Summary of CO2 & methane emissions from identified oil & NGL production

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25-Nov-14

Crude Oil & Natural Gas Liquids

		Production less sequestration		Ancillary emissions from flaring, venting, field use, refining and processing, etc.					
		This study	Percent of CDIAC	Flaring CO2	Vented CO2	Fugitive methane		Fugitive methane	Total oil & NGL emissions
Rank	Entity	MtCO2	Percent	MtCO2	MtCO2	MtCH4		MtCO2e	MtCO2e
			IPCC values (28Dec12)	15.94	3.833	1.924	EPA	40.39	
				kg CO2/tCO2	kg CO2/tCO2	kg CH4/tCO2		kg CO2e/tCO2	
			IPCC values pasted:	15.19	3.651	10.080		211.7	IPCC SAR GWP 21xCO2
		y	y	y	y	y		y	y
1	China, PR (coal & cement only)								
2	FSU (Former Soviet Union)	35,462	6.99%	565	136	68		1,432	37,596
3	ChevronTexaco, USA	37,307	7.35%	595	143	72		1,507	39,552
4	Saudi Aramco, Saudi Arabia	44,449	8.76%	709	170	85		1,795	47,124
5	ExxonMobil, USA	30,495	6.01%	486	117	59		1,232	32,330
6	BP, UK	26,727	5.27%	426	102	51		1,080	28,335
7	Gazprom, Russia	2,256	0.44%	36	9	4		91	2,392
8	Royal Dutch Shell, The Netherlands & UK	21,839	4.30%	348	84	42		882	23,153
9	National Iranian Oil Co., Iran	24,754	4.88%	395	95	48		1,000	26,244
10	Poland								
11	Pemex, Mexico	15,966	3.15%	255	61	31		645	16,926
12	British Coal Corporation, UK								
13	Coal India, India								
14	ConocoPhillips, USA	9,624	1.90%	153	37	19		389	10,203
15	Peabody Energy, USA								
16	Petroleos de Venezuela, Venezuela	11,079	2.18%	177	42	21		448	11,746
17	Russian Federation								
18	Total, France	9,286	1.83%	148	36	18		375	9,844
19	PetroChina (CNPC), China	9,383	1.85%	150	36	18		379	9,948
20	Kuwait Petroleum Corp., Kuwait	10,381	2.05%	166	40	20		419	11,006
21	Abu Dhabi, United Arab Emirates	8,562	1.69%	137	32.8	16		346	9,077
22	Sonatrach, Algeria	4,953	0.98%	79	19	10		200	5,251
23	CONSOL Energy, USA								
24	BHP Billiton, Australia	1,330	0.26%	21	5	3		54	1,410
25	Iraq National Oil Company, Iraq	7,274	1.43%	116	28	14		294	7,712
26	Czechoslovakia								
27	Anglo American, UK								
28	Nigerian National Petroleum, Nigeria	6,203	1.22%	99	24	12		251	6,576
29	Pertamina, Indonesia	4,998	0.99%	80	19	10		202	5,299
30	Petrobras, Brazil	5,570	1.10%	89	21	11		225	5,905
31	Libya National Oil Corp., Libya	6,062	1.19%	97	23	12		245	6,426
32	Arch Coal Company, USA								
33	ENI, Italy	3,583	0.71%	57	14	7		145	3,799
34	RWE, Germany								
35	Rio Tinto, UK								
36	Petronas, Malaysia	2,994	0.59%	48	11	6		121	3,174
37	Kazakhstan								
38	Anadarko, USA	2,574	0.51%	41	10	5		104	2,728
39	Occidental, USA	2,669	0.53%	43	10	5		108	2,829
40	Statoil, Norway	3,259	0.64%	52	12	6		132	3,455
41	Alpha Natural Resources, USA								
42	Qatar Petroleum, Qatar	2,653	0.52%	42	10	5		107	2,812
43	Lukoil, Russia	4,072	0.80%	65	16	8		164	4,317
44	Oil and Gas Corp., India	2,973	0.59%	47	11	6		120	3,152
45	Rosneft, Russian Federation	3,420	0.67%	55	13	7		138	3,626
46	Ukraine								
47	Sasol, South Africa								
48	Repsol, Spain	2,000	0.39%	32	8	4		81	2,120
49	Marathon, USA	1,973	0.39%	31	8	4		80	2,092
50	Xstrata, Switzerland								
51	Egyptian General Petroleum, Egypt	2,040	0.40%	33	8	4		82	2,163
52	North Korea								
53	Petroleum Development Oman, Oman	2,049	0.40%	33	8	4		83	2,172
54	Yukos, Russia	2,645	0.52%	42	10	5		107	2,804
55	Hess, USA	1,596	0.31%	25	6	3		64	1,692
56	Czech Republic								
57	CNOOC, PR China	1,733	0.34%	28	7	3		70	1,837
58	Sonangol, Angola	2,040	0.40%	33	8	4		82	2,162
59	Singareni Collieries, India								
60	Ecopetrol, Colombia	1,683	0.33%	27	6	3		68	1,785
61	Sinopec, China	1,677	0.33%	27	6	3		68	1,778
62	Devon Energy, USA	724	0.14%	12	3	1		29	767
63	EnCana, Canada	542	0.11%	9	2	1		22	575
64	BG Group (British Gas) UK	363	0.07%	6	1	1		15	384
65	Cyprus Amax, USA								
66	Suncor, Canada	1,076	0.21%	17	4	2		43	1,140
67	Westmoreland Mining, USA								
68	Syrian Petroleum, Syria	1,195	0.24%	19	5	2		48	1,267
69	Kiewit Mining Group, USA								
70	Apache, USA	571	0.11%	9	2	1		23	606
71	North American Coal, US								
72	Lafarge, France								
73	Canadian Natural Resources, Canada	631	0.12%	10	2	1		25	669
74	Holcim, Switzerland								
75	Luminant / TXU, USA								
76	Ruhrkohle AG (RAG), Germany								
77	Talisman, Canada	510	0.10%	8	2	1		21	540
78	Murray Coal Corporation, USA								
79	Bahrain Petroleum Corporation	339	0.07%	5	1	1		14	360
80	UK Coal, UK								
81	Husky, Canada	494	0.10%	8	2	1		20	524
82	HeidelbergCement, Germany								
83	Cemex, Mexico								
84	Italcementi								
85	Polish Oil & Gas, Poland	326	0.06%	5	1	1		13	345
86	Murphy Oil, USA	303	0.06%	5	1	1		12	322
87	OMV Group, Austria	248	0.05%	4	1	0		10	263
88	Taiheiyo, Japan								
89	Massey Energy Corporation, US								
90	Nexen, Canada	-	0.00%	-	-	-		-	-
	Total CO2 & methane emissions	388,912	76.65%	6,201	1,491	748		15,710	412,313
		388,912	vertical check					vertical check	412,313
		94.32%		1.50%	0.36%			3.81%	100.00%
		38.35%	of total						

	Oil & NGL CO2		Total EF/Combustion EF:	Flaring CO2		Vented CO2		
This study, MtCO2	388,912	This study, MtCO2		6,431	This study, MtCO2	5,272	This study, MtCO2	y
CDIAC emissions, MtCO2	507,408	CDIAC oil CO2		13,096	CDIAC Flaring CO2	CDIAC includes in gas CO2	CDIAC Flaring CO2	y
	linked to SumOil.xls			linked to CDIAC.xls				
Percent this study of total CDIAC 1751-2010	76.6%	Percent of CDIAC		49.1%	Percent of CDIAC	na	Percent of CDIAC	y

