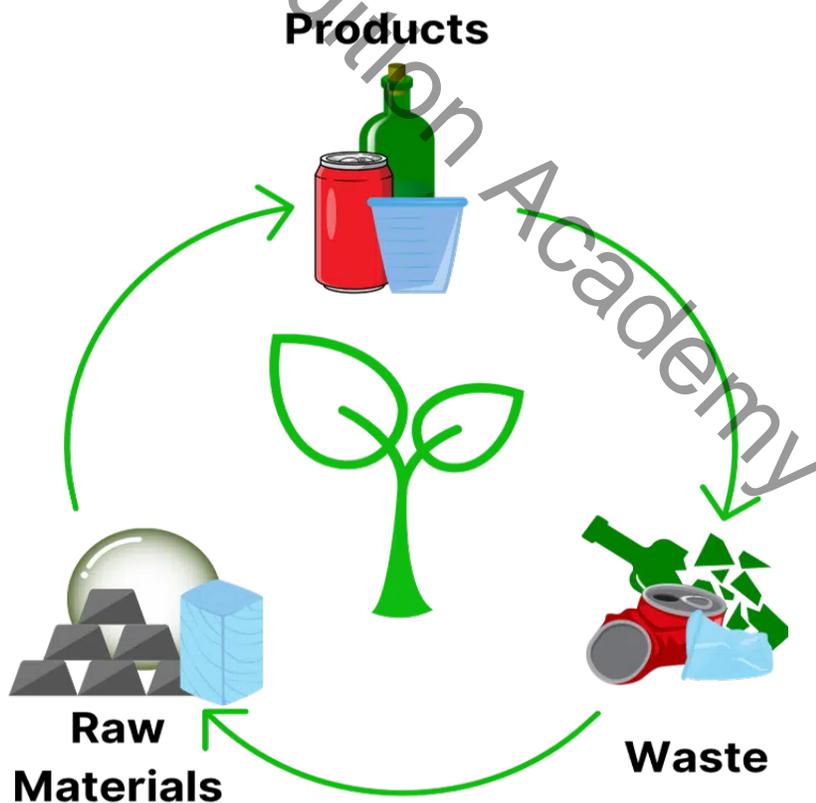


Recycling

Reducing The Use Of Resources

- Many of the materials and products that we use in our day-to-day lives are produced using **limited** natural resources.
- Materials like **metals, glass, and ceramics** require the **extraction** of **finite raw materials**.
- The Extraction process **causes damage** to the **natural environment**.
- To live sustainably, it is important that society **reduces** the amounts of **raw materials** that it extracts from the Earth.
- To do this we can **reuse** and **recycle** materials that have already been extracted and processed. This means that instead of discarding products after once they have been used, they should be kept and **properly processed** to extract the materials used in their manufacture.
- This **reduces the demand** for new supplies of already pressured natural resources and also **reduces the amount of waste** that goes to land fill.



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Reuse of Glass

- Some materials can be **reused** after they have reached the end of their operational life.
- For example, **glass bottles** can be reused after we are done with them. By returning them to their manufacturers where they can be **cleaned** out and **refilled**. This allows us to dramatically reduce the demand for the raw materials required to produce the bottles.

Recycle the metals

- Not all products can be reused however. For example, **aluminium cans** are typically **difficult to reuse** once they have been used once. In these cases, it may be possible to **recycle** the product instead.
- This is particularly useful for **metals**. Metals can be recycled using the following process:
 1. **Separation:** Products that have reached the end of their useful life are taken to **recycling centres**. These products are **dismantled** and the **different components separated** out. Non-recyclable materials are removed and sent to landfill. The recyclable metal components are kept and processed further.
 2. **Melting Down:** The recovered metal components are then **melted down** to obtain the isolated metal. Depending on the desired use of the recycled metal, alloys may be further separated into their elements, or simply left as they are.
 3. **Recasting:** The new raw metal can then be **melted down** again and **recast** into other products. In some cases, the melted down metal may also be added into the process of **new metal manufacture**. For example **scrap steel** can be added to blast furnaces in the production of **iron**. This **reduces the amount of iron ore needed**.

Pros and Cons of Recycling

Cons:

- Recycling is one way in which society can live more sustainably. However, like most things, recycling is not free of its **issues**. There are certain disadvantages to the recycling process:
 1. Waste must be **transported** to recycling centres. This generates **carbon emissions** from the vehicles used.
 2. **Recyclable materials** often need to be **separated** from **non-recyclable materials**. This process can be very **labour intensive**.
 3. Melting down materials needs a lot of **energy**. This adds to **fossil fuel demand** by increasing the demand for **power generation**.

