

	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										Entity emissions from combustion, venting, flaring, and fugitive methane																													
3																																								
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6																																								
7	Sonatrach, Algeria										Sonatrach, Algeria																													
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	
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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	0.00%	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%	0.03%	0.05%	0.07%	0.07%	0.23%
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	
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Entity emissions from combustion, venting, flaring, and fugitive methane

Richard Heede
Climate Accountability Institute
18-Oct-20

Sonatrach, Algeria

	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		
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	1960s					1970s					1980s					1990s					1990s																				
	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		
11																																									
12																																									
13																																									
14																																									
15	25	32	38	43	47	52	41	57	60	57	57	64	70	77	79	73	69	70	69	77	81	86	86	85	97	108	109	105	102	102	104	111	116	112	104	110	106	115	191		
16	2	2	2	3	4	4	4	4	6	8	14	15	16	17	18	19	36	45	64	68	69	69	79	82	124	85	86	98	95	95	98	108	112	110	114	123	123	142	152		
17																																									
18	27	35	40	46	50	56	45	61	67	65	71	79	86	94	96	92	105	115	134	145	150	155	164	167	221	193	195	203	198	197	202	219	228	222	217	233	230	257	342		
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
21	0	1	1	1	1	1	1	1	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	3
22	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	3	4	4	4	4	5	5	7	5	5	6	5	5	6	6	6	6	6	7	7	7	8	9	
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2	2	4	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	4	
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	0	0	0
25	1	1	1	1	1	1	1	2	2	2	2	3	3	3	3	3	5	5	7	7	8	8	9	9	13	10	10	11	10	10	11	12	12	12	12	13	13	15	17		
26																																									
27																																									
28																																									
29	27	35	41	48	51	57	46	63	69	67	73	82	89	97	99	95	109	120	141	153	158	162	173	176	233	202	205	214	208	207	212	230	240	234	229	246	242	272	359		
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
34	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	1	1	1
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
37																																									
38																																									
39	1	2	2	2	3	3	2	3	3	3	3	3	4	4	4	4	4	4	4	4	4	5	5	5	5	6	6	6	5	5	6	6	6	6	6	6	6	6	6	10	
40	1	1	1	1	1	1	1	1	2	2	4	4	4	4	5	5	5	10	12	18	19	19	19	22	23	34	23	24	27	26	26	27	30	31	31	31	34	34	39	42	
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	2	2	3	3	3	4	3	4	5	5	7	7	8	9	9	9	14	16	22	23	24	24	26	27	39	29	30	33	32	32	33	36	37	37	37	40	40	45	52		
43																																									
44																																									
45	29	38	44	51	55	61	49	67	74	72	80	89	97	105	109	104	123	136	162	176	181	186	199	204	273	232	235	246	240	239	245	266	277	271	266	286	282	317	412		
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	0.24%	0.30%	0.34%	0.37%	0.37%	0.39%	0.30%	0.39%	0.40%	0.39%	0.43%	0.46%	0.48%	0.51%	0.51%	0.49%	0.58%	0.64%	0.74%	0.79%	0.78%	0.79%	0.82%	0.80%	1.05%	0.90%	0.89%	0.96%	0.92%	0.91%	0.91%	0.96%	0.99%	0.97%	0.94%	0.98%	0.96%	1.05%	1.33%		
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	0.13%	0.16%	0.18%	0.20%	0.21%	0.16%	0.13%	0.15%	0.16%	0.17%	0.23%	0.23%	0.25%	0.25%	0.27%	0.30%	0.52%	0.62%	0.86%	0.95%	0.97%	0.97%	1.11%	1.06%	1.51%	1.16%	1.19%	1.30%	1.27%	1.26%	1.30%	1.39%	1.49%	1.55%	1.61%	1.73%	1.71%	1.96%	2.12%		
57																																									
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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	Sonatrach, Algeria																																		
4																																			
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7																																			
