

1.9°C: New COP26 pledges bring projected warming to below 2°C for the first time in history.

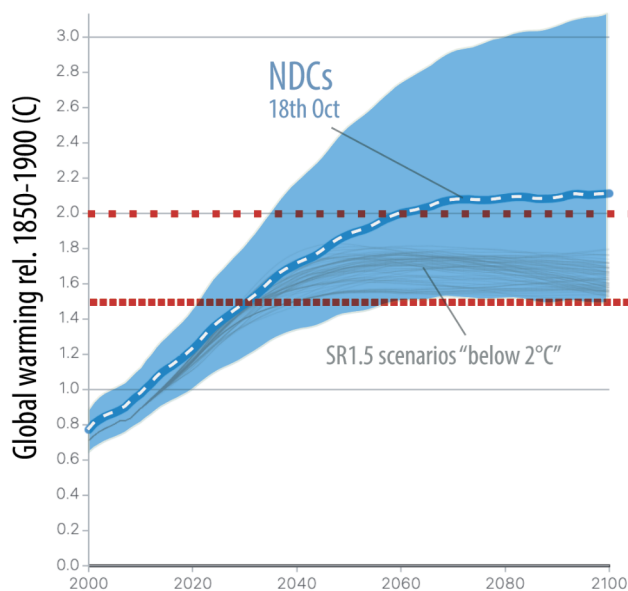
Malte Meinshausen, Jared Lewis, Zebedee Nicholls, Rebecca Burdon, 3 Nov 2021

Summary:

If all NDC and long-term pledges are fulfilled and adequately supported, the best-estimate peak warming this century is 1.9 C. This is still a far stretch from halting warming around 1.5K, but substantially improved over projections from just a few weeks ago¹.

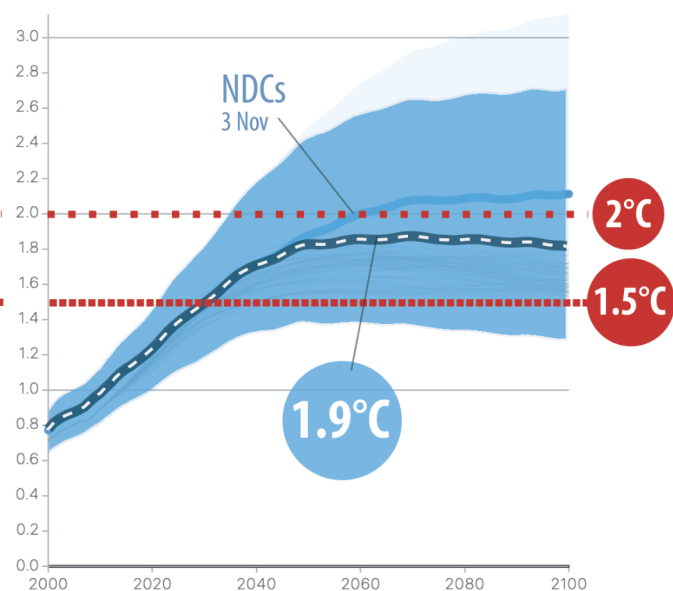
How it started:

Pre-COP26: conditional NDCs + long-term targets, no hot air, 18th Oct 2021



How it's going:

conditional NDCs + long-term targets, no hot air, 3 Nov 2021



¹ The data for the graph (and more) is freely available for reproduction here (citation appreciated): https://data.climateresource.com.au/ndc/20211102-briefing/20211102_CR_complete.csv

Key results:

- **An historical moment:** For the first time in history, the aggregate effect of the combined pledges by 194 countries might bring the world to below 2°C warming with more than a 50% chance.
- **China and India:** The major changes that bring projected warming below the significant benchmark of 2°C are China's new NDC and India's new announcement at COP26, both featuring net-zero emission targets by 2060 and 2070, respectively. Overall 11 countries updated their NDCs since 18th October, our pre-COP26 comparison point.
- **Strong step forward from the 2.7°C projected warming in recent NDC assessments:** The reported warming of 2.7°C in line with the SSP2-4.5 scenario - is often associated with the NDC pledges from a few weeks ago (UNFCCC Synthesis Report, UNEP Gap report). The less ambitious and unconditional end of the NDC pledges to 2030 received before those reports were published were in line with the SSP2-4.5 scenario up to 2030. That SSP2-4.5 scenario is assessed by IPCC AR6 WG1 to yield peak median 2100 temperatures around 2.7°C (with a range from 2.1°C to 3.5°C). Our 3 November aggregation pathway yields peak median temperatures of 1.9°C and 2100 temperatures of 1.8°C (1.3°C - 2.7°C), very similar to the SSP1-2.6 scenario. The SSP1-2.6 scenario in IPCC AR6 WG1 is assessed to be 1.8°C (1.3°C to 2.4°C) by the end of the century.
- **Reasons for change:** The large difference between the 2.7°C warming estimates and an estimated peak warming of 1.9°C is twofold: For one, the 1.9°C estimate includes all the 70+ countries' long-term strategies (2050, 2060 or 2070 net-zero targets etc). Secondly, it includes the new NDCs by China and a few other countries, including the announcement by India for lower 2030 emissions and net-zero by 2070. The UNEP Gap report published in October 2021 quantified the effect of net-zero targets in the decades beyond 2030 as reducing mean projected 2100 warming by 0.5°C, and together with targets announced in the last few days, we estimate this difference is now approximately 0.8°C.
- **The footprint - the limitations:** The temperature projections obviously hinge on the assumption that the pledges are going to be underpinned by respective climate, energy and land use policies and actions. In the near-term up to 2030, several pledged NDCs are far higher than business-as-usual emission projections, whereas net-zero targets in the long-term require in all cases a substantial upscaling of efforts. All the conditional NDCs also require appropriately scaled-up climate finance and adequate support in order to be implemented. Take Australia's hollow net-zero pledge as an example: Without climate policies, sectoral targets and a change of course, the 2050 net-zero target won't come about. And 1.9°C won't be achieved without a proper implementation of the pledges.
- **Still a long way from 1.5°C:** The combined pledges of countries, both the conditional ones, and certainly the unconditional ones, are not yet sufficient to halt warming at around 1.5°C. Using probabilistic projections, the exceedance probability for 1.5°C is still around 90%, meaning wide scale increases of extreme climate events and the demise of the coral reefs, unless the pace of transition to net-zero emissions continues to accelerate rapidly.

