010	8,402	8,450	8,838	9,010	9,131	9,545	9,197	9,245	9,329	9,399	9,615	9,893	10,135
2,241	2,245	2,132	2,314	2,398	2,392	2,544	2,422	2,289	2,196	2,176	2,199	2,186	2,293	2,306	2,412	2,459	2,492	2,605	2,510	2,523	2,546	2,565	2,624	2,700	2,766
90%	94%	87%	92%	92%	92%	87%	86%	84%	79%	77%	74%	74%	75%	76%	77%	82%	85%	82%	70%	71%	74%	75%	76%	76%	77%
32,823	35,068	37,200	39,514	41,912	44,304	46,848	49,270	51,559	53,755	55,931	58,130	60,316	62,609	64,915	67,327	69,786	72,278	74,883	77,393	79,916	82,462	85,027	87,651	90,351	93,117
23.7%	25.3%	26.9%	28.5%	30.3%	32.0%	33.8%	35.6%	37.2%	38.8%	40.4%	42.0%	43.6%	45.2%	**46.9%**	48.6%	50.4%	52.2%	54.1%	55.9%	57.7%	59.5%	61.4%	63.3%	65.2%	67.2%
																	[SumGas.xls]Gas Emissions'!DP125								
1,486	1,553	1,578	1,663	1,716	1,776	1,850	1,838	1,878	1,893	1,988	2,187	2,352	2,437	2,630	2,779	2,683	2,732	2,737	2,753	2,764	2,826	2,855	2,992	3,108	3,184
406	424	431	454	468	485	505	502	512	517	543	597	642	665	718	759	732	746	747	751	754	771	779	817	848	869
2,155	2,188	2,213	2,308	2,382	2,492	2,642	2,712	2,770	2,712	2,715	2,961	3,067	3,045	3,276	3,433	3,609	3,734	3,895	4,012	4,137	4,174	4,239	4,430	4,426	4,555
588	597	604	630	650	680	721	740	756	740	741	808	837	831	894	937	985	1,019	1,063	1,095	1,129	1,139	1,157	1,209	1,208	1,243
69.0%	71.0%	71.3%	72.0%	72.0%	71.3%	70.0%	67.8%	67.8%	69.8%	73.2%	73.9%	76.7%	80.0%	80.3%	81.0%	74.3%	73.2%	70.3%	68.6%	66.8%	67.7%	67.3%	67.5%	70.2%	69.9%
8,202	8,799	9,403	10,033	10,683	11,363	12,084	12,824	13,580	14,320	15,061	15,869	16,706	17,537	18,431	19,368	20,353	21,372	22,435	23,530	24,659	25,798	26,955	28,164	29,372	30,615
15.3%	16.5%	17.6%	18.8%	20.0%	21.3%	22.6%	24.0%	25.4%	26.8%	28.2%	29.7%	31.3%	32.8%	34.5%	36.2%	38.1%	40.0%	42.0%	44.0%	**46.1%**	48.3%	50.4%	52.7%	55.0%	57.3%
																	[SumCoal.xls]Coal Emissions'!FA94								
4,094	4,184	4,342	4,420	4,496	4,632	4,858	5,103	5,060	5,330	5,402	5,585	6,006	6,209	6,422	6,670	6,827	6,930	6,627	6,514	6,272	6,372	6,280	6,684	6,636	6,797
1,117	1,142	1,185	1,206	1,227	1,264	1,326	1,393	1,381	1,455	1,474	1,524	1,639	1,694	1,753	1,820	1,863	1,891	1,809	1,778	1,712	1,739	1,714	1,824	1,811	1,855
5,793	5,786	6,130	6,266	6,467	6,570	6,914	7,134	7,039	7,299	7,310	7,673	8,197	8,428	8,662	8,845	9,003	8,864	8,593	8,636	8,420	8,640	8,948	9,047	9,142	8,761
1,581	1,579	1,673	1,710	1,765	1,793	1,887	1,947	1,921	1,992	1,995	2,094	2,237	2,300	2,364	2,414	2,457	2,419	2,345	2,357	2,298	2,358	2,442	2,469	2,495	2,391
70.7%	72.3%	70.8%	70.5%	69.5%	70.5%	70.3%	71.5%	71.9%	73.0%	73.9%	72.8%	73.3%	73.7%	74.1%	75.4%	75.8%	78.2%	77.1%	75.4%	74.5%	73.7%	70.2%	73.9%	72.6%	77.6%
85,251	86,830	88,503	90,213	91,978	93,771	95,658	97,605	99,526	101,518	103,513	105,607	107,844	110,144	112,508	114,922	117,379	119,798	122,143	124,500	126,798	129,156	131,598	134,067	136,562	138,953
45.4%	46.2%	**47.1%**	48.0%	49.0%	49.9%	50.9%	52.0%	53.0%	54.1%	55.1%	56.2%	57.4%	58.7%	59.9%	61.2%	62.5%	63.8%	65.0%	66.3%	67.5%	68.8%	70.1%	71.4%	72.7%	74.0%
