OVERVIEW OF EFFECTS OF DECREASED GREENHOUSE GAS EMISSIONS

Introduction

The connections between the climate change issue and the forest products industry are more complex than for any other industry. The forests that supply the industry's raw material remove carbon dioxide from the atmosphere and store the carbon in the forest ecosystem and ultimately in forest products. Most of the industry's manufacturing facilities require fossil fuels, and these fuels generate greenhouse gases when burned. The industry obtains much of its energy, however, from biomass fuels, which are carbon neutral due to their short-term renewable life cycle. This characteristic contrasts with that of fossil fuels, which when burned undergo a one-way transfer to the atmosphere from geologic reserves. The forest products industry is a leader in using co-generation, also known as combined heat and power, which is far more efficient than conventional electricity generation; thus, smaller amounts of fuel are required and fewer greenhouse gases are emitted where this is employed. End of life management options for forest products, ranging from recycling to landfilling and burning for energy, have important but complex greenhouse gas and carbon implications. The World Business Council for Sustainable Development publication *Facts & trends: Forests, forest products, carbon and energy* (WBCSD 2012) provides an effective overview of these characteristics, from the global perspective.

Industry Performance

Greenhouse gases can be emitted from a number of places in the life cycle of a forest product. A recent study of the emissions from U.S. forest products sector, summarized in Figure G1, found that the largest single source is emissions related to energy use in manufacturing (NCASI 2008). Similar findings are presented in two other studies, on the Canadian and global forest products industries (NCASI 2007a, 2007b). These energy-related emissions come from the burning of fossil fuels and from power plants that produce the electricity purchased by the industry. Emissions of methane from municipal solid waste landfills attributable to the decay of discarded paper and wood products are also significant. These methane emissions are significant primarily because methane is 25 times more powerful than CO_2 as a greenhouse gas (a factor that is reflected in Figure G1 below).

