

D.1.2 Over the period 1850–2019, a total of 2390 ± 240 (*likely* range) GtCO₂ of anthropogenic CO₂ was emitted. Remaining carbon budgets have been estimated for several global temperature limits and various levels of probability, based on the estimated value of TCRE and its uncertainty, estimates of historical warming, variations in projected warming from non-CO₂ emissions, climate system feedbacks such as emissions from thawing permafrost, and the global surface temperature change after global anthropogenic CO₂ emissions reach net zero.

{5.1, 5.5, Box 5.2, TS.3.3} (Table SPM.2)

Table SPM.2: Estimates of historical CO₂ emissions and remaining carbon budgets. Estimated remaining carbon budgets are calculated from the beginning of 2020 and extend until global net zero CO₂ emissions are reached. They refer to CO₂ emissions, while accounting for the global warming effect of non-CO₂ emissions. Global warming in this table refers to human-induced global surface temperature increase, which excludes the impact of natural variability on global temperatures in individual years. {Table TS.3, Table 3.1, Table 5.1, Table 5.7, Table 5.8, 5.5.1, 5.5.2, Box 5.2}

Global warming between 1850–1900 and 2010–2019 (°C)	Historical cumulative CO ₂ emissions from 1850 to 2019 (GtCO ₂)
1.07 (0.8–1.3; <i>likely</i> range)	2390 (± 240 ; <i>likely</i> range)

Approximate global warming relative to 1850–1900 until temperature limit (°C)* ⁽¹⁾	Additional global warming relative to 2010–2019 until temperature limit (°C)	Estimated remaining carbon budgets from the beginning of 2020 (GtCO ₂)					Variations in reductions in non-CO ₂ emissions* ⁽³⁾
		<i>Likelihood of limiting global warming to temperature limit*⁽²⁾</i>					
		17%	33%	50%	67%	83%	
1.5	0.43	900	650	500	400	300	Higher or lower reductions in accompanying non-CO ₂ emissions can increase or decrease the values on the left by 220 GtCO ₂ or more
1.7	0.63	1450	1050	850	700	550	
2.0	0.93	2300	1700	1350	1150	900	

*⁽¹⁾ Values at each 0.1°C increment of warming are available in Tables TS.3 and 5.8.

*⁽²⁾ This likelihood is based on the uncertainty in transient climate response to cumulative CO₂ emissions (TCRE) and additional Earth system feedbacks, and provides the probability that global warming will not exceed the temperature levels provided in the two left columns. Uncertainties related to historical warming (± 550 GtCO₂) and non-CO₂ forcing and response (± 220 GtCO₂) are partially addressed by the assessed uncertainty in TCRE, but uncertainties in recent emissions since 2015 (± 20 GtCO₂) and the climate response after net zero CO₂ emissions are reached (± 420 GtCO₂) are separate.

*⁽³⁾ Remaining carbon budget estimates consider the warming from non-CO₂ drivers as implied by the scenarios assessed in SR1.5. The Working Group III Contribution to AR6 will assess mitigation of non-CO₂ emissions.