Summary of CO2 & methane emissions from identified natural gas production

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			Natural Gas							
			Production less sequestration		Ancillary emissions from flaring, venting, own use of fuels, and fugitive methane					
			This study	Percent of CDIAC	Flaring CO2	Vented CO2	Fugitive methane	Fugitive methane	Own fuel use	Total natural gas emissions
Rank		Entity	MtCO2	Percent	MtCO2	MtCO2	MtCH4	MtCO2e	MtCO2	MtCO2e
				IPCC values (28Dec12)	1.736	28.53	9.878	207.44	57.26	EPA
					kg CO2/tCO2	kg CO2/tCO2	kg CH4/tCO2	kg CO2e/tCO2	kg CO2e/tCO2	
				IPCC values pasted:	1.525	25.08	3.708	77.9		IPCC SAR GWP 21xCO2
			y	y	10% of oil flaring	y	y	y		y
	2	China, PR (coal & cement only)								
	1	FSU (Former Soviet Union)	17,937	9.16%	31.1	511.80	177.18	3,721	1,027	23,227
	3	ChevronTexaco, USA	8,762	4.47%	15.2	250.00	86.55	1,818	502	11,346
	5	Saudi Aramco, Saudi Arabia	3,337	1.70%	5.8	95.21	32.96	692	191	4,321
	4	ExxonMobil, USA	11,427	5.84%	19.8	326.05	112.88	2,370	654	14,797
	6	BP, UK	6,116	3.12%	10.6	174.50	60.41	1,269	350	7,920
	7	Gazprom, Russia	26,262	13.41%	45.6	749.35	259.42	5,448	1,504	34,009
	8	Royal Dutch Shell, The Netherlands & UK	6,963	3.56%	12.1	198.69	68.79	1,445	399	9,017
	9	National Iranian Oil Co., Iran	4,181	2.13%	7.3	119.29	41.30	867	239	5,414
	10	Poland								
	11	Pemex, Mexico	3,734	1.91%	6.5	106.55	36.89	775	214	4,836
	12	British Coal Corporation, UK								
	15	Coal India, India								
	13	ConocoPhillips, USA	5,676	2.90%	9.9	161.95	56.07	1,177	325	7,350
	16	Peabody Energy, USA								
	14	Petroleos de Venezuela, Venezuela	1,561	0.80%	2.7	44.53	15.42	324	89	2,021
	18	Russian Federation								
	17	Total, France	2,348	1.20%	4.1	66.99	23.19	487	134	3,040
	19	PetroChina (CNPC), China	1,720	0.88%	3.0	49.08	16.99	357	98	2,227
	20	Kuwait Petroleum Corp., Kuwait	537	0.27%	0.9	15.31	5.30	111	31	695
	21	Abu Dhabi, United Arab Emirates	1,602	0.82%	2.8	45.70	15.82	332	92	2,074
	22	Sonatrach, Algeria	3,930	2.01%	6.8	112.13	38.82	815	225	5,089
	23	CONSOL Energy, USA	62	0.03%	0.1	1.77	0.61	13	4	80
	24	BHP Billiton, Australia	493	0.25%	0.9	14.06	4.87	102	28	638
	27	Iraq National Oil Company, Iraq	162	0.08%	0.3	4.61	1.60	34	9	209
	25	Czechoslovakia								
	26	Anglo American, UK								
	32	Nigerian National Petroleum, Nigeria	620	0.32%	1.1	17.70	6.13	129	36	803
	29	Pertamina, Indonesia	1,336	0.68%	2.3	38.11	13.20	277	76	1,730
	33	Petrobras, Brazil	865	0.44%	1.5	24.69	8.55	180	50	1,121
	30	Libya National Oil Corp., Libya	443	0.23%	0.8	12.65	4.38	92	25	574
	35	Arch Coal Company, USA								
	31	ENI, Italy	2,189	1.12%	3.8	62.46	21.62	454	125	2,835
	28	RWE, Germany								
	34	Rio Tinto, UK								
	37	Petronas, Malaysia	2,327	1.19%	4.0	66.39	22.99	483	133	3,013
	39	Kazakhstan								
	36	Anadarko, USA	1,621	0.83%	2.8	46.25	16.01	336	93	2,099
	38	Occidental, USA	534	0.27%	0.9	15.24	5.28	111	31	692
	40	Statoil, Norway	1,273	0.65%	2.2	36.34	12.58	264	73	1,649
	56	Alpha Natural Resources, USA								
	44	Qatar Petroleum, Qatar	1,536	0.78%	2.7	43.82	15.17	319	88	1,989
	42	Lukoil, Russia	327	0.17%	0.6	9.33	3.23	68	19	423
	41	Oil and Gas Corp., India	1,122	0.57%	1.9	32.02	11.09	233	64	1,453
	52	Rosneft, Russian Federation	407	0.21%	0.7	11.62	4.02	84	23	527
	46	Ukraine								
	43	Sasol, South Africa	36	0.02%	0.1	1.02	0.35	7	2	46
	45	Repsol, Spain	1,084	0.55%	1.9	30.94	10.71	225	62	1,404
	48	Marathon, USA	842	0.43%	1.5	24.01	8.31	175	48	1,090
	47	Xstrata, Switzerland								
	51	Egyptian General Petroleum, Egypt	764	0.39%	1.3	21.81	7.55	159	44	990
	50	North Korea								
	53	Petroleum Development Oman, Oman	679	0.35%	1.2	19.37	6.71	141	39	879
	49	Yukos, Russia	41	0.02%	0.1	1.18	0.41	9	2	54
	54	Hess, USA	643	0.33%	1.1	18.35	6.35	133	37	833
	57	Czech Republic								
	72	CNOOC, PR China	284	0.14%	0.5	8.10	2.80	59	16	368
	60	Sonangol, Angola	22	0.01%	0.0	0.63	0.22	5	1	28
	58	Singareni Collieries, India								
	59	Ecopetrol, Colombia	245	0.13%	0.4	7.00	2.42	51	14	318
	65	Sinopec, China	239	0.12%	0.4	6.81	2.36	49	14	309
	63	Devon Energy, USA	963	0.49%	1.7	27.49	9.52	200	55	1,248
	62	EnCana, Canada	1,054	0.54%	1.8	30.08	10.41	219	60	1,365
	64	BG Group (British Gas) UK	1,116	0.57%	1.9	31.84	11.02	232	64	1,445
	61	Cyprus Amax, USA								
	67	Suncor, Canada	390	0.20%	0.7	11.12	3.85	81	22	505
	66	Westmoreland Mining, USA								
	68	Syrian Petroleum, Syria	171	0.09%	0.3	4.87	1.69	35	10	221
	69	Kiewit Mining Group, USA								
	77	Apache, USA	526	0.27%	0.9	15.02	5.20	109	30	682
	70	North American Coal, US								
	74	Lafarge, France								
	76	Canadian Natural Resources, Canada	416	0.21%	0.7	11.88	4.11	86	24	539
	75	Holcim, Switzerland								
	73	Luminant / TXU, USA								
	71	Ruhrkohle AG (RAG), Germany								
	79	Talisman, Canada	437	0.22%	0.8	12.46	4.32	91	25	566
	80	Murray Coal Corporation, USA								
	78	Bahrain Petroleum Corporation	511	0.26%	0.9	14.59	5.05	106	29	662
	81	UK Coal, UK								
	82	Husky, Canada	213	0.11%	0.4	6.07	2.10	44	12	276
	84	HeidelbergCement, Germany								
	85	Cemex, Mexico								
	87	Italcementi								
	86	Polish Oil & Gas, Poland	128	0.07%	0.2	3.66	1.27	27	7	166
	88	Murphy Oil, USA	140	0.07%	0.2	4.00	1.38	29	8	181
	90	OMV Group, Austria	161	0.08%	0.3	4.59	1.59	33	9	208
	89	Taiheiyo, Japan								
	55	Massey Energy Corporation, US								
	83	Nexen, Canada	-	0.00%	-	-	-	-	-	-
		Total CO2 & methane emissions	132,514	67.67%	230	3,781	1,309	27,489	7,588	171,602
			132,514	vertical check						171,602
			77.22%		0.13%	2.20%		16.02%	4.42%	100.00%
			13.07%	of total						

