

Finite and Nonrenewable resources

Natural resources

- ▶ Natural resources are all around us and provide us with the materials we need for shelter, food, warmth and transport.
- ▶ These resources can be:
 1. **Living:** plants and animals
 2. **Non-living:** Minerals, fossil fuels, water and air
- ▶ Some resources can be replaced by synthetic products and others cannot. Resources that can not be replaced are described as **finite and Non-renewable resources**.
- ▶ Chemistry plays an important role in the development of new materials through sustainable processes that enable the need of the current generation to be met without compromising the availability of natural resources for future generations.



1. **Rubber:**

which is extracted from the sap of trees (called latex), is an example of a natural product that can be replaced by a synthetic one. Polymers are the replacing material of rubber which have been developed to specifically replace the rubber in many products.

2. **Fertilisers:**

Fertilisers is use to enhance crop yields and their productivity

Renewable & non-renewable resources

- ▶ Natural resources can be classified as either **renewable** or **non-renewable**. Non-renewable resources are also described as **finite**
- 1. **Renewable Resources:** Renewable resources is those resources which can be replaced themselves over a period of time even as they are used.



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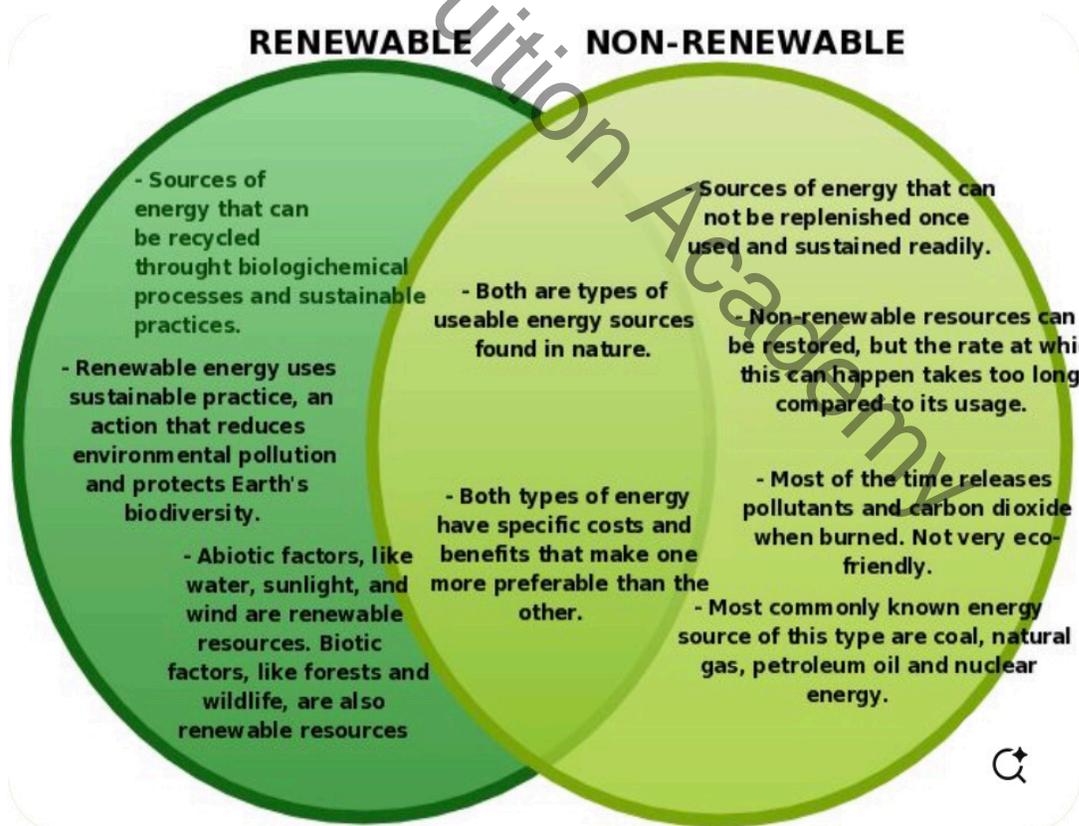
- ▶ **Timber** is an example of a renewable resource as trees and forests can be replanted after the wood has been harvested, although they do take years to replenish

2. Finite or renewable resources

- ▶ Finite or non-renewable resources are those that don't reform quickly enough or don't reform at all



- ▶ It include **minerals** from the Earth's crust and **metal ores**. After extraction, many resources require further processing to make the desired products. These processes require energy and make the extraction process **less sustainable**.
- ▶ The extraction of non-renewable resources carries risks.
- ▶ The Earth's natural resources are being **depleted** and large amounts of **energy** are being consumed in the process of extraction



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Using Resources Sustainably

- The **finite** nature of many of the Earth's resources means that it is important for humanity to use them **sustainably**.
- Sustainable use of resources means that we use those resources in a way that **meets our current needs** without jeopardizing the ability of **future generations** to meet theirs.
- For example, **fossil fuels** are **finite** resources that we use to meet our **energy needs**. To use them sustainably, we must be sure that we do not **deplete** them.
- If society in the present day were to burn through all the world's fuel reserves, this would prevent future generations from being able to meet their own energy needs.
- Any resource that can be depleted should be **conserved** as much as is possible to ensure that future generations will not be deprived of them.

Number of ways to ensure that our use of resources is sustainable.

