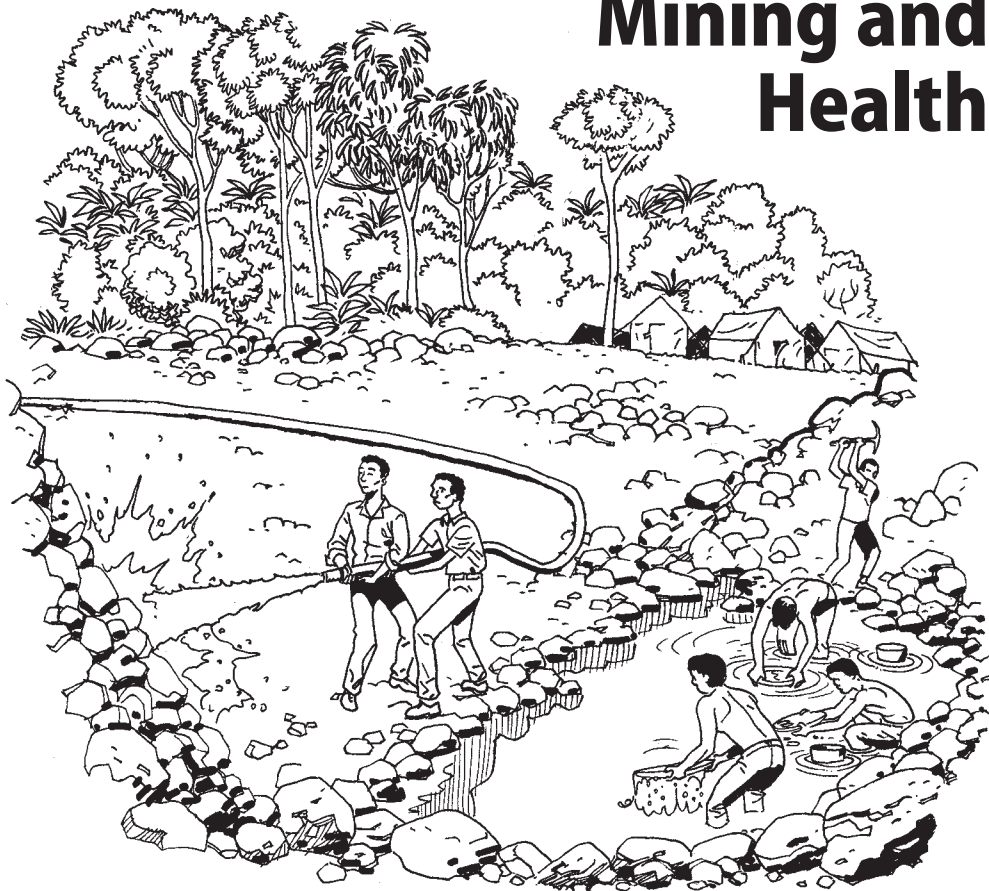


21 Mining and Health

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Mining and Health



People mine the earth for metals such as gold, silver, and copper; for gems such as diamonds and rubies; and for minerals such as uranium, asbestos, coal, sand, and salt. All mining is dangerous, and it is difficult for miners to earn a livelihood while also protecting their health and the environment. But there are ways to make mining safer. Often the only way to get the mining industry to use less harmful methods is through community pressure.

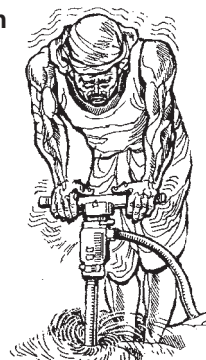
Mining is done in very large open-pit surface mines or deep underground mines operated by large corporations, as well as in small-scale mines run by local people. Large-scale mining causes greater damage because it requires clearing large amounts of land, digging huge pits and tunnels, and moving massive amounts of earth. But small-scale mining can also hurt people and the environment.

Mining conditions are very different depending on the location, type, and size of the mining operation. By understanding mining's threats to health and long-term well-being, and by taking precautions to reduce harm in all mines, miners and other people in mining communities can better protect their health and improve their lives.

