

A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Summary of emissions from identified coal production											
2		Richard Heede Climate Accountability Institute 12-Nov-14											
3		Copyright Climate Accountability Institute											
8		Coal											
9		Emission factor											
10		tCO2/tonne											
11		thermal coal = average utility coal (USA)											
12		lignite, brown, or soft coal											
13		sub-bituminous coal											
14		bituminous coal											
15		anthracite											
16		metallurgical											
17		Tonnes CO2 per tonne coal (tCO2/t)											
18		thermal coal = average utility coal											
19		lignite, brown, or soft coal											
20		sub-bituminous coal											
21		bituminous coal											
22		anthracite											
23		metallurgical											
24		Tonnes CO2 per tonne coal (tCO2/t)											
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	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK
1	Summary of emissions from identified coal production																						
2	Richard Heede																						
3	Climate Accountability Institute																						
4	12-Nov-14																						
5																							
6																							
7																							
8	1850s											1860s											
9	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	
10	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	
11	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	
12	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	
13	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	
14	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	
15	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	
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98	198	198	209	216	253	260	278	282	286	304	333	348	352	377	410	436	447	476	491	520	535	572	
99	54	54	57	59	69	71	76	77	78	83	91	95	96	103	112	119	122	130	134	142	146	156	
100																							
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	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ
1	<div style="background-color: yellow; padding: 5px; border: 1px solid black; display: inline-block;"> Summary of emissions from identified coal production </div> Richard Heede Climate Mitigation Services 12-Nov-14																								
2																									
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7																									
8	1870s									1880s									1890s						
9	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896
10	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129
11	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203
12	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814
13	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439
14	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622
15	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665
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90	0.9	1.0	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4
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94	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	5	5	5	5	5	5	6	6	6	6
95																									
96	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
97																									
98	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	1,363	1,440	1,484
99																									
100	173	183	173	187	190	192	194	207	233	239	252	269	271	273	275	287	317	318	345	360	363	358	372	393	405
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	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH
1	Summary of emissions from identified coal production																								
2	Richard Heede Climate Accountability Institute 12-Nov-14																								
3																									
4																									
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7																									
8	1920s								1930s								1940s								
9	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
10	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129
11	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203
12	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814
13	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439
14	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622
15	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665
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48	28	35	43	50	58	65	72	80	87	110	154	190	243	238	276	277	290	360	431	485	540	304	277	320	352
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90																									
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92																									
93																									
94	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
95																									
96	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
97																									
98	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
99																									
100	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
101																									
102	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%
103																									
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	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE	EF	EG
1	Summary of emissions from identified coal production																								
2																									
3																									
4	<div style="display: flex; justify-content: space-between; align-items: center;"> dataset marker Richard Heede Climate Accountability Institute 12-Nov-14 Copyright Climate Accountability Institute </div>																								
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7																									
8	1940s					1950s										1960s									
9	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
10	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129
11	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203
12	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814
13	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439
14	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622
15	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665
16																									
17																									
18																									
19																									
20																									
21																									
22	23	24	25	25	24	26	28	27	28	29	29	31	31	33	33	33	33	34	42	40	39	33	27	30	32
23																									
24																									
25																									
26	488	504	520	536	538	541	544	546	549	535	521	507	494	480	474	469	464	458	453	433	413	393	373	353	344
27																									
28																									
29																									
30																									
31																									
32	47	64	81	98	115	132	219	307	394	482	261	657	744	832	497	497	542	579	597	651	452	596	719	928	934
33																									
34																									
35																									
36																									
37																									
38	38	40	42	44	46	48	52	56	60	77	82	87	92	96	101	106	111	115	120	125	130	134	137	144	123
39	<--- bituminous bituminous & metallurgical ---->																								
40																									
41																									
42	33	32	31	33	43	52	62	71	81	90	100	109	119	128	139	147	154	158	153	153	148	153	162	167	172
43																									
44																									
45																									
46																									
47																									
48	382	448	516	599	614	656	772	880	942	1,034	1,116	1,194	1,220	1,237	1,231	1,247	1,282	1,335	1,393	1,411	1,435	1,434	1,289	1,278	1,318
49																									
50																									
51																									
52																									
53	6	6	7	7	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11
54																									
55																									
56																									
57																									
58																									
59																									
60																									
61																									
62																									
63																									
64																									
65																									
66	9	11	13	15	18	13	13	16	19	22	25	28	31	34	37	41	44	47	50	53	56	59	69	68	52
67																									
68	7	10	13	16	26	21	16	18	22	42	45	43	50	56	58	64	76	91	95	105	109	112	116	132	109
69																									
70																									
71																									
72	142	149	157	165	172	179	186	192	199	206	213	220	226	233	240	247	263	282	290	300	303	319	340	354	369
73																									
74																									
75																									
76																									
77																									
78																									
79																									
80																									
81																									
82																									
83																									
84	5	5	5	5	5	6	6	6	6	6	7	7	8	8	9	10	10	10	11	11	11	11	12	10	9
85																									
86																									
87																									
88																									
89																									
90	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	11	11	11	12	12	12	12	17	17	12
91																									
92																									
93																									
94	1,187	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
95																									
96	324	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
97																									
98	3,635	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
99																									
100	992	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
101																									
102	32.7%	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%
103																									
104																									
105																									
106																									

