ENVIRONMENTAL FOOTPRINT COMPARISON TOOL

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

EFFECTS OF RECYCLED FIBER USE ON GREENHOUSE GAS EMISSIONS

Fossil Fuel-Related Greenhouse Gas Emissions from Manufacturing and Along the Value Chain

Of the various elements of this analysis, the emissions associated with fossil fuel use are best understood, in terms of currently available data. Even here, however, there are significant uncertainties. These uncertainties derive in part from factors that affect greenhouse gas (GHG) emissions but are independent of whether mills are virgin- or recycling-based, such as fuel choice or geographical location in the case of purchased power. In addition, different studies are based on different data sets and use different boundary conditions (in particular, some studies include emissions from purchased power while others do not).

A number of published studies suggest that, except for newsprint mills, most virgin mills have somewhat lower GHG emissions than recycled paper mills making similar products. In the case of newsprint, published studies often report that recycling mills have lower GHG emissions than virgin mills, especially if you also consider indirect emissions associated with purchased power production.

NCASI's analysis of site-specific mill emissions data, excluding emissions associated with purchased power, reveals a more complicated situation. Mill-level information available to NCASI suggests that the ranges in GHG emissions are significant among seemingly similar mills because they are heavily impacted by the selection of fuel. Indeed, the differences in greenhouse gas emissions between virgin and recycling mill manufacturing-related emissions can be outweighed by the effects of a selected fossil fuel within the mill's fuel mix.

In specific, NCASI's analysis reveals statistically significant differences between virgin mills and recycled mills (excluding emissions associated with purchased power) only in two cases:

1. for grades of board that compete with bleached kraft board (in which case recycled board mills tend to have lower emissions), and
2. newsprint mills (where recycling mills tend to have lower GHG emissions).

Manufacturing-Related GHG emissions

Mill emissions of GHGs are governed by the types and amounts of fuel burned, factors that can vary to a great degree among otherwise similar mills.

Because chemical pulp mills derive a large fraction of their energy from biomass fuels, primarily in the form of pulping liquors, studies often find that they have lower GHG emissions than recycling mills making comparable products. Statistical analysis of NCASI site-specific data, however, reveals no statistically significant differences in GHG emissions between virgin chemical pulp mills and recycled mills making comparable grades of board, paper, or tissue except for the bleached board sector, where the virgin mills tend to have higher GHG emissions than recycling mills making competing products.

The mills producing virgin mechanical pulp, used in products such as newsprint and phonebooks, do not generate pulping liquors and therefore have less access to biomass fuels. As a result, studies usually find that virgin mechanical pulp mills are more GHG-intensive than recycled mills making the same grades.

Data from a number of published studies are summarized in the following table. The emissions documented in the published literature include emissions from the mill and indirect emissions associated

with purchased electricity. Although the table does not show data for tissue manufacturing, it would be expected that the comparison of energy requirements for virgin and recycled tissue manufacturing would be directionally similar to that for office paper since both involve bleached chemical pulp.

Table R8.

Product and Process Description	GHG Emissions from Manufacturing		Reference
Virgin newsprint	5478 lb/ton	2739 kg/tonne	Paper Task Force (2002)
Recycled newsprint	3269 lb/ton	1634.5 kg/tonne	
Virgin newsprint	2.10 tonne/ton	2315 kg/tonne**	USEPA (2012), includes raw material transportation
Recycled newsprint *	1.11 tonne/ton	1224 kg/tonne**	
Virgin corrugated boxes	2799 lb/ton	1399.5 kg/tonne	Paper Task Force (2002)
Recycled corrugated boxes	3240 lb/ton	1620 kg/tonne	
Virgin[1] corrugated containers	0.84 tonne/ton	926 kg/tonne**	USEPA (2012), includes raw material transportation
Recycled corrugated containers *	0.87 tonne/ton	959 kg/tonne**	
Virgin office paper	2995 lb/ton	1497.5 kg/tonne	Paper Task Force (2002)
Recycled office paper	3353 lb/ton	1676.5 kg/tonne	
Virgin office paper	1.01 tonne/ton	1114 kg/tonne**	USEPA (21012), includes raw material transportation
Recycled office paper *	0.81 tonne/ton	893 kg/tonne**	
Virgin coated unbleached board	2326 lb/ton	1163 kg/tonne	Paper Task Force (2002)
Virgin bleached board	2895 lb/ton	1447.5 kg/tonne	
Recycled Paperboard	3015 lb/ton	1507.5 kg/tonne	
Virgin magazines	1.67 tonne/ton	1841 kg/tonne**	USEPA (2012), includes raw material transportation
Recycled magazines *	1.11 tonne/ton	1224 kg/tonne**	
Virgin phonebooks	2.43 tonne/ton	2679 kg/tonne**	USEPA (2012), includes raw material transportation
Recycled phonebooks *	1.02 tonne/ton	1125 kg/tonne**	
Virgin textbooks	2.15 tonne/ton	2370 kg/tonne**	USEPA (2012), includes raw material transportation
Recycled textbooks *	1.37 tonne/ton	1510 kg/tonne**	

*Recycled product GHG emissions calculated from USEPA 2012 based on best interpretation of information therein.
**Converted from units of metric tonne per short ton.

[1] Note that USEPA 2012 considers “virgin” corrugated containers to be comprised of 9.8% recycled fiber.

Other fossil fuel-related GHG emissions along the value chain

Other than emissions associated with purchased power, which are included in manufacturing emissions discussed elsewhere, the only GHG emissions that differ significantly between virgin and recycled value chains are those associated with fiber transportation.

Transportation distances related to fiber procurement and product delivery vary enormously. Wood, pulp, and recovered paper are now routinely shipped halfway around the globe. Therefore, to understand whether increased recycling causes significant increases in transportation-related GHG emissions, it is necessary to understand the relative distances and modes of transport involved in bringing additional recovered fiber to specific mills. If the transportation distances for virgin fiber and additional recovered fiber are greatly different, the impact of transportation-related GHG emissions can be significant to the overall GHG implications of increased recycling. Put another way, the assumption of "typical" transportation distances can yield misleading results in judging the effects of specific efforts to increase recycling.

One study that attempted to use typical transportation distances in the U.S. found that the GHG emissions associated with collecting and transporting virgin fiber (200 to 300 lb/ton) were not significantly different from the GHG emissions associated with collecting, processing and transporting wastepaper (about 220 lb/ton) (Paper Task Force 2002). These emissions are small compared to those for manufacturing (2300 to 5500 lb/ton) discussed elsewhere in this Tool.

It is important to repeat, however, that these "typical" results can mask site-specific circumstances where transportation-related GHG emissions might be much more significant. Those wanting to understand the GHG-implications of specific recycling initiatives will need information that allows them to judge the potential significance of transportation emissions. In specific, it will be necessary to know the likely distances and modes of transportation involved in bringing additional recovered fiber to mills.

References

Paper Task Force. 2002. *Paper Task Force recommendations for purchasing and using environmentally preferable paper.* http://epa.gov/epawaste/conserve/tools/warm/pdfs/EnvironmentalDefenseFund.pdf

United States Environmental Protection Agency (USEPA). 2012. *Waste Reduction Model (WARM) Version 12*. February 2012. Washington, DC: United States Environmental Protection Agency. http://www.epa.gov/climatechange/waste/SWMGHGreport.html