																	'[SumCement.xls]Process emissions'!BQ36								
12	12	24	35	39	45	50	52	54	59	65	72	81	90	100	115	114	264	287	317	348	376	405	415	426	438
3	3	7	9	11	12	14	14	15	16	18	20	22	25	27	31	31	72	78	86	95	103	111	113	116	120
348	352	348	377	396	425	436	440	443	443	458	469	480	502	524	557	572	575	590	612	645	682	722	744	766	766
95	96	95	103	108	116	119	120	121	121	125	128	131	137	143	152	156	157	161	167	176	186	197	203	209	209
		7.0%	9.2%	10.0%	10.7%	11.5%	11.9%	12.2%	13.2%	14.3%	15.2%	16.9%	17.9%	19.0%	20.6%	19.9%	46.0%	48.6%	51.8%	54.0%	55.2%	56.1%	55.8%	55.6%	57.2%
																(IH69*HR15/10^3)+(IA69*HR29/10^3)									
120	126	111	128	131	131	133	125	115	105	101	99	98	104	106	113	122	129	129	108	110	114	117	122	126	129
33	34	30	35	36	36	36	34	31	29	28	27	27	28	29	31	33	35	35	29	30	31	32	33	34	35
403	392	337	396	381	388	359	315	235	235	213	187	180	169	161	183	150	147	161	128	132	139	132	136	139	128
110	107	92	108	104	106	98	86	64	64	58	51	49	46	44	50	41	40	44	35	36	38	36	37	38	35
29.8%	32.1%	33.1%	32.3%	34.5%	33.7%	37.1%	39.8%	49.1%	44.8%	47.6%	53.2%	54.6%	61.8%	66.0%	61.8%	81.1%	87.9%	80.3%	83.9%	83.1%	82.2%	88.5%	89.8%	90.2%	101.0%
																	HR57+HR43+HR15+HR29+HR71								
13,078	13,595	12,876	14,071	14,431	14,605	15,041	14,780	14,128	13,768	13,684	13,937	14,425	15,113	15,647	16,477	17,095	17,838	17,604	16,136	16,069	16,560	16,669	17,519	17,833	18,324
3,569	3,710	3,514	3,840	3,938	3,986	4,105	4,034	3,856	3,757	3,735	3,804	3,937	4,125	4,270	4,497	4,665	4,868	4,804	4,404	4,385	4,519	4,549	4,781	4,867	5,001
16,910	16,943	16,841	17,826	18,413	18,640	19,673	19,475	18,874	18,735	18,669	19,347	19,933	20,545	21,073	21,857	22,344	22,450	22,784	22,586	22,579	22,963	23,440	23,971	24,367	24,345
4,615	4,624	4,596	4,865	5,025	5,087	5,369	5,315	5,151	5,113	5,095	5,280	5,440	5,607	5,751	5,965	6,098	6,127	6,218	6,164	6,162	6,267	6,397	6,542	6,650	6,644
77.3%	80.2%	76.5%	78.9%	78.4%	78.4%	76.5%	75.9%	74.9%	73.5%	73.3%	72.0%	72.4%	73.6%	74.3%	75.4%	76.5%	79.5%	77.3%	71.4%	71.2%	72.1%	71.1%	73.1%	73.2%	75.3%
																						CMEs	Global		
																	HQ99+HR85/1000				1988-2013	435	571	76.3%	
189	203	216	230	244	259	274	289	303	316	330	344	358	374	389	406	423	441	458	474	490	507	524	541	559	577
926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926	926
20.4%	21.9%	23.3%	24.8%	26.4%	27.9%	29.6%	31.2%	32.7%	34.2%	35.7%	37.2%	38.7%	40.4%	42.0%	43.8%	**45.7%**	47.6%	49.5%	51.2%	53.0%	54.8%	56.6%	58.5%	60.4%	62.4%
472	489	506	524	542	561	581	600	619	638	657	676	696	716	737	759	782	804	827	849	872	895	918	942	967	991
1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443
32.7%	33.9%	35.1%	36.3%	37.6%	38.9%	40.3%	41.6%	42.9%	44.2%	45.5%	**46.9%**	48.23%	49.66%	51.12%	52.63%	54.2%	55.7%	57.3%	58.9%	60.4%	62.0%	63.7%	65.3%	67.0%	68.7%
1973	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**

