

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	
1	CONSOL / CNX, USA		Entity emissions from combustion, venting, flaring, and fugitive methane																										Entity emi												
2			Richard Heede Climate Accountability Institute 18-Oct-20																																						
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13																																									
14																																									
15	Entity CO2 emissions		kg CO2/tCO2																																						
16	Oil & NGLs		MtCO2		linked																																				
17	Natural Gas		MtCO2		linked																																				
18	Coal		MtCO2		linked																																				
19	Combustion total		MtCO2		sum																																				
20	Oil & NGLs: Venting		MtCO2		calculated		3.83		linked																																
21	Oil & NGLs: Flaring		MtCO2		calculated		15.94		linked																																
22	Own fuel use		MtCO2		calculated		57.26		linked																																
23	Natural Gas: Venting		MtCO2		calculated		28.53		linked																																
24	Natural Gas: Flaring		MtCO2		calculated		1.74		linked																																
25	Venting & Flaring total		MtCO2		sum																																				
26																																									
27	Cement		MtCO2		linked																																				
28																																									
29	Total CO2 emissions		MtCO2		sum		8.06		1850-1879																																
30																																									
31																																									
32	Entity methane emissions		kg CH4/tCO2																																						
33	Methane: Oil & NGLs		MtCH4		calculated		1.92		linked																																
34	Methane: Natural Gas		MtCH4		calculated		9.88		linked																																
35	Methane: Coal		MtCH4		calculated		4.03		linked																																
36	Total methane emissions		MtCH4		sum		0.03		1850-1879																																
37																																									
38	Entity methane emissions		GWP																																						
39	Methane: Oil & NGLs		MtCO2e		calculated		28		linked																																
40	Methane: Natural Gas		MtCO2e		calculated		28		linked																																
41	Methane: Coal		MtCO2e		calculated		28		linked																																
42	Total methane emissions		MtCO2e		sum		(per IPCC AR5)																																		
43																																									
44																																									
45	Total attributed emissions		MtCO2e		sum																																				
46																																									
47																																									
48	CDIAC CO2 emissions		MtCO2		Converted to CO2:		4,595																																		
49	Oil, Natural Gas, Coal, Flaring, & Cement		Mt Carbon		Sum 1751-1849:		1,254																																		
50																																									
51	Entity percent of total CO2 emissions		Percent																																						
52																																									
53																																									
54	CDIAC/EDGAR methane		Tg CH4		(MtCH4)																																				
55																																									
56	Entity percent of total methane emissions		Percent																																						
57																																									
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	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD			
1	Emissions from combustion, venting, flaring, and fugitive methane																																					Entity emissions from combustion, venting, flaring, and fugitive methane						
2	Richard Heede Climate Accountability Institute 18-Oct-20																Richard Heede Climate Accountability Institute 18-Oct-20																											
3	CONSOL / CNX, USA																																											
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9																																												
10	1890s					1900s					1900s					1910s					1920s																							
11	1885	1886	1887	1888	1889	1890	1891	1892	1893	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	1921	1922	1923	1924	1925			
12																																												
13																																												
14																																												
15																																												
16	1.3	1.4	1.4	1.5	2	2	2	2	2	2	2	2	2	2	2	6	11	15	15	16	16	16	17	17	18	18	18	19	19	20	20	20	21	21	21	22	22	23	23	23				
17	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	6	11	15	15	16	16	16	17	17	18	18	18	19	19	20	20	20	21	21	21	22	22	23	23	23				
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
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23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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26																																												
27																																												
28																																												
29	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	6	11	15	15	16	16	16	17	17	18	18	18	19	19	20	20	20	21	21	21	22	22	23	23	23				
30																																												
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34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	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
