	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN
1																																						
2	, and fugitive methane																										Entity emissions from combustion, venting, flaring, and fugitive methane											
3																																						
4																											Richard Heede											
5																											Climate Accountability Institute											
6																											18-Oct-20											
7				Pemex, Mexico																													Pemex, Mexico					
8																																						
9																																						
10	1920s						1930s							1930s			1940s										1950s											
11	1924	1925	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
12																																						
13																																						
14																																						
15															16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	32	33	34	35	37	38	39	40	43
16																																				18	18	19
17																																						
18															16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	32	33	34	35	37	38	57	59	63
19																																						
20															0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21															0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
22															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
23															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
24															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
25															0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	2	2	3
26																																						
27																																						
28																																						
29															17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	35	36	37	39	59	61	65
30																																						
31																																						
32																																						
33															0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
35															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36															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	0.2	0.3	0.3
37																																						
38																																						
39															1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
40															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	5
41															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42															1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	7	7	8
43																																						
44																																						
45															18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	34	35	37	38	39	41	66	68	73
46																																						
47																																						
48	3,525	3,573	3,606	3,891	3,906	4,195	3,855	3,441	3,104	3,276	3,565	3,759	4,141	4,430	4,188	4,364	4,760	4,884	4,914	5,097	5,068	4,254	4,536	5,104	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
49	962	975	984	1,062	1,066	1,145	1,052	939	847	894	973	1,026	1,130	1,209	1,143	1,191	1,299	1,333	1,341	1,391	1,383	1,161	1,238	1,393	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
50																																						
51	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%	0.40%	0.40%	0.39%	0.40%	0.42%	0.42%	0.45%	0.55%	0.54%	0.50%	0.49%	0.53%	0.48%	0.46%	0.47%	0.48%	0.49%	0.46%	0.45%	0.45%	0.45%	0.67%	0.65%	0.70%
52																																						
53																																						
54	21.1	21.2	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
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	0.01	0.01	0.01
57																																						
58																																						
59																																						
60																																						
61																																						

Entity emissions from combustion, venting, flaring, and fugitive methane

Richard Heede
Climate Accountability Institute

18-Oct-20

Pemex, Mexico

	DO	DP	DQ	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
10	1960s					1960s			1970s										1980s										1990s										
11	1962	1963	1964	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
15	45	47	48	52	50	56	60	63	66	66	68	71	89	109	121	151	180	199	263	313	319	324	329	334	339	344	341	341	358	376	361	362	426	416	445	462	475	453
16	20	21	26	26	25	31	31	33	36	34	34	36	40	42	41	46	50	57	69	79	77	76	74	72	70	68	68	70	71	71	70	70	71	73	82	87	93	93
18	65	68	74	78	76	86	90	95	102	100	103	107	128	151	162	196	230	256	333	393	396	399	403	406	409	413	409	410	429	447	432	432	497	489	527	550	568	547
20	0	0	0	0	0	0	0	0	0	0	0	0	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	2
21	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	3	4	5	5	5	5	5	5	5	5	5	6	6	6	6	7	7	7	7	8	7
22	1	1	2	1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5
23	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
24	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
25	3	3	3	3	3	4	4	4	4	4	4	5	5	6	6	7	8	9	11	13	13	13	13	13	13	13	13	13	13	14	13	13	15	15	16	17	18	17
29	68	71	78	81	79	90	94	99	106	105	107	112	134	157	168	203	238	265	344	406	409	412	416	419	422	425	421	423	442	461	445	446	511	504	543	566	586	564
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	0.3	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.8	0.9	1.2	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.5	1.5	1.7	1.7	1.8	1.8
39	2	3	3	3	3	3	3	3	4	4	4	4	5	6	7	8	10	11	14	17	17	17	18	18	18	19	18	18	19	20	19	20	23	22	24	25	26	24
40	5	6	7	7	7	8	9	9	10	9	9	10	11	12	11	13	14	16	19	22	21	21	20	20	19	19	19	19	20	20	19	19	20	20	23	24	26	26
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	8	8	10	10	10	11	12	12	13	13	13	14	16	18	18	21	24	26	33	39	39	38	38	38	38	37	37	38	39	40	39	39	42	43	47	49	51	50
45	76	80	88	91	89	102	106	112	119	118	120	126	149	175	186	224	262	292	377	445	448	451	454	457	460	463	459	461	481	501	484	485	554	546	590	615	637	614
48	9,699	10,248	10,781	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
49	2,647	2,797	2,942	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
51	0.70%	0.69%	0.72%	0.72%	0.67%	0.74%	0.73%	0.72%	0.71%	0.68%	0.66%	0.66%	0.79%	0.93%	0.94%	1.11%	1.25%	1.36%	1.77%	2.15%	2.18%	2.18%	2.14%	2.08%	2.07%	2.02%	1.92%	1.90%	1.96%	2.00%	1.99%	1.97%	2.25%	2.17%	2.27%	2.35%	2.44%	2.32%
54	45.1	47.1	49.4	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
56	0.63%	0.64%	0.72%	0.69%	0.65%	0.75%	0.73%	0.73%	0.55%	0.50%	0.47%	0.44%	0.50%	0.59%	0.54%	0.64%	0.68%	0.79%	1.08%	1.48%	1.48%	1.53%	1.58%	1.55%	1.55%	1.57%	1.44%	1.44%	1.55%	1.60%	1.54%	1.55%	1.68%	1.69%	1.81%	1.96%	2.19%	2.19%

