

# Biomining

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## Why in news?

- It is a new environment friendly way to extract minerals.

## What is it?

- Biomining is the **process of using microorganisms (microbes) to extract metals of economic interest** from rock ores or mine waste.
- Biomining techniques may also be **used to clean up sites that have been polluted with metals.**
- Some **microbes can oxidize valuable metals bound in solid minerals**, allowing them to dissolve in water.
- This is the basic process behind most bio mining, which is used for metals that can be more easily recovered when dissolved than from the solid rocks.
- Metals currently bio mined are **copper, uranium, nickel, and gold** that is commonly found in sulfidic (**sulfur-bearing**) minerals.
- When the metal of interest is directly dissolved, the bio mining process is called "**bioleaching**," and when the metal of interest is made more accessible or "enriched" in the material left behind, it is called "**bio oxidation**."

## Advantages of bio mining:

- Improved rates of metal recovery
- Reduced capital cost
- Ideally suited for use in remote locations
- Environmentally friendly
- Appropriate to recover a wide spectrum of metals and stabilizing toxic elements

- Short lead time from design to construction to operation
- Bio-mining is more environmentally friendly than other processing methods such as smelting or roasting of mineral ores, which produce a lot of pollutants such as sulphur dioxide and carbon dioxide.
- The bioleaching technology is implemented in closed-circuit, so water usage is well controlled.

### **Environmental risks of bio mining:**

- When base metals such as cobalt, zinc, nickel or copper are extracted by use of acidophilic bacteria, water containing sulphuric acid, similar to acid mine drainage needs to be properly disposed of.

### **Mercury pollution:**

- It is basically contamination caused due to spread and presence of mercury in our daily lives.
- Mercury occurs naturally in the earth's crust, but human activities, such as mining and fossil fuel combustion, have led to widespread global mercury pollution.
- Mercury emitted into the air eventually settles into water or onto land where it can be washed into water.
- Once deposited, certain microorganisms can change it into **methyl mercury**, a highly toxic form that builds up in fish, shellfish and animals that eat fish.
- Most human exposure to mercury is from eating fish and shellfish contaminated with methyl mercury.
- Land, water, and other surfaces can repeatedly **re-emit mercury into the atmosphere** after its initial release into the environment.
- Globally, **artisanal and small-scale gold mining (ASGM) is the largest source of anthropogenic mercury emissions followed by stationary combustion of coal.**
- Other large sources of emissions are non-ferrous metals production and cement production.

### **Effects:**

- It has toxic effects on nervous, digestive and immune systems and on lungs, kidneys, skin and eyes.
- Developing fetus and young children are most at risk.
- Minamata disease, a neurological disease is caused by severe mercury poisoning.
- Once released into the environment, mercury bio accumulates and biomagnifies in the food chain and easily enters the human body.
- Mercury pollution also harms wildlife and ecosystems.
- It may also cause skin rashes and dermatitis.