36	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	0.1	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	0.1	0.1	0.1	
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38																																												
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40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
43																																												
44	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	7	12	17	17	17	18	18	19	19	20	20	20	21	21	22	22	23	23	23	24	24	25	25	26	26	26			
45																																												
46																																												
47																																												
48	1,019	1,033	1,081	1,198	1,198	1,304	1,359	1,370	1,356	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	2,942	3,096	3,554	3,525	3,573			
49	278	282	295	327	327	356	371	374	370	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	803	845	970	962	975			
50																																												
51	0.13%	0.13%	0.13%	0.13%	0.13%	0.12%	0.12%	0.13%	0.13%	0.13%	0.13%	0.13%	0.12%	0.12%	0.11%	0.32%	0.51%	0.66%	0.67%	0.64%	0.62%	0.57%	0.61%	0.60%	0.59%	0.59%	0.57%	0.54%	0.61%	0.64%	0.60%	0.58%	0.60%	0.71%	0.63%	0.74%	0.72%	0.64%	0.65%	0.66%				
52																																												
53																																												
54	6.4	6.4	6.8	7.4	7.5	8.0	8.3	8.4	8.2	8.5	9.0	9.3	9.7	10.2	11.2	11.8	12.1	12.4	13.6	13.7	14.4	15.5	17.1	16.3	17.0	17.8	18.1	19.1	20.4	18.4	18.1	19.5	20.6	20.3	17.9	20.6	17.7	19.0	21.3	21.1	21.2			
55																																												
56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
57																																												
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	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	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	
1																																								
2	ve methane																																							
3	Entity emissions from combustion, venting, flaring, and fugitive methane																																							
4	Richard Heede																																							
5	Climate Accountability Institute																																							
6	18-Oct-20																																							
7	CONSOL / CNX, USA															CONSOL / CNX, USA																								
8																																								
9																																								
10						1930s					1930s					1940s					1950s					1960s														
11	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	
12																																								
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16																																								
17	24	24	22	21	19	17	15	13	16	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	52	56	60	77	82	87	92	96	101	106	111	115	
18	24	24	22	21	19	17	15	13	16	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	52	56	60	77	82	87	92	96	101	106	111	115	
19																																								
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22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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29	24	24	22	21	19	17	15	13	16	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	52	56	60	77	82	87	92	96	101	106	111	115	
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34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	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
36	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	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
37																																								
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40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	3	3	3	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	7	9	9	10	10	11	11	12	13
42	3	3	3	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	6	6	7	9	9	10	10	11	11	12	13	
43																																								
44																																								
45	26	27	25	23	21	19	17	15	17	16	18	20	22	25	27	29	31	34	36	38	40	43	45	47	49	52	54	58	63	67	86	91	97	102	107	113	118	123	128	
46																																								
47																																								
48	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	5,383	5,199	5,976	6,475	6,577	6,742	6,834	7,490	7,977	8,318	8,538	8,857	9,345	9,366	9,699	10,248	10,781	
49	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	1,469	1,419	1,631	1,767	1,795	1,840	1,865	2,044	2,177	2,270	2,330	2,417	2,550	2,556	2,647	2,797	2,942	
50																																								
51	0.66%	0.62%	0.57%	0.49%	0.49%	0.49%	0.49%	0.41%	0.44%	0.37%	0.39%	0.41%	0.48%	0.51%	0.51%	0.54%	0.57%	0.59%	0.64%	0.80%	0.80%	0.75%	0.75%	0.81%	0.74%	0.72%	0.74%	0.78%	0.82%	0.80%	0.97%	0.99%	1.02%	1.03%	1.03%	1.08%	1.09%	1.08%	1.07%	
52																																								
53																																								
54	21.2	23.0	22.8	24.4	22.3	19.9	17.9	18.8	20.4	21.0	23.3	24.8	23.4	24.8	26.2	27.0	27.0	27.4	26.9	23.5	24.7	27.6	29.2	28.1	30.4	32.2	32.7	33.1	33.1	35.9	38.4	39.7	40.9	42.7	44.6	44.3	45.1	47.1	49.4	
55																																								
56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.95%	0.95%	0.94%
57																																								
58																																								
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Entity emissions from combustion, venting, flaring, and fugitive methane

