

Environmental Management

Key Terms:

Rocks & Minerals

<p style="text-align: center;">Rock</p>	<p>A combination of one or more mineral.</p>	<p style="text-align: center;">Solution</p>	<p>Formed when a solid is dissolved in a liquid.</p>
<p style="text-align: center;">Mineral</p>	<p>A naturally occurring inorganic substance with a specific chemical composition.</p>	<p style="text-align: center;">Precipitates</p>	<p>When a substance comes out of a solution.</p>
<p style="text-align: center;">Igneous Rock</p>	<p>Rock made during a volcanic process.</p>	<p style="text-align: center;">Crystals</p>	<p>Crystals are solids in which all of the atoms are arranged in repeating patterns.</p> <p>Those found in rocks form when solutions of minerals cannot absorb any more dissolved minerals. Some of each mineral type precipitates out of solution to form the centre of a crystal. More mineral ions precipitate onto the surface, and the crystal becomes larger until the solution disappears.</p> <p>Quick cooling = small crystals, slow = large.</p>
<p style="text-align: center;">Magma</p>	<p>Molten rock below the surface of the Earth.</p>	<p style="text-align: center;">Ion</p>	<p>An atom in which the number of positively charged protons is not equal to the number of negatively charged electrons.</p>
<p style="text-align: center;">States of Matter</p>	<p>Solid: firm and stable in shape, cannot flow or be compressed (squashed), as particles have little space to move, or to move into</p> <p>Liquid: flows freely and take the shape of its container, as particles can move around each other, but cannot be compressed, because particles are close together and have no space to move into</p> <p>Gas: flows freely and will expand to fill the whole container, as particles can move quickly in all directions, and can be compressed, because their particles are far apart and have space to move into</p>	<p style="text-align: center;">Sedimentary Rock</p>	<p>A rock formed from material derived from the weathering of other rocks or the accumulation of dead plants and animals.</p> <p style="text-align: center;">Builds in layers.</p> <p>E.g. limestone, sandstone, shale.</p>

Metamorphic Rock

A rock formed from existing rocks (igneous, sedimentary and other metamorphic rock) by a combination of heat and pressure.

E.g. granite (igneous) to gneiss
shale (sedimentary) to slate
limestone (sed) to marble

The conditions to make metamorphic rock destroy any fossils that might be in the rock.

Remote Sensing

A process in which information is gathered about the Earth's surface from above.

Aerial photos

Satellites:

- Picking up mineral deposits unique radiation patterns

Or

- Reflected signals from the surface of the Earth

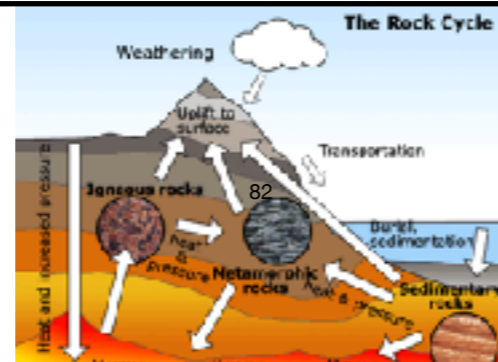
Rock Cycle 1

A representation of the changes between the three rock types and the processes causing them.

Geochemical

The chemical properties of rocks

Rock Cycle 2



<http://questgarden.com/21/45/2/121108171322/index.htm>

Geophysical

The physical properties of rocks.
A type of mining used when the mineral is either exposed on the surface or overlain by only small amounts of **overburden**

Ore

A rock with enough of an important metal or mineral to make it worth mining, and producing a profit.

Surface Mining

<https://slidetodoc.com/minerals-and-mining-minerals-concentration-of-naturally-occurring/>



Prospecting

A process of searching for minerals.

- Remote sensing: cheaper when covering very large area
- Field surveys: geochemical analysis - where chemicals in the samples are identified
geophysical analysis - a series of vibrations (seismic waves) are sent through the Earth's surface and are reflected back to sensors on the surface.

Overburden

The rock and soil overlying an economically viable mineral deposit.

Open-pit Mining

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Types of Surface Mining



Open Pit Mining

- Dig hole and remove ores
- Fe, Cu, and Sand

Surface Mining

Mineral is either exposed on the surface or overlain by only small amounts of overburden.

Pros:

- more efficient than sub-surface mining: quicker and higher recovery rate of minerals
- Cheaper
- Safer

Cons:

- Destroys environment: flora and fauna, water contamination, air pollution, noise pollution, visual pollution

Strip Mining

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Types of Surface Mining



Used for:
Tar
sand
and
Coal

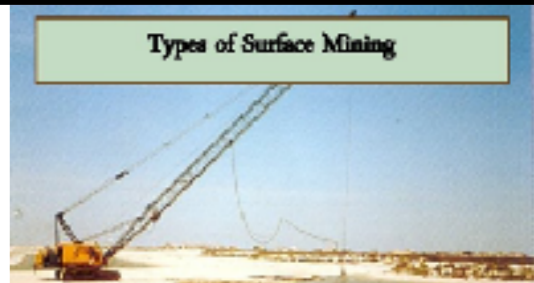
Area Strip Mining

- Cut new strips away; spoil placed on side, mineral taken out.

