
To understand mining: Starting from the beginning

Mining is the series of activities referring to the discovery and extraction of minerals lying under the surface of the earth. Minerals can be metal (such as gold and copper) or non-metal (such as coal, asbestos and gravel). Metals are mixed with many other elements, but occasionally large quantities of certain metals can be found concentrated in a relatively small area - the deposit - from which one or more metals can be mined with financial benefit. The impacts of mining are related to mining itself, to the elimination of the residues from the mine, to the transportation of the mineral and to its processing, which frequently involves or produces hazardous substances.

Mines vary in size, from small operations producing less than 100 tons per day, to large mines moving hundreds of thousands of tons. The method of exploitation used to mine specific mineral deposits depends on the type, size and depth of the mineral deposit and the economic and financial aspects of the undertaking.

Until the middle of the twentieth century, underground mining was the method most commonly used to extract large deposits. Following the Second World War, technological progress and the development of larger and more powerful machinery such as bulldozers, levellers, power shovels and trucks, made it possible to move enormous quantities of material, promoting the exploitation of opencast mines. However, underground mines still exist such as the Witwatersrand gold mines in South Africa --the deepest in the world-- or the El Teniente mine in Chile --the largest underground mine in the world-- or Olympic Dam in Australia. An underground mine is reached by a shaft or a decline spiral, leading to the galleries and production levels that are interconnected by raises and winzes used to transport the mineral and workers. Drills and explosives are used to break up the ore --the mixture of minerals from which one or more metals can be extracted-- underground. Generally, this type of mining has less impact on the environment than opencast mines. There is less disturbance of the ground's surface, but all the same, it can have effects on the water by contaminating it with acids and metals and by intercepting aquifers. The workers are exposed to more hazardous situations than those working in opencast mines, due to the risk of collapse, poor air quality and underground explosions. Progressively, companies have abandoned this method due to a problem of profitability, although minerals such as coal, nickel, zinc or lead are still usually mined underground.

Presently, over 60% of the materials mined in the world are extracted by the opencast method, causing devastation of the ecosystem where they are operating (deforestation, contamination and alteration of the water, destruction of habitats). Within this type of mining we may distinguish, among others, open cast mines (usually for hard rock metals), quarries (for industrial building materials such as sand, granite, slate, marble, gravel, clay, etc.), and leach mining (the application of chemical products to filter and separate the metal from the rest of the minerals).

Opencast mines look like a series of terraces arranged in great deep wide pits in the middle of a desolated and stark landscape, lacking any living resources. The operation usually starts with removal of the vegetation and the soil, followed by extensive dynamiting and removal of the rocks and materials above the ore until the deposit is reached, which is again dynamited to obtain smaller

pieces. The new technologies, enabling better performance in the speed of extraction and processing of the minerals, increase environmental problems, as the waste materials do not normally revert to restoring the site.

Quarries are surface mines, very similar to open cast mines, as the end result of their exploitation is also a desolated landscape with deep trenches between wide steps. The aggression to the environment that this type of mining generates is more serious due to its proximity to urban zones, as the reduction of transportation costs is sought to make the quarries more profitable. This proximity causes further environmental problems, because the excavation sites, already lacking vegetation, end up by becoming urban waste dumps, in addition to affecting surface and groundwater near them.

In leach mining, chemicals are used (such as sulphuric acid in the case of copper or a solution of cyanide and sodium in the case of gold) to dissolve (leach) the metals in question from the mineral containing them, obtaining a very high rate of recovery. In situ leaching involves boring the intact rock with drills and adding the solvent, whereas the very frequent type of heap leaching is done on heaps of crushed minerals. The chemical solutions used not only release the desired metals but also mobilize other heavy metals such as cadmium, thus contaminating surface and groundwater.

Even though the environmental impacts of mining vary according to the type of mineral and the mine, this is intrinsically an unsustainable activity, as it implies the exploitation of a non-renewable resource by means of destructive or contaminating methods, such as crushing, grinding, washing and classifying minerals, refining and casting. Mining is presently doubly destructive both due to its large scale and to technology, which has increased its productive capacity.

Article based on information from: "Los Impactos Ambientales de la Minería: Una Guía Comunitaria", http://andes.miningwatch.org/andes/espanol/guia/capitulo_1.htm ; "El hombre y la Tierra. La minería de superficie", http://www.iespana.es/natureduca/hom_mineriasuperf.htm