		Natural Gas CO2		Total EF/Combustion EF:		Total Methane		Oil and Natural Gas methane rate	
This study, MtCO2	y	132,514	This study, MtCO2	123.77%	excludes "own fuel use"	75,448	This study, MtCO2e	388,912	1.924
				percent				million tCO2	kgCH4/tCO2
CDIAC emissions, MtCO2	y	195,831	CDIAC gas CO2	1,237.71		122,687	CDIAC CH4, MtCO2e	132,514	9.878
		linked to SumGas.xls		kgCO2e/tCO2		linked to Ancillary "General Non-CO2 data" (CDIAC & EDGAR 1860-2013)			
Percent this study of total CDIAC 1751-2010	y	67.7%	Percent of CDIAC			61.5%	Percent of CDIAC	521,426	3.945

Summary of CO2 & methane emissions from identified coal and cement production

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Rank	Entity	Coal: Coal CO2 emissions: This study MtCO2	Coal: Coal CO2 emissions: Percent of CDIAC	Coal: Fugitive methane emissions: Fugitive methane MtCH4	Coal: Fugitive methane emissions: Fugitive methane MtCO2e	Coal: Total coal emissions MtCO2e	Cement production: Calcining emissions: Cement MtCO2	Cement production: Calcining emissions: Percent of CDIAC Percent
			IPCC values (22Dec12)	4.035	84.73			
				kg CH4/tCO2	kg CO2e/tCO2			
			IPCC values pasted:	4.03	84.73	IPCC SAR GWP 21xCO2		
		y	y	y	y	y	y	y
2	China, PR (coal & cement only)	142,634	20.73%	575	12,085	154,719	12,500	32.64%
1	FSU (Former Soviet Union)	63,480	9.23%	256	5,378	68,858		
3	ChevronTexaco, USA	1,243	0.18%	5	105	1,349		
5	Saudi Aramco, Saudi Arabia							
4	ExxonMobil, USA	1,317	0.19%	5	112	1,429		
6	BP, UK	918	0.13%	4	78	996		
7	Gazprom, Russia							
8	Royal Dutch Shell, The Netherlands & UK							
9	National Iranian Oil Co., Iran							
10	Poland	26,237	3.81%	106	2,223	28,460		
11	Pemex, Mexico							
12	British Coal Corporation, UK	17,742	2.58%	72	1,503	19,245		
15	Coal India, India	16,677	2.42%	67	1,413	18,090		
13	ConocoPhillips, USA							
16	Peabody Energy, USA	12,785	1.86%	52	1,083	13,869		
14	Petroleos de Venezuela, Venezuela							
18	Russian Federation	12,551	1.82%	51	1,063	13,614		
17	Total, France							
19	PetroChina (CNPC), China							
20	Kuwait Petroleum Corp., Kuwait							
21	Abu Dhabi, United Arab Emirates							
22	Sonatrach, Algeria							
23	CONSOL Energy, USA	8,457	1.23%	34	717	9,174		
24	BHP Billiton, Australia	6,086	0.88%	25	516	6,601		
27	Iraq National Oil Company, Iraq							
25	Czechoslovakia	7,041	1.02%	28	597	7,638		
26	Anglo American, UK	6,894	1.00%	28	584	7,478		
32	Nigerian National Petroleum, Nigeria							
29	Pertamina, Indonesia							
33	Petrobras, Brazil							
30	Libya National Oil Corp., Libya							
35	Arch Coal Company, USA	6,238	0.91%	25	528	6,766		
31	ENI, Italy							
28	RWE, Germany	5,967	0.87%	24	506	6,472		
34	Rio Tinto, UK	5,760	0.84%	23	488	6,248		
37	Petronas, Malaysia							
39	Kazakhstan	5,112	0.74%	21	433	5,545		
36	Anadarko, USA	636	0.09%	3	54	690		
38	Occidental, USA	1,725	0.25%	7	146	1,871		
40	Statoil, Norway							
56	Alpha Natural Resources, USA	4,468	0.65%	18	379	4,847		
44	Qatar Petroleum, Qatar							
42	Lukoil, Russia							
41	Oil and Gas Corp., India							
52	Rosneft, Russian Federation							
46	Ukraine	3,585	0.52%	14	304	3,888		
43	Sasol, South Africa	3,530	0.51%	14	299	3,829		
45	Repsol, Spain							
48	Marathon, USA							
47	Xstrata, Switzerland	2,929	0.43%	12	248	3,177		
51	Egyptian General Petroleum, Egypt							
50	North Korea	2,828	0.41%	11	240	3,067		
53	Petroleum Development Oman, Oman							
49	Yukos, Russia							
54	Hess, USA							
57	Czech Republic	2,254	0.33%	9	191	2,445		
72	CNOOC, PR China							
60	Sonangol, Angola							
58	Singareni Collieries, India	2,014	0.29%	8	171	2,184		
59	Ecopetrol, Colombia							
65	Sinopec, China							
63	Devon Energy, USA							
62	EnCana, Canada							
64	BG Group (British Gas) UK							
61	Cyprus Amax, USA	1,611	0.23%	7	137	1,748		
67	Suncor, Canada							
66	Westmoreland Mining, USA	1,514	0.22%	6	128	1,642		
68	Syrian Petroleum, Syria							
69	Kiewit Mining Group, USA	1,315	0.19%	5	111	1,427		
77	Apache, USA							
70	North American Coal, US	1,183	0.17%	5	100	1,283		
74	Lafarge, France						1,232	3.22%
76	Canadian Natural Resources, Canada							
75	Holcim, Switzerland						1,197	3.12%
73	Luminant / TXU, USA	1,070	0.16%	4	91	1,161		
71	Ruhrkohle AG (RAG), Germany	1,049	0.15%	4	89	1,138		
79	Talisman, Canada							
80	Murray Coal Corporation, USA	1,001	0.15%	4	85	1,085		
78	Bahrain Petroleum Corporation							
81	UK Coal, UK	778	0.11%	3	66	844		
82	Husky, Canada							
84	HeidelbergCement, Germany						677	1.77%
85	Cemex, Mexico						630	1.65%
87	Italcementi						544	1.42%
86	Polish Oil & Gas, Poland							
88	Murphy Oil, USA							
90	OMV Group, Austria							
89	Taiheiyo, Japan						427	1.12%
55	Massey Energy Corporation, US	-	0.00%	-	-	-		
83	Nexen, Canada							
	Total CO2 & methane emissions	380,629	55%	1,536	32,250	412,878	17,207	45% y
		380,629 vertical check				412,878 vertical	17,207 vertical check	
		92.19%			7.81%	100.00%	1.70% of total	
		37.54% of total			8.47%			

		Coal CO2		Total EF/Combustion EF:	Coal Methane			Cement	
This study, MtCO2	y	380,629	This study, MtCO2e	108.47%	32,250	This study, MtCO2e	y y	17,207	This study, MtCO2e
				percent				linked to SumCement.xls	
CDIAC emissions, MtCO2	y	688,027	CDIAC coal CO2	1,084.73	76,269	CDIAC CH4, MtCO2e	y y	38,299	CDIAC cement CO2
		linked to SumCoal.xls		kgCO2e/tCO2	linked to CDIAC.xls				
Percent this study of total CDIAC 1751-2010	y	55.3%	Percent of CDIAC		42.3%	Percent of CDIAC	y	44.9%	Percent of CDIAC

Summary of CO2 & methane emissions from identified fossil fuel & cement production