Entity emissions from combustion, venting, flaring, and fugitive methane

Richard Heede
Climate Accountability Institute
18-Oct-20

Pemex, Mexico

2000s										2010s											Cumulative		Entity emissions					to 2015	to 2016
2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020		MtCO2e						Cumulative	Cumulative
																					(except where noted)	V (V = verified)						MtCO2e	MtCO2e
																												(except where noted)	(except where noted)
																							Entity CO2 emissions			kg CO2/tCO2		to 2015	to 2016
468	483	486	514	519	510	499	471	428	403	400	398	395	391	378	351	333	302	281			V	17,611	Oil & NGLs	MtCO2	linked			16,695	17,028
91	88	86	88	89	94	104	84	83	87	87	88	85	86	85	79	72	63	58			V	3,786	Natural Gas	MtCO2	linked			3,594	3,665
																						-	Coal	MtCO2	linked			-	-
559	571	572	601	608	604	604	554	511	489	488	486	480	477	463	431	405	365	338				21,397	V Combustion total	MtCO2	sum			20,288	20,693
2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1				67	Oil & NGLs: Venting	MtCO2	calculated	3.83	linked	64	65
7	8	8	8	8	8	8	8	7	6	6	6	6	6	6	6	5	5	4				281	Oil & NGLs: Flaring	MtCO2	calculated	15.94	linked	266	272
5	5	5	5	5	5	6	5	5	5	5	5	5	5	5	5	4	4	3				217	Own fuel use	MtCO2	calculated	57.26	linked	206	210
3	3	2	3	3	3	3	2	2	2	2	3	2	2	2	2	2	2	2				108	Natural Gas: Venting	MtCO2	calculated	28.53	linked	103	105
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				7	Natural Gas: Flaring	MtCO2	calculated	1.74	linked	6	6
17	17	17	18	18	18	19	17	16	16	16	16	15	15	15	14	13	11	11				680	Venting & Flaring total	MtCO2	sum			645	658
																						-	Cement	MtCO2	linked				
576	588	589	619	626	622	623	571	527	505	503	502	496	492	478	445	418	377	349			V	22,076	Total CO2 emissions	MtCO2	sum	row 18+24+26		20,933	21,351
																							Entity methane emissions			kg CH4/tCO2			
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				34	Methane: Oil & NGLs	MtCH4	calculated	1.92	linked	32	33
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				37	Methane: Natural Gas	MtCH4	calculated	9.88	linked	35	36
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				-	Methane: Coal	MtCH4	calculated	4.03	linked	-	-
1.8	1.8	1.8	1.9	1.9	1.9	2.0	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.3	1.2	1.1			V	71	V Total methane emissions	MtCH4	sum			68	69
																							Entity methane emissions			GWP			
25	26	26	28	28	27	27	25	23	22	22	21	21	21	20	19	18	16	15				948	Methane: Oil & NGLs	MtCO2e	calculated	28		899	917
25	24	24	24	25	26	29	23	23	24	24	24	24	24	23	22	20	17	16				1,047	Methane: Natural Gas	MtCO2e	calculated	28		994	1,014
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				-	Methane: Coal	MtCO2e	calculated	28		-	-
50	50	50	52	53	53	56	48	46	46	46	46	45	45	44	41	38	34	31				1,996	Total methane emissions	MtCO2e	sum	(per IPCC SAR)		1,893	1,931
627	638	639	671	678	675	679	619	572	550	549	548	541	537	521	485	456	410	380			V	24,072	V Total attributed emissions	MtCO2e	sum			22,826	23,282
25,025	25,235	25,788	27,034	28,308	29,264	30,231	31,135	31,854	31,414	33,018	34,136	34,660	34,825	35,089	35,106	35,251	35,681	36,443			V	1,612,851	CDIAC CO2 emissions	MtCO2				1,505,476	1,540,727
6,830	6,887	7,038	7,378	7,726	7,986	8,250	8,497	8,693	8,573	9,011	9,316	9,459	9,504	9,576	9,581	9,620	9,738	9,946			V	440,166	Oil, Natural Gas, Coal, Flaring, & Cement	Mt Carbon					
																						CDIAC sums December 2019							
2.30%	2.33%	2.29%	2.29%	2.21%	2.13%	2.06%	1.83%	1.65%	1.61%	1.52%	1.47%	1.43%	1.41%	1.36%	1.27%	1.19%	1.06%	0.96%				1.37%	Entity percent of total CO2 emissions	Percent				1.39%	1.39%
82.6	83.0	82.8	88.0	91.7	94.7	98.4	99.5	101.2	99.9	105.1	109.5	113.4	115.2	118.2	117.8	118.4	120.0	122.7			V	6,971	CDIAC/EDGAR methane	Tg CH4				6,610	6,728
2.18%	2.16%	2.16%	2.11%	2.05%	2.01%	2.02%	1.74%	1.62%	1.63%	1.55%	1.50%	1.41%	1.39%	1.32%	1.24%	1.14%	1.00%	0.90%				1.02%	Entity percent of total CH4 emissions	Percent				1.02%	1.02%

Cell: FY48
Comment: Rick Heede:
CAI compares entity emissions to the CDIAC / Global Carbon Project (www.globalcarbonproject.org) annual estimate of carbon dioxideee emissions from fossil fuels and cement production. The CAI Carbon Majors methodology is based on the CDIAC methdology; 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 Quéré, 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 Gilfillan, 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 Metzl, David R. Munro, Julia E. M. S. Nabel, Shin-Ichiro Nakaoka, Craig Neill, Abdirahman M. Omar, Tsuneo 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 Zaehle. Global Carbon Budget 2019, Earth Syst. Sci. Data, 2019. https://doi.org/10.5194/essd-11-1783-2019
See also: Gilfillan, 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 rom 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 dataasets.
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

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