Summary of emissions from oil, natural gas, coal, cement production, and flaring

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dataset marker

Oil & NGL

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		Sum 1751 to 2013 (Million tonnes CO2 & C)	
7,622	7,862	7,842	7,666	8,133	8,457	8,801	8,523	8,540	8,602	8,398	8,459	8,328	8,490	8,592					388,912	Annual and cumulative Carbon Majors (MtCO2)
2,080	2,146	2,140	2,092	2,220	2,308	2,402	2,326	2,331	2,348	2,292	2,308	2,273	2,317	2,345					106,139	Annual and cumulative Carbon Majors (MtC)
10,029	10,399	10,406	10,373	10,842	11,187	11,271	11,319	11,289	11,440	11,198	11,410	11,537	11,689	11,820					507,408	Annual and cumulative global oil emissions (MtCO2)
2,737	2,838	2,840	2,831	2,959	3,053	3,076	3,089	3,081	3,122	3,056	3,114	3,149	3,190	3,226					138,477	Annual and cumulative global oil emissions (MtC)
76%	76%	75%	74%	75%	76%	78%	75%	76%	75%	75%	74%	72%	73%	73%					76.6%	Percent of annual CDIAC oil emissions identified
95,854	98,692	101,532	104,363	107,322	110,375	113,451	116,540	119,621	122,743	125,799	128,913	132,062	135,252	138,477						Global cumulative to date oil emissions (MtCO2)
69.2%	71.3%	73.3%	75.4%	77.5%	79.7%	81.9%	84.2%	86.4%	88.6%	90.8%	93.1%	95.4%	97.7%	100.0%						Global cumulative to date oil emissions (percent)

GCP/CDIAC Global Carbon Budget data 1959-2013 (Sep14)

Natural Gas

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Sum 1751 to 2013	
3,273	3,214	3,324	3,451	3,502	3,650	3,784	3,883	3,951	4,118	3,991	4,311	4,329	4,357	4,400	132,514	Annual and cumulative Carbon Majors (MtCO2)
893	877	907	942	956	996	1,033	1,060	1,078	1,124	1,089	1,176	1,182	1,189	1,201	36,164	Annual and cumulative Carbon Majors (MtC)
4,654	4,719	4,807	4,925	5,097	5,265	5,423	5,588	5,760	5,976	5,808	6,236	6,339	6,491	6,563	195,831	Annual and cumulative global nat gas emissions (MtCO2)
1,270	1,288	1,312	1,344	1,391	1,437	1,480	1,525	1,572	1,631	1,585	1,702	1,730	1,772	1,791	53,445	Annual and cumulative global nat gas emissions (MtC)
70.3%	68.1%	69.2%	70.1%	68.7%	69.3%	69.8%	69.5%	68.6%	68.9%	68.7%	69.1%	68.3%	67.1%	67.0%	67.7%	Percent of annual CDIAC gas emissions identified
31,885	33,173	34,485	35,829	37,220	38,657	40,137	41,662	43,234	44,865	46,450	48,152	49,882	51,653	53,445		Global cumulative to date nat gas emissions (MtCO2)
59.7%	62.1%	64.5%	67.0%	69.6%	72.3%	75.1%	78.0%	80.9%	83.9%	86.9%	90.1%	93.3%	96.6%	100.0%		Global cumulative to date nat gas emissions (percent)

GCP/CDIAC Global Carbon Budget data 1959-2013 (Sep14)