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Pros

1. The **environmental impact** from the **extraction** and **processing** of new raw materials is **significantly reduced**.
 2. The amount of **waste** that goes to **landfill** is also **greatly reduced**.
 3. As demand for **raw materials** is reduced, the supplies of these materials will **last longer**.
- On the whole, though recycling has its drawbacks, the positive results of the process have been seen by society to **outweigh** its issues. This has led to most local governments providing at least some kind of recycling provision in its waste disposal systems.

Life Cycle Assessments

- A **life cycle assessment (LCA)** is a method used to estimate and evaluate the environmental impacts of a product or service throughout its entire life.
- It involves analysing the consumption of water, materials and energy. Also, it considers waste production (including wastewater and solid waste) and atmospheric emissions during the product's creation.

Stages of Life Cycle assessment:

1. Extracting and processing raw materials:

When raw materials are **extracted** and **processed** at the beginning of a product life cycle, pollution can occur. This is because extraction and processing of raw materials can use a lot of energy. Examples of pollution which arise from extracting different raw materials.

① **Extracting metals: Metal mining** causes acidic solutions which can leach into water bodies and kill organisms. Dust from mines can cause respiratory problems.

② **Extracting crude oil to make plastics: Carbon dioxide** from burning fossil fuels is a greenhouse gas, causing global climate change. Lots of fuel is burnt to use heavy machinery in mining and drilling.

③ **Extracting wood to make paper: Deforestation** reduces biodiversity

2. Manufacturing and packaging:

Both the **manufacturing** and **packaging** of a product can use a lot of energy. Similar to the first step, this can also produce a lot of pollution. Disposing of any waste products can also use up a lot of energy.

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3. Use and operation during the product lifetime:

Use of products can produce **pollution**, for example, the burning of fuels. The more a product is used, the more pollution it could create.

4. Disposal at the end of its useful life:

Once a product has come to the end of its life, it must be **disposed of**. This can cause pollution in the form of creating landfill sites. Methane gas, a greenhouse gas, is made in landfill sites.

Quantifying the Use of Resources

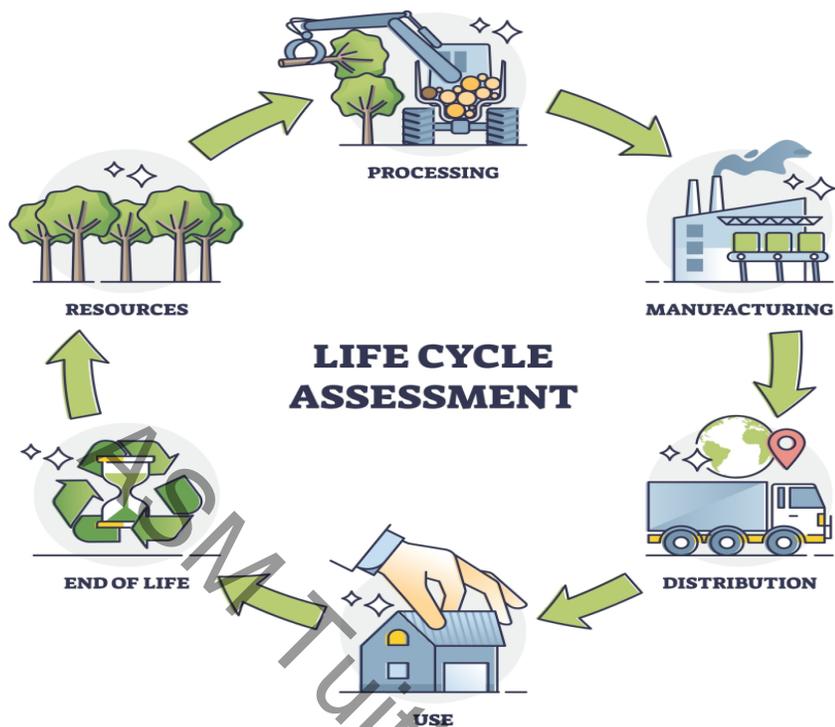
► Allocating Numerical Values

1. **Resource use can be quantified:** For example, we could quantify the number of litres of water used to create a product.
2. **LCA assessment is not purely objective:** Despite being able to place a number of resources used in an LCA, this is **not** an **objective** process. It is much more difficult to quantify the effects of pollution at each stage.

► Misuse of LCAs

1. **LCA assessment is not objective:** it is difficult to quantify **exact values** in an LCA. This means that they are not objective values – they are subjective.
2. **LCAs can be misused:** Companies can **misuse LCAs** to portray their products in a positive light. People may be more likely to buy a product if they think it has a minimal environmental impact.

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Comparing Simple LCAs

Plastic Bag	Paper Bag
Crude oil polymers used as raw material	Wood used as raw material
Manufacturing and packaging requires fractional distillation, cracking and polymerisation	Manufacturing and packaging requires lots of energy to pulp the wood, producing lots of waste
Can be reused	Single use
Recyclable, but not biodegradable	Recyclable and biodegradable

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