



	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		
1	<b>Entity emissions from combustion, venting, flaring, and fugitive methane</b>																																	<b>Entity emis</b>						
2																																								
3	Richard Heede																																							
4	Climate Accountability Institute																																							
5	25-Jan-20																																							
6																																								
7	<b>Petróleos de Venezuela, S.A.</b>																																							
8																																								
9																																								
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		
12																																								
13																																								
14																																								
15	43	44	46	47	46	48	49	49	50	48	44	46	40	32	248	243	235	256	242	234	212	202	201	189	204	200	217	219	244	272	272	284	301	322	343	379	367	335		
16	1.1	1.2	1.3	1	1	2	2	2	2	2	2	2	3	2	21	24	27	30	33	24	26	25	26	26	29	28	28	33	38	40	38	41	44	45	49	52	58	51		
17																																								
18	45	45	47	48	47	50	50	50	52	50	46	48	43	34	269	266	262	285	274	258	238	226	227	215	233	228	245	252	282	311	310	325	345	367	391	431	425	385		
19																																								
20	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	1	1	
21	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	4	4	4	5	5	5	5	6	6	5	
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	
23	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	2	1	
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
25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	7	7	8	8	7	6	6	6	6	7	6	7	7	8	9	9	9	10	10	11	12	12	11		
26																																								
27																																								
28																																								
29	45	46	48	49	48	51	52	51	53	51	47	49	44	35	276	273	269	293	282	265	244	232	234	221	240	235	252	259	290	320	319	334	355	378	402	443	437	397		
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	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.1	1.1	1.2	1.3	1.1		
37																																								
38																																								
39	2	2	2	3	2	3	3	3	3	3	2	2	2	2	13	13	13	14	13	13	11	11	11	10	11	11	12	12	13	15	15	15	16	17	18	20	20	18		
40	0	0	0	0	0	0	0	0	1	1	1	1	1	1	6	7	7	8	9	7	7	7	7	7	7	8	8	8	9	10	11	11	11	12	13	13	14	16	14	
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
42	3	3	3	3	3	3	3	3	3	3	3	3	3	2	19	20	20	22	22	19	19	18	18	17	19	19	21	24	26	25	27	28	30	32	35	36	32			
43																																								
44																																								
45	48	49	51	52	51	54	55	55	57	54	50	52	47	37	295	293	289	315	304	285	263	250	252	239	259	253	271	280	314	346	344	360	383	407	434	478	473	429		
46																																								
47																																								
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		
50																																								
51	0.47%	0.45%	0.45%	0.44%	0.41%	0.42%	0.40%	0.38%	0.36%	0.33%	0.29%	0.29%	0.26%	0.21%	1.55%	1.49%	1.42%	1.50%	1.45%	1.41%	1.30%	1.23%	1.20%	1.10%	1.17%	1.11%	1.15%	1.16%	1.29%	1.39%	1.43%	1.48%	1.56%	1.63%	1.68%	1.84%	1.82%	1.63%		
52																																								
53																																								
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		
55																																								
56	0.21%	0.21%	0.21%	0.20%	0.19%	0.20%	0.19%	0.18%	0.13%	0.12%	0.11%	0.10%	0.09%	0.08%	0.58%	0.61%	0.58%	0.66%	0.71%	0.74%	0.71%	0.71%	0.75%	0.72%	0.78%	0.78%	0.75%	0.80%	0.94%	1.03%	1.00%	1.06%	1.12%	1.19%	1.24%	1.39%	1.52%	1.40%		
57																																								
58																																								
59																																								
60																																								
61																																								