Health Problems from Mining

Mining causes serious accidents such as fires, explosions, or collapsed mine tunnels that affect miners and people living in communities near mines. Even in places where mining happened long ago, people can still be exposed to health threats from mining waste and chemicals that remain in the soil and water. Mining damages health in many ways:

- **Dust, chemical spills, harmful fumes, heavy metals and radiation** can poison workers and cause life-long health problems as well as allergic reactions and other immediate problems.
- **Heavy lifting** and working with the body in awkward positions can lead to injuries to the arms, legs, and back.
- **Use of jackhammers or other vibrating machinery** can cause damage to nerves and blood circulation, and lead to loss of feeling, very dangerous infections such as gangrene, and even death.
- **Loud, constant noise** from machines can cause hearing problems, including deafness.
- **Long hours working** underground with little light can harm vision.
- **Working in very hot conditions** without drinking enough water can cause heat stress. Signs of heat stress include: dizziness, weakness, rapid heartbeat, extreme thirst, and fainting.



- **Hiring and labor practices** of mining companies create divisions among families, neighbors, and communities. These disagreements can lead to tears in the social fabric, an increase in personal stress, and mental health problems throughout the community.
- **Water pollution and overuse of water** resources leads to many health problems (see Chapters 5 and 6).
- **Land and soil are destroyed**, leading to food scarcity and hunger.
- **Air pollution** from power plants and smelting factories built near mines causes serious illness (see Chapter 16).

Mining and sickness among the Dineh

The Dineh tribe and other Native people from the deserts of the western United States tell of 2 kinds of yellow powder the Creator put in the ground. One kind is the yellow pollen of maize. For the Dineh, maize is a sacred food, and its pollen is used in religious rituals. The other yellow powder is known as “yellow cake,” or uranium. The Dineh believe that uranium was supposed to stay under the ground and never be dug up or used.

In the 1940s, when the US government discovered how uranium could be used to make nuclear weapons and nuclear energy, mining companies began to dig for uranium on Dineh land. Young Dineh men, who had formerly earned their living raising sheep, eagerly took jobs in the new mines. Uranium mining quickly became one of the most important ways Dineh people earned money. But over the years, uranium mining made many Dineh people very ill.

The government and the mining companies knew the dangers of uranium mining, but the miners and their families had to find out about the dangers on their own. Dineh miners died young from the harmful effects of radiation. Many women had miscarriages or had children with birth defects and other health problems. Men who worked in the mines developed lung cancer and breathing problems. Some lost the ability to walk. Even cattle and sheep near the mines grew sick and died before they could give milk or wool.

These problems continued for over 50 years. In 2005, the Dineh finally banned uranium mining on their land. But Dineh land still has hundreds of abandoned uranium mines and piles of toxic waste. The US government is paying some families of people who died from uranium poisoning, but not very much. And there is great pressure from the nuclear industry for the Dineh to open more mines.

Dineh land also has some of the largest deposits of coal in the United States. With the loss of jobs from closing the uranium mines, coal mining has become one of the only sources of well-paying jobs for Dineh men. But coal mining is also dangerous to health as well as the environment, both when it is dug out of the ground and when it is burned to make electricity in power plants.

Like many people, the Dineh are being asked to choose between poor health and poverty. Many things must change for the Dineh to have better choices, especially an end to the racism that denies Native people the right to control their own communities, resources, and futures. And the whole world, but especially the United States, must use less harmful ways of producing energy than coal and uranium.

Social Problems

Mining affects people's health directly, when people work in dangerous conditions and are exposed to toxic chemicals. It also affects people's health through the social problems it brings. Mining towns and camps develop quickly, with little planning or care. This usually causes many problems. Men come looking for work in the mines, women who need income become sex workers, and this combination can lead to the rapid passing of HIV/AIDS and other sexually transmitted infections. The sudden wealth and sudden poverty that mining brings is often accompanied by increased violence against women and children, abuse of workers by mine owners, and fights for control over resources. Many people are forced to leave the community by the violence or because it becomes impossible for them to continue living as they did before the mine opened.

Mining provides a livelihood for millions of people, often in areas where there are few other sources of income. But riches in the ground do not always result in wealth for miners. The nature of the mining industry is to exploit every last piece of earth and every available worker, sacrificing the health, human rights, and environment of mining communities.

Women bear an enormous share of the costs to people and the environment from large mining projects.



Joining or forming a workers organization has proven to be the most effective strategy for miners to earn a decent living, and to defend their

human and environmental rights. Miners' unions together with their allies have forced companies and governments to make and follow rules that protect miners' health and safety. However, unions often place more importance on miners' short-term needs for jobs and

income than on preventing long-term health problems caused by mining and mineral use (for example, pollution from burning coal for energy).