1. **Recycling**: One method is to **recycle** what materials we can so that we do not use more than is necessary. By recycling resources we can make them last **longer**.
2. **Reduce the usage of resource**: Another is to **reduce** the use of a resource in the first place. We can do this cutting down on **waste** and **unnecessary usage**. We can also **replace** non-renewable resources with **alternative resources** that are **renewable** (such as solar and wind in the case of fossil fuels) and that will not be depleted.

Copper and its Ores:

- **Copper** is one of the most widely used metal on Earth. Copper is used in **electronics** to conduct electricity, in **alloys** to produce other metals with desirable properties, in **construction** for roofs, and in the **arts** as brass and bronze.
- The global demand for copper has **increased** dramatically over the last century as human civilization has become more and more developed.
- Copper is a **finite natural resource**. That means that once we have used it all up, it will be gone. Already, human consumption is **depleting** the supply of **copper rich ores** (ores that have contain a high percentage of copper). This makes it harder to meet the demand for copper in a sustainable way and is driving a move towards extraction of copper from **low grade ores**.

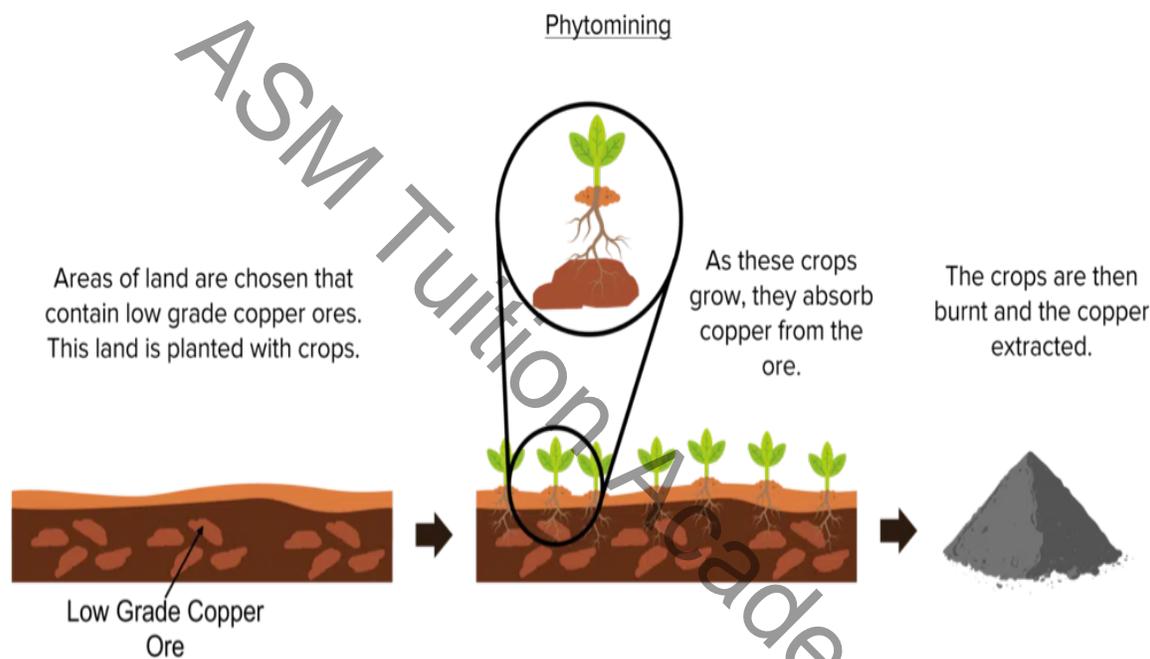
Techniques to Extract copper:

1. **Phytomining.**
2. **Bioleaching**

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1. Phytomining:

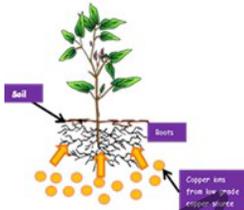
- **Phytomining** is the process of using **plants** to extract **copper** from **low grade ores** in the ground.
- Firstly, areas of land must be found that contain a **high concentration** of low grade copper ores. Once found, plants are planted on this land and allowed to **grow**.
- As the plants grow they **absorb minerals** from the ground in which they are growing. This process causes **copper compounds** to be taken up into these plants and stored within them.
- Once the plants have grown, they are **harvested** and **burnt**. The **ash** left behind will contain a relatively **high concentration** of copper compounds. Copper can then be **extracted** from these compounds.



2. Bioleaching

- In bioleaching, **bacteria** are used to **extract copper ions** from **low grade copper ores**. During this process, bacteria convert copper compounds within ores into **solution**.
- These copper compound solutions are called the **leachate** and can be separated using **electrolysis** or **displacement reactions** to form copper metal.

Extracting Metals – Biological Methods

	How does it work?	Pros	Cons
<p>Phytomining</p> 	<ul style="list-style-type: none"> • Grow plants • Plants take metal from the ground • Burn plant • Metal is extracted from ashes using electrolysis 	<ul style="list-style-type: none"> • Can remove metal from soil • Don't need to mine/destroy habitats • Conserves metal ores 	<ul style="list-style-type: none"> • Slow • Depends on weather/climate • Burning the plants makes CO₂
<p>Bioleaching</p> 	<ul style="list-style-type: none"> • Uses bacteria • Bacteria break down metal forming a leachate • Scrap iron is used to displace metal from leachate 	<ul style="list-style-type: none"> • Works on ores with very little metal • Don't need mines • Conserves metal ores • Doesn't produce CO₂ 	<ul style="list-style-type: none"> • Slow • Makes toxins, which harm the environment