New research provides insights into potential ecological costs and cobenefits of REDD

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A new paper just published in *Global Change Biology* examines the potential of a REDD (Reducing Emissions from Deforestation and Forest Degradation) mechanism to provoke ecological damage and/or promote ecological cobenefits. Such analysis is key as negotiations and discussions continue between now and early December when the United Nation's Framework Convention on Climate Change holds its 15th Conference of the Parties, where an agreement on REDD may emerge. Scientists and research staff from the Woods Hole Research Center (WHRC), the Instituto de Pesquisa Ambiental da Amazônia (IPAM), and the Universidade Federal de Minas Gerais (UFMG) authored the paper.

According to Claudia Stickler, of the Woods Hole Research Center and IPAM and the paper's lead author, "There are reasons to be concerned about possible ecological damages that could be caused by REDD, and to make sure that those damages are kept to a minimum, but the overwhelming evidence points to enormous ecological benefits overall, especially if REDD programs are well-planned."

The authors addressed three questions in the paper: (1) What are the potential ecological costs of the specific interventions that may be carried out under the aegis of REDD and how can they be mitigated? (2) What are the potential ecological cobenefits of REDD interventions? (3) How can these potential costs and cobenefits of REDD be measured and incorporated into monitoring programs? They then examined these potential ecological cobenefits through analysis of possible REDD program interventions in a large-scale Amazon landscape. Finally, they discuss the possible integration of ecological cobenefits into the REDD architecture.

Nations could potentially participate in REDD by slowing clear-cutting of mature tropical forest, slowing or decreasing the impact of selective logging, promoting forest regeneration and restoration, and expanding tree plantations. REDD could also foster efforts to reduce the incidence of forest fire. Potential ecological costs include the accelerated loss (through displaced agricultural expansion) of low-biomass, high-conservation-value ecosystems, and substitution of low-biomass vegetation by monoculture tree plantations. These costs could be avoided through measures that protect low-biomass native ecosystems. Substantial ecological co-benefits should be conferred under most circumstances, and include the maintenance or restoration of (1) watershed functions, (2) local and regional climate regimes, (3) water quality and aquatic habitat, (4) terrestrial habitat, and (5) soils and biogeochemical processes.

Daniel Nepstad, also of WHRC and IPAM and second author, adds, "We need a balanced approach to REDD as we get into the details of how this mechanism will work. Images of rainforests being razed for Eucalyptus plantations in the name of carbon are simply not helpful."

The general themes of the paper were illustrated for a case study of the upper Xingu Basin in the southeastern Brazilian Amazon, a region larger than 90% of the tropical nations that could seek participation in REDD within the UNFCCC and responsible for between 5 and 13% of carbon emissions from the Brazilian Amazon over the past decade.

Analysis of possible REDD program interventions in a large-scale Amazon landscape indicates that even modest flows of forest carbon funding can provide substantial co-benefits for aquatic ecosystems, but that the functional integrity of the landscape's myriad small watersheds would be best protected under a more even spatial distribution of forests. For the Xingu River headwaters region (~178,000 km2) in the southeastern Amazon, a possible REDD program based on a state zoning plan (Zoning) that takes into account agricultural suitability, environmental vulnerability, and conservation value would lead to avoided emissions of over 300 million tCO2e over a 10-year period relative to a business-as-usual (BAU) scenario. Simultaneously, in the zoning-plan based scenario, change in mean annual river discharge is reduced by 50%, mean annual evapotranspiration is increased two-fold, aquatic habitat quality and water quality is increased in 40% of the region's streams, and habitat fragmentation is reduced by nearly two-thirds and interior habitat area is increased by nearly 50%. In contrast, a scenario which prioritizes the protection of riparian areas and extant protected areas and indigenous territories (Protected Area+) without protecting forests on private lands in the region as well, would only achieve emissions reductions of 1.6 million tCO2e over BAU, a more than 200-fold decrease relative to the Zoning scenario. Although aquatic habitat quality and water quality is increased by the same amount as in the Zoning scenario, the gains for regional climate (through evapotranspiration), river discharge regulation, and habitat interior quality are much less.

Overall, these results highlight the importance of the spatial distribution of forest carbon that is protected or restored through REDD. Although the Protected Area+ scenario reduced emissions by less than 2 percent by 2020, it created connectivity across the Xingu headwaters through riparian zone forest restoration, which also provided shade and organic matter inputs to the streams. Protection of hydrological functions of watersheds and forest interior habitats was achieved only when severe restrictions were placed on agricultural and pasture expansion on private lands, as represented in the Zoning scenario. Furthermore, if Zoning-type scenario were to be developed and implemented at a state or national level, the potential threat for leakage to occur would be greatly reduced. Separate analyses indicate that REDD could suppress agricultural expansion in the region with a moderate carbon price.

More information: The potential ecological costs and cobenefits of REDD: a critical review and case study from the Amazon region; Claudia M. Stickler, Daniel C. Nepstad, Michael T. Coe, David G. McGrath, Hermann O. Rodrigues, Wayne S. Walker, Britaldo S. Soares-Filho, Eric A. Davidson; Volume 15, Issue 12, Pages 2803-2824 (p 2803-2824) DOI: 10.1111/j.1365-2486.2009.02109.x

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