Dredging (Sand)

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Types of Surface Mining



Dredging (Sand)

- Draglines scrape up underwater mineral deposits

Sub-surface Mining

A type of mining used when the deposit is covered by a deep layer(s) of unwanted rock.

Pros:

- Less environmental impact; only a small area of land is cleared of vegetation, but mine waste will build up above ground.

Cons:

- Expensive
- Dangerous
- Can cause land collapse

Whether you use a shaft, sloping or drift mine depends on how deep you need to go.

Mountain Top Removal

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Types of Surface Mining



Mountaintop Removal

- Use TNT, huge shovels, and large machines to remove top of a mtn and expose coal underneath.

Deep mining

Mining that goes more than 1500m below the surface. Deep rock mass is characterised by high *in situ* stress, high temperature, and high water pressure.

Compared with shallow resource extraction, deep mining may be associated with disasters such as rockbursts (when the opening of mine workings relieves neighbouring rocks of tremendous pressure, which can literally cause the rock to explode, or trigger abrupt movement on nearby geological structures), large-scale caving, and large inrush of mixed coal, gas, and water.

Sub-Surface Mining

<https://slidetodoc.com/minerals-and-mining-minerals-concentration-of-naturally-occurring/>

Subsurface Mining

- Used to remove minerals deep in Earth's surface.
- Less env. Impact


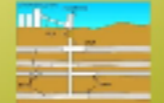


Shaft Mining

<https://slidetodoc.com/mining-101-ap-environmental-science-the-principles-of/>

Mine Shafts and Winzes

- **Shaft mining** refers to the method of excavating a vertical or near-vertical tunnel from the top down with no bottom access. When the top of the excavation is the ground surface, it is referred to as a shaft; when the top of the excavation is underground, it is called a **winze** or a sub-shaft.







Mining 1

<https://slidetodoc.com/mining-101-ap-environmental-science-the-principles-of/>

The Principles of Mining

- Mining is the extraction of valuable minerals or other geological materials from the earth from an orebody, lode, vein, seam, or reef, which forms the mineralized package of economic interest to the miner.



<p style="text-align: center;">Mining 2</p> <p style="text-align: center;">https://slidetodoc.com/mining-101-ap-environmental-science-the-principles-of/</p>	<p style="text-align: center;">Mining</p> <ul style="list-style-type: none"> Mining is required to obtain any material that cannot be grown through agricultural processes, or created artificially in a laboratory or factory. Mining in a wider sense includes extraction of any non-renewable resource such as petroleum, natural gas, or even water. 	<p style="text-align: center;">Mining 4</p>	<p>Factors affecting the viability of extraction of minerals:</p> <ul style="list-style-type: none"> cost of exploration and extraction geology climate accessibility environmental impact supply and demand
<p style="text-align: center;">Mining 3</p> <p style="text-align: center;">https://slidetodoc.com/mining-101-ap-environmental-science-the-principles-of/</p>	<p style="text-align: center;">Steps in Obtaining Mineral Commodities</p> <ul style="list-style-type: none"> Prospecting-finding places where ores occur Mine exploration & development-learn whether ore can be extracted economically Mining- extract ore from ground Beneficiation- separate ore minerals from other mined rock Smelting & refining- extract pure mineral from ore mineral (get the good stuff out of waste rock) Transportation- carry mineral to market Marketing & sales- find buyers & sell the mineral 	<p style="text-align: center;">Strike Rate</p>	<p>The frequency with which attempts to find a desired mineral are successful.</p>
<p style="text-align: center;">Drift and Slope Mining</p> <p style="text-align: center;">https://slidetodoc.com/mining-101-ap-environmental-science-the-principles-of/</p>	<p style="text-align: center;">Drift Mining and Slope Mining</p> <ul style="list-style-type: none"> Drift mining utilizes horizontal access tunnels, slope mining uses diagonally sloping access shafts. Drift Mining Slope Mining 	<p style="text-align: center;">Supply and Demand</p>	<p>The relationship between how much of a commodity is available and how much of s needed or wanted by consumers of the product.</p>
<p style="text-align: center;">Mining 5</p>	<p>A pit/mine will cease to operate when:</p> <ul style="list-style-type: none"> costs of removing a mineral is greater than the profit made from excavating a site, because... <ul style="list-style-type: none"> there is not enough mineral at the site to begin with to make it worthwhile the easy to get to minerals have all been removed, so costs suddenly increase for getting the left overs <p>After (as should be set out in the mining licence application): safe disposal of mining waste, land restoration, bioremediation</p>	<p style="text-align: center;">Environmental Impact Assessment</p>	<p>A process by which the probable effects on the environment of a development are assessed and measured. It is submitted with a license application before mining is permitted.</p>
<p style="text-align: center;">Adit</p>	<p style="text-align: center;">Entrance to a horizontal drift mine.</p>	<p style="text-align: center;">Biomagnification</p>	<p>The process in which the concentration of a substance in living things becomes higher at progressively higher levels in a food chain or web.</p>

Mining 6

Pros:

- Jobs
- prosperity to an area
- taxes
- Improves local infrastructure, healthcare and education
- Resources for industry, energy, technology etc.

Cons:

- Most mining is done by machinery, so few people are directly employed in the mining process
- Pollution: air, water, visual, sound, and land

Bioremediation

A process in which living things are used to remove toxic chemicals from a natural site.