Richard Heede
Climate Accountability Institute
18-Oct-20

CONSOL / CNX, USA

	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE	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		
1																																									
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9																																									
10	1960s					1970s									1980s									1990s																	
11	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003		
12																																									
13																																									
14																																									
15																																									
16																																									
17	120	125	130	134	137	144	123	146	136	116	123	125	108	94	113	110	94	105	95	105	96	93	118	123	120	123	124	126	102	158	155	157	163	164	157	156	165	149	136		
18	120	125	130	134	137	144	123	146	136	116	123	125	108	94	113	110	94	105	95	105	96	93	118	123	120	123	124	126	102	158	155	157	163	164	157	157	167	151	138		
19																																									
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23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
26																																									
27																																									
28																																									
29	120	125	130	134	137	144	123	146	136	116	123	125	108	94	113	110	94	105	95	105	96	93	118	123	120	123	124	126	102	158	155	157	163	164	157	157	167	151	138		
30																																									
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34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	0	1	1	1	1	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	
36	0.5	0.5	0.5	0.5	0.6	0.6	0.5	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.7	0.6		
37																																									
38																																									
39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
41	14	14	15	15	15	16	14	16	15	13	14	14	12	11	13	12	11	12	11	12	11	11	13	14	14	14	14	14	12	18	18	18	18	18	19	18	18	19	17	15	
42	14	14	15	15	15	16	14	16	15	13	14	14	12	11	13	12	11	12	11	12	11	11	13	14	14	14	14	14	12	18	18	18	18	18	19	18	18	19	17	16	
43																																									
44																																									
45	134	139	144	150	152	160	137	162	151	129	137	140	120	104	125	122	105	117	105	117	107	104	131	137	134	136	138	141	114	176	173	175	182	183	175	175	187	168	154		
46																																									
47																																									
48	11,282	11,807	12,184	12,849	13,705	14,840	15,440	16,158	17,016	16,943	16,921	17,819	18,308	18,979	19,485	19,392	18,865	18,725	18,903	19,453	20,146	20,433	21,095	21,902	22,232	22,547	23,032	22,313	22,580	22,742	23,232	23,963	24,103	24,018	24,326	25,025	25,235	25,788	27,034		
49	3,079	3,222	3,325	3,507	3,740	4,050	4,214	4,410	4,644	4,624	4,618	4,863	4,996	5,180	5,318	5,292	5,149	5,110	5,159	5,309	5,498	5,576	5,757	5,977	6,067	6,153	6,286	6,089	6,162	6,207	6,340	6,540	6,578	6,555	6,639	6,830	6,887	7,038	7,378		
50																																									
51	1.07%	1.06%	1.06%	1.05%	1.00%	0.97%	0.80%	0.90%	0.80%	0.69%	0.73%	0.70%	0.59%	0.49%	0.58%	0.57%	0.50%	0.56%	0.50%	0.54%	0.48%	0.46%	0.56%	0.56%	0.54%	0.54%	0.54%	0.57%	0.45%	0.70%	0.67%	0.66%	0.68%	0.68%	0.64%	0.63%	0.66%	0.59%	0.51%		
52																																									
53																																									
54	51.3	53.4	54.7	57.2	60.6	86.8	92.3	99.4	112.6	112.5	105.2	117.3	114.8	122.9	119.4	110.5	93.4	92.8	89.4	86.3	87.0	86.8	84.9	92.0	93.2	90.0	89.1	89.9	89.7	90.1	89.9	91.9	89.3	84.0	82.0	82.6	83.0	82.8	88.0		
55																																									
56	0.94%	0.94%	0.96%	0.95%	0.91%	0.67%	0.54%	0.59%	0.49%	0.42%	0.47%	0.43%	0.38%	0.31%	0.38%	0.40%	0.41%	0.46%	0.43%	0.49%	0.44%	0.43%	0.56%	0.54%	0.52%	0.55%	0.56%	0.57%	0.46%	0.71%	0.70%	0.69%	0.74%	0.79%	0.77%	0.78%	0.83%	0.75%	0.65%		
57																																									
58																																									
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60																																									
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	FE	FF	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	GF	GG	GH	GI	GJ	GK	GL
1	Entity emissions from combustion, venting, flaring, and fugitive methane																																	
2	Richard Heede Climate Accountability Institute 18-Oct-20																																	
3	CONSOL / CNX, USA																																	
4																							to 2015		to 2016		to 2017		to 2018					
5																					Cumulative		Cumulative		Cumulative		Cumulative							
6																					MtCO2e		MtCO2e		MtCO2e		MtCO2e							
7																					(except where noted)		(except where noted)		(except where noted)		(except where noted)							
8																					Entity emissions													
9																					Entity CO2 emissions		kg CO2/tCO2		to 2015		to 2016		to 2017		to 2018			
10																					Oil & NGLs		linked											
11																					Natural Gas		linked											
12																					Coal		linked											
13																					Combustion total		sum											
14																																		
15																					Oil & NGLs: Venting		calculated		3.83									
16																					Oil & NGLs: Flaring		calculated		15.94									
17																					Own fuel use		calculated		57.26									
18																					Natural Gas: Venting		calculated		28.53									
19																					Natural Gas: Flaring		calculated		1.74									
20																					Venting & Flaring total		sum											
21																					Cement		linked											
22																					Total CO2 emissions		sum		row 18+24+26									
23																																		
24																					Entity methane emissions		kg CH4/tCO2		to 2015		to 2016		to 2017		to 2018			
25																					Methane: Oil & NGLs		calculated		1.92									
26																					Methane: Natural Gas		calculated		9.88									
27																					Methane: Coal		calculated		4.03									
28																					Total methane emissions		sum											
29																																		
30																					Entity methane emissions		GWP		to 2015		to 2016		to 2017		to 2018			
31																					Methane: Oil & NGLs		calculated		28									
32																					Methane: Natural Gas		calculated		28									
33																					Methane: Coal		calculated		28									
34																					Total methane emissions		sum		(per IPCC SAR)									
35																					Total attributed emissions		sum											
36																																		
37																					CDIAC CO2 emissions		MtCO2											
38																					Oil, Natural Gas, Coal, Flaring, & Cement		Mt Carbon											
39																																		
40																					CDIAC sums December 2019													
41																					Entity percent of total CO2 emissions		Percent											
42																																		
43																					CDIAC/EDGAR methane		Tg CH4											
44																					Entity percent of total CH4 emissions		Percent											
45																																		
46																																		
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Cell: FY48