8																																			
9																																			
10	2000s															2010s										Cumulative									
11	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	MtCO2e		Entity emissions						to 2015		to 2016		to 2017		to 2018			
12	(except where noted)																	(V = verified)		Cumulative MtCO2e		Cumulative MtCO2e		Cumulative MtCO2e		Cumulative MtCO2e		(except where noted)		(except where noted)		(except where noted)		(except where noted)	
13																																			
14																																			
15	164	183	183	184	186	168	169	173	158	155	150	164	155	144	141	5,707	Entity CO2 emissions						to 2015		to 2016		to 2017		to 2018						
16	159	170	176	177	176	157	159	146	146	147	147	242	176	179	181	4,855	Oil & NGLs		to 2015		to 2016		to 2017		to 2018										
17																		Natural Gas		5,267		5,422		5,566		5,707									
18																		Coal		4,319		4,495		4,674		4,855									
19																		Combustion total		9,586		9,917		10,239		10,561									
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22	Oil & NGLs: Venting		to 2015		to 2016		to 2017		to 2018										
21	3	3	3	3	3	3	3	3	3	2	2	3	2	2	2	91	Oil & NGLs: Flaring		20		21		22												
22	9	10	10	10	10	9	9	8	8	8	8	14	10	10	10	278	Own fuel use		84		86		89												
23	5	5	5	5	5	4	5	4	4	4	4	7	5	5	5	139	Natural Gas: Venting		247		257		268												
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	Natural Gas: Flaring		123		128		133												
25	17	18	19	19	19	17	17	16	16	16	16	24	18	18	19	538	Venting & Flaring total		7		8		8												
26																		Cement		482		501		519		538									
27																		Total CO2 emissions		10,068		10,418		10,759		11,099									
28																		Total CO2 emissions		11,099															
29	340	372	377	380	381	342	346	335	319	319	313	431	350	341	341	11	Entity methane emissions		to 2015		to 2016		to 2017		to 2018										
30																		Methane: Oil & NGLs		10		10		11		11									
31																		Methane: Natural Gas		43		44		46		48									
32																		Methane: Coal		-		-		-		-									
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	Total methane emissions		53		55		57												
34	2	2	2	2	2	2	2	1	1	1	1	2	2	2	2	59																			
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																				
36	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2																				
37																		Methane: Oil & NGLs		284		292		300		307									
38	9	10	10	10	10	9	9	9	9	8	8	9	8	8	8	307	Methane: Natural Gas		1,195		1,243		1,293												
39	44	47	49	49	49	43	44	40	40	41	41	67	49	49	50	1,343	Methane: Coal		-		-		-												
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,650	Total methane emissions		1,478		1,535		1,592												
41	53	57	58	59	59	53	53	50	49	49	49	76	57	57	58																				
42																		Total attributed emissions		11,546		11,953		12,351		12,749									
43																		Total attributed emissions		12,749															
44	393	429	436	439	440	395	399	385	368	368	362	506	407	398	398	1,612,851	CDIAC CO2 emissions		to 2015		to 2016		to 2017		to 2018										
45																		Oil, Natural Gas, Coal, Flaring, & Cement		1,505,476		1,540,727		1,576,408		1,612,851									
46	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	440,166	Entity percent of total CO2 emissions		0.67%		0.68%		0.68%												
47	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	0.69%																			
48	1.20%	1.27%	1.25%	1.22%	1.20%	1.09%	1.05%	0.98%	0.92%	0.91%	0.89%	1.23%	0.99%	0.96%	0.93%	6,971	CDIAC/EDGAR methane		to 2015		to 2016		to 2017		to 2018										
49	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	0.85%	Entity percent of total CH4 emissions		6.61%		6.72%		6.84%		6.97%										
50	2.06%	2.14%	2.12%	2.11%	2.07%	1.88%	1.81%	1.62%	1.54%	1.52%	1.48%	2.30%	1.72%	1.70%	1.68%			0.80%		0.81%		0.83%		0.85%											
51																																			
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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 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 Gillilan, 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: Gillilan, 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