Effects of Decreased Greenhouse Gas Emissions

General Overview

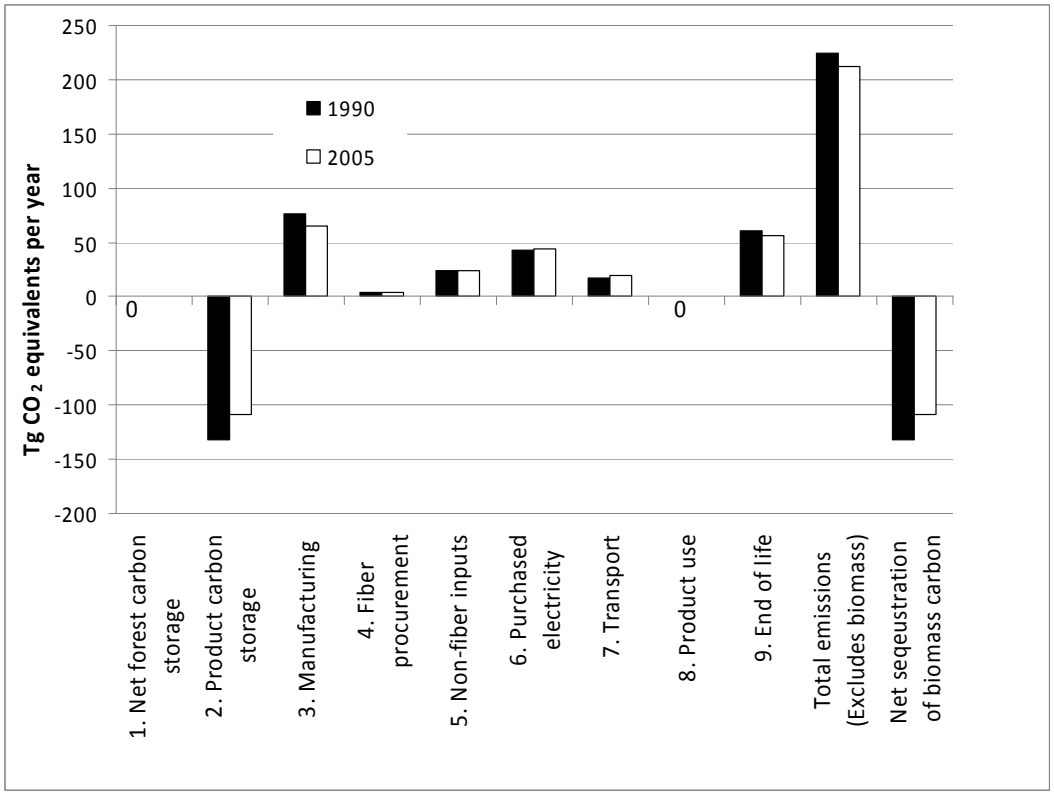

Figure G.1. Greenhouse Gas and Carbon Profile of the U.S. Forest Products Sector – 1990 and 2004/2005 (Source: NCASI 2008)

The life cycle of forest products also includes carbon sequestration and storage. The CO_2 removed from the atmosphere in the forest can remain stored in forests and forest products for periods ranging from days to centuries. For many forest products, the net removals of CO_2 from the atmosphere associated with this sequestration and storage are large enough to offset a significant fraction of the life cycle emissions, as shown for the U.S. industry in Figure G1.

Figure G2, below, shows energy use and biomass-based energy levels for the U.S. industry since the early 1970s.

Effects of Decreased Greenhouse Gas Emissions

General Overview

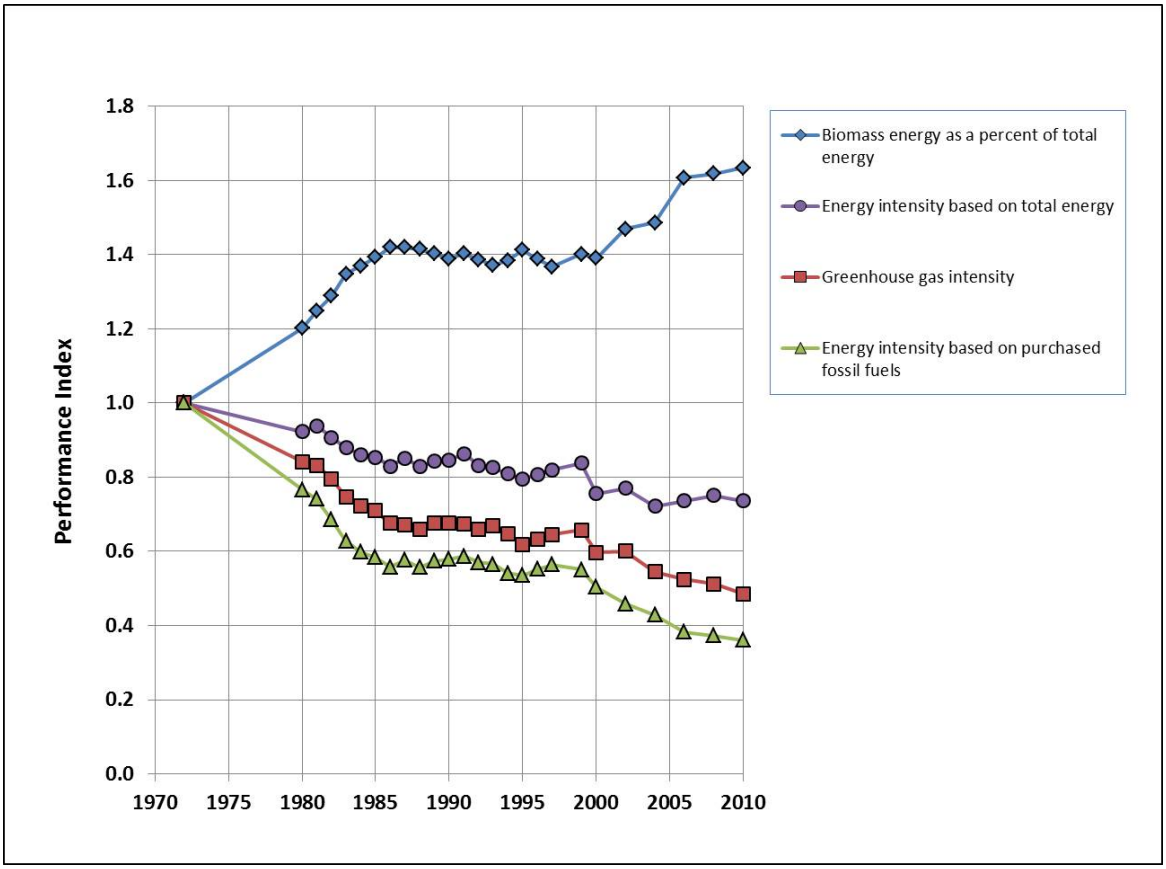

Figure G.2. U.S. Forest Products Industry Energy Use and Biomass-Based Energy Levels Since 1970 (Source: Data collected by AF&PA)

