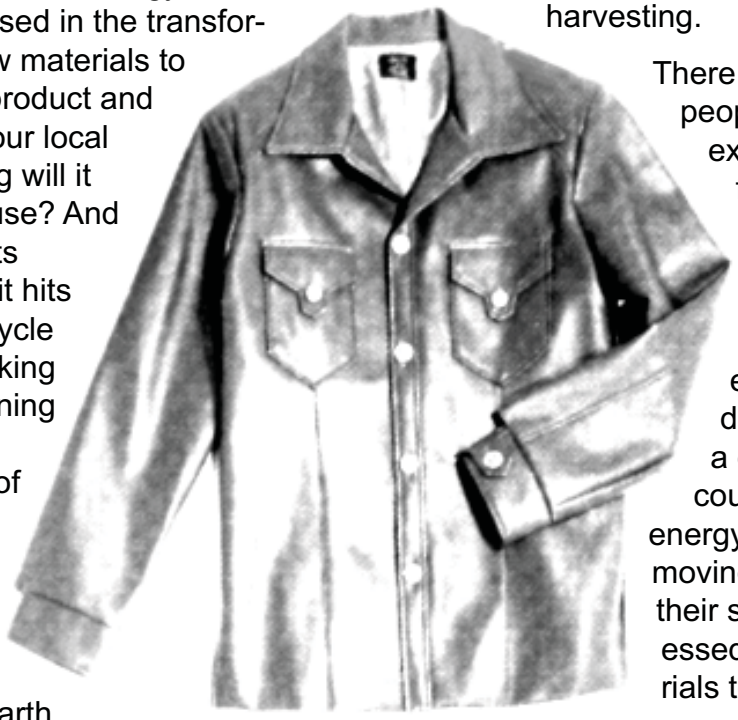
Life Cycle Analysis

Student Activity Sheet 5a

The Life Cycles of Your "Stuff"

Consider the dramatic birth - life - death ... of your felt pen! apple! CD! or skateboard! Next time you grab something from your room to carry with you, think about its life cycle. We usually think about the cost of a product and how useful or beautiful or fun it is. We don't think about how this item left a trail of impacts on the environment - water, air, soil, living things. Or about all the people who have touched that object and the raw materials in it as it makes its way to our backpack. Who are they? Where do they live?

To do this, we need to look at the product's life cycle. How much energy and resources were used in the transformation from raw materials to its "birth" as a product and its journey to your local store? How long will it "live" in active use? And how long until its "death" - when it hits the trash or recycle bin, finally breaking down and returning to the earth or becoming part of a new product? It's a cycle: every product comes from the earth and returns to the earth eventually.



A lot happens between a product's birth and death. There is a lot of energy involved - energy to extract resources, refine them, manufacture the product and package it. For agricultural products, energy is used in fertilizers, irrigation systems and harvesting.

There are also many people involved, for example, miners, farmers, factory workers, distributors, retailers. In an increasingly global economy, each stage of production may occur in a different region or country. This uses energy for transportation: moving resources from their source to be processed; bringing raw materials to factories; moving consumer-ready goods to Canada's borders, ports and airports; moving goods by truck or train to your local store; and then you bringing them home to be used.

Take a polyester shirt! The fabric started life as a few cups of Venezuelan petroleum. A refinery in the Netherlands Antilles "cracked" the petroleum at high temperature to produce smaller molecules needed to make the polyester. Further processes at a chemical plant in Delaware, U.S.A. used heavy-metal catalysts like cadmium acetate during production. And that's just the beginning of the shirt's life.

What is Life-cycle Analysis?

Life-cycle analysis is a technique used by manufacturers and environmental scientists to assess the environmental impacts of producing something. It helps producers choose the most environmentally sound methods to create goods and services .

Retailers and consumers can compare life cycles of similar products to help choose which is the most environmentally acceptable, e.g., a paper, Styrofoam or glass cup? Life cycle analysis looks at resource INPUTS, i.e. water, energy, raw materials, herbicides and pesticides (for food products). It also looks at waste OUTPUTS to air, water and land. These inputs and outputs are identified for each stage of producing a product or service, i.e., from "cradle-to-grave".

Life cycle analysis identifies options for reducing, reusing or recycling resource inputs, such as water, and waste outputs, such as waste heat. It also looks at ways to reduce, reuse or recyle the outputs.

Some kinds of life cycle analysis also look at include human labour, wages and working conditions or the product.

www.eiolca.net provides an interactive life cycle calculator for 500 consumer items.

Life Cycle Analysis. Case Study: Running Shoes

Student Activity Sheet 5b

PRODUCT DECONSTRUCTION: Trainers

I'm wearing sneakers - "cross-trainers" they call them - although I don't "cross-train" or even know what it is.

Composition

Made up of dozens of different, mostly synthetic, materials, my trainers were assembled in a Korean-owned factory in Indonesia. The leather for the upper came from Texan cows, whose hides were sent for tanning in South Korea, where labour is cheaper and environmental standards lower. Tanning today is a 20-step process involving strong chemicals. The rest of my shoe was made from petroleum-based chemicals. The mid-sole is a custom-designed EVA (ethylene vinyl acetate) foam: a composite of several chemicals which, when combined and baked, release tiny air bubbles, giving the shoes their cushy feel. Below the heel was inserted a U.S.-made component - a small amber-coloured polyurethane bag filled with a pressurized gas of secret composition. The outer soles were made of styrene-butadiene rubber, synthesized from Saudi petroleum and local benzene.

