Carbon accounting

Atmospheric CO_2 concentrations are at the highest level for around 15 million years. Accurate accounting is crucial for informed decision-making on how to curb the rise.

As announcements of seasonal low concentrations of CO_2 emerge, understanding of the anthropogenic and natural factors affecting this balance continues to develop. Decision-makers rely on the best information about the Earth's changing sinks and sources as they seek to constrain global emissions. This is why *Nature Climate Change* has launched a new online collection, Carbon Accounting (http://www.nature.com/carbon-accounting).

Earlier this year, a Commentary by Richard Betts *et al.* (*Nat. Clim. Change* **6,** 806–810; 2016) predicted that atmospheric CO_2 concentrations at Mauna Loa observatory, Hawaii, would fail to fall below 400 parts per million (ppm) at any time during the year as a consequence of natural and anthropogenic drivers. Given the time-lag in the relationship between reducing emissions and altering that concentration, the authors concluded that the concentration is unlikely to dip below this level again in our lifetimes.

The 400-ppm level is a milestone. Passing 400 ppm serves as a reminder of how far-reaching, fast, and deep efforts to reduce emissions must be. Carbon accounting provides the foundations for efforts to tackle climate change by providing data on where greenhouse gases are released into the atmosphere, and where they are removed.

There are three strands to the Collection. The first includes scholarship on methods to calculate the balance of the carbon account. Developing nuanced means of attributing emissions to different sources is crucial for understanding which countries, companies, or activities are responsible for rapidly spending the world's carbon budget.

The second strand presents the latest research on carbon sinks. Significant progress has been made in this area in recent years and knowing how much CO_2 the world's forests, oceans, and other natural and engineered sinks can absorb is essential to balancing the carbon account.

Finally, the Collection presents research on the world's carbon sources. As some countries intensify emissions to develop, others decarbonize, and consumption patterns change, as do the major sources of anthropogenic emissions. Understanding how these emissions interact with natural sources and create additional warming can allow policymakers to target mitigation policies.

This evolving Collection will bring together a selection of multi-disciplinary research and commentary from across the natural and social sciences that explores the major inputs and outputs that comprise the world's carbon account. We hope it will prove a useful resource to inform decision-makers about what ecosystems need protecting, which resources can be used, and how responsibility for these should be shared, if the world is going to rapidly decarbonize. ❐

Published online: 5 October 2016

Researching 1.5 °C

The academic community is beginning to gather content for a special report on the Paris Agreement's most ambitious aspiration.

Prior to the Paris Agreement, much research focussed on holding warming to 2 °C above pre-industrial levels. With the inclusion of an aspiration to limit warming to 1.5 °C in the Agreement's text, and a 2018 deadline for an IPCC special report on the subject, the academic community is having to coordinate to modify the focus of the research agenda.

To be included in the IPCC's special report, research must be submitted for publication by October 2017 and accepted by April 2018. As such, we hope to be regularly updating our dedicated 'Targeting 1.5 °C' Collection (www.nature.com/1.5Ctarget) over the coming months.

With this timeframe in mind, researchers gathered at a special conference on the 1.5 °C goal at the end of September, hosted by Oxford University's Environmental Change Institute. It was clear that reservations remained about the achievability of the goal. Nonetheless, there was a sense that scientists have a duty to try and answer policymakers' questions. Over the course of the conference, a few key themes emerged.

There was some disagreement on the precise point at which the world may blow a carbon budget commensurate with the 1.5 °C goal. Nonetheless, it's clear that time is running out for the deep decarbonization that will be necessary if policymakers are to stand a chance of fulfilling their aspirations. That likely requires some fundamental lifestyle changes; an idea that many governments have so far found difficult to sell. There were also concerns that the emissions reductions required to put the world on a path to 1.5 °C rather than 2 °C could potentially obstruct efforts on related social goals, such as alleviating poverty or encouraging sustainable development. Exploring how an additional 0.5 °C of warming could impact vulnerable countries, compared to the impacts of mitigating this, remains a research priority. This may have to be achieved through modifications to current models, with the IPCC's timetable constraining researchers' ability to conduct entirely new research.

The 1.5 °C goal — and the idea of producing a dedicated IPCC report on the topic — continues to be controversial. But the research community is mobilizing to try to provide a solid scientific foundation for policy discussions around this ambitious aspiration. ❐