Mining

Mining is the extraction of valuable minerals or other geological materials from the earth, usually (but not always) from an ore body, vein, or (coal) seam. Materials recovered by mining include bauxite, coal, diamonds, iron, precious metals, lead, limestone, nickel, phosphate, rock salt, tin, uranium, and molybdenum. Any material that cannot be grown from agricultural processes must be mined. Mining in a wider sense can also include extraction of petroleum, natural gas, and even water.

History

The oldest known mine in the archaeological record is the "Lion Cave" in Swaziland. At this site, which by radiocarbon dating is 43,000 years old, paleolithic humans mined for the iron-containing mineral hematite, which they ground to produce the red pigment ochre. Sites of a similar age where Neanderthals may have mined flint for weapons and tools have been found in Hungary.

Another early mining operation was the turquoise mine operated by the ancient Egyptians at Wady Maghareh on the Sinai Peninsula. Turquoise was also mined in pre-Columbian America in the Cerillos Mining District in New Mexico, where a mass of rock 200 feet (60 m) in depth and 300 feet (90 m) in width was removed with stone tools; the mine dump covers 20 acres (81,000 m^2). Black gun powder in mining was first used in a mineshaft under Banska Stiavnica, Slovakia in 1627, in the same town in 1762 the first Mining Academy in the world was established.

Mining in the United States became prevalent in the 19th century. Mining for minerals and precious metals, such as in the California Gold Rush in the mid 1800s, was very important in westward expansion to the Pacific coast along with ranching and exploration of oil and gas fields. During this time period many white Americans and post-slavery African Americans, with the aid of railroads, travelled west for work opportunities in mining. Many western cities such as Denver and Sacramento originated as mining towns.

Steps in the mining process

1. Prospecting to locate ore
2. Exploration to defining the extent and value of ore where it was located
3. Conduct resource estimate to mathematically estimate the extent and grade of the deposit
4. Conduct mine planning to evaluate the economically recoverable portion of the deposit
5. Conduct a feasibility study to evaluate the total project and make a decision as whether to develop or walk away from a proposed mine project. This includes a cradle to grave analysis of the possible mine, from the initial excavation all the way through to reclamation.
6. Development to create access to an ore body
7. Exploitation to extract ore on a large scale
8. Reclamation to make land where a mine had been suitable for future use

Environmental effects and mitigation

Environmental issues can include erosion, formation of sinkholes, loss of biodiversity and contamination of groundwaters by chemicals from the mining process and products.

Modern mining companies in many countries are required to follow strict environmental and rehabilitation codes, ensuring the area mined is returned to close to its original state, or an even better environmental state than before mining took place. In some countries with pristine environments, such as large parts of Australia, this is impossible despite the best intentions. Past

mining methods have had, and methods used in countries with lax environmental regulations can continue to have, devastating environmental and public health effects.

Mining can have adverse effect on surrounding surface and ground water if protection measures are not exercised. The result can be unnaturally high concentrations of some chemical elements over a significantly large area of surface or subsurface. Coal mining releases approximately twenty toxic release chemicals, of which 85% is said to be managed on site. Combined with the effects of water and the new 'channels' created for water to travel through, collect in, and contact with these chemicals, a situation is created where mass-scale contamination can occur. In well-regulated mines hydrologists and geologists to careful measures to mitigate any type of water contamination that could be caused by mines. In modern American mining, operations must, under federal and state law, meet standards for protecting surface and ground waters from contamination, including acid mine drainage (AMD). To mitigate these problems water is continuously monitored at coal mines. The five principal technologies used to control water flow at mine sites are : diversion systems, containment ponds, groundwater pumping systems, subsurface drainage systems, and subsurface barriers. In the case of AMD, contaminated water is generally pumped to a treatment facility that neutralizes the contaminants.