Forest carbon stocks have been overestimated for 50 years

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A tree cut from a dry forest in Madagascar to measure its wood density Credit: CIRAD, G. Vieilledent

Basic density is widely used to compute carbon storage by trees. A formula used to calculate basic wood density has recently been corrected. Researchers estimate that the error in the initial formula resulted in an overestimation of forest carbon stocks, to the tune of almost 5 percent. These results were published in the scientific journal *American Journal of Botany* on 16 October.

It may be a small correction, but it is far from negligible as far as forest ecologists and carbon cycle specialists are concerned. The error lies in a formula established in 1971 for calculating basic wood density. Given that basic density is used to assess the amount of carbon stored in a tree, the fact that the formula had to be corrected meant that forest carbon stocks may have been overestimated by 4–5 percent. "This new formula should enable us to determine more accurately the role of forests in the carbon cycle and the impact of deforestation on climate change," says Ghislain Vieilledent, an ecologist with CIRAD, the corresponding author of the work published in the journal *American Journal of Botany* on 16 October.

For more than 70 years, CIRAD has maintained a database on 1300 wood species and almost 4500 trees. While promoting this resource, Vieilledent and his colleagues at CIRAD and at Paul Sabatier University in Toulouse discovered an incoherence in a conversion factor, one used to compute the basic density of a tree based on wood density at 12 percent moisture, which corresponds to the average wood moisture content in temperate regions. Since this technical characteristic is widely available in wood technology databases, ecologists only have to apply a conversion factor in order to establish the basic density of a tree species. However, it was precisely that conversion factor that did not tally with the researchers' new calculations. "To start with, I thought we had made a mistake in our calculations or that there was some uncertainty surrounding measurement of the relevant data. It was not easy to cast doubt on a formula that had been widely accepted for years and quoted

in several scientific articles."

The researchers took a new look at the data in CIRAD's historic database in order to determine a new formula for establishing basic density based on density at 12 percent. The new conversion factor will be used to calculate the basic density of woods in forest ecology databases. In particular, it will serve to update the global wood density database on which Jérôme Chave and Fabian Fischer, co-authors of the publication, are working at CNRS-Paul Sabatier University in Toulouse. The correction will make it possible to estimate carbon forest stocks more accurately and understand more clearly the role played by forests in climate regulation.

More information: Ghislain Vieilledent et al, New formula and conversion factor to compute basic wood density of tree species using a global wood technology database, *American Journal of Botany* (2018). DOI: 10.1002/ajb2.1175

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