Comment: Rick Heede:

CAI compares entity emissions to the CDIAC / Global Carbon Project (www.globalcarbonproject.org) annual estimate of carbon dioxide emissions from fossil fuels and cement production. The CAI Carbon Majors methodology is based on the CDIAC methodology; see: Heede, Richard (2019) Carbon Majors: Accounting for carbon and methane emissions 1854-2010 Methods & Results Report, ISBN 978-3-659-57841-0, OmniScriptum, Riga, 148 pp.
 Reference of the full global carbon budget 2019: Pierre Friedlingstein, Matthew W. Jones, Michael O'Sullivan, Robbie M. Andrew, Judith Hauck, Glen P. Peters, Wouter Peters, Julia Pongratz, Stephen Sitch, Corinne Le Quééré, Dorothee C. E. Bakker, Josep G. Canadell, Philippe Ciais, Rob Jackson, Peter Anthoni, Leticia Barbero, Ana Bastos, Vladislav Bastrikov, Meike Becker, Laurent Bopp, Erik Buitenhuis, Naveen Chandra, Frédéric Chevallier, Louise P. Chini, Kim I. Currie, Richard A. Feely, Marion Gehlen, Dennis Gillfillan, Thanos Gkritzalis, Daniel S. Goll, Nicolas Gruber, Sören Gutekunst, Ian Harris, Vanessa Haverd, Richard A. Houghton, George Hurtt, Tatiana Ilyina, Atul K. Jain, Emilie Joetzjer, Jed O. Kaplan, Etsushi Kato, Kees Klein Goldewijk, Jan Ivar Korsbakken, Peter Landschützer, Siv K. Lauvset, Nathalie Lefèvre, Andrew Lenton, Sebastian Lienert, Danica Lombardozzi, Gregg Marland, Patrick C. McGuire, Joe R. Melton, Nicolas Metz, David R. Munro, Julia E. M. S. Nabel, Shin-Ichiro Nakaoka, Craig Neill, Abdirahman M. Omar, Tsunee Ono, Anna Peregon, Denis Pierrot, Benjamin Poulter, Gregor Rehder, Laure Resplandy, Eddy Robertson, Christian Rödenbeck, Roland Séférian, Jörg Schwinger, Naomi Smith, Pieter P. Tans, Hanqin Tian, Bronte Tilbrook, Francesco N Tubiello, Guido R. van der Werf, Andrew J. Wiltshire, Sönke Zaehele. Global Carbon Budget 2019, Earth Syst. Sci. Data, 2019.
<https://doi.org/10.5194/essd-11-1783-2019>
 See also: Gillfillan, D., Marland, G., Boden, T. and Andres, R.: Global, Regional, and National Fossil-Fuel CO2 Emissions.

Cell: FY54

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). CAI uses revised data from EDGAR for 1970-2015, with extrapolation by CAI for 2016-2018 (based on growth of emissions from oil, gas, and coal production). There is a non-linearity at 1969/1970 btw datasets.
 Methane emissions may be revised if a more comprehensive and integrated dataset becomes available.
 Furthermore, the Stern & Kaufman does not estimate methane emissions from oil (only gas-related CH4). The most recent EDGAR Nov19 datasets aggregate methane emissions from the Oil & Gas sector. CAI disaggregates methane from oil and methane from gas on the basis of an earlier EDGAR dataset 1970-2008 that reports CH4 from oil and gas separately. CAI uses this average allocation of ~695% from gas and ~30.5% from oil to estimate methane emissions from both sectors. This, given the fluctuations of methane emissions --the proportion from natural gas increases over time (from 50% in 1970 to 76% in 2008) -- this disaggregation is only approximate.

Stern, David I., & Robert K. Kaufmann (1998) "Annual Estimates of Global Anthropogenic Methane Emissions: 1860-1994," in Trends Online: A Compendium of Data on Global Change, Carbon Dioxide Information Analysis Center, Oak Ridge National Lab., U.S. DOE, Oak Ridge, Tenn., U.S.A. <http://cdiac.esd.ornl.gov/trends/meth/ch4.htm#flaring>

Crippa, M., G. Oreggioni, D. Guizzardi, M. Muntean, E. Schaaf, E. Lo Vullo, E. Solazzo, F. Monforti-Ferrario, J.G.J. Olivier, & E. Vignati (2019) Fossil CO2 and GHG emissions of all world countries - 2019 Report, Publications Office of the European Union, Luxembourg. ISBN 978-92-76-11100-9. https://edgar.jrc.ec.europa.eu/overview.php?VP_GHG