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Ecological carbon sequestration via wood harvest and storage: Can it be a viable climate mitigation and adaptation strategy?

N. Zeng (1) and B. Zaitchik (2)

(1) University of Maryland, Department of Atmospheric and Oceanic Science and Earth System Science Interdisciplinary Center, College Park, United States (zeng@atmos.umd.edu, +1-301-4055377), (2) Johns Hopkins University

A carbon sequestration strategy is proposed in which forests are sustainably managed to optimal carbon productivity, and a fraction of the wood is selectively harvested and stored to prevent decomposition under anaerobic, dry or cold conditions. Because a large flux of CO_2 is constantly assimilated into the world's forests via photosynthesis, cutting off its return pathway to the atmosphere forms an effective carbon sink. The live trees serve as a 'carbon scrubber' or 'carbon remover' that provides continuous sequestration (negative emissions). The stored wood is a semi-permanent carbon sink, but also serves as a 'biomass/bioenergy reserve' that could be utilized in the future.

Based on forest coarse wood production rate, land availability, bioconservation and other practical constraints, we estimate a carbon sequestration potential for wood harvest and storage (WHS) 1-3 GtC y-1. The implementation of such a scheme at our estimated lower value of 1 GtC y-1 would imply a doubling of the current world wood harvest rate. This can be achieved by harvesting wood at a modest harvesting intensity of 1.2 tC ha-1 y-1, over a forest area of 8 Mkm2 (800 Mha). To achieve the higher value of 3 GtC y-1, forests need to be managed this way on half of the world's forested land, or on a smaller area but with higher harvest intensity. However, the actual implementation may face challenges that vary regionally.

We estimate a cost of \$10-50/tCO_2 for harvest and storage around the landing site. The technique is low tech, distributed and reversible. We compare the potential of WHS with a number of other carbon sequestration methods, and recommend conducting demo projects and research into WHS as a climate mitigation and adaptation option.