New data and methods paint clearer picture of emissions from tropical deforestation

June 21 2012

A team led by researchers at Winrock International, a U.S. environmental nonprofit organization, has developed an estimate of gross carbon emissions from tropical deforestation for the early 2000s that is considerably lower than other recently published estimates.

The Winrock team, which included scientists from Applied GeoSolutions, NASA's Jet Propulsion Laboratory and University of Maryland, combined the best available spatially consistent datasets on gross forest loss and forest carbon stocks to track emissions from deforestation in millions of individual map pixels. Their methods focus on carbon losses to the atmosphere and do not include regrowth, which sequesters carbon from the atmosphere. The resulting gross emissions estimate of 0.81 billion metric tons of carbon emitted per year, with a statistically derived 90 percent prediction interval of 0.57-1.22 billion metric tons, is approximately one third of previously published estimates and represents just 10 percent of total global anthropogenic carbon emissions over the time period analyzed. The findings are published in the journal *Science*.

Two countries – Brazil and Indonesia – produced the highest emissions between 2000 and 2005, and accounted for 55 percent of total emissions from tropical deforestation. Nearly 40 percent of all forest loss in the study region was concentrated in the dry tropics, but accounted for only 17 percent of total carbon emissions, reflecting low carbon stocks in these forests compared to tropical moist forests.

The Winrock study is not the first to tackle the question of how much carbon is emitted from tropical deforestation. Researchers have been studying the land-use component of the global carbon cycle since the early 1980s, when a tabular "bookkeeping" model was developed that aggregates data and calculations over large geographic regions. This model uses broad assumptions about forest carbon stocks as well as national forest data collected by the Food and Agriculture Organization (FAO). Virtually all published estimates of carbon emissions from land-use change rely on this model.

"Tabular bookkeeping models for carbon accounting from land-use change were the best approach at the time they were developed," said Dr. Nancy Harris, lead author of the Winrock study. "But the emergence of earth observing satellites combined with an international policy focus on reducing emissions from deforestation in developing countries has pushed the scientific community to adopt more transparent methods and increasingly spatial approaches to carbon accounting."

Dr. Sassan Saatchi of NASA's Jet Propulsion Laboratory in Pasadena, Calif., put the critical role of these earth observing satellites into perspective. "These detailed emissions estimates would not have been possible without the NASA satellites that helped us quantify forest cover change and forest carbon stocks, which are the two critical data sources for this work," he said.

"It's time to acknowledge the problems with the FAO data and accept that we can now do much better," added Winrock's Dr. Sandra Brown, a co-author of the study. "We have the ability, at last, to match the areas of forest clearing with their carbon stocks before clearing in much greater detail, allowing us to pinpoint more precisely where the highest emissions are occurring."

The team hopes that the policy mechanism of the United Nations

Framework Convention on Climate Change that proposes to compensate developing countries for reducing emissions from deforestation and forest degradation (REDD) will benefit from a more accurate benchmark of emissions from deforestation that are disaggregated from the forest regrowth term and that do not use a priori assumptions about the fate of vegetation carbon stocks after clearing. Calculating regrowth would require assumptions about the fate of cleared land for which reliable spatial data do not exist, although new spatial datasets may become available over time.

"The relative contribution of deforestation to total greenhouse gas emissions will likely continue to decline through time as emissions from other sectors rise, but the loss of millions of hectares of forest per year remains considerable," said Alexander Lotsch of the World Bank, which funded the study. "Effectively reducing forest-related emissions through international efforts that also promote biodiversity conservation, forest livelihoods and help maintain essential forest functions such as water regulation, is an essential measure to avoid serious climate change impacts and to ensure low carbon sustainable development in the developing world."

The team plans to update their work for 2006 to 2010 to assess whether carbon emissions increased or decreased in the latter half of the 2000s.

Provided by Winrock International