	FA	FB	FC	FD	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					
1	<b>Emissions from combustion, venting, flaring, and fugitive methane</b>																																		
2	Richard Heede Climate Accountability Institute [25-Jan-20]																																		
3																																			
4																																			
5																																			
6																																			
7	<b>Petróleos de Venezuela, S.A.</b>																																		
8																																			
9																																			
10	<b>2000s</b>										<b>2010s</b>										<b>Cumulative</b>														
11	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>MtCO2e</b>		<b>Entity emissions</b>											
12																							(except where noted)		V (V = verified)										
13																																			
14																																			
15	373	360	315	278	308	309	296	289	319	294	302	339	337	336	364	360	322	276	205	V	12,911	<b>Entity CO2 emissions</b>													
16	52	57	50	43	48	50	46	51	47	44	44	38	48	38	41	49	52	56	47	V	1,761	<b>Oil &amp; NGLs</b>	MtCO2	linked	<b>kg CO2/tCO2</b>										
17																							-		<b>Natural Gas</b>	MtCO2	linked	<b>Oil &amp; NGLs: Venting</b>	MtCO2	calculated	3.83	linked			
18	425	417	365	321	356	359	342	340	366	339	347	377	385	375	405	409	374	332	252	V	14,672	<b>Coal</b>	MtCO2	linked	<b>Oil &amp; NGLs: Flaring</b>	MtCO2	calculated	15.94	linked						
19																							-		<b>Combustion total</b>	MtCO2	sum	<b>Own fuel use</b>	MtCO2	calculated	57.26	linked			
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	49		<b>Natural Gas: Venting</b>	MtCO2	calculated	28.53	linked									
21	6	6	5	4	5	5	5	5	5	5	5	5	5	5	6	6	5	4	3	206		<b>Natural Gas: Flaring</b>	MtCO2	calculated	1.74	linked									
22	3	3	3	2	3	3	3	3	3	3	3	3	2	3	2	2	3	3	3	101		<b>Venting &amp; Flaring total</b>	MtCO2	sum	<b>Cement</b>	MtCO2	linked								
23	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	50		<b>Total CO2 emissions</b>	MtCO2	sum	<b>row 18+24+26</b>										
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3		<b>Entity methane emissions</b>	MtCO2	sum	<b>Methane: Oil &amp; NGLs</b>	MtCH4	calculated	1.92	linked						
25	12	12	11	9	10	10	10	10	10	10	10	10	11	10	11	11	11	10	8	410		<b>Methane: Natural Gas</b>	MtCH4	calculated	9.88	linked									
26																																			
27																																			
28																																			
29	437	429	376	330	366	369	352	350	377	348	357	387	396	385	416	420	385	342	260	V	15,082	<b>Methane: Coal</b>	MtCH4	calculated	4.03	linked									
30																																			
31																																			
32																																			
33	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	25		<b>Total methane emissions</b>	MtCH4	sum	<b>GWP</b>										
34	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	17		<b>Methane: Oil &amp; NGLs</b>	MtCO2e	calculated	28	linked								
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		<b>Methane: Natural Gas</b>	MtCO2e	calculated	28	linked									
36	1.2	1.3	1.1	1.0	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.1	1.0	1.1	1.2	1.1	1.1	0.9	V	42	<b>Methane: Coal</b>	MtCO2e	calculated	28	linked										
37																																			
38																																			
39	20	19	17	15	17	17	16	16	17	16	16	18	18	18	20	19	17	15	11	695		<b>Total attributed emissions</b>	MtCO2e	sum											
40	14	16	14	12	13	14	13	14	13	12	12	11	13	11	11	14	14	16	13	487		<b>CDIAC CO2 emissions</b>	MtCO2	sum											
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		<b>Oil, Natural Gas, Coal, Flaring, &amp; Cement</b>	Mt Carbon	sum											
42	35	35	31	27	30	30	29	30	30	28	29	29	31	29	31	33	32	30	24	1,183		<b>Entity percent of total CO2 emissions</b>	Percent	sum											
43																																			
44																																			
45	472	464	407	357	396	400	380	379	407	376	385	416	427	413	447	453	417	373	284	V	16,264	<b>Entity percent of total CH4 emissions</b>	Percent	sum											
46																																			
47																																			
48	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	<b>CDIAC/EDGAR methane</b>	Tg CH4	sum											
49	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	<b>Entity percent of total CH4 emissions</b>	Percent	sum											
50																																			
51	1.75%	1.70%	1.46%	1.22%	1.29%	1.26%	1.16%	1.12%	1.18%	1.11%	1.08%	1.13%	1.14%	1.10%	1.19%	1.20%	1.09%	0.96%	0.71%	0.94%		<b>CDIAC sums December 2019</b>													
52																																			
53																																			
54	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	<b>CDIAC sums December 2019</b>													
55																																			
56	1.50%	1.51%	1.33%	1.09%	1.16%	1.15%	1.04%	1.06%	1.07%	1.00%	0.97%	0.94%	0.99%	0.89%	0.94%	1.00%	0.96%	0.91%	0.70%	0.61%		<b>CDIAC sums December 2019</b>													
57																																			
58																																			
59																																			
60																																			
61																																			

**Cell:** FY48

**Comment:** Rick Heede:

CAI compares entity emissions to the CDIAC / Global Carbon Project ([www.globalcarbonproject.org](http://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 Gilfillan, Thanos Gkritzalis, Daniel S. Gol, Nicolas Gruber, Sören Gutekunst, Jan 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 Liener, 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, Abdrahman 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: 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 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](https://edgar.jrc.ec.europa.eu/overview.php?vP_GHG)