

# Resistant Materials in our Environment

## Lesson 3: Every material we use affects the environment.

### Learning Objectives:

- To develop skills in seeking information about materials from different sources.
- To use skimming and scanning reading techniques to identify key points.
- To develop an understanding of how the use of materials can impinge on the environment.
- To be introduced to the environmental concepts of climate change and embodied energy.
- To raise awareness of the amount of energy consumed in the production of manufactured items

### Resources:

- Photographs of examples of outdoor seating constructed from processed materials from the previous lesson ie wrought iron chair, deck chair, softwood picnic table, hardwood garden chair, plastic garden chair, pre cast concrete seat.
- ICT and / or library resources.
- Photocopy of Activity Sheet 3 per pupil.

### Activity:

This is a research activity. It could be used as a class lesson or could be used as a homework activity.

In either case give out Activity Sheet 3 and together read the *four key facts* the top of the page. Examine each statement with the pupils.

1. *All the materials that we use were originally extracted from, or grown on, the Earth's surface:* Ask pupils where a variety of materials originate (steel - iron ore which is quarried or mined; paper - produced from softwood trees grown in forests; salt - sometimes evaporated from salt sea water etc).
2. *Wherever materials originate they have an effect on the environment* (mining, quarrying, farming, forestry and extracting materials from the sea all affect the local environment).
3. *Sometimes the effect on the environment is positive but often it is negative* (quarries, for example, can damage the local environment, but when exhausted can provide useful habitats for a variety of plants and animals).
4. *Often the environmental effect is obvious* (ie when an oil tanker sinks) *but sometimes it is hidden* (ie when a chemical, that is widely used, is suddenly discovered to cause unexpected effects. Examples are asbestos, creosote and DDT, all of which have been linked with serious diseases).

Now, with the pupils, read the three 'newspaper reports'. These are all paraphrased reports of actual events.

In each case try to elicit from the pupils 'news' stories of similar events.

Obvious negative effect of materials on the environment: eg oil tanker accidents, river pollution, local concerns about aggregate or mineral extraction or land fill sites. etc.

Obvious positive effect of materials on the environment: eg Local recycling or waste reduction initiatives, reinstatement projects for mines, landfill sites etc.

Hidden negative effects of materials on the environment: eg Explore pupils understanding of subjects such as climate change (They may know about retreating polar ice caps etc.) and the ozone layer. Ensure they understand the role of fossil fuels and carbon dioxide in the concept of climate change.

Discuss the research activity with the pupils. Encourage pupils to use the internet and library to find information and to present their research in the form of maps, diagrams and lists that can be displayed and presented to their peers.

Now finally focus on the third part of the research activity which is designed to introduce pupils to the concept of embodied energy within materials ie *try and identify the occasions when energy derived from fossil fuels has to be used to make the finished product. List the occasions.*

You could simplify the process of making corn flakes as an example. Listing the occasions when fossil fuel energy is used.

*ie Oil / diesel powers the tractor that sows the maize seed. Oil / diesel powers the tractor that helps apply fertilisers and pesticides to the crop and is used in the production of these products. Oil / diesel powers the combine harvester that harvests the corn. Oil / diesel powers the vehicle that carries the corn to the factory. Coal / Oil produces the electricity that heats the corn in the oven and drives the machinery that packs the corn flakes in boxes and is used in making the packaging and the processing machinery. Oil / diesel powers the transport that distributes the corn flakes to shops, Oil / diesel / petrol powers the cars that fetch the corn flakes from the shop.*

Encourage pupils to make a similar list for the material they investigated at the end of their research.

When the pupils display their research you could look at the length of the list of occasions when fossil fuel energy is used. The wood ought to have a shorter list than the other materials as it has lower embodied energy levels in tables published on the subject.

**Four key facts.**

1. All the materials that we use were originally extracted from, or grown on, the earth's surface.
2. Wherever materials originate they have an effect on the environment.
3. Sometimes the effect on the environment is positive but often it is negative.
4. Often the environmental effect is obvious but sometimes it's hidden

**Obvious negative effect of materials on the environment****26th April 1998****Iron ore mine threatens to pollute important nature reserve**

Engineers in Southern Spain are desperately working to prevent dangerous toxic pollution from the Los Frailes Iron ore mine entering a valuable nature reserve.

Poisonous water, containing chemicals, such as arsenic and cadmium, have been pumped from the mine and stored in a reservoir. The dam holding the reservoir has been damaged and large amounts of poisoned water are spilling into the nearby Guadiamar River.

The river flows through the Donana National Park which is home to rare plants and animals. Local farmers have been told to stop irrigating their land with the poisoned river water and there are fears that the local fishing industry has been badly damaged.

**Obvious positive effect of materials on the environment.****28th July 2003**

Plastic cartridge recycling scheme helps people with special needs and the environment

A new scheme to recycle plastic laser and ink jet computer cartridges has begun in West Dorset. Volunteers from a local NHS Trust have set up a collection point for the waste cartridges at a Tesco car park in Dorchester.

The volunteers will sell the empty cartridges to a local company which will clean, refill and retail them. The money earned by the recycling scheme will be used to benefit the people with special needs who are supported by the trust.

A spokesperson for the Trust said "The environment and everybody involved wins from this scheme! Less waste is thrown away, useful items are reused and local people benefit."

**Hidden negative effect of materials on the environment****7th January 2004****Scientist predicts that pollution will cause extinction of a million species by 2050**

Scientists writing in the journal *Nature* predict that a quarter of the world's species will be extinct by 2050. They believe that air pollution, caused by the burning of fossil fuels (coal, gas and oil) is changing the world's climate. One of the authors of the report said " Our lifestyles are damaging the planet. The transport, heating and industrial processes we use are releasing tonnes of polluting carbon dioxide gas into the atmosphere. We believe this is quickly changing the earth's climate. Many species of plant and animal will not be able to move to different parts of the world where the climate will be better for them. They will be forced into extinction."

The United Nations says the prospect is also a threat to the billions of people who rely on nature for their survival.

**Activity**

1. Choose one of the materials used to make the outside seating. Choose either **steel**, **softwood**, hardwood such as **teak**, **plastic** or **concrete**.
2. Find out from the internet or books:
  - a) where the raw materials to make the seat comes from;
  - b) what processes occur to change the raw material into the chair.
  - c) if there have been any environmental problems in obtaining and processing the raw material.
3. From your research try and identify the occasions when energy derived from fossil fuels has to be used to make the finished product. List the occasions.