NCASI Fact Sheet

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What to Look for in Published LCA Studies of Forest Products

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Introduction

Life cycle assessment (LCA) studies of forest products are complex and based on multiple methodological choices and assumptions. This fact sheet tries to demystify some of the most important choices that must be made by the author of an LCA and helps put users of these studies in a better position to understand and objectively interpret the results.

Was the LCA Critically Reviewed?

The international standard for LCA (ISO 14044) requires that LCA studies comparing competitive products be critically reviewed by a panel comprised of at least three people. The reviewers, individually or as a group, should have knowledge of and proficiency in the international standards for LCA (ISO 14040 and ISO 14044), the LCA methodology and current practices, the scientific disciplines relevant to the significant impact categories of the study in question, and the environmental, technical and other relevant performance aspects of the product system(s) being assessed.

Are Products Compared on the Same Basis?

One underlying principle of LCA is that product comparisons must be made based on the same service provided. This is called being "functionally equivalent" and the service provided is called the “functional unit”. For instance, it would make no sense to compare one paper towel to one hand dryer. Instead, one must compare their use in performing the same function, i.e., drying a pair of hands. The uncertainties and potential for bias associated with functional units are among the most common sources of controversy in comparative LCA studies with potentially significant impact on the results of the comparison. A comparative LCA should disclose functional equivalence considerations in a transparent manner.

What Impact Categories Are Used and How Uncertain Are They?

An LCA needs to include a comprehensive set of environmental indicators (called “impact categories”) that adequately characterizes the potential environmental significance of the resources consumed and pollutants released during the life cycle of a product. Typically, an LCA includes results for the global warming, ozone depletion, smog, eutrophication, particulate matter, and acidification indicators. An LCA can also include results for a series of "inventory" indicators such as life cycle energy use, water use or solid wastes.

An LCA study can also include indicators associated with higher uncertainty (often because they are location-dependent, are under development, or lack scientific consensus). Classic examples of these indicators include human toxicity, ecotoxicity, biodiversity and other land use-related impacts, water depletion and non-renewable resource depletion. Special care should be applied using or interpreting the results of these indicators. The conclusions of the study should reflect the relative uncertainty of each indicator studied, more specifically for comparative LCAs.

How is Biogenic CO_2 Handled?

Understanding how biogenic CO_2 is handled in LCA is critical to interpreting the results of a study of forest products for the climate change indicator. In general, four approaches can be found in published LCA studies.

The most common approach is to include both the removal from the atmosphere by growing trees and releases of biogenic CO_2 to the atmosphere from combustion or other types of degradation (e.g., landfills). In this approach, any emission of biogenic CO_2 is counted while a compensating quantity is shown removed from the atmosphere by growth of biomass, unless land use change occurred and was included in the study. Importantly, removals and releases of biogenic CO_2 will be attributed to different life cycle stages. Removals of CO_2 from the atmosphere will be attributed to fiber procurement, for instance, while releases will mainly occur in manufacturing and end-of-life. This is particularly important in interpreting studies that include only part of the life cycle of a forest product. For instance, cradle-to-gate (i.e., from the forest to the mill gate) studies of forest products typically show a negative contribution (i.e., a benefit) to the climate change indicator because these studies include the full removal of CO_2 by trees but not the full releases of biogenic CO_2 in the life cycle of the product.

In the past, LCA practitioners often simply ignored biogenic CO_2, typically based on the observation that all biogenic carbon was previously removed from the atmosphere so returning it to the atmosphere results in a net release of zero (i.e., assuming "carbon neutrality"). The problem with this approach is that all carbon removed from the atmosphere by trees is not necessarily returned to the atmosphere, for instance when some is permanently stored in landfills. Hence, ignoring biogenic carbon could lead to situations where mass is not conserved, mass conservation being an important principle for all LCAs. A fix to this approach is to ignore emissions of biogenic CO_2, but to correct for carbon that is not returned to the atmosphere. This approach is not used extensively by LCA practitioners.

How is Recycling Handled?

A typical challenge in LCAs of forest products, and of paper products in particular, is how to handle flows of recycled fibers through the boundary of the product being studied. For instance, should the recycled material be assigned some of the burden of turning trees into virgin pulp or should the recycled product be granted a credit for "avoiding" landfilling emissions? Should end-of-life recovery for recycling be granted a credit for "avoided" virgin pulp production? There are several different methods to deal with recycling in LCA and no consensus on which should be selected. All of the existing methods have embedded value judgments on whether use or recovery of fiber should be encouraged. Results of LCAs involving paper products are heavily influenced by the method used to include recycling in the life cycle. This can have significant implications for studies that compare paper products with different recycled contents or paper products with non-cellulose alternatives (e.g., plastic). Generally, it is expected that an LCA study includes sensitivity analyses to demonstrate how the conclusions can be affected by the choice of a specific method for recycling.

Do the Conclusions and Summary Reflect the Limitations of the Study?

Lastly, conclusions or executive summaries of published LCA studies sometimes go far beyond what the actual results show. For instance, the executive summary of a comparative LCA study could state something such as "Product A has been shown to be environmentally superior for 8 out the 10 environmental indicators studied." However, drilling down into the results can indicate that, for 6 out of the 8 indicators, this is true in very specific conditions only. Relying on the executive summary or conclusions, only, for LCA study interpretation can thus skew the understanding of the detailed results, which are better seen through a review of the full report – in particular its sensitivity and uncertainty analyses – which put the LCA results in perspective.

For More Information

A more detailed Research Note on this topic can be found on the NCASI website or you can contact Caroline Gaudreault at cgaudreault@ncasi.org.