Methods and Details:

- **Data availability:** The emission data for individual country pledges is provided here: climate-resource.com/tools/ndcs - free for re-use with a share alike & cite license. This includes the temperature plots². The data for the two pathways, including the GHG emissions (not shown) and temperature quantifications from the graph, is also available³, free for any reproduction with attribution to Climate Resource.
- **Climate calculations:** This analysis uses probabilistic climate model emulator projections in line with the IPCC AR6 WG1 report released in August, 2021, specifically using the climate emulator MAGICC, available at live.magicc.org, which is maintained by scientists and programmers at Climate Resource and the University of Melbourne. The model configuration used to quantify the projected temperature implications of NDCs and longer-term net-zero targets was also used by our team to assist the IEA to deliver the World Energy Outlook, in the UNEP Gap Report and other scientific endeavours (stay tuned).
- **NDC quantifications:** The NDC are quantified in terms of their total GHG emissions. While several NDC pledges are difficult to quantify, we transparently provide 196 individual country factsheets for all current NDCs at climate-resource.com/tools/ndcs. This temperature projection is based on the NDCs as of 2 November 2021 - considering both conditional and unconditional elements. At Climate Resource, we were one of four global teams (PBL, Climate Action Tracker, and JRC) contributing to the quantitative assessment of NDC pledges.
- **Hot Air:** In this analysis, we assume that NDC target levels that are higher than high reference scenarios (i.e. scenarios without additional climate or energy policies to reduce emissions) are not going to be reached, but “overachieved”. (Overachievement is the wrong word, as the NDC targets are simply set too high). Specifically, we assume the country-downscaled and high-emission growth SSP5 reference scenarios, normalised with recent historical emissions, to be the maximal amount of emissions for any country. This assumption does not make a difference for most countries, but it does for some (like Turkey or Pakistan).
- **Extension beyond 2030/2050:** The end of century temperatures obviously depend a great deal on the assumptions made beyond the horizon of a country’s pledge, whether that is 2030 or 2050. With more and more net-zero targets, that influence of the methodological choice is diminishing, though. Here, we assume SSP1 - reference growth rates for the period from 2030 - 2050.

² The data for the current NDC (as of 2 Nov 2021) conditional pathway is available here: Current conditional <https://live.magicc.org/public/scenarios/ba3f3134-ad29-466c-9111-c83c39a3e42c>
The data for the 18th October NDC aggregate pathway is available here:

<https://live.magicc.org/public/scenarios/6f013083-34e0-4029-9544-f24377bccc7f>

³ https://data.climateresource.com.au/ndc/20211102-briefing/20211102_CR_complete.csv



Context of other reports:

- There is a very useful collection of other reports and analysis out there on the question of what NDCs mean for future emissions of different countries and global temperatures (and stay tuned, some key analysis is forthcoming, also from our US colleagues). Many of these other analyses we contributed to in one form or another. Those analyses are:
 - The UNFCCC Synthesis Report⁴.
 - The UNEP Emission Gap report⁵ (Climate Resource was one of four global teams providing NDC quantifications):
 - The Climate Action Tracker analysis (CAT also uses MAGICC, which we maintain and develop).
 - PBL NDC quantifications (we did not contribute to this one from our colleague)⁶

About Climate Resource:

Climate Resource was established in mid 2020. We use climate science to create tools that support decision makers to assess and respond to climate risk, and the opportunities in the transition to a net-zero emissions global economy. We're doing all we can to ensure the best science accelerates an effective global response to climate change.

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⁴ Available here:

<https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs/ndc-synthesis-report>

⁵ Available here: <https://www.unep.org/resources/emissions-gap-report-2021>

⁶ Available here: <https://themasites.pbl.nl/o/climate-ndc-policies-tool/>