



Building
Green with
Wood

MODULE 8

Transportation Effects

Looking at the Complete Picture

While a building's operation over time has the greatest environmental impact, there is also energy consumed in extracting, manufacturing and transporting the materials and components used for the building construction, installing them, and their ongoing maintenance. In combination, these energy inputs are referred to as embodied energy.

Calculating the amount of embodied energy is a complex issue, one that is often overlooked. For example, LEED (Leadership in Energy and Environmental Design), the most widely used green design tool in North America, does not measure embodied energy at all. It awards credits for measures such as sourcing local materials, but does not require a life cycle assessment to determine that this is an important consideration.

There may be times when sourcing local products yields the most environmental benefit. But the decision should not be based on one factor alone, such as transportation impacts. Other aspects of embodied energy – and issues such as pollution or environmental degradation – may be of far greater significance in product selection than transportation energy. Life cycle assessment takes away much of the guesswork by calculating outcomes based on quantifiable indicators.



Life cycle assessment accounts for the effects of transportation mode and not just distance. A product traveling a long distance using a highly efficient transportation method can actually have a smaller transportation footprint than a closer product traveling inefficiently.



Deciding When to Buy Locally

It is natural to expect that locally sourced products would be more environmentally responsible than those shipped a great distance. But this is usually based on the assumption that transportation energy contributes a lot to the overall energy equation – and life cycle assessment can prove that that this is usually not the case.

While buying local may help the local economy, it is not necessarily the best environmental choice. In many cases, transportation energy is a very small component of overall energy consumption.

For example, the figure below shows that in a typical wood frame house in Ottawa, transportation energy represents less than five per cent of the total embodied energy in the building.

Life cycle assessment also accounts for the mode of transportation, not just the distance. For example, shipping products a long distance by train or tanker may result in a light environmental footprint as these modes of transport are usually very efficient.



Wood is plentiful across North America, and Canada has the most certified forests in the world with close to 150 million hectares certified.

Embodied Energy, Typical House

Materials Manufacturing Phase: 68.1% —

Materials Operations Phase: 25.3% —

Materials Construction Phase: 1.8% —

Transportation Construction Phase: 3.8% —

Transportation Manufacturing Phase: 0.8% —

Transportation Operations Phase: 0.3% —



The ATHENA Impact Estimator for Buildings

The above graphic illustrates embodied energy consumption related to the manufacture, construction and operation of a typical Ottawa, Ontario home. In other words, it is the energy used to make the materials, get them to the site, build with them, and maintain or replace them over 60 years of the structure's life. Life cycle assessment ensures that all slices of the pie are considered, enabling decisions based on sound knowledge.

Source: The sample "R-2000 house" file that comes with the ATHENA Impact Estimator for Buildings life cycle assessment software. The example is a typical new 2,200-square-foot wood-frame home in Ottawa. Energy consumption to operate the home (such as heat) is not shown as it is not relevant to the evaluation of using local materials, and would dominate the graph, making it hard to see the transportation effects at all.



Green design requires careful choices. Life cycle assessment can help determine whether a product coming from a sustainably managed forest versus a rapidly renewable product that is high in processing emissions and transportation emissions is the better choice.

The best green choice is...?



On the cover:

*Pocono Environmental Education Center,
Dingman's Ferry, Pennsylvania
Architect: Bohlin Cywinski Jackson*

Green buildings

- Mitigate climate change
- Use less energy and water
- User fewer materials
- Reduce waste
- Are healthy for people and the planet