

Human-induced warming to date and implications for outstanding carbon budgets for 1.5°C

Article 14 of the Paris Agreement stated that the “global stocktake”, assessing progress towards the long-term goals of the Paris Agreement, should be informed “by the best available science”. As the Paris Agreement is a goal-driven regime, in which mitigation commitments are intended to be continually revised to meet the long-term warming goals of the Agreement, an adaptive process in which mitigation ambition updates are directly informed by the state of knowledge about the physical climate system will be necessary.

A key indicator for this process is the current level of human-induced warming in the climate system. Human-induced warming can be robustly calculated using observations and simple climate modelling tools to give an up-to-date assessment of its present-day magnitude. Human-induced warming is currently at about 1°C above a 1861-1880 pre-industrial baseline and is presently increasing by about 0.15°C per decade. Combining human-induced warming with natural climate fluctuations (such as the 2015-2016 El Niño) resulted in observed warming in 2016 in excess of 1°C above pre-industrial. An index of human-induced warming can be maintained and continually updated based on the latest observations of the climate and improvements in the understanding of climate forcing agents. This index can be used to provide a reliable measure of current human influence on the climate to the UNFCCC process in-between the 7 yearly IPCC assessment reports.

Such an index of human-induced warming can also help understand the required level of future mitigation ambition needed to limit warming to the Paris Agreement’s long-term goals. Article 4 of the Paris Agreement states a commitment “to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century”. In order to meet a long-term temperature goal of 2°C, emissions must reduce by on average 10% for every additional 0.1°C increase in human-induced warming in order to achieve this balance by the time human-induced warming reaches 2°C. Likewise, for a 1.5°C goal, emissions must fall by on average 20% per additional 0.1°C of human-induced warming.