

UNFCCC Global Stocktake Technical Dialogue – Round Table 1

Expert panel 1

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Carbon budgets consistent with global warming limits

IPCC AR6 WGI – Table SPM.2 | Estimates of historical carbon dioxide (CO₂) emissions and remaining carbon budgets.

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; likely range)		2390 (± 240; likely range)					
Approximate global warming relative to 1850–1900 until temperature limit (°C) ^a	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 ^c
		<i>Likelihood of limiting global warming to temperature limit^b</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	

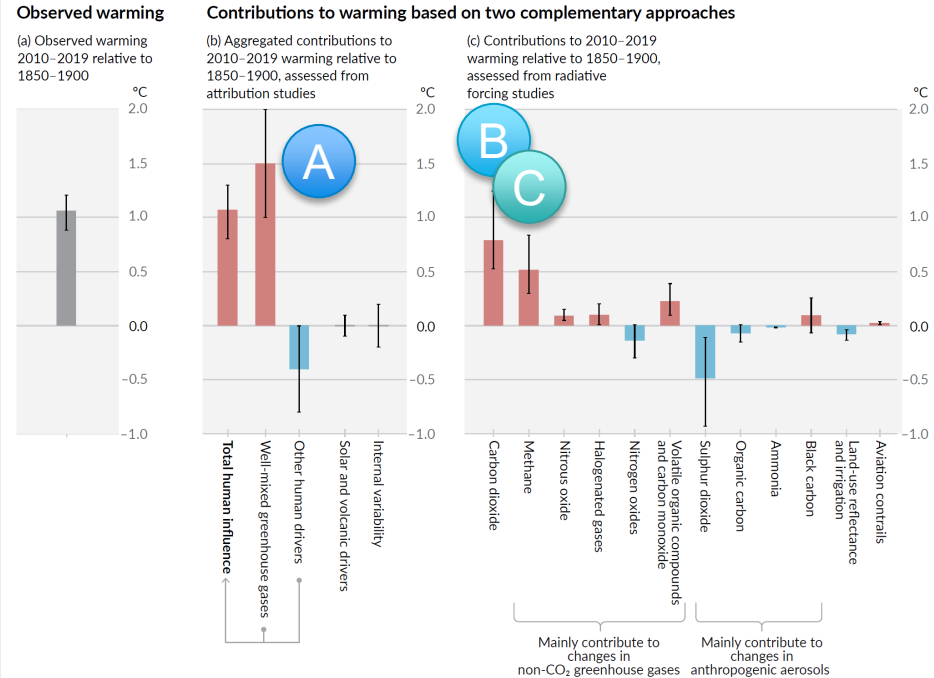
Contributions to observed warming

IPCC AR6 WGI – Figure SPM.2 | Assessed contributions to observed warming in 2010–2019 relative to 1850–1900

Observed warming is caused by **well-mixed greenhouse gases**, **A** and in particular:

- B** Historical **cumulative emissions of CO₂**
- C** The **current levels of CH₄ methane emissions**

Observed warming is driven by emissions from human activities, with greenhouse gas warming partly masked by aerosol cooling



Remaining carbon budgets consistent with global warming limits

IPCC AR6 WGI – Table SPM.2 | Estimates of historical carbon dioxide (CO₂) emissions and remaining carbon budgets.

Choices and policy decisions determining size:

1. Warming limit
2. Likelihood of staying below warming limit
3. How successfully non-CO₂ warming can be limited through emissions reductions

1

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; likely range)		2390 (± 240; likely range)				
Approximate global warming relative to 1850–1900 until temperature limit (°C) ^a	Additional global warming relative to 2010–2019 until temperature limit (°C)	Estimated remaining carbon budgets from the beginning of 2020 (GtCO ₂)				
		Likelihood of limiting global warming to temperature limit ^b				
		17%	33%	50%	67%	83%
1.5	0.43	900	650	500	400	300
1.7	0.63	1450	1050	850	700	550
2.0	0.93	2300	1700	1350	1150	900