Coal

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Sum 1751 to 2013	
6,993	7,284	7,638	7,871	8,616	9,174	9,944	10,425	10,842	11,265	11,412	11,997	12,330	12,845	12,984	380,629	Annual and cumulative Carbon Majors (MtCO2)
1,908	1,988	2,085	2,148	2,351	2,504	2,714	2,845	2,959	3,074	3,114	3,274	3,365	3,505	3,544	103,878	Annual and cumulative Carbon Majors (MtC)
8,618	8,673	9,131	9,237	10,051	10,872	11,568	12,235	12,693	13,085	13,264	14,078	14,732	15,111	15,529	688,027	Annual and cumulative global coal emissions (MtCO2)
2,352	2,367	2,492	2,521	2,743	2,967	3,157	3,339	3,464	3,571	3,620	3,842	4,021	4,124	4,238	187,771	Annual and cumulative global coal emissions (MtC)
81.1%	84.0%	83.7%	85.2%	85.7%	84.4%	86.0%	85.2%	85.4%	86.1%	86.0%	85.2%	83.7%	85.0%	83.6%	55.3%	Percent Carbon Majors of global coal emissions
141,305	143,672	146,164	148,685	151,428	154,395	157,552	160,891	164,355	167,926	171,546	175,388	179,409	183,532	187,771		Global cumulative to date coal emissions (MtCO2)
75.3%	76.5%	77.8%	79.2%	80.6%	82.2%	83.9%	85.7%	87.5%	89.4%	91.4%	93.4%	95.5%	97.7%	100.0%		Global cumulative to date coal emissions (percent)

GCP/CDIAC Global Carbon Budget data 1959-2013 (Sep14)

Cement

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Sum 1751 to 2013	
457	470	504	537	613	678	735	838	914	937	1,034	1,126	1,267	1,325	1,366	17,207	Annual and cumulative Carbon Majors (MtCO2)
125	128	138	147	167	185	201	229	249	256	282	307	346	362	373	4,696	Annual and cumulative Carbon Majors (MtC)
795	828	868	923	1,011	1,092	1,173	1,304	1,400	1,422	1,513	1,649	1,829	1,920	2,005	38,299	Annual and cumulative global cement emissions (MtCO2)
217	226	237	252	276	298	320	356	382	388	413	450	499	524	547	10,452	Annual and cumulative global cement emissions (MtC)
57.5%	56.8%	58.0%	58.2%	60.6%	62.1%	62.7%	64.3%	65.3%	65.9%	68.3%	68.3%	69.3%	69.0%	68.1%	44.9%	Percent Carbon Majors of global cement emissions

GCP/CDIAC Global Carbon Budget data 1959-2013 (Sep14)

Flaring

Natural gas flaring rate: 1.736 kg CO2 per tCO2

Crude oil flaring rate: 15.94 kg CO2 per tCO2

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Sum 1751 to 2013	
127	131	131	128	136	141	147	143	143	144	141	142	140	143	145	6,431	Annual and cumulative Carbon Majors (MtCO2)
35	36	36	35	37	39	40	39	39	39	38	39	38	39	39	1,755	Annual and cumulative Carbon Majors (MtC)
121	165	169	176	176	194	220	224	249	260	242	216	216	216	216	13,096	Annual and cumulative global flaring (MtCO2)
33	45	46	48	48	53	60	61	68	71	66	59	59	59	59	3,574	Annual and cumulative global flaring (MtC)
105.2%	79.4%	77.6%	72.9%	77.2%	72.7%	66.8%	63.8%	57.4%	55.5%	58.2%	65.8%	64.9%	66.1%	66.9%	49.1%	Percent Carbon Majors of global flaring emissions

GCP/CDIAC Global Carbon Budget data 1959-2013 (Sep14)

Total

CDIAC includes vented CO2 in natural gas estimates.