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25-Nov-14

Grand Total of emissions identified in this study

Rank	Entity	Total fuel and cement CO2 emissions: This study MtCO2	This study MtC	Percent of CDIAC Percent	Emissions from flaring, venting, and fugitive methane: Flaring CO2 MtCO2	Vented CO2 MtCO2	Own fuel use MtCO2e	Fugitive methane MtCH4	Fugitive methane MtCO2e	Total CO2 and methane: Total emissions MtCO2e	Percent of this study Percent	% of CDIAC 1751-2013 Percent
		y	y	y	y	y	y	y	y	y	y	y
2	China, PR (coal & cement only)	155,134	42,338	11.15%				575	12,085	167,219	16.49%	10.68%
1	FSU (Former Soviet Union)	116,879	31,898	8.40%	597	648	1,027	502	10,532	129,682	12.79%	8.28%
3	ChevronTexaco, USA	47,312	12,912	3.40%	610	393	502	163	3,430	52,247	5.15%	3.34%
5	Saudi Aramco, Saudi Arabia	47,786	13,041	3.43%	715	266	191	118	2,488	51,445	5.07%	3.29%
4	ExxonMobil, USA	43,239	11,801	3.11%	506	443	654	177	3,714	48,557	4.79%	3.10%
6	BP, UK	33,761	9,214	2.43%	437	277	350	116	2,426	37,251	3.67%	2.38%
7	Gazprom, Russia	28,518	7,783	2.05%	82	758	1,504	264	5,539	36,400	3.59%	2.33%
8	Royal Dutch Shell, The Netherlands & UK	28,802	7,861	2.07%	360	282	399	111	2,327	32,171	3.17%	2.06%
9	National Iranian Oil Co., Iran	28,935	7,897	2.08%	402	214	239	89	1,867	31,658	3.12%	2.02%
10	Poland	26,237	7,160	1.89%				106	2,223	28,460	2.81%	1.82%
11	Pemex, Mexico	19,700	5,376	1.42%	261	168	214	68	1,420	21,762	2.15%	1.39%
12	British Coal Corporation, UK	17,742	4,842	1.28%				72	1,503	19,245	1.90%	1.23%
15	Coal India, India	16,677	4,551	1.20%				67	1,413	18,090	1.78%	1.16%
13	ConocoPhillips, USA	15,300	4,176	1.10%	163	199	325	75	1,566	17,553	1.73%	1.12%
16	Peabody Energy, USA	12,785	3,489	0.92%				52	1,083	13,869	1.37%	0.89%
14	Petroleos de Venezuela, Venezuela	12,640	3,450	0.91%	179	87	89	37	771	13,767	1.36%	0.88%
18	Russian Federation	12,551	3,425	0.90%				51	1,063	13,614	1.34%	0.87%
17	Total, France	11,633	3,175	0.84%	152	103	134	41	862	12,884	1.27%	0.82%
19	PetroChina (CNPC), China	11,103	3,030	0.80%	153	85	98	35	736	12,175	1.20%	0.78%
20	Kuwait Petroleum Corp., Kuwait	10,917	2,980	0.78%	166	55	31	25	531	11,700	1.15%	0.75%
21	Abu Dhabi, United Arab Emirates	10,163	2,774	0.73%	139	79	92	32	678	11,151	1.10%	0.71%
22	Sonatrach, Algeria	8,882	2,424	0.64%	86	131	225	48	1,015	10,340	1.02%	0.66%
23	CONSOL Energy, USA	8,519	2,325	0.61%	0	2	4	35	729	9,254	0.91%	0.59%
24	BHP Billiton, Australia	7,908	2,158	0.57%	22	19	28	32	672	8,649	0.85%	0.55%
27	Iraq National Oil Company, Iraq	7,436	2,029	0.53%	116	32	9	16	327	7,921	0.78%	0.51%
25	Czechoslovakia	7,041	1,922	0.51%				28	597	7,638	0.75%	0.49%
26	Anglo American, UK	6,894	1,881	0.50%				28	584	7,478	0.74%	0.48%
32	Nigerian National Petroleum, Nigeria	6,823	1,862	0.49%	100	41	36	18	379	7,380	0.73%	0.47%
29	Pertamina, Indonesia	6,334	1,729	0.46%	82	57	76	23	479	7,029	0.69%	0.45%
33	Petrobras, Brazil	6,435	1,756	0.46%	90	46	50	19	404	7,026	0.69%	0.45%
30	Libya National Oil Corp., Libya	6,505	1,775	0.47%	97	36	25	16	337	7,000	0.69%	0.45%
35	Arch Coal Company, USA	6,238	1,702	0.45%				25	528	6,766	0.67%	0.43%
31	ENI, Italy	5,772	1,575	0.41%	61	76	125	29	599	6,634	0.65%	0.42%
28	RWE, Germany	5,967	1,628	0.43%				24	506	6,472	0.64%	0.41%
34	Rio Tinto, UK	5,760	1,572	0.41%				23	488	6,248	0.62%	0.40%
37	Petronas, Malaysia	5,321	1,452	0.38%	52	78	133	29	604	6,188	0.61%	0.40%
39	Kazakhstan	5,112	1,395	0.37%				21	433	5,545	0.55%	0.35%
36	Anadarko, USA	4,831	1,318	0.35%	44	56	93	24	494	5,517	0.54%	0.35%
38	Occidental, USA	4,928	1,345	0.35%	43	25	31	17	365	5,392	0.53%	0.34%
40	Statoil, Norway	4,532	1,237	0.33%	54	49	73	19	396	5,104	0.50%	0.33%
56	Alpha Natural Resources, USA	4,468	1,219	0.32%				18	379	4,847	0.48%	0.31%
44	Qatar Petroleum, Qatar	4,188	1,143	0.30%	45	54	88	20	426	4,801	0.47%	0.31%
42	Lukoil, Russia	4,399	1,200	0.32%	65	25	19	11	232	4,740	0.47%	0.30%
41	Oil and Gas Corp., India	4,095	1,118	0.29%	49	43	64	17	353	4,605	0.45%	0.29%
52	Rosneft, Russian Federation	3,827	1,044	0.28%	55	25	23	11	223	4,153	0.41%	0.27%
46	Ukraine	3,585	978	0.26%				14	304	3,888	0.38%	0.25%
43	Sasol, South Africa	3,566	973	0.26%	0	1	2	15	306	3,875	0.38%	0.25%
45	Repsol, Spain	3,084	842	0.22%	34	39	62	15	306	3,524	0.35%	0.23%
48	Marathon, USA	2,815	768	0.20%	33	32	48	12	254	3,182	0.31%	0.20%
47	Xstrata, Switzerland	2,929	799	0.21%				12	248	3,177	0.31%	0.20%
51	Egyptian General Petroleum, Egypt	2,805	765	0.20%	34	30	44	11	241	3,153	0.31%	0.20%
50	North Korea	2,828	772	0.20%				11	240	3,067	0.30%	0.20%
53	Petroleum Development Oman, Oman	2,728	744	0.20%	34	27	39	11	224	3,052	0.30%	0.19%
49	Yukos, Russia	2,686	733	0.19%	42	11	2	5	115	2,858	0.28%	0.18%
54	Hess, USA	2,239	611	0.16%	27	24	37	9	198	2,525	0.25%	0.16%
57	Czech Republic	2,254	615	0.16%				9	191	2,445	0.24%	0.16%
74	CNOOC, PR China	2,017	550	0.14%	28	15	16	6	129	2,205	0.22%	0.14%
60	Sonangol, Angola	2,062	563	0.15%	33	8	1	4	87	2,191	0.22%	0.14%
58	Singareni Collieries, India	2,014	550	0.14%				8	171	2,184	0.22%	0.14%
59	Ecopetrol, Colombia	1,929	526	0.14%	27	13	14	6	119	2,102	0.21%	0.13%
65	Sinopec, China	1,915	523	0.14%	27	13	14	6	117	2,087	0.21%	0.13%
63	Devon Energy, USA	1,687	460	0.12%	13	30	55	11	229	2,015	0.20%	0.13%
62	EnCana, Canada	1,597	436	0.11%	10	32	60	11	241	1,940	0.19%	0.12%
64	BG Group (British Gas) UK	1,479	404	0.11%	8	33	64	12	246	1,830	0.18%	0.12%
61	Cyprus Amax, USA	1,611	440	0.12%				7	137	1,748	0.17%	0.11%
67	Suncor, Canada	1,465	400	0.11%	18	15	22	6	124	1,645	0.16%	0.11%
66	Westmoreland Mining, USA	1,514	413	0.11%				6	128	1,642	0.16%	0.10%
68	Syrian Petroleum, Syria	1,366	373	0.10%	19	9	10	4	84	1,488	0.15%	0.10%
69	Kiewit Mining Group, USA	1,315	359	0.09%				5	111	1,427	0.14%	0.09%
77	Apache, USA	1,098	300	0.08%	10	17	30	6	132	1,287	0.13%	0.08%
70	North American Coal, US	1,183	323	0.08%				5	100	1,283	0.13%	0.08%
74	Lafarge, France	1,232	336	0.09%						1,232	0.12%	0.08%
76	Canadian Natural Resources, Canada	1,047	286	0.08%	11	14	24	5	112	1,208	0.12%	0.08%
75	Holcim, Switzerland	1,197	327	0.09%						1,197	0.12%	0.08%
73	Luminant / TXU, USA	1,070	292	0.08%				4	91	1,161	0.11%	0.07%
71	Ruhrkohle AG (RAG), Germany	1,049	286	0.08%				4	89	1,138	0.11%	0.07%
79	Talisman, Canada	947	258	0.07%	9	14	25	5	111	1,106	0.11%	0.07%
80	Murray Coal Corporation, USA	1,001	273	0.07%				4	85	1,085	0.11%	0.07%
78	Bahrain Petroleum Corporation	851	232	0.06%	6	16	29	6	120	1,022	0.10%	0.07%
81	UK Coal, UK	778	212	0.06%				3	66	844	0.08%	0.05%
82	Husky, Canada	707	193	0.05%	8	8	12	3	64	800	0.08%	0.05%
84	HeidelbergCement, Germany	677	185	0.05%						677	0.07%	0.04%
85	Cemex, Mexico	630	172	0.05%						630	0.06%	0.04%
87	Italcementi	544	148	0.04%						544	0.05%	0.03%
86	Polish Oil & Gas, Poland	454	124	0.03%	5	5	7	2	40	511	0.05%	0.03%
88	Murphy Oil, USA	443	121	0.03%	5	5	8	2	41	503	0.05%	0.03%
90	OMV Group, Austria	409	112	0.03%	4	6	9	2	43	471	0.05%	0.03%
89	Taiheiyo, Japan	427	117	0.03%						427	0.04%	0.03%
55	Massey Energy Corporation, US	-	-	0.00%				-	-	-	0.00%	0.00%
83	Nexen, Canada	-	-	0.00%	-	-	-	-	-	-	0.00%	0.00%
	Total CO2 & methane emissions	919,261	250,877	66.07%	6,431	5,272	7,588	3,593	75,448	1,014,001	100.0%	64.78%

