

Be a mineral expert 4 – Recycle your mobile phone

Why should I recycle my mobile (cell) phone?

In some countries, there are more mobile phones than there are people! Use the information in this activity to encourage your pupils to ensure that their families' mobile phones are not thrown away when they break, or pass out of fashion, but are recycled instead. A working phone may be re-used in a less well developed area: a broken phone can be stripped down and the materials which make up its components recycled. Pupils may be prompted to answer the question, "Why should I recycle my mobile phone?" by following the activities. Issue the **Information Sheet** to help them.



A typical mobile phone (Photo: Peter Kennett)

Using the Information Sheet:

- Draw up a diagram showing "The Life Cycle of a mobile phone".
- Plot on an outline world map the countries where the components of a mobile phone are sourced.
- Discuss the implications of mining for rare raw materials in regions which are politically unstable, thinking of the impact on the lives of the miners and transport providers, and possible shortages of materials in the event of conflict.
- Discuss the problems associated with burying a broken mobile phone in landfill, given its

content of heavy metals and other toxic materials. Leaching of such substances into ground water could affect drinking water supplies.



A landfill site

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- Discuss the impact on the production of greenhouse gases from the use of energy at all stages of a mobile phone's life.



Recharging a mobile phone (Photo: Peter Kennett)

Information Sheet

There are several stages in the life of a mobile phone:

- **Materials extraction and processing**

Mobile phones contain between 500 and 1000 components. 40% of the phone is made of metals; 40% of plastics and fibreglass and 20% of ceramics and trace materials. The metals and trace materials include: copper, gold, lead, nickel, zinc, beryllium, "coltan" (columbite-tantalite), antimony, arsenic, tin, silver. Plastics are made from oil; fibreglass from sand and limestone. The liquid crystal display (LCD) may be made from toxic substances such as mercury, sandwiched between two sheets of glass, although the exact composition of the LCD is a trade secret of the manufacturers. Depending on its type, the rechargeable battery may contain nickel, cadmium, cobalt, zinc, copper, lead or lithium. Some of these vital materials are mined in countries, which are troubled by civil wars, such as the Democratic Republic of Congo, (which contains 64% of the world's reserves of coltan). In some countries, there is very little safety protection for the miners or environmental protection for the countryside. Energy is needed to run the machinery to mine the materials from the ground and to transport them to ports and airports.

- **Manufacturing**

The raw materials are made into mobile phone components in many different countries. For

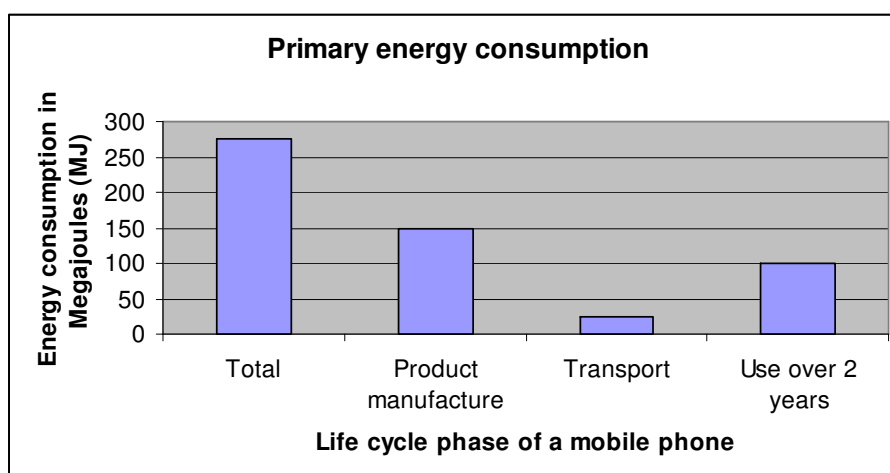
example, Nokia, obtains its components from at least 29 countries. The main ones are: Austria, Brazil, China, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Japan, Korea, Malaysia, Mexico, Morocco, Netherlands, Philippines, Portugal, Singapore, Slovakia, Spain, Sweden, Switzerland, Taiwan, Thailand, UK and USA. Energy is needed to run the factories and to transport the components to the places where they are assembled into a finished mobile phone.