Environmental and Social Impacts

The Indonesian women who made my $75 shoes earned $2 a day and worked in temperatures nearing 34 degrees Celsius. Though solvent fumes cause health problems for some workers, the shoe factory itself generated little pollution and used little energy compared with the refineries, chemicals plants and tanneries that made the shoe's components. Chemicals from tanneries in South Korea are discharged into the Nattong River along with other industrial pollutants, making tap water in that part of the country undrinkable.

What's my role in this life cycle?

I could research the shoe companies to find out which have the best record on environmental protection, fair wages and safe working conditions. (Check both the official company information and its critics.) I could write to companies to encourage them to improve their practices. I could ask myself how many pairs of shoes I really need; replace them less often; buy more durable shoes, have them repaired instead of throwing them out, and give my old ones to someone who could use them.

(Source: Adapted from New Internationalist #295)

Sustainable and Unsustainable Life Cycles of a Product

Student Activity Sheet 5c

1. Read Student Activity Sheets 5a and 5b thoroughly. Read these instructions before starting.

   a. If you did Activity 1, go back to your lists of "The Things I Carry" and/or your lists from Activity 3 of the countries of origin and raw materials for certain products.

   b. If you didn't do those activities, choose a manufactured or processed item from the following categories:

      - your clothing (e.g., leather boot, polyester shirt),
      - your lunch or dinner (e.g., soft drink, granola bar, apple),
      - other items that you "carry" (e.g, pen, cell phone), and/or
      - materials used to construct the school or furnishings (e.g, desk).

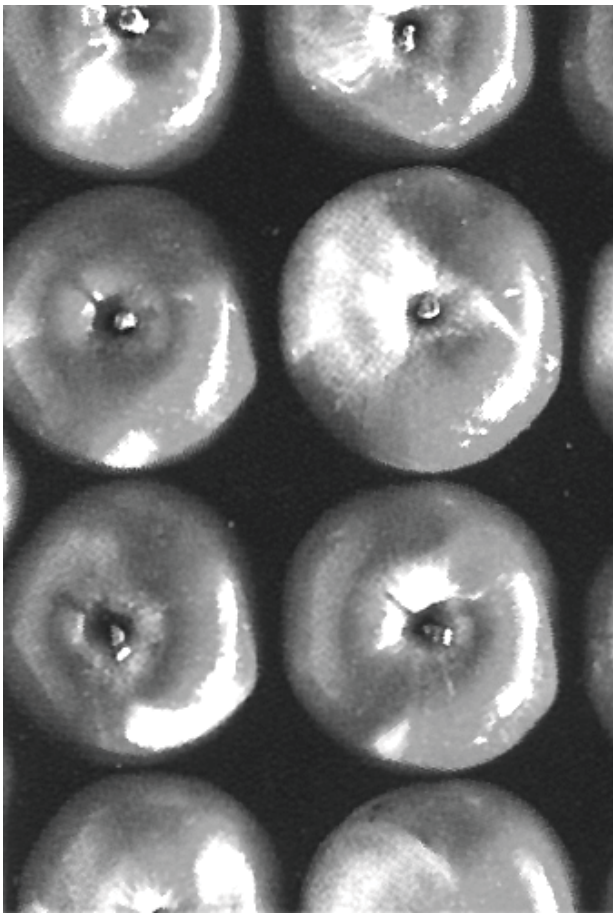
2. Illustrate on a poster or small mural the basic "life cycle" of the product from birth to death - or "reincarnation" if it can be reused or recycled into a new product. Be sure to leave enough room on the page for the information you will add in step 3! Use a comic strip, movie story board, flow chart, collage, sketch map enlarged from an atlas, or format of your choice, combining both drawings and text. Include the following:

   - basic stages in the "birth, life and death" (and "reincarnaton") of your product, including: production or processing, transportation, use, and recycling or disposal;
   - resource inputs at each stage, e.g., raw materials, soil nutrients, energy, water, fertilizers and pesticides;
   - waste outputs at each stage, e.g., solid (garbage) and liquid wastes and air emissions;
   - people involved in the process, that is, all the "hands that touched the product"; these can be drawings of human figures, stick figures or labelled "hands".

3. Go back to your life cycle from step 2 and show an “unsustainable life cycle” and a “sustainable life cycle” for your product. At each stage, show activities and practices that would be sustainable and unsustainable.

   Show both ecological and social aspects, that is, positive and negative impacts on the environment and on people.

   You can show the unsustainable version in the space above and the sustainable one in the space below OR make two separate drawings OR create your own format. (Note: Student Activity Sheets on Sustainable Development from Activity 4 will guide you on what is sustainable.)



Example: apple sauce.

Unsustainable	Sustainable
First stage: grow apples	
Heavy use of pesticides on apples can causes water or soil pollution and this can poison fish and wildlife. Pesticides can have negative impacts on the health of those who handle them as well as orchard workers and pickers. Too much pesticide residue can harm consumer health, especially children. Some irrigation systems waste scarce water.	Organic production or integrated pest management (combining minimal use of pesticides and with natural pest control.) reduces negative impacts on ecosystems and people. Use of drip irrigation systems will waste less water.
Second Stage: processing	
	etc.
Third Stage: transportation	
	etc.

4. Find somewhere in the school you could display your results and/or present them to other students, for example, in the school newspaper, display board or on a web site.