

There is a difference between an inventory and an account. You can count your money today but it does not tell you how much you will have tomorrow. We can keep an inventory of CO₂ emissions to the atmosphere and we do this in mass units (e.g. kg or metric tons). We can also keep an account of the value of CO₂ emissions and we do this in monetary units (e.g. U.S. dollars). A common reference for emissions accounting is the Social Cost of Carbon, the estimated cost of damages caused by the emission of one ton of CO₂. The most recent estimate for the Social Cost of Carbon is \$190/ton.

It has been demonstrated by mathematical modeling exercises that peak warming of the Earth's atmosphere is strongly correlated with cumulative CO₂ emissions and is insensitive to the timing of those emissions.

The objective of the Paris Climate Treaty is to limit the maximum temperature change to 2 degrees C, and preferably 1.5 degrees C.

The question posed here has to do with the value of temporarily removing CO₂ from the atmosphere or of delaying the release of CO₂ to the atmosphere.

Demonstration of the relationship between the “cumulative warming commitment” as “the peak warming response to a given total injection of CO₂ into the atmosphere following our best estimate of anthropogenic emissions to date and any further emissions pathway that is smooth, positive, and ends in exponential decay.” (Allen et al., 2009). That is, the emissions scenario involves the maximum emissions rate followed by exponential decline in the emissions rate such that the integral provides a measure of cumulative total CO₂ emissions and the decline path provides time for the functioning of the global carbon cycle to achieve a balance between the carbon in the atmosphere and the rest of the global carbon cycle and the global climate system to seek thermal balance.

The rationale behind temporary removal of CO₂ from the atmosphere is that it provides a delay in climate change damages and motivation for greater participation in efforts to limit total CO₂ emissions. Temporary carbon storage will have value with respect to the near term impacts of climate change if it delays or reduces these impacts and with respect to the goals of the Paris Treaty if it reduces the maximum emissions rate and the rate of decrease in emissions and hence the integrated value of cumulative CO₂ emissions. These 2 objectives should be compatible.

We note also that most recent analyses conclude that emissions are likely to overshoot Paris-based emissions limits and that achievement of Paris objectives is likely to require significant quantities of negative emissions. Emissions inventories will be required to accommodate both positive and negative values and this is likely to increase the importance of time in the inventory progression. The importance of negative emissions will be minimized if the overshoot is minimized and this can be facilitated with both negative emissions and temporary offsets.