ENVIRONMENTAL MINING ACCIDENTS – DISASTERS TO BE CHECKED

1. Introduction - Environmental disaster is a disaster that is due to human activities and some of the most publicized environmental disasters are associated with the mining industry. These disasters are attributed to both natural and mining-related causes. Acid drainage, for example, formed by rainwater or snowmelt in contact with mineral deposits can damage nearby ecosystems by polluting streams and destroying wildlife. The mining and processing of ores, however, may accentuate and accelerate the natural processes.

On a long-term basis, mining can increase the acidity of water in streams; cause increased sediment loads, some of which may be metal-laden, in drainage basins; initiate dust with windborne pathogens; and cause the release of toxic chemicals, some contained in exposed ore bodies and waste rock piles and some derived from ore-processing reactions. Contaminants containing such toxic chemicals as cyanide and lead may be transported far from a mining site by water or wind, polluting soils, groundwater, rivers, and the atmosphere. These toxic chemicals can be remobilized intermittently (e.g., by intense wind or rainstorms) and eventually distributed over vast regions. Some of this contamination, because of its scale or intensity, may not be amenable to remediation.

Mining may also have effects that can be short-term, depending on their severity, such as distortion to the surrounding topography or removal of vegetation. In many cases, these effects may be minimized or even prevented by means of a comprehensive mining plan that includes a reclamation and remediation stage.

2. Environmental Impacts by use of Toxic Chemicals in Mining or Ore Processing with Case Studies –

Leaching and Floatation Process:

Copper: Sulfuric Acid is used for leaching of copper from oxide ore, and some sulfide ores. The leaching solution is claimed to be diluted and recycled. However, it is recycled into lined ponds of high toxic levels of sulfuric acid. The sulfuric acid can enter the soil and groundwater through breaks, spills, tears in liners.

Gold: Cyanide is used for leaching gold. This leaching has been banned in many of the developed countries.

Toxic chemicals are used in the Flotation Process to separate the copper and molybdenum out of the milled powder. This Flotation process is the major extraction method. Some chemicals produce bubbles that that the copper adheres to and the “bad stuff” falls to the bottom. These chemicals are hydrocarbons with complex configurations, but some are as simple as kerosene. It is claimed that the volatile organics used in the Flotation Process do not go into the slurry that goes into the tailings impoundment because they are filtered out before the slurry goes to the impoundment. This is not a sound analysis.

a) Filtration is not a treatment technology for volatile organics. Treatment is pushing air the solution which releases the volatile chemicals into the air.

b) Some are amine compounds that break down into nitrates, so the presence of nitrates in the groundwater is an indicator of travel of these compounds, which can be very mobile in an oxygen solution.

Super powerful explosives—ANFO (ammonium nitrate and fuel oil)—used to blast the rock in the pit leaves traces of nitrates in the blasted rock and the flotation solution.

Case Studies:

* The Summitville Mine in Colorado has become a case study of environmental damage as a result of mining. Gold was mined there from 1870 until 1992. In 1994 the U.S. Environmental Protection Agency (EPA) declared the area a Superfund site. Some of the following events affected the environment at the mine: Geologic characteristics at the mine site contributed to the generation of both natural and mining-related acid drainage; the height of the containing dike for cyanide leach solutions (used to chemically extract gold) was below the level required for snowstorms and spring runoff; broken pump lines and a French drain beneath the leach pad caused cyanide-contaminated solutions to be released into the local watershed ; several waste rock piles at the mine reacted with rain and snowmelt to form acidic waters that flowed into area streams; an underground tunnel released large volumes of contaminated waters;

and mining deforested much of the land. Remediation of the site has included such projects as backfilling mine waste into existing open pits, which reduces polluted water percolating into the ground; plugging underground tunnels; and replanting. Remediation is ongoing with the goal of restoring the nearby Alamosa River to support aquatic life; the U.S. Public Health Service classified this site as "no apparent public health hazard."