	FI	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	FU	FV	FW	FX	FY	FZ	GA	GB	GC	GD	GE	
1	Summary of emissions from identified coal production																						Carbon coefficient 2.129 Million tonnes CO2 / million tonnes of coal	
2																							(average utility coal, USA)	
3																							Copyright Climate Accountability Institute	
4																							sums verified, linked to columns D-J and rows 11-16.	
5																								
6																								
7																								
8	2000s												2010s						Sum to 2013		Coal			
9	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Million tonnes CO2					
10	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	2.129	thermal coal = average utility		Tonnes CO2 per tonne produced (tCO2/t)			
11	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	1.203	lignite, brown, or soft coal		Tonnes CO2 per tonne produced (tCO2/t)			
12	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	1.814	sub-bituminous coal		Tonnes CO2 per tonne produced (tCO2/t)			
13	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	2.439	bituminous coal		Tonnes CO2 per tonne produced (tCO2/t)			
14	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	2.622	anthracite		Tonnes CO2 per tonne produced (tCO2/t)			
15	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	2.665	metallurgical		Tonnes CO2 per tonne produced (tCO2/t)			
16																			Sum to 2013					
17																			4,468		Alpha Natural Resources, USA			
18																			6,894		Anglo American, UK			
19																			6,238		Arch Coal Company, USA			
20																			17,742		British Coal Corporation			
21																			918		BP Coal, UK			
22																			6,086		BHP Billiton, Australia			
23																			142,634		China, Peoples Republic			
24																			16,677		Coal India, India			
25																			-		ConocoPhillips (see CONSOL Energy)			
26																			8,457		CONSOL Energy, USA			
27																			1,611		Cyprus Amax, USA			
28																			7,041		Czechoslovakia			
29																			2,254		Czech Republic + Slovakia			
30																			1,317		Exxon Mobil			
31																			63,480		FSU (Former Soviet Union)			
32																			5,112		Kazakhstan			
33																			636		Kerr-McGee Coal (Anadarko), USA			
34																			1,315		Kiewit Mining Group, USA			
35																			1,070		Luminant, USA			
36																			-		Massey Energy, USA (acq. by Alpha)			
37																			1,001		Murray Coal Corporation, USA			
38																			1,183		North American Coal Corp., USA			
39																			2,828		North Korea			
40																			1,725		Occidental, USA			
41																			12,785		Peabody Energy, USA			
42																			1,243		Pittsburgh & Midway Coal (Chevron)			
43																			26,237		Poland			
44																			5,760		Rio Tinto, Australia			
45																			1,049		Ruhrkohle AG (RAG), Germany			
46																			12,551		Russian Federation (not including FSU)			
47																			5,967		RWE, Germany			
48																			3,530		Sasol, South Africa			
49																			2,014		Singareni Collieries Company, India			
50																			778		UK Coal, UK			
51																			3,585		Ukraine			
52																			1,514		Westmoreland Coal, USA			
53																			2,929		Xstrata, Switzerland			
54																			380,629		sum check			
55																			380,629		Emissions from identified prod'n (MtCO2/yr)			
56																			103,878		Emissions from identified prod'n (MtC/yr)			
57																			688,027		CDIAC coal emissions (MtCO2/yr) 1751-2010			
58																			187,771		CDIAC coal emissions (MtC/yr) 1751-2010			
59																			55.3%		Percent of total CDIAC coal emissions identified			
60																			6,993		1,908			
61																			7,284		1,988			
62																			7,638		2,085			
63																			7,871		2,148			
64																			8,616		2,351			
65																			9,174		2,504			
66																			9,944		2,714			
67																			10,425		2,845			
68																			10,842		2,959			
69																			11,265		3,074			
70																			11,412		3,114			
71																			11,997		3,274			
72																			12,330		3,365			
73																			12,845		3,544			
74																			8,618		9,131			
75																			8,673		9,237			
76																			9,131		10,051			
77																			9,237		10,872			
78																			10,051		11,568			
79																			10,872		12,235			
80																			11,568		12,693			
81																			12,235		13,085			
82																			12,693		13,264			
83																			13,085		14,078			
84																			13,264		14,732			
85																			14,078		15,111			
86																			14,732		15,529			
87																			15,111		2,352			
88																			15,529		2,367			
89																			2,352		2,492			
90																			2,367		2,521			
91																			2,492		2,743			
92																			2,521		2,967			
93																			2,743		3,157			
94																			2,967		3,339			
95																			3,157		3,464			
96																			3,339		3,571			
97																			3,464		3,842			
98																			3,571		4,021			
99																			3,842		4,124			
100																			4,021		4,238			
101																			4,124		81.1%			
102																			4,238		84.0%			
103																			81.1%		83.7%			
104																			84.0%		85.2%			
105																			83.7%		85.7%			
106																			85.2%		84.4%			
107																			84.4%		86.0%			
108																			86.0%		85.2%			
109																			85.2%		85.4%			
110																			85.4%		86.1%			
111																			86.1%		86.0%			
112																			86.0%		85.2%			
113																			85.2%		83.7%			
114																			83.7%		85.0%			
115																			85.0%		83.6%			
116																			83.6%					
117																			Total emissions from identified coal producers through 2013 (million tonnes CO2)		380,629			

