

### Earths Resources + Recycling

Humans use the Earth's resources to provide warmth, shelter, food and transport.

Natural resources, supplemented by agriculture, provide food, timber, clothing and fuels. For example Wood, Cotton and Leather.

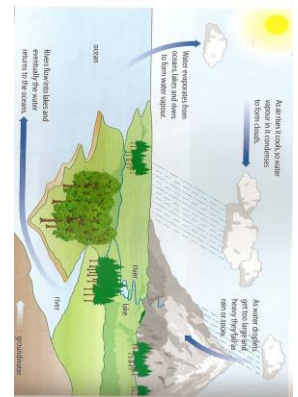
Finite resources from the Earth, oceans and atmosphere are processed to provide energy and materials. For example, Stone, Gold and Crude oil.

Obtaining raw materials from the Earth by quarrying and mining causes environmental impacts. Some products, such as glass bottles, can be reused, other products cannot be reused. Metals can be recycled by melting and recasting or reforming into different products. Different materials require different levels of separation before recycling. For example, some scrap steel can be added to iron from a blast furnace to reduce the amount of iron that needs to be extracted from iron ore

### Potable Water

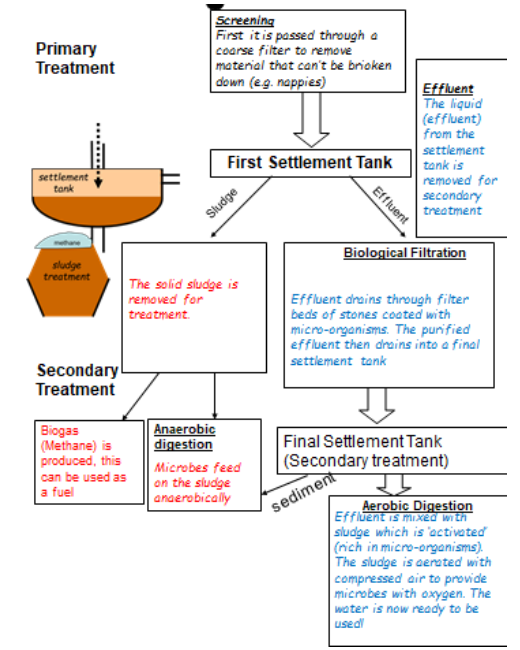
Water that is safe to drink is called potable water. Potable water is not pure water in the chemical sense because it contains dissolved substances.

In the UK rain provides low levels of fresh water that collects in; the ground, lakes and rivers. It is then passed through filter beds to remove larger contaminants it is then sterilized by using either chlorine, ozone or ultraviolet light to kill bacteria.

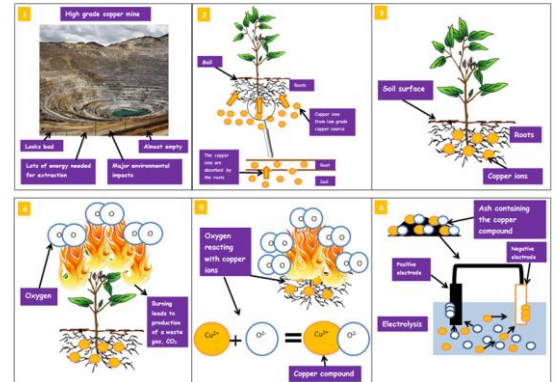


It is not always possible to access fresh water. Desalination of sea water can be done by distillation or by processes that use membranes such as reverse osmosis. These processes require large amounts of energy.

### Waste Water Treatment



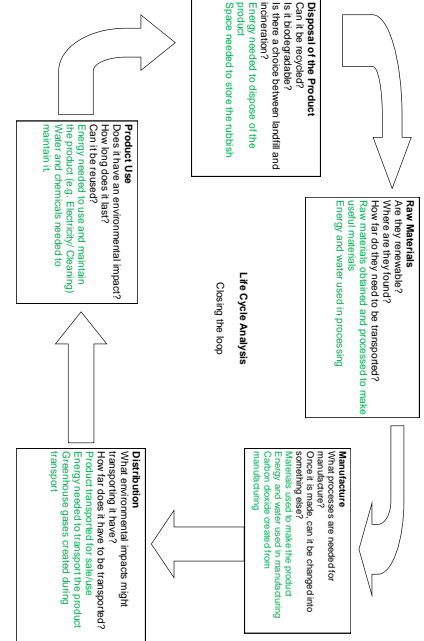
### Phytomining



### Bioleaching

In Bioleaching, bacteria are mixed with low grade copper ore. The bacteria produce leachate solutions that contain metal compounds from the ore. These metal compounds can then be separated by displacement or electrolysis

