ENVIRONMENTAL FOOTPRINT COMPARISON TOOL

A tool for understanding environmental decisions related to the pulp and paper industry

GREENHOUSE GASES

EFFECTS OF RECYCLED FIBER USE ON GREENHOUSE GAS EMISSIONS

Carbon Sequestered in Forests, Products and Landfills

Forest carbon sequestration

In most studies that examine the effects of recycling on GHG emissions, the effects of recycling on forest carbon sequestration are ignored. In those studies that attempt to estimate the impact of recycling on forest carbon, it is usually determined to result in additional sequestration. The estimated benefits of recycling to forest carbon sequestration, however, are highly uncertain because they depend on assumptions about, among other things, the effects of changes in virgin fiber demand on forest ownership and management decisions.

Some studies are based on the simple assumption that trees not needed for fiber will grow to maturity, sequestering carbon as they grow. In actuality, some of this sequestration benefit will be lost because, in the absence of a market for the fiber, some private forest owners will sell their land or convert it to other uses, usually resulting in reductions in carbon sequestration compared to a forest managed for fiber production. In addition, forests that are no longer managed will often be more susceptible to carbon loss due to fire or infestation. The magnitude of this loss, sometimes called “leakage,” is highly uncertain.

In one major U.S. study, the net benefits for paper recycling compared to landfilling were found to range from 2.65 to 3.11 tonnes CO_2 per short ton of paper recovered (USEPA 2012). Of this, 2.02 and 3.06 tonnes CO_2/ton (for mechanical pulp and chemical pulp, respectively) were due to anticipated increased forest carbon sequestration, meaning that forest carbon sequestration was largely responsible for the estimated benefits of recycling. In describing its study, USEPA pointed out limitations in the agency’s analysis.

- “The analysis… does not account for any potential long-term changes in land use caused by a reduction in pulpwood or softwood demand, and landowners’ choices to change land use from silviculture to other uses.”
- “Results are very sensitive to the assumption on paper exports (i.e., that paper exports comprise a constant proportion of total paper recovery).”
- EPA “applies a single point estimate reflecting a time period that best balances the competing criteria of (1) capturing the long-term forest carbon sequestration effects, and (2) limiting the uncertainty inherent in projections made well into the future. The variation in forest carbon storage estimates over time and the limitations of the analysis … indicate considerable uncertainty in the point estimate selected.”(USEPA 2012).

When considering the impacts of recycling on forest carbon, it is also important to understand that carbon stocks in U.S. and Canadian forests are not declining. This is due, in part, to the effectiveness of sustainable forest management practices. In the U.S., the carbon stored in forests is increasing at a rate of about 59 million metric tonnes of carbon per year (216 million metric tonnes CO_2 per year) (USEPA 2005). EPA estimated that the 2008 annual net carbon flux in U.S. forests was about 792 million metric tons of carbon dioxide equivalents, which offset about 3% of U.S. energy-related CO_2 emissions (USEPA 2012). Any increases in forest carbon sequestration attributable to increased recycling would occur on top of this already increasing pool of forest carbon.

Product carbon sequestration

Carbon in paper and paperboard products is sequestered from the atmosphere. Over time, the amount of carbon sequestered in products is increasing, meaning that the amounts in the atmosphere are declining by a corresponding amount (Miner and Perez-Garcia 2007). The amount of carbon sequestered in products, however, does not depend on whether the product is made from virgin or recovered fiber. The effects of recycling on carbon sequestration occur in the forest and landfill.

Landfill carbon sequestration

In North America, large amounts of carbon are sequestered in paper and wood products discarded in landfills. Many assessments of paper recycling do not address carbon sequestration in products in use or in landfills, yet studies indicate that this sequestration represents a very important part of the value chain GHG profile of the industry, and is part of the overall accounting of the forest carbon cycle, as are the GHGs released during their degradation in these landfills (discussed elsewhere in this Tool).

If used forest products are recycled rather than landfilled, this reduces the amount of carbon sequestered in the landfill. In the long term, recycled fiber products will ultimately end up in landfills or burned, as paper or processing waste, but the quantities of fiber going to end of life will be smaller on an annual basis than would have been the case without recycling. (If forest products are recycled rather than an alternative of being burned for energy, there is no effect on carbon sequestration in landfills.) Thus, the assessment of recycling on carbon and greenhouse gas emissions must address the likely alternative fate of used products and if the alternative is landfilling, the assessment must account for the impacts on landfill carbon sequestration. It must also account for impacts on landfill methane releases, discussed elsewhere in this Tool.

For various grades of paper, USEPA has estimated the following impacts of landfilling on carbon sequestration (USEPA 2012).

Table R9

Product	Carbon Sequestered (metric tonnes of CO_2 equivalents) per Wet Short Ton of Material Landfilled
Corrugated containers	0.82
Magazines/Third class mail	0.82
Newspaper	1.33
Office Paper	0.16
Phone Books	1.33
Textbooks	0.16

References

Miner, R. and J. Perez-Garcia. 2007. The greenhouse gas and carbon profile of the global forest products industry. *Forest Products Journal* 57: 80-90.

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