* Another case study is the Iron Mountain Mine in California, which the EPA declared a Superfund site in 1983. Mining for copper, gold, silver, and zinc began in 1879 and continued until 1963 using underground and open-pit methods. The site contains inactive mines and numerous waste piles from which harmful quantities of untreated acidic, metal-rich waters were discharged. Mining operations fractured the mountain, changing the hydrology and exposing the mineral deposit to oxygen and water, which resulted in intense acid mine drainage into nearby creeks and waterways. These caused numerous fish kills and posed a health risk to the area drinking water. Some current remediation projects include: capping areas of the mine and the diversion of nearby creeks, both of which serve to reduce surface water contamination; construction of a retention reservoir to control the area source acid mine drainage discharges; enlargement of a landfill to provide an additional thirty years of storage capacity for heavy metals sludges; and construction of a significant upgrade to facilities in mine tunnels to assure safe travel for workers and equipment to perform maintenance and routinely remove mine wastes from the tunnels and other projects.

* Leaching Gold has been banned in Montana, thanks to the heroic efforts of Montana Environmental Information Center who led a twice-won, citizen- initiated law banning cyanide heap-leach mining in Montana. The law has been upheld in the district, federal, and state Supreme Courts despite Canyon Resources (Mining), Inc.'s efforts to repeal it in order to develop a massive open-pit, cyanide leach gold mine less than 800 feet from the Blackfoot River headwaters.

Initiative 137 was a response to the abysmal track record of open pit cyanide leach mining in Montana, as exemplified by cleanup fiascos at the Golden Sunlight, Zortman/Landusky, and Kendall mines and the Montana Department of Environmental Quality's failure to adequately regulate such mines as required by state law.

3. Use of bacteria in industry: Applied bacteriology – Bacteria have many properties that are useful to industry. The diversity of the Bacterial kingdom is reflected by the diverse applications of bacteria as a cheap labor force.

* Bacteria can be used to mine gold! well, not quite, but the discovery that Thiobacillus ferrooxidans can concentrate gold trapped in rock minerals drew the attention of mining companies, and they are now developing a method of applying these bacteria in the gold mining industry. Biomining may be the way of mining in the future, and researchers are now trying to modify the bacteria so that they collect the ores of interest.

* Certain bacteria are used to clean our waste: be it pollution, compost heaps, or sewage: bacteria can get rid of things. The subject may not appeal to you, but there are microbes that clean sewage. That industrial waste can be cleaned with bacteria has been known for over 30 years. Bacteria have a taste for mining wastewaters no matter how toxic the contaminants are for animals and humans. Specialized bacteria metabolize these toxic chemicals into non-toxic, or less toxic compounds. Drunk bacteria can clean up mining pollutants.

* Bacteria can degrade herbicides.Also pesticides can be degraded by bacteria and thus can groundwater that is contaminated be cleaned.

* How can ammonia, a component of dung and fertilizer, be benificial to plants? Only when nitrifying bacteria convert it to nitrite, and others change that to nitrate, which is a component that plants can use directly.

* Bacteria eat oil and a whole range of organic chemicals, like gasoline, diesel, benzene, toluene, acetone, and even PCB’s. Most of these are toxic to humans and higher organisms, can they be degraded into safe compounds by bacteria. This application of bacteria is called bioremediation. More about biomediation: using bacteria to clean up hazardous waste.

* The most spectacular bacterial species in use for cleaning up our industrial waste is D. radiodurans, which is the only bacteria so far known that can survive high doses of radioactivity. It can be used to clean up radioactive waste. The radioactivity cannot be destroyed by the bacteria, but they can ‘eat’ all chemical toxic solvents in which these radioactive wastes are often present, and thus slow down or prevent corrosion

Source : http://saferenvironment.wordpress.com/2010/03/04/environmental-mining-accidents-%E2%80%93-disasters-to-be-checked/