### Life Cycle Assessment

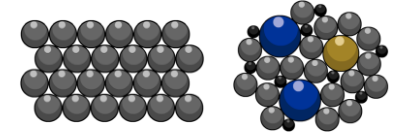


LCA'S assess the environmental impact of products in each of these stages

- Extracting and processing raw materials
- Manufacturing and packaging
- Use and operation during its life time
- Disposal at the end of its useful life

### Alloys (Triple Only)

Most metals in everyday use are alloys.



Bronze is an alloy of copper and tin and used in coins. Brass is an alloy of copper and zinc and used in piping.

Gold used as jewelry is usually an alloy with silver, copper and zinc. The proportion of gold in the alloy is measured in carats. 24 carat being 100 % (pure gold), and 18 carat being 75 % gold.



Steels are alloys of iron that contain specific amounts of carbon and other metals. High carbon steel is strong but brittle. Low carbon steel is softer and more easily shaped. Steels containing chromium and nickel (stainless steels) are hard and resistant.

### Ceramics, Composites and Glass (Triple Only)

Glass  
Most of the glass we use is soda-lime glass, made by heating a mixture of sand, sodium carbonate and limestone. Borosilicate glass, made from sand and boron trioxide, melts at higher temperatures than soda-lime glass.



Ceramics  
Pottery and brick ceramics are made by shaping wet clay and then heating in a furnace

Composites  
Most composites are made of two materials, a matrix or binder surround and binding together fragments of the different material called the reinforcement



- Uses
- Fiberglass
  - Dental Fillings
  - MDF

### Polymers

Polymers depend on what monomers they are made from and the conditions under which they are made.



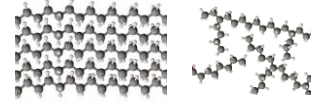
Thermosoftening  
Individual tangles of polymers that melt when heated



Thermosetting  
Polymer chains with cross links between them, they do not melt when heated

#### LDPE AND HDPE

Ethene can be polymerized in slightly different ways to produce low density polyethene and high density polyethene. LDPE has side branches that stop the polymer molecules lining up properly, it is not crystalline, therefore it has weaker bonds and has a lower melting point. HDPE has a crystalline structure therefore has a higher melting point due to the force of attractions



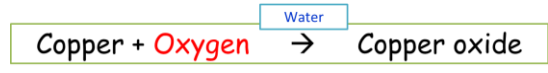
### Corrosion Prevention (Triple Only)

Rusting is an example of corrosion. Both air and water are necessary for iron to rust.

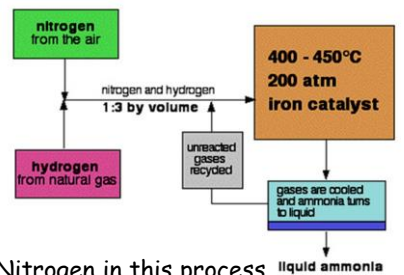
There are 2 main methods to help prevent rusting

- 1) Putting a barrier between the metal and the air and moisture e.g. grease, paint, plastic, unreactive metal
- 2) Sacrificial protection - The iron is covered or connected to a more reactive metal so it will 'corrode' ahead of the iron.

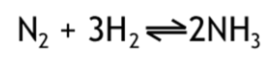
**Corrosion** = Metals corrode when they react with **oxygen** to form oxides in the presence of **water**/moisture



### Haber Process (Triple Only)



The Nitrogen in this process is from the fractional distillation of air and the hydrogen is obtained from the natural gas (CH4) or electrolysis of water



The reaction is reversible. To separate the ammonia, it is cooled and removed, the remaining nitrogen is recycled

### NPK Fertilisers (Triple Only)

Compounds such as Nitrogen, phosphorus and potassium (NPK) are used in agriculture.

Ammonia can be used to manufacture ammonium salts and nitric acid to give the nitrogen (N). Potassium (K) comes from mining of potassium chloride and potassium sulphate. Phosphorous (P) comes from mining phosphate rock.

Acid	Alkali	Fertiliser
Nitric Acid	Ammonia Solution	Ammonium Nitrate
Phosphoric Acid	Ammonia Solution	Ammonium Phosphate
Sulfuric Acid	Ammonia Solution	Ammonium Sulphate