This project estimates vented CO2 from gas operations separately, total: 5,272 MtCO2

Total including vented CO2: 930,964

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		Sum 1751 to 2013	
18,472	18,962	19,440	19,654	20,999	22,100	23,412	23,812	24,390	25,067	24,976	26,034	26,395	27,159	27,487	Y	925,692	Annual and cumulative Carbon Majors (MtCO2)
5,041	5,175	5,305	5,364	5,731	6,031	6,389	6,499	6,656	6,841	6,816	7,105	7,203	7,412	7,502	Y	252,632	Annual and cumulative Carbon Majors (MtC)
24,217	24,785	25,382	25,635	27,177	28,610	29,654	30,669	31,391	32,183	32,025	33,590	34,653	35,427	36,133	Y	1,442,661	Annual and cumulative global 1751-2013 (MtCO2)
6,609	6,764	6,927	6,996	7,417	7,808	8,093	8,370	8,567	8,783	8,740	9,167	9,457	9,668	9,861	Y	393,719	Annual and cumulative global 1751-2013 (MtC)
76.3%	76.5%	76.6%	76.7%	77.3%	77.2%	78.9%	77.6%	77.7%	77.9%	78.0%	77.5%	76.2%	76.7%	76.1%	Y	64.2%	Percent Carbon Majors of global CO2 1751-2013

Cumulative

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		Billion tonnes CO2	
596	615	634	654	675	697	720	744	769	794	819	845	871	898	926				Y	926	Annual Carbon Majors 1854-2013 (GtCO2)
926	926	926	926	926	926	926	926	926	926	926	926	926	926	926				Y	926	Total Carbon Majors 1854-2013 (GtCO2)
64.4%	66.4%	68.5%	70.6%	72.9%	75.3%	77.8%	80.4%	83.0%	85.7%	88.4%	91.2%	94.1%	97.0%	100.0%						Percent Carbon Majors of global CO2 1751-2013
1,015	1,040	1,066	1,091	1,118	1,147	1,177	1,207	1,239	1,271	1,303	1,336	1,371	1,407	1,443				Y	1,443	Annual global CO2 1751-2013 (GtCO2)
1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443				Y	1,443	Cumulative global CO2 1751-2013 (GtCO2)
70.4%	72.1%	73.9%	75.6%	77.5%	79.5%	81.6%	83.7%	85.9%	88.1%	90.3%	92.6%	95.0%	97.5%	100.0%					64.2%	Percent Carbon Majors of global CO2 1751-2013
1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		705	CDIAC/GCP 1988-2013 (GtCO2)

Cell: IA19
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: IA21
Comment: Rick Heede:
From the associated "Methods" paper: CDIAC's emissions are estimated for each fuel using the following formula: CO2 = (P) (FO) (C).

From crude oil and natural gas liquids production in the global-total accounts2
CO2l = CO2 emissions in 106 metric tons of carbon
Pl = annual production or consumption in 106 tons
FOl = 0.918 ± 3%
Cl = carbon content in tons C per ton fuel = 0.85 ± 1%

From primary and secondary liquid fuel production and trade in the national accounts when non-energy liquid products are specifically subtracted3
CO2l = CO2 emissions in 106 metric tons of carbon
Pl = annual production or consumption in 106 tons
FOl = 0.985 ± 3%
Cl = carbon content in tons C per ton fuel = 0.85 + 1% ± 2%.

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: IA33
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: IA35
Comment: Rick Heede:
From the associated "Methods" paper: CDIAC's emissions are estimated for each fuel using the following formula: CO2 = (P) (FO) (C).

From primary and secondary gas fuel production and trade:
CO2 = CO2 emissions in 10^6 metric tonnes of carbon;
P = annual production or consumption in thousands of 10^12 joules;
FO = 0.98 ± 1%;
C = carbon content in 10^6 tonnes per thousand 10^12 joules = 0.0137 ± 2%.

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.

Cell: IA47
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: IA49
Comment: Rick Heede:
From the associated "Methods" paper: CDIAC's emissions are estimated for each fuel using the following formula: CO2 = (P) (FO) (C).

From primary and secondary solid fuel production and trade5
CO2s = CO2 emissions in 106 metric tons of carbon
Ps = annual production or consumption in 106 tons coal equivalent6
FOs = 0.982 ± 2%
Cs = carbon content in tons C per ton coal equivalent = 0.746 ± 2%.

While there is, as Marland et al point out, a strong correlation between heat rate and carbon content and the "C content is quite constant when production is in units of tonnes coal equivalent where 1 tonne coal equivalent is defined as 29.31 10^9 joules." CMS factor of 21 million Btu per short on = 23.15 million Btu/tonne, and the CDIAC datum (29.31 10^9 joules/tonne) = 27.78 million Btu/tonne.