919,261 vertical check | Flaring CO2 | Vented CO2 | Own fuel use | Fugitive methane | Fugitive methane | 1,014,000.7 vertical check

90.66% | 0.63% | 0.52% | 0.75% | 7.44% | 100.00% of total

921,345 (all CO2: combustion, venting, flaring, own fuel, minus cement)

Sum venting, flaring, own fuel use: 2.0%

	Total CO2: fossil fuels (excl. cement, flaring & vented)	Total EF/Comb. EF	Total CO2: fossil fuels, flaring, venting, cement	Total CO2 and methane
This study, MtCO2	902,054 This study: oil, gas, coal combustion	109.48% percent	938,552 This study, MtCO2	1,014,001 This study, MtCO2e
CDIAC emissions, MtCO2	1,391,266 CDIAC: oil, gas, coal combustion	1,095 kgCO2e/tCO2	1,442,661 CDIAC, MtCO2	1,565,348 CDIAC, MtCO2e
Percent this study of total CDIAC 1751-2010	64.8% This study: Percent of CDIAC		65.06% This study: Percent of CDIAC	64.78% Study: % of CDIAC

Cumulative emissions by entity type

Last modified: 25 November 2014

Entity type

Flaring + venting CO2	Flaring + Venting + Own fuel
11,703	19,291

Top Five IOCs (Nov14): 187,778 12.00%

SOE State-Owned Entity
IOC Investor Owned Company
State (coal ministry)

			Unattributed	Unattributed	551,347	% CDIAC
1	State	China, F	China		167,219	10.68%
2	State	FSU (Fo	FSU		129,682	8.28%
3	IOC	Chevror	Chevron		52,247	3.34%
4	SOE	Saudi A	Saudi Aramco		51,445	3.29%
5	IOC	ExxonM	ExxonMobil		48,557	3.10%
6	IOC	BP, UK	BP		37,251	2.38%
7	SOE	Gazpror	Gaprom		36,400	2.33%
8	IOC	Royal D	Royal Dutch Shell		32,171	2.06%
9	SOE	Nationa	National Iranian		31,658	2.02%
10	State	Poland	Poland		28,460	1.82%
11	SOE	Pemex,	Pemex		21,762	1.39%
12	SOE	British (	British Coal		19,245	1.23%
13	SOE	Coal Inc	Coal India		18,090	1.16%
14	IOC	Conoco	ConocoPhillips		17,553	1.12%
15	IOC	Peabod	Peabody		13,869	0.89%
16	SOE	Petrolec	PDVSA		13,767	0.88%
17	State	Russian	Russian Federation		13,614	0.87%
18	IOC	Total, F	Total		12,884	0.82%
19	SOE	PetroCh	PetroChina		12,175	0.78%
20	SOE	Kuwait	Kuwait Petroleum		11,700	0.75%
21	SOE	Abu Dh	Abu Dhabi NOC		11,151	0.71%
22	SOE	Sonatra	Sonatrach		10,340	0.66%
23	IOC	CONSOI	Consol Energy		9,254	0.59%
24	SOE	BHP Bill	BHP Billiton		8,649	0.55%
25	SOE	Iraq Nat	Irac NOC		7,921	0.51%
26	State	Czecho	Czechoslovakia		7,638	0.49%
27	IOC	Anglo A	Anglo American		7,478	0.48%
28	SOE	Nigerian	Nigerian NPC		7,380	0.47%
29	SOE	Pertami	Pertamina		7,029	0.45%
30	SOE	Petrobr	Petrobras		7,026	0.45%
31	SOE	Libya N	Libya NOC		7,000	0.45%
32	IOC	Arch Cc	Arch Coal		6,766	0.43%
33	IOC	ENI, Ital	ENI		6,634	0.42%
34	IOC	RWE, G	RWE		6,472	0.41%
35	IOC	Rio Tint	Rio Tinto		6,248	0.40%
36	SOE	Petrona	Petronas		6,188	0.40%
37	State	Kazakhs	Kazakhstan		5,545	0.35%
38	IOC	Anadarl	Anadarko		5,517	0.35%
39	IOC	Occider	Occidental		5,392	0.34%
40	SOE	Statoil,	Statoil		5,104	0.33%
41	IOC	Alpha N	Alpha		4,847	0.31%
42	SOE	Qatar P	Qatar Petroleum		4,801	0.31%
43	IOC	Lukoil, I	Lukoil		4,740	0.30%
44	SOE	Oil and	Oil & Gas India		4,605	0.29%
45	IOC	Rosnef	Rosneft		4,153	0.27%
46	State	Ukraine	Ukraine		3,888	0.25%
47	IOC	Sasol, S	Sasol		3,875	0.25%
48	IOC	Repsol,	Repsol		3,524	0.23%
49	IOC	Marathc	Marathon		3,182	0.20%
50	IOC	Xstrata	Xstrata		3,177	0.20%
51	SOE	Egyptia	Egyptian Genl Petr		3,153	0.20%
52	State	North K	North Korea		3,067	0.20%
53	SOE	Petrole	PD Oman		3,052	0.19%
54	IOC	Yukos, I	Yukos		2,858	0.18%
55	IOC	Hess, U	Hess		2,525	0.16%
56	State	Czech F	Czech Republic		2,445	0.16%
57	SOE	CNOOC	CNOOC		2,205	0.14%
58	SOE	Sonang	Sonangol		2,191	0.14%
59	SOE	Singare	Singareni Collieries		2,184	0.14%
60	SOE	Ecopetr	EcoPetrol		2,102	0.13%
61	SOE	Sinopec	Sinopec		2,087	0.13%
62	IOC	Devon I	Devon Energy		2,015	0.13%
63	IOC	EnCana	Encana		1,940	0.12%
64	IOC	BG Gro	BG Group		1,830	0.12%
65	IOC	Cyprus	Cyprus		1,748	0.11%
66	IOC	Suncor,	Suncor		1,645	0.11%
67	IOC	Westmc	Westmoreland Mini		1,642	0.10%
68	SOE	Syrian F	Syrian Petroleum		1,488	0.10%
69	IOC	Kiewit I	Kiewit Mining		1,427	0.09%
70	IOC	Apache	Apache		1,287	0.08%
71	IOC	North A	North American Cc		1,283	0.08%
72	IOC	Lafarge	Lafarge		1,232	0.08%
73	IOC	Canadia	Canadian NR		1,208	0.08%
74	IOC	Holcim,	Holcim		1,197	0.08%
75	IOC	Luminar	Luminant		1,161	0.07%
76	IOC	Ruhrkol	RAG		1,138	0.07%
77	IOC	Talisma	Talisman		1,106	0.07%
78	IOC	Murray	Murray Coal		1,085	0.07%
79	SOE	Bahrain	Bahrain NOC		1,022	0.07%
80	IOC	UK Coal	UK Coal		844	0.05%
81	IOC	Husky, (	Husky		800	0.05%
82	IOC	Heidelb	HeidelbergCement		677	0.04%
83	IOC	Cemex,	Cemex		630	0.04%
84	IOC	Italcem	Italcementi		544	0.03%
85	SOE	Polish C	Polish Oil & Gas		511	0.03%
86	IOC	Murphy	Murphy Oil		503	0.03%
87	IOC	OMV Gr	OMV		471	0.03%
88	IOC	Taiheiyo	Taiheiyo		427	0.03%
89	acquired	Massey	Massey		-	0.00%
90	acquired	Nexen,	Nexen		-	0.00%

