

# Scientists improve how global climate progress can be calculated

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Workers plant trees as part of the 'Green Great Wall' project in China.  
Credit: Ian Teh

Researchers have worked out how to improve the assessment of progress towards limiting global heating to 2 degrees C above preindustrial levels.

To reach the Paris Agreement [goal](#) of limiting global heating to no more than 2 degrees C, and ideally 1.5 degrees C, above preindustrial levels, countries must set their own targets that contribute to a global lowering of carbon output.

As well as cutting sources of carbon, such as by reducing the use of fossil fuels for energy and industry, countries can also increase the 'sinks' of carbon—processes that take it out of the atmosphere, from planting trees to using technology to capture carbon from the air.

However, there are subtle differences in the way balances of carbon sinks and sources are calculated at the country level compared to their calculation for guidelines as to how the world should reach the Paris Agreement goals. This could lead to countries underestimating the level of action they need to take to reach their targets.

## **Correct calculations**

Now, a team led by researchers from the European Commission's Joint Research Centre, and including an Imperial College London scientist, have proposed a way to solve this problem. Their study is published today in *Nature Climate Change*.

Dr. Joeri Rogelj, Research Director of the Grantham Institute—Climate Change and Environment at Imperial, said: "Progress towards the Paris Agreement goals is checked periodically by a five-yearly 'global stocktake,' with the first starting in 2022. This will involve adding up and comparing countries' planned climate actions with what science indicates is necessary globally to reach the agreed climate goals.

"If there's a gap—and make no mistake, given where we are today it is guaranteed that there will be one—it will be expected that countries should adjust their actions, so we need to ensure the calculations are

correct."

## **Carbon sources and sinks**

The team discovered that the difference rests in the calculation of sources and sinks of carbon due to land use changes. For example, when deforestation occurs, the land can change from a sink of carbon to a source, as the trees are no longer absorbing the carbon from the atmosphere. This is a humanmade, or 'anthropogenic' contribution.

However, there are also 'indirect' contributions that are caused by human activities. For example, as carbon concentrations in the atmosphere rise because of our emissions, plants are able to take more in and grow quicker, becoming a more efficient sink.

Countries report their progress according to a framework called National Greenhouse Gas Inventories. In this framework, the direct and indirect anthropogenic contributions are treated together, and natural contributions are calculated separately. This means, for example, all forests that are aged to some degree are considered anthropogenic sources or sinks of [carbon](#).

However, the models that map how the world must get to the Paris Agreement goals calculate direct anthropogenic contributions separately from indirect and natural contributions, which are pooled together.

## **Ensuring a like-with-like comparison**

This leads to a discrepancy when the two values are compared in order to assess progress toward the Paris Agreement goals—a discrepancy that today adds up to more than 10 percent of annual CO<sub>2</sub> emissions, or five billion metric tons of CO<sub>2</sub>.

In the new study, the team propose a 'translation' between the two methods that would allow a more accurate comparison and therefore a better assessment of climate progress. They suggest reallocating the indirect anthropogenic contributions to better match and compare numbers between the two frameworks.

Dr. Rogelj said: "Our proposed solution ensures a like-with-like comparison. It doesn't change what needs to be done at the global level, but changes the understanding of how deeply countries must reduce their emissions in order to be aligned with the Paris Agreement goals and avert climate disaster."

**More information:** Giacomo Grassi et al. Critical adjustment of land mitigation pathways for assessing countries' climate progress, *Nature Climate Change* (2021). [DOI: 10.1038/s41558-021-01033-6](https://doi.org/10.1038/s41558-021-01033-6)

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