CDIAC uses average carbon content of 74.6 percent per tonne of coal equivalent, whereas CMS uses an average factor of 60.1 percent for utility coal per tonne (albeit not the same eqiuv tonne used by CDIAC; the average utility coal factor CMS applies to coal production when coal rank is not specified).

If we modify "average utility coal" to CDIAC's coal equivalent, the CMS carbon factor per tonne of coal becomes 27.78/23.15 = 1.20; 1.20 times the CMS carbon content per tonne of average utililty coal = 601.4 tonne carbon per tonne of coal times 1.2 = 721.7 kgC/tonne, or 0.7217. Compare CDIAC's carbon factor of 0.746 ± 2%, which is 3.4 percent higher than the adjusted CMS factor. In practice, however, for the companies and countries listed in the coal production sheet, and applying the coal ranks when known (and thus a higher proportion of lignite than higher-grade coals on a tonnage basis), the AVERAGE coal contains 0.5733 tonne carbon per tonne produced (20July06: 72,724 million tonnes C / 126,862 million tonnes coal produced = 0.5733). (Note: this is prior to any application of oxidation rate and non-fuel uses.) In sum, CMS may be underestimating the emissions of carbon dioxide by (0.746 - 0.573)/0.573 = 0.302, or 30.2 percent relative to the CDIAC data.

Now, let's compare the annual CDIAC carbon data with EIA's global coal production data as follows:
1990: CDIAC estimates 2,378 million tonnes carbon (MtC) vs EIA coal production of 4,851 million tonnes of coal: 0.4902 tC/tonne coal;
2000: CDIAC estimates 2,214 million tonnes carbon (MtC) vs EIA coal production of 4,473 million tonnes of coal: 0.4950 tC/tonne coal.
In other words, curious results compared to the CDIAC factors discussed above, even though the FO (fuel oxidation rate) factor is not applied to 1990 and 2000; the FO would reduce the carbon emitted from a tonne of coal by 1.8 percent.
Applying CDIAC's formula of CO2 = (P) (FO) (C) without making any adjustment for CDIAC's coal equivalent or fuel oxidation rate for 2000 coal production: CO2 = (4,473 million tonnes of coal produced) * 0.982 * 0.746 = 3,277 million tonnes of carbon; in contrast, CDIAC's estimated emissions = 2,214 MtC. The EIA data includes lignite, sub-bituminous, bituminous, and anthracite coal.
CMS has not resolved this apparent discrepancy between CDIAC emissions estimates from combustion of solid fuels and the EIA coal production data.

Sources: Marland, Gregg, Tom Boden, & R. J. Andres (~2005) "Global, Regional, and National Fossil Fuel CO2 Emissions," Carbon Dioxide Information Analysis Center (CDIAC), Oak Ridge National Laboratory, US DOE, http://cdiac.esd.ornl.gov/trends/emis/em_cont.htm
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.

Cell: IA51
Comment: Rick Heede:
Of CDIAC estimated emissions of carbon dioxide from combustion of coal worldwide 1751-2004, CMS has identified (at this writing, 26Nov06) 47.5 percent from the production of coal by identified producers from 1990 to 2004. Note that CMS has differentiated emissions by rank of coal produced, when company or country production data makes this possible to do.

Cell: HI69
Comment: Rick Heede:
CMS reviews numerous estimates of flaring emissions in the oil and gas industries in the worksheets in "AncillaryCH4&CO2.xls".
See "Flaring and Venting" worksheet in the "AncillaryCH4&CO2.xls" workbook for details.

Cell: HP69
Comment: Rick Heede:
Flaring rates are calculated in the worksheet "AncillaryCH4&CO2.xls".
See the "Flaring and Venting" worksheet in the AncillaryCO2CH4.xls workbook.

Cell: IA75
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: IA77
Comment: Rick Heede:
Marland, Gregg, & Ralph Rotty (1984) "Carbon dioxide emissions from fossil fuels: a procedure for estimation and results for 1950-1982," Tellus, vol. 36b:232-261.
Fossil fuel, cement, and flaring emissions are estimated in the dataset available at: http://cdiac.ornl.gov/by_new/bysubjec.html#trace
Boden, T.A., G. Marland, and R.J. Andres. 2011. 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.

Cell: HY91
Comment: Rick Heede:
Curiously, the CDIAC data through 2013, if all sopurces are added, as we have done here, total precisely 6 Mt larger than CDIAC's own sum of sources.