Biomass Carbon Neutrality

The carbon in trees started as carbon dioxide (CO_2) in the atmosphere. The trees removed this CO_2 from the atmosphere in the relatively recent past. When this carbon returns to the atmosphere as CO_2, as a result of decay or combustion, this merely completes a cycle. As long as this cycle is in balance, it neither adds carbon to, nor removes carbon from, the atmosphere. This is what is meant by carbon neutrality in the context of woody biomass. Because there is concern about keeping this cycle in balance, the amounts of carbon in national forests are monitored (typically by national governments) to ensure that that the amounts of biomass being removed from forests do not exceed the amounts being added to the forest as a result of photosynthesis, the process whereby trees remove CO_2 from the atmosphere and convert it into forest biomass.

Opportunities for Improvement

Figure G1 makes it clear that there are many places in the life cycle of forest products where there are opportunities for reducing greenhouse gas emissions. Not shown on the figure are the many opportunities to use forest products to reduce society's greenhouse gas emissions, for instance via the use of wood-based building materials in place of more greenhouse gas-intensive alternatives.

In this section of the Tool, we will focus on the opportunities to reduce the emissions shown in Figure G1 as they apply to the pulp, paper and paperboard industry, and to the wood products sector. The co-

benefits and trade-offs associated with pursuing these opportunities depend on many factors, many of which are highly site-specific and beyond this Tool's ability to explore. Nonetheless, we can explore some of the general issues you can expect to encounter if you attempt to reduce greenhouse gas emissions from various places in the life cycle of forest products.

By clicking on the parameters of interest, you can explore what happens to them when you attempt to reduce atmospheric levels of greenhouse gases via the following major sources and sinks in the life cycle of paper products.

1. increasing carbon storage in the forest
2. increasing carbon stored in paper, paperboard, and wood products
3. reducing emissions related to energy use in manufacturing facilities
4. reducing emissions from the end of life of paper and wood products
5. reducing emissions through practices that avoid emissions elsewhere in society, especially a) the burning of used paper and wood products that are not economically recycled and b) exports of "green" electricity from pulp and paper mills

Challenges to Further Greenhouse Gas Emission Reduction

Some circumstances beyond a mill's control (e.g., availability of natural gas or biomass fuels, or the design of municipal solid waste landfills) may contribute to higher than expected GHG emissions. Complex mills that produce a variety of product grades using a combination of manufacturing processes may have complex internal energy flows that can be difficult to compare to those of other facilities. Therefore, comparisons across facilities should be used with caution and an awareness of the potential limitations in their utility in seeking GHG emission reductions.

References

National Council for Air and Stream Improvement, Inc. (NCASI). 2007a. *The greenhouse gas and carbon profile of the Canadian forest products industry*. Special Report No. 07-09. Research Triangle Park, NC: National Council for Air and Stream Improvement, Inc.

National Council for Air and Stream Improvement, Inc. (NCASI). 2007b. *The greenhouse gas and carbon profile of the global forest products industry*. Special Report No. 07-02. Research Triangle Park, NC: National Council for Air and Stream Improvement, Inc.

National Council for Air and Stream Improvement, Inc. (NCASI). 2008. *The greenhouse gas and carbon profile of the U.S. forest products sector*. Special Report No. 08-05. Research Triangle Park, NC: National Council for Air and Stream Improvement, Inc.

World Business Council for Sustainable Development (WBCSD). 2012. *Facts & trends: Forests, forest products, carbon and energy*. http://www.wbcsd.org/Pages/EDocument/EDocumentDetails.aspx?ID=14964&NoSearchContextKey=true