



	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	GE	GF																		
1	<b>Entity emissions from combustion, venting, flaring, and fugitive methane</b>																																																	
2																																																		
3	Richard Heede Climate Accountability Institute 18-Oct-20																																																	
4																																																		
5																																																		
6																																																		
7	<b>PetroChina, China</b>																																																	
8																																																		
9																																																		
10	<b>2000s</b>										<b>2010s</b>										<b>Cumulative</b>		<b>Entity emissions</b>		<b>Cumulative</b>																									
11	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	MtCO2e		to 2015		MtCO2e		to 2015																						
12																							(except where noted)		V (V = verified)		(except where noted)		kg CO2/tCO2		to 2015		(except where noted)		to 2015															
13																																																		
14																																																		
15	355	315	323	336	332	346	370	378	381	377	388	329	340	347	447	457	451	315	303	V	11,357	Oil & NGLs		MtCO2	linked	10,288																								
16	35	40	44	50	59	75	91	109	125	139	156	128	137	150	215	220	229	375	409	V	3,169	Natural Gas		MtCO2	linked	2,155																								
17																							-		-		-		-		-		-		-		-		-		-		-		-		-		-	
18	389	355	367	386	391	420	460	487	506	517	545	457	477	496	662	677	679	691	712	14,525		Combustion total		MtCO2	sum	12,443																								
19																																																		
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	44		Oil & NGLs: Venting		MtCO2	calculated	3.83	linked	39																						
21	6	5	5	5	5	6	6	6	6	6	6	5	5	6	7	7	7	5	5	181		Oil & NGLs: Flaring		MtCO2	calculated	15.94	linked	164																						
22	2	2	3	3	3	4	5	6	7	8	9	7	8	9	12	13	13	21	23	181		Own fuel use		MtCO2	calculated	57.26	linked	123																						
23	1	1	1	1	2	2	3	3	4	4	4	4	4	4	6	6	7	11	12	90		Natural Gas: Venting		MtCO2	calculated	28.53	linked	61																						
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5		Natural Gas: Flaring		MtCO2	calculated	1.74	linked	4																						
25	10	10	10	11	12	13	15	17	19	20	21	18	19	20	28	28	29	39	42	502		Venting & Flaring total		MtCO2	sum	392																								
26																																																		
27																																																		
28																																																		
29	399	365	377	397	403	434	476	504	525	536	566	475	496	516	690	706	708	730	754	V	15,027	Cement		MtCO2	linked	-																								
30																							15,027		Total CO2 emissions		MtCO2	sum	row 18+24+26	12,835																				
31																																																		
32																																																		
33	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22		Entity methane emissions		kg CH4/tCO2		to 2015																								
34	0	0	0	0	1	1	1	1	1	1	2	1	1	1	2	2	2	4	4	31		Methane: Oil & NGLs		MtCH4	calculated	1.92	linked	20																						
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		Methane: Natural Gas		MtCH4	calculated	9.88	linked	21																						
36	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	4	5	V	53	Methane: Coal		MtCH4	calculated	4.03	linked	-																						
37																							53		Total methane emissions		MtCH4	sum	41																					
38																																																		
39	19	17	17	18	18	19	20	20	21	20	21	18	18	19	24	25	24	17	16	612		Entity methane emissions		GWP		to 2015																								
40	10	11	12	14	16	21	25	30	35	39	43	35	38	41	59	61	63	104	113	876		Methane: Oil & NGLs		MtCO2e	calculated	28	linked	554																						
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		Methane: Natural Gas		MtCO2e	calculated	28	linked	596																						
42	29	28	30	32	34	39	45	50	55	59	64	53	56	60	84	86	88	121	129	-		Methane: Coal		MtCO2e	calculated	28	linked	-																						
43																																																		
44																																																		
45	428	393	406	429	437	473	521	554	580	595	630	528	552	576	773	791	796	851	883	V	16,515	Total attributed emissions		MtCO2e	sum	13,985																								
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	CDIAC CO2 emissions		MtCO2		1,505,476																								
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	Oil, Natural Gas, Coal, Flaring, & Cement		Mt Carbon		-																								
50																																																		
51	1.60%	1.45%	1.46%	1.47%	1.42%	1.48%	1.57%	1.62%	1.65%	1.71%	1.71%	1.39%	1.43%	1.48%	1.97%	2.01%	2.01%	2.05%	2.07%	0.93%		CDIAC sums December 2019		Entity percent of total CO2 emissions		Percent	0.85%																							
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	CDIAC/EDGAR methane		Tg CH4		6,610																								
55																																																		
56	1.24%	1.21%	1.27%	1.30%	1.33%	1.48%	1.63%	1.81%	1.95%	2.10%	2.18%	1.73%	1.77%	1.86%	2.52%	2.59%	2.64%	3.60%	3.77%	0.76%		Entity percent of total CH4 emissions		Percent	0.62%																									
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, 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 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)