Carbon Majors total 1,014,001 64.78%

SOE State-Owned Entity
IOC Investor Owned Company
State (coal ministry)

NOT linked (values)
updated and sorted 25 Nov 2014

				% CDIAC
1	IOC	Chevron	52,247	3.34%
2	IOC	ExxonMobil	48,557	3.10%
3	IOC	BP	37,251	2.38%
4	IOC	Royal Dutch Shell	32,171	2.06%
5	IOC	ConocoPhillips	17,553	1.12%
6	IOC	Peabody	13,869	0.89%
7	IOC	Total	12,884	0.82%
8	IOC	Consol Energy	9,254	0.59%
9	IOC	BHP Billiton	8,649	0.55%
10	IOC	Anglo American	7,478	0.48%
11	IOC	Arch Coal	6,766	0.43%
12	IOC	ENI	6,634	0.42%
13	IOC	RWE	6,472	0.41%
14	IOC	Rio Tinto	6,248	0.40%
15	IOC	Anadarko	5,517	0.35%
16	IOC	Occidental	5,392	0.34%
17	IOC	Alpha	4,847	0.31%
18	IOC	Lukoil	4,740	0.30%
19	IOC	Rosneft	4,153	0.27%
20	IOC	Sasol	3,875	0.25%
21	IOC	Repsol	3,524	0.23%
22	IOC	Marathon	3,182	0.20%
23	IOC	Xstrata	3,177	0.20%
24	IOC	Yukos	2,858	0.18%
25	IOC	Hess	2,525	0.16%
26	IOC	Devon Energy	2,015	0.13%
27	IOC	Encana	1,940	0.12%
28	IOC	BG Group	1,830	0.12%
29	IOC	Cyprus	1,748	0.11%
30	IOC	Suncor	1,645	0.11%
31	IOC	Westmoreland Mini	1,642	0.10%
32	IOC	Kiewit Mining	1,427	0.09%
33	IOC	Apache	1,287	0.08%
34	IOC	North American Cc	1,283	0.08%
35	IOC	Lafarge	1,232	0.08%
36	IOC	Canadian NR	1,208	0.08%
37	IOC	Holcim	1,197	0.08%
38	IOC	Luminant	1,161	0.07%
39	IOC	RAG	1,138	0.07%
40	IOC	Talisman	1,106	0.07%
41	IOC	Murray Coal	1,085	0.07%
42	IOC	UK Coal	844	0.05%
43	IOC	Husky	800	0.05%
44	IOC	HeidelbergCement	677	0.04%
45	IOC	Cemex	630	0.04%
46	IOC	Italcementi	544	0.03%
47	IOC	Murphy Oil	503	0.03%
48	IOC	OMV	471	0.03%
49	IOC	Taiheiyo	427	0.03%
50	IOC	Massey	-	0.00%
51	IOC	Nexen	-	0.00%
1	SOE	Saudi Aramco	51,445	3.29%
2	SOE	Gaprom	36,400	2.33%
3	SOE	National Iranian	31,658	2.02%
4	SOE	Pemex	21,762	1.39%
5	SOE	British Coal	19,245	1.23%
6	SOE	Coal India	18,090	1.16%
7	SOE	PDVSA	13,767	0.88%
8	SOE	PetroChina	12,175	0.78%
9	SOE	Kuwait Petroleum	11,700	0.75%
10	SOE	Abu Dhabi NOC	11,151	0.71%
11	SOE	Sonatrach	10,340	0.66%
12	SOE	Irac NOC	7,921	0.51%
13	SOE	Nigerian NPC	7,380	0.47%
14	SOE	Pertamina	7,029	0.45%
15	SOE	Petrobras	7,026	0.45%
16	SOE	Libya NOC	7,000	0.45%
17	SOE	Statoil	5,104	0.33%
18	SOE	Qatar Petroleum	4,801	0.31%
19	SOE	Oil & Gas India	4,605	0.29%
20	SOE	Egyptian Genl Petr	3,153	0.20%
21	SOE	PD Oman	3,052	0.19%
22	SOE	CNOOC	2,205	0.14%
23	SOE	Sonangol	2,191	0.14%
24	SOE	Singareni Collieries	2,184	0.14%
25	SOE	EcoPetrol	2,102	0.13%
26	SOE	Sinopec	2,087	0.13%
27	SOE	Syrian Petroleum	1,488	0.10%
28	SOE	Bahrain NOC	1,022	0.07%
29	SOE	Polish Oil & Gas	511	0.03%
30	State	China	167,219	10.68%
1	State	FSU	129,682	8.28%
2	State	Poland	28,460	1.82%
3	State	Russian Federation	13,614	0.87%
4	State	Czechoslovakia	7,638	0.49%
5	State	Kazakhstan	5,545	0.35%
6	State	Ukraine	3,888	0.25%
7	State	North Korea	3,067	0.20%
8	State	Czech Republic	2,445	0.16%
9				

Carbon Majors total 1,014,001 64.78%

IOC total 337,662 21.57%

SOE total 314,780 20.11%

State total 361,559 23.10%

Total 1,014,001 64.78%

64.78% ck

Top 20 IOCs & SOEs

				% CDIAC
1	ChevronTexa	Chevron	52,247	3.34%
2	Saudi Aramc	Saudi Aramco	51,445	3.29%
3	ExxonMobil, (	ExxonMobil	48,557	3.10%
4	BP, UK	BP	37,251	2.38%
5	Gazprom, Ru	Gazprom	36,400	2.33%
6	Royal Dutch	Royal Dutch Shell	32,171	2.06%
7	National Irani	National Iranian	31,658	2.02%
8	Pemex, Mexic	Pemex	21,762	1.39%
9	Coal India, In	Coal India	18,090	1.16%
10	ConocoPhillip	ConocoPhillips	17,553	1.12%
11	Peabody Ene	Peabody	13,869	0.89%
12	Petroleos de	PDVSA	13,767	0.88%
13	Total, France	Total	12,884	0.82%
14	PetroChina ((	PetroChina	12,175	0.78%
15	Kuwait Petro	Kuwait Petroleum	11,700	0.75%
16	Abu Dhabi, U	Abu Dhabi NOC	11,151	0.71%
17	Sonatrach, A	Sonatrach	10,340	0.66%
18	CONSOL Ene	Consol Energy	9,254	0.59%
19	BHP Billiton, .	BHP Billiton	8,649	0.55%
20	Iraq National	Anglo American	7,921	0.51%
21	Anglo American, UK		7,478	0.48%
22	Nigerian National Petroleum, Nigeri		7,380	0.47%
23	Pertamina, Indonesia		7,029	0.45%
24	Petrobras, Brazil		7,026	0.45%
25	Libya National Oil Corp., Libya		7,000	0.45%
	Top Twenty		458,842	29.31%
	Top Twenty-five		494,754	31.61%

