

## Guiding Mother Earth: taking stock of progress to a long-term temperature goal

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The IPCC Special Report on 1.5°C found that human-induced global warming had reached  $1^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$ , increasing at  $0.2^{\circ}\text{C}$  per decade, leaving only a few decades for emissions to be reduced to net zero to limit warming to 1.5°C. The Paris Climate Agreement introduced a regime of periodic stocktakes of progress to the long-term temperature goal of limiting warming to well below  $2^{\circ}\text{C}$ , pursuing efforts to 1.5°C. While there is general agreement that these stocktakes are to be informed by science, there is less consensus on how this will be done. I will explain how we can robustly estimate the level of human-induced warming to date, and how this information was used to support a revision in the remaining carbon budget for cumulative future CO<sub>2</sub> emissions consistent with limiting warming to 1.5°C. CO<sub>2</sub> budgets in the IPCC Special Report were contingent on scenarios for non-CO<sub>2</sub> forcing, but the concept of a carbon budget can be generalised if we recognise how other anthropogenic forcing agents affect climate on different timescales, either expressing them as CO<sub>2</sub>-forcing-equivalent emissions, or applying the traditional GWP<sub>100</sub> metric in a new way. Taken together, these insights provide a simple, transparent, scenario-independent and model-independent method of assessing the implications of current and future emissions for progress towards a long-term temperature goal.

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