- **Packaging and transport**

Mobile phones are packaged to protect them from damage and to attract the buyers. Packaging is made from paper or cardboard (made from trees), plastics (from oil), and other materials. Energy is needed by the packaging factory and in transporting the finished product to the shops.

- **The phone in use**

Energy is needed to charge the batteries in the phone. This is often wasted, if the phone is left to charge longer than is needed. Mostly, phone systems are not interchangeable between companies and the urge for a different type of phone encourages many people to change their phone more often than necessary. In the USA, a mobile phone is only used for an average of 18 months before being replaced. If a phone ends up in landfill, the toxic components remain in the ground for hundreds of years, or may leak out into water supplies.



Source: http://ec.europa.eu/environment/ipp/pdf/nokia_mobile_05_04.pdf page 59

The back up

Title: Be a mineral expert 4 – Recycle your mobile phone.

Subtitle: Why should I recycle my mobile (cell) phone?

Topic: An activity based on an information sheet, which prompts pupils to think about the materials and energy which go into the manufacture and use of a mobile phone, and why they should consider carefully what happens to the phone when its useful life is over.

Age range of pupils: 11 -18 years

Time needed to complete activity: 15 to 45 minutes depending on the depth of study

Pupil learning outcomes: Pupils can:

- appreciate the wide range of components and materials which make up a mobile phone;
- plot the locations of the countries involved in the supply chain of a mobile phone;
- debate the morality of the excessive replacement of mobile phones;
- adapt their own habits when charging their mobile phones, to reduce energy use;
- take appropriate action when disposing of a mobile phone.

Context: This activity can be used in a variety of contexts, from a science lesson, covering the nature and origin of the raw materials, to geography or economics lessons. An example of the life cycle of a mobile phone can be viewed at <http://www.epa.gov/osw/education/pdfs/life-cell.pdf>

Following up the activity:

- Pupils can carry out a websearch for information from the manufacturer of their own mobile phone.
- Encourage pupils to spread the word about the environmental concerns involved in the mobile phone industry, among their peers and in their own families.

- Watch out for TV programmes concerning conflict or environmental abuse in countries where the raw materials for mobile phones are extracted.
- Investigate the country of manufacture of their own mobile phones and their battery packs. This usually requires switching off the device for a few minutes, with blessed relief to the class!

Underlying principles:

- Many underlying principles regarding the manufacture and use of mobile phones are given in the text on page 2.
- In all phases of the life cycle of a mobile phone, the use of energy is the biggest single environmental factor.

Thinking skill development:

- appreciation of the large number of materials needed to make a mobile phone – construction;
- debating the issues involved – metacognition;
- relating the disposal of their own phone to environmental factors – bridging.

Resource list:

- copies of the Information Sheet, or the equivalent, prepared by the teacher.
- copies of blank world maps

Useful links: See

<http://www.epa.gov/osw/education/pdfs/life-cell.pdf> for a pupil sheet on the life cycle of a mobile phone and http://ec.europa.eu/environment/ipp/pdf/nokia_mobile_05_04.pdf for an industry view of the components of a mobile phone. www.dizolele.com contains images of coltan mining in the DR Congo. Several websites offer payment for mobile phones, once their useful life is over.

Source: Devised by Peter Kennett of the Earthlearningidea team.

The progression of thinking skills shown by the Earthlearningidea Mineral Expert activities

Earthlearningidea	Strategies and skills developed
Be a mineral expert – 1: Beginning to identify minerals – introducing colour, habit, lustre, cleavage	Observational skills are used to begin to identify minerals.
Be a mineral expert – 2: Identifying minerals using 'action' tests – streak, density, hardness, acid test	Tests involving motor skills are added to purely visual ones, leading to an understanding of the need for more data to be sure of an identification.
Be a mineral expert – 3: The mineral foundations of everyday life	A much wider range of minerals is introduced, together with their chemical compositions, involving higher level thinking skills to match them to their uses in the real world.
Be a mineral expert 4 – Recycle your mobile phone: Why <u>should</u> I recycle my mobile (cell) phone?	An introduction to responsible citizenship, widening the scope from the purely scientific to a mature understanding of the need for recycling scarce materials.

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