Activity 9: The Real Cost
LCA and Externalities: Teacher Notes

Slide	Notes
1	This presentation provides background information for teachers and students on life cycle assessments and the concept of externalities.
2	Often when people discuss the life cycle of something, they are talking about an animal or a plant. A frog, for example, begins its life cycle as an egg. It then becomes a tadpole, and eventually an adult frog. Though it's not shown in this figure, we also know that another animal will eventually eat the frog, or it will die and its body will decompose, releasing nutrients back into the water or the soil.
3	Other things have life cycles too. All of the products that we buy, use, and eventually discard have life cycles. And they have environmental impacts. To understand those impacts, we have to look at their entire life cycles.
4	The life cycle of a product has five basic steps: 1. extracting the raw materials, 2. processing those raw materials, 3. building the products out of those processed materials, 4. using the products, and 5. disposing of the products. We also must consider the impacts of transporting the materials from one step to the next (represented by T in the figure). To understand the environmental impacts of any product, we measure the impacts at each step along the life cycle. This type of study is called "life cycle assessment" (LCA for short). When the entire life cycle is included in the assessment, it is called a "cradle-to-grave" LCA. Of course things can get even more complicated than this figure implies. Most of the products we use involve many different types of raw materials, each of which is processed separately before being combined into the products we use.
5	For example, consider the raw materials inside a common cell phone. These materials might include plastic derived from crude oil; liquid crystal for the display screen; nickel, lithium, cobalt, cadmium, zinc, and copper for the battery and charging device; and copper or other materials for the circuit boards. Each of these raw materials must be extracted, purified, and processed before it can be used inside a cell phone. Therefore, performing an LCA of a cell phone would require tracking all of these materials back to their sources and tracking them again through their disposal (or recycling and reprocessing). A 2007 study estimated that there were 500 million obsolete cell phones in homes, businesses, and storage in 2005, and these had a precious metals value of $314 million (Sullivan, 2006).

6	People look at many different types of impacts when performing LCAs. This is just a partial list of the types of impacts that that can be explored. In this unit, however, we will focus on the global warming impacts of greenhouse gases. Also, to keep things relatively simple, we will look at products that do not include so many different types of raw materials. As you will see, even with these simplifications, the assessment can get complicated! That's largely the result of the convoluted lives of the products we use every day.
7	Sometimes the decision made by a producer or consumer causes an impact on a third party not involved in the economic transaction. This is called an "externality." There are positive and negative externalities, depending on whether the action benefits or harms the third party.
8	For example, imagine a beekeeper producing and selling honey. The bees likely pollinate all the crops in the vicinity, which provides an environmental benefit to nearby farmers. Productivity will increase on these farms or orchards. In this case, neighbors who may not buy honey or may not be paying for the pollination service still benefit from their neighbors' beekeeping. This is a positive externality since the added benefit of pollination is not reflected in the price of the honey.
9	An example of a negative externality is air pollution that results from fossil fuel combustion. Air pollution impacts human health, and the hidden or additional costs of healthcare or shortened lifespans are not reflected in the price of electricity. Society is bearing these costs. While some of the producers and consumers of the electricity will be affected, mostly third parties (other people in the community) will be affected by the decision to burn fossil fuels.
10	Externalities can be reduced or "internalized" in several ways. Internalizing means the price of the good or service has been adjusted to account for the benefits or costs to all third parties. There are several ways that externalities can be reduced. In the air pollution example, the externality could be reduced in the following ways: • Corporate responsibility: The company could decide to regulate its own emissions through adopting practices or technology to minimize air pollution. The additional cost of these actions could be absorbed by the company or passed on to the consumer. • Government regulation: The government could pass regulations that force the company to adopt practices to minimize air pollution, in which case the costs may also be passed on to the consumer. • Consumer responsibility: Some consumers could voluntarily pay an additional fee to pay for electricity made from renewable energy. • Tax: The government could chose to levy a tax to pay to clean up the air. The more we learn about the mysterious lives of the products we consume and use, the more prepared we will be to make decisions about purchases and use better strategies to internalize negative externalities.

References Cited:

Sullivan, D. E. (2006). *Recycled cell phones: A treasure trove of valuable metals.* Fact Sheet 2006–3097, U.S. Geological Survey, Department of the Interior. Retrieved from http://pubs.usgs.gov/fs/2006/3097/fs2006-3097.pdf