2

3

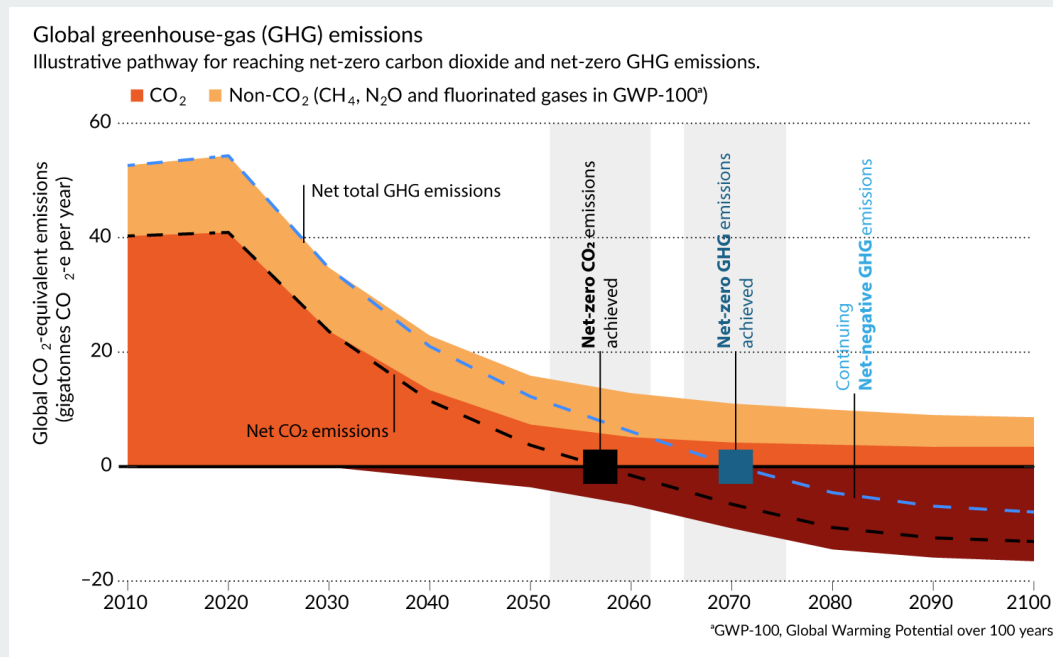
Variations in reductions in non-CO₂ emissions^c

Higher or lower reductions in accompanying non-CO₂ emissions can increase or decrease the values on the left by 220 GtCO₂ or more

From global carbon budgets to net-zero pathways

D.1 From a physical science perspective, limiting human-induced global warming to a specific level requires limiting cumulative CO₂ emissions, reaching at least net zero CO₂ emissions, along with strong reductions in other greenhouse gas emissions.

(IPCC AR6 WG1 SPM)



Global warming outcomes of global net-zero pathways

IPCC AR6 WG1 SPM – D.1.8 Achieving global net zero CO₂ emissions, with anthropogenic CO₂ emissions balanced by anthropogenic removals of CO₂, is a requirement for stabilizing CO₂-induced global surface temperature increase. This is different from achieving net zero GHG emissions, where metric-weighted anthropogenic GHG emissions equal metric-weighted anthropogenic GHG removals. [...]

Emissions pathways that reach and sustain net zero GHG emissions defined by the 100-year global warming potential are projected to result in a decline in surface temperature after an earlier peak (high confidence). {4.6, 7.6, Box 7.3, TS.3.3}

IPCC AR6 WG3 SPM – C.2.4 At the time of global net zero GHG emissions, net negative CO₂ emissions counterbalance metric-weighted non-CO₂ GHG emissions. Typical emissions pathways that reach and sustain global net zero GHG emissions based on the 100 year global warming potential (GWP100) are projected to result in a gradual decline of global warming.