Cell: FX2

Comment: Rick Heede:

We have calculated carbon coefficients for various coal ranks in the attached worksheet ("Coal C Coefficients") and here apply the coefficient for "average utility coal," which comprises the bulk of the coal mined by the identified coal operators. Where information on coal types and ranks is available in company annual reports, each coal rank and amounts produced are listed in separate columns, permitting more precise estimation of the amount of carbon dioxide emitted by the coal's combustion. EPA (2011) "Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2010," Annex B, Table B2 and Annex 4 (IPCC Reference Approach for Estimating CO2 Emissions from Fossil Fuel Combustion: Tables 4-2 and 4-4. Also see citations and calculations at "Coal Carbon Coefficients" worksheet.

Cell: L18

Comment: Rick Heede:

Are the coal-type percentages linked to each entity's worksheet? And verified?

Cell: EJ22

Comment: Rick Heede:

Since Anglo apparently started mining metallurgical coal in 1974, CMS applies the average metallurgical to thermal coal factor to 1974-2004 only; prior years are applied the thermal coal factor.

Cell: GD92

Comment: Rick Heede:

Xstrata plc's acquisition of Glencore International AG's Australian and South African coal business in March 2002 and its acquisition of M.I.M. Holdings in June 2003. Today Xstrata Coal has interests in over thirty coal mines located in Australia and South Africa and employs around 10,000 people, including contractors.

Cell: GD98

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: $C=12.0107 + O=15.9994 \times 2 = 44.0095/12.0107 = 3.664191$.

Cell: GD100

Comment: Rick Heede:

From the associated "Methods" paper: CDIAC's emissions are estimated for each fuel using the following formula: $CO_2 = (P) (FO) (C)$.

From primary and secondary solid fuel production and trade⁵
 $CO_2s = CO_2$ emissions in 106 metric tons of carbon
 $Ps =$ annual production or consumption in 106 tons coal equivalent⁶
 $FOs = 0.982 \pm 2\%$
 $Cs =$ carbon content in tons C per ton coal equivalent = $0.746 \pm 2\%$.

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 29.31 10⁹ joules." CMS factor of 21 million Btu per short ton = 23.15 million Btu/tonne, and the CDIAC datum (29.31 10⁹ 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 equiv tonne used by CDIAC; the average utility coal factor CMS applies to coal production when coal rank is not specified).

If we "upgrade" CMS's "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 utility coal = 60.1 tonne carbon per tonne of coal times 1.2 = 72.17 kgC/tonne, or 0.7217. Compare CDIAC's carbon factor of $0.746 \pm 2\%$, 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 $CO_2 = (P) (FO) (C)$ without making any adjustment for CDIAC's coal equivalent or fuel oxidation rate for 2000 coal production: $CO_2 = (4,473 \text{ million tonnes of coal produced}) * 0.982 * 0.746 = 3,277 \text{ million tonnes of carbon}$; 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.

Source: 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 10.33334/CDIAC/00001.

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

Cell: GD102

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: GD105

Comment: Rick Heede:

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Cell: GE105

Comment: Rick Heede:

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