Explainer: How much carbon can the world's forests absorb?

June 12 2013, by Peter Reich

If deforestation is cut down, the world’s forests could act as a large net sink for carbon emissions. Credit: Flickr/sobriquet.net

You are walking through the bush when you see an enormous tree trunk, tens of metres long, lying across the forest floor. Imagine you and several dozen friends lifting it by hand. Now you've literally grasped the significance of trees and forests when it comes to carbon sequestration –

trees are heavy, and carbon accounts for almost half their dry weight, or biomass.

The world's forests are a net carbon "sink". Each year they remove more carbon from the atmosphere by photosynthesis than they return via their own respiration, decomposition of dead roots, trunks and leaves, and by forest fires.

That is how the growth and re-growth of forests around the world has slowed climate change in the past century. It has been estimated that between one-third and one-fourth of the total carbon dioxide (CO2) emissions from burning coal, gas and petrol has been turned into wood and other plant parts through this process. Without that incredible ecosystem service, climate change would be much more extreme today than it already is.

Despite advances in satellite remote sensing and ground inventories, our estimate of the area covered by forests globally is surprisingly shaky. We are unsure how much the trunks of all those trees weigh, nor can we know for certain the weight of their roots. It is even harder to figure out how much the total global forest biomass grows from one year to the next – a key figure that tells us how much of our annual CO2 pollution has been scrubbed out of the air by forests.

Forest ecologists like a challenge however, and there have been several attempts at estimating the forest carbon "sink". Perhaps the most internationally comprehensive approach was an assessment of forest carbon stocks and fluxes across the globe between 1990 and 2007. They assessed the carbon content of live biomass, dead wood, litter, oil organic matter and harvested wood products in tropical, temperate and boreal forests, and examined how these stocks changed over roughly two decades.

According to this analysis, intact forests and those re-growing after disturbance (like harvesting or windthrow) sequestered around 4 billion tonnes of carbon per year over the measurement period—equivalent to almost 60% of emissions from fossil fuel burning and cement production combined.

This news is not as good as it seems. During the time measured, tropical deforestation resulted in the release of almost 3 billion tonnes per year. Thus, globally, the net forest carbon sink amounted to just 1.1 billion tonnes per year or one-seventh of average emissions from fossil fuel burning and cement production over the period measured.

These numbers suggest that forests, and tropical forests in particular, could play a key role in slowing the rise of atmospheric CO2 in the decades to come.

In the tropics, growth and re-growth of forests generated a colossal carbon sink of 2.8 billion tonnes of carbon per year. This largely, but not entirely, counterbalanced the equally colossal carbon emissions associated with deforestation of other tropical forests. As a result, the tropics served as a relatively small net source of carbon to the atmosphere since 1990.

If deforestation continues unabated, and droughts and forest fires become more common, as is expected, then tropical forests could become a large net source of carbon to the atmosphere, heating up the pace of climate change. Disturbances to temperate and boreal forests from climate change-induced droughts, wildfires and windstorms could make the situation even worse.

Conversely, if deforestation was to slow in comparison to continued growth of recovering and intact forests, tropical forests could serve as a large net sink of carbon in the future and make the United Nation's

Reducing Emissions from Deforestation and Forest Degradation (REDD) programme a meaningful contributor to offsetting emissions.

Our best estimates of global forest carbon sinks and sources demonstrate the ongoing importance of forests to the global carbon cycle. Unfortunately, however, they do not provide a road map to the future.

If forest "scrubbing of CO2" declines while release of CO2 remains stable or grows, the "braking" effect of the world's forests on the pace of climate change will grow weaker, perhaps disappearing entirely. That would be truly bad news for the global climate and those who depend on it.

And unfortunately, that is not just a lot of hot air.

Provided by The Conversation

Citation: Explainer: How much carbon can the world's forests absorb? (2013, June 12) retrieved 19 April 2024 from https://phys.org/news/2013-06-carbon-world-forests-absorb.html