Top 20 investor-owned

1	Chevron	52,247	3.34%
2	ExxonMobil	48,557	3.10%
3	BP	37,251	2.38%
4	Royal Dutch Shell	32,171	2.06%
5	ConocoPhillips	17,553	1.12%
6	Peabody	13,869	0.89%
7	Total	12,884	0.82%
8	Consol Energy	9,254	0.59%
9	BHP Billiton	8,649	0.55%
10	Anglo American	7,478	0.48%
11	Arch Coal	6,766	0.43%
12	ENI	6,634	0.42%
13	RWE	6,472	0.41%
14	Rio Tinto	6,248	0.40%
15	Anadarko	5,517	0.35%
16	Occidental	5,392	0.34%
17	Alpha	4,847	0.31%
18	Lukoil	4,740	0.30%
19	Rosneft	4,153	0.27%
20	Sasol	3,875	0.25%
21	Repsol	3,524	0.23%
22	Marathon	3,182	0.20%
23	Xstrata	3,177	0.20%
24	Yukos	2,858	0.18%
25	Hess	2,525	0.16%
	Top Twenty	294,556	18.82%
	Top Twenty-five	309,822	19.79%

Excludes Yukos (not assigned)

Top 10 IOCs & SOEs	MtCO2	%
	347,132	22.18%

Top 10 IOCs	MtCO2	%
	239,911	15.33%

Top Dozen IOCs	MtCO2	%
	253,311	16.18%

Top 40 IOCs & SOEs	MtCO2	%
#1-47 less 7 Nation-States only	589,940	37.69%
#1-48 less 7 Nation-States & BritCoal	574,219	36.68%

Top 40 IOCs	MtCO2	%
All top 40	331,681	21.19%
Extant (Top 42 less Yuk & Cyp)	328,071	20.96%

All extant IOCs & SOEs	MtCO2	%
All 81 IOCs & SOEs	652,442	41.68%
Yukos, Cyprus, British Coal	27,302	1.74%
Total 78 extant entities	625,140	39.94%
	625,140	39.94%

All extant IOCs	MtCO2	%
All IOCs (incl Yuk & Cyp)	337,662	21.57%
Extant IOCs (all less Yuk & Cyp)	332,122	21.22%

Top 10 all entities	MtCO2	%
All (incl British Coal)	615,088	39.3%

Top 20 all entities	MtCO2	%
All (incl British Coal)	769,748	49.2%

Top 40 all entities	MtCO2	%
All (incl British Coal)	914,479	58.4%

CDIAC global industrial 1751-2010

	MtCO2e	Percent
CO2	1,442,661	92.16%
CH4 (CO2e)	122,687	7.84%
Total	1,565,348	100.0%

Cell BG116 1,565,348

Carbon Majors 1854-2010

	MtCO2e	Percent
CO2	938,552	92.56%
CH4 (CO2e)	75,448	7.44%
Total	1,014,001	100.0%

All SOEs	Percent of CMEs	% CDIAC	
314,780	31.04%	20.11%	All SOEs
293,018	28.90%	18.72%	excl. Brit Coal

States	Percent of CMEs	% CDIAC
361,559	35.66%	23.10%

IOCs	Percent of CMEs	% CDIAC
337,662	21.57%	21.57%

All Carbon Majors	Percent of CMEs	% CDIAC
1,014,001	100%	65%

Data for pie chart:

Total anthropogenic GHG emissions 1751-2010		
Carbon Majors	1,014,001	64.78%
Unattributed Carbon	551,347	35.22%
CDIAC total	1,565,348	

Data for pie chart:

Carbon Majors by entity type &	MtCO2	%
Investor-Owned	337,662	21.57%
State-Owned	314,780	20.11%
Nation-States	361,559	23.10%
Unattributed Carbon	551,347	35.22%
Total CDIAC	1,565,348	100%

excluding British Coal

Top 10 & Top 20 SOEs	MtCO2	%
1 Nexen	-	0.0%
2 Saudi Aramco	51,445	3.3%
3 Gaprom	36,400	2.3%
4 National Iranian	31,658	2.0%
5 British Coal	19,245	1.2%
6 Coal India	18,090	1.2%
7 PDVSA	13,767	0.9%
8 PetroChina	12,175	0.8%
9 Kuwait Petroleum	11,700	0.7%
10 Abu Dhabi NOC	11,151	0.7%
11 Sonatrach	10,340	0.7%
12 Irac NOC	7,921	0.5%
13 Nigerian NPC	7,380	0.5%
14 Pertamina	7,029	0.4%
15 Petrobras	7,026	0.4%
16 Libya NOC	7,000	0.4%
17 Petronas	6,188	0.4%
18 Statoil	5,104	0.3%
19 Qatar Petroleum	4,801	0.3%
20 Oil & Gas India	4,605	0.3%
Top 10 SOEs	205,631	13.14%
Top 20 SOEs	273,023	17.44%

If methane scaled to all CO2

75,448 This study total CH4 (CO2e)

80,490 if scaled to all CO2

5,042 Additional CH4 as CO2e

All CO2 but cement: Combustion venting flaring own fuel

921,345 This study MtCO2

1,404,362 CDIAC

65.606% Percent of CDIAC

Cell: M9
Comment: Rick Heede:
This section sums emissions from combustion of produced crude oil and NGLs reported by identified oil and gas companies (including national oil and gas companies). Non-energy uses of gas are accounted for, and IPCC coefficients are applied to net production and combustion. Emissions of CO2 from company energy use, vented CO2, flaring, and methane sources are also detailed below and in related worksheets.
See production worksheets and production and emissions sums in "SumOil.xls" and "SumGas.xls" and "AncillaryCH4&CO2.xls" for production data, emissions estimates, results, and methodological discussion.

Cell: AA9
Comment: Rick Heede:
This section sums emissions from combustion of produced natural gas reported by identified oil and gas companies (including national oil and gas companies). Non-energy uses of gas are accounted for, and IPCC coefficients are applied to net production and combustion. Emissions of CO2 from company energy use, vented CO2, flaring, and methane sources are also detailed below and in related worksheets.
See production worksheets and production and emissions sums in "SumOil.xls" and "SumGas.xls" and "AncillaryCH4&CO2.xls" for production data, emissions estimates, results, and methodological discussion.

Cell: AL9
Comment: Rick Heede:
See production worksheets ("CoalAngloNorthAmerican.xls" and "CoalPeabodyXstrata.xls") and production and emissions sums in "SumCoal.xls" and "AncillaryCH4&CO2.xls" for production data, emissions estimates, results, and methodological discussion.

Cell: AP9
Comment: Rick Heede:
CMS methodology and results are shown in the worksheets "Cement.xls" and "SumCement.xls". CMS has included the largest six cement manufacturers plus PR China in an industry with relatively few large multinational companies meeting the threshold of > 10 MtC per year, hence our total is a fraction of CDIAC's estimated emissions of CO2 (the CDIAC estimates start in 1928). Most of this project's emissions estimates start in ~1990.

Cell: BI9
Comment: Rick Heede:
This section sums all emissions from identified producers of crude oil (including NGLs), natural gas, coal, and cement manufacturing. Emissions are estimated from primary production data, and account for net non-energy uses and other factors discussed throughout this assemblage of ~one hundred worksheets.
This summary table also sums CO2 emissions from flaring, CO2 emissions from direct venting, and emissions of methane associated with primary production and flaring in oil, gas, and coal operations. Methane gas is converted to CO2-equivalent (at IPCC SAR value of 21 x CO2).
The table sums all emissions sources for each entity, and ranks total emissions in tonnes CO2e and as a percent of total identified emissions. Finally, all estimates are compared to global industrial emissions of CO2 and methane from the CDIAC database of CO2 emissions by fuel, cement, flaring, and methane from ocoal, oil, and natural gas operations.

Cell: H11
Comment: Rick Heede:
Flaring rates are calculated in the worksheet "AncillaryCH4&CO2.xls".
In brief, flaring rate is computed for kg CO2 of flared associated gas per kg CO2 from oil combustion and is based on IPCC Tier 1 default values. See the "Flaring and Venting" worksheet in the AncillaryCO2CH4.xls workbook for details.

Cell: I11
Comment: Rick Heede:
Recent data from the IPCC on venting from petroleum systems is used to compute vented CO2 as a function of CO2 from the combustion of oil and NGLs. See "Flaring and Venting" worksheet in AncillaryCH4&CO2.xls for details. CO2 vented from petroleum operations is small compared to CO2 venting from natural gas operations.

Cell: J11
Comment: Rick Heede:
The US EPA (2012) Draft Inventory of U.S Emissions and Sinks 2010 data on methane emissions from petroleum systems were used to develop a fugitive methane rate as a function of oil & NGL production and combustion (in kg CH4 per tonne CO2 from combusted liquids).
See "Oil and Gas ancillary CH4" worksheet in AncillaryCH4&CO2.xls for details.

Cell: L11
Comment: Rick Heede:
The IPCC Second Assessment Report (SAR) GWP value for methane -- 21xCO2 -- is used throughout.

Cell: V11
Comment: Rick Heede:
CMS reviews numerous estimates of flaring emissions in the oil and gas industries in the worksheets in "AncillaryCH4&CO2.xls". CMS allocates flaring to both oil and gas production, with the preponderance to natural gas flared at oil operations based on IPCC Tier 1 default values.
See "Flaring and Venting" worksheet in the "AncillaryCH4&CO2.xls" workbook for details.

Cell: W11
Comment: Rick Heede:
Vented CO2 from natural gas processing -- chiefly Acid Gas Removal vents at processing plants to meet market specifications -- based on IPCC Tier 1 default values. The CO2 content of raw produced gas varies widely from region to region.
See the "Flaring & Venting" worksheet in "AncillaryCH4&CO2.xls" for details.

Cell: X11
Comment: Rick Heede:
The US EPA (2012) data on methane emissions from natural gas systems were used to develop a fugitive methane rate as a function of natural gas production and combustion (in kg CH4 per tonne CO2 from combusted natural gas).
See "Oil and Gas ancillary CH4" worksheet in AncillaryCH4&CO2.xls for details.
U.S. Environmental Protection Agency (2012) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010, 481 pp., 15 April 2012; www.epa.gov/climatechange/emissions/usinventoryreport.html

Cell: Y11
Comment: Rick Heede:
The IPCC Second Assessment Report (SAR) GWP value for methane -- 21xCO2 -- is used throughout.

Cell: Z11
Comment: Rick Heede:
Globally ~600 Mtoe used in oil and natural gas supply chain, 2004. Compare total production, 2004: 3,879 Mtoe oil, 2,427 Mtoe gas (excl flared gas), total 6,306 Mtoe. IPIECA estimates that 9.5 to 10 percent of world oil and gas production is consumed in the oil and gas supply chain for production, refineries, pipelines, LNG, processing, and transportation. IPIECA, 2007, p. 4.
International Petroleum Industry Environmental Conservation Association (2007) Saving Energy in the Oil and Gas Industry, IPIECA, London, 17 pp.
CMS analyzed ten oil and gas companies (Royal Dutch Shell, Hess, BP, ExxonMobil, ConocoPhillips, Statoil, Petrobras, Chevron, Total, and ENI) GHG submissions to the Carbon Disclosure Project (www.cdproject.net). Of the five companies that provided sufficient detail on Scope 1 "combustion emissions" (thus ignoring flaring, process emissions, vented and fugitive emissions), the average company emitted 10.3 percent as scope 1 combustion emissions compared to the emissions from its oil and gas products, or 103 kg CO2/tCO2 from product emissions. However, CMS has already accounted for the full supply chain of oil production through to combustion of marketed products. We therefore isolate the natural gas proportion of oil and gas producers' energy inputs, which, according to IPIECA (IEA data), comprises 48 percent of total energy inputs, with oil products (such as pet coke, diesel, bunker fuel, refinery gas, residual fuel) supplying 42 percent; the 10 percent remainder is imported electricity and steam. Thus, of the direct fuel inputs, natural gas supplies 53.3 percent and oil products supply 46.7 percent.
See "Entity CDP Scopes 1-3" worksheet in AncillaryCH4&CO2.xls for details, and discussion in Methods & Results Report, Annex B: Methodology.

Cell: AJ11
Comment: Rick Heede:
IPCC Tier 1 default values on methane emissions from coal mining were used to develop a methane rate per tCO2 from coal combustion, including surface and underground mines and post-mining emissions. See the Methodology report and "Coal ancillary CH4" worksheet in AncillaryCO2CH4.xls for details.

Cell: AK11
Comment: Rick Heede:
The IPCC Second Assessment Report (SAR) GWP value for methane -- 21xCO2 -- is used throughout.

Cell: B12
Comment: Rick Heede:
Ranking is based on total emissions of CO2 and methane (column BE).

Cell: D12
Comment: Rick Heede:
CMS has identified a total of 88 company, multinational, and state entities that produce the majority of global carbon dioxide emissions from fossil fuel and cement manufacturing in 2010 as well as cumulatively. (Note: See worksheet "SumSum.xls" for the emissions from identified entities by year from 1854 through 2010.

Cell: Z13
Comment: Rick Heede:
25Nov14: This value modified from previous 59.24 kgCO2/tCO2 to 57.26 kgCO2/tCO2 upon modifying the methane data in AncillaryCH4&CO2 worksheet. This reduced total Own Fuel Use from 7,850 MtCO2 to 7,588 MtCO2 (net minus 262 MtCO2).

Cell: I113
Comment: Rick Heede:
This study's estimate of flaring emissions from all sources (oil and natural gas; CO2 from coal mines are minor and typically not quantified) is compared to CDIAC's historic total. CDIAC begins the flaring dataset in 1950.

Cell: L113
Comment: Rick Heede:
Vented CO2 is estimated in this study, based on IPCC Tier default values (see AncillaryCO2&CH4.xls"). CDIAC, however, does not estimate vented CO2 separately -- instead including a small factor within natural gas combustion estimates (See Marland & Rotty, 1984, Tellus).

Cell: X113

Comment: Rick Heede:
This study's total fugitive and vented methane from oil and natural gas systems and coal mining are summed here and compared to CDIAC's estimate for 1860 to 1969 (Stern & Kaufmann, 1998). CDIAC estimates are average with verisimilar EDGAR estimates for 1970-1995. EDGAR estimates for 1995-2008, plus 2009 and 2010 extrapolated by CMS.

Cell: AK113
Comment: Rick Heede:
Total methane from coal mining, based on Stern & Kaufmann (1998) CH4 estimates 1860-1994. CMS extrapolates for 1995-2010.
Note: the EDGAR methane estimates are an average of 45 percent lower than the S & K estimates for the overlap years 1970-1994.
Note: the coal methane rate used in the carbon majors study is close to the average value of the EDGAR estimates (3.64 kg CH4/tCO2 from coal combustion). See the final report for details.

Cell: BG113
Comment: Rick Heede:
This study's cumulative historic emissions of CO2 and methane attributed to all 88 entities 1854 to 2010 is compared to CDIAC's total 1971-2010.

Cell: CM116
Comment: Rick Heede:

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Cell: CM118
Comment: Rick Heede:

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