When a mining operation is too dangerous, unhealthy, or polluting, it should be shut down. But mine workers should not be abandoned to unemployment and poverty. Communities must demand that plans for their well-being and livelihood are included in plans for and costs of shutting down the mine.

The union protects my health, my job, and my benefits. When the company is so big and powerful, workers have to get organized.



Protecting Children

Children often work in mining to help their families. Working long hours under difficult conditions is dangerous for them, creates serious problems for their growing bodies and soft bones, and leaves them no time to go to school. Child labor is illegal under international law (see Appendix B). If mining companies provided good wages and benefits for adult workers, children could go to school instead of to work.



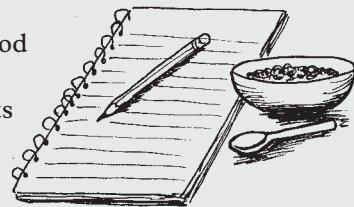
School and nutrition for child miners

When men and women go to work in the stone quarries in India, their children often go to work with them. This is the way it has always been. Without education and organizing for change, this is the way it will always be.

In Pune, India, the children who work in the stone quarry are malnourished and covered from head to toe in rock dust. Some social workers started a volunteer group called Santulan to work with these children. “Children have basic rights to education, good health, and childhood,” they said. To promote these rights they started schools in the quarries.

First, Santulan trained new teachers. Some women quarry workers were taught songs and other teaching methods, and given pencils, paper, chalkboards, and books. Some quarry owners offered spaces for Santulan to hold classes. In other quarries, the workers themselves organized classrooms.

Once the children started going to school, the teachers realized they would not learn without food to eat during the day. Santulan began to provide rice, lentils, and boiled eggs. This gave the parents another reason to let their children go to school. Not only did the children learn, but they came home with full bellies.



A few years after the quarry schools opened, over 3,000 children were participating in classes. Many are the first in their families to read and write. The children sing songs, learn history, and, above all, learn they have the right to education and the right to childhood.

Illnesses from Dust

Lung damage caused by rock and mineral dust is a major health problem. Whether you are mining underground or above ground, you may develop lung damage if:

- dust covers your clothes, body, and equipment as you work.
- you cough a lot and have trouble breathing.



Once dust has damaged the lungs, there is no way to reverse the damage. Dust is a threat both to mineworkers and to communities near mines.

The most dangerous kinds of dust are coal dust, which causes **black lung disease**, and silica dust, which causes **silicosis**. Dust that contains asbestos (which causes asbestosis, see page 371) or heavy metals (page 337) is also dangerous.

Signs of lung damage

Dust from mining can make it difficult to breathe. Large amounts of dust can make the lungs fill with fluid and swell up. Signs of lung damage from dust include:

- shortness of breath, coughing, wheezing
- coughing up green or yellow sputum (mucus that comes up from the lungs)
- sore throat
- bluish skin at ears or lips
- fever
- chest pain
- loss of appetite
- tiredness



Black lung disease, silicosis, and asbestosis, are serious conditions with no cure. It is best to prevent exposure to harmful dust. Because these diseases worsen very quickly, by the time you have signs all you can do is keep the disease from getting worse. If you have any of the signs above, or have been exposed to these kinds of dust, see a health worker right away.

Because smoking greatly increases the risk of lung damage from dust, it is particularly important that miners do not smoke tobacco.

Black lung disease and silicosis

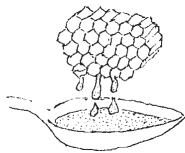
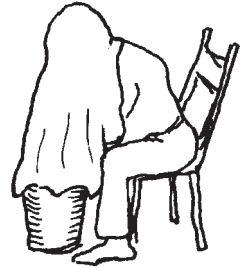
Black lung is caused when coal dust blocks the lungs, causing severe and permanent breathing problems. Underground coal miners, and children and women who work separating rocks from coal, are most affected by black lung.

Silicosis is caused by exposure to silica dust. Silica is a common mineral released from sand and rocks during mining, exposing many miners to harm.

Treatment

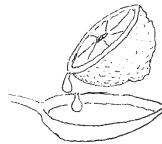
Black lung and silicosis cannot be cured. But you can reduce the suffering they cause.

- Drink plenty of water to help loosen mucus from the lungs.
- Keep breathing passages open. Fill a bowl with steaming hot water and strong-smelling herbs such as eucalyptus, oregano, mint, or thyme. Put your head over the bowl, cover yourself with a towel or cloth, and breathe the vapors. Do this for 15 minutes at a time, several times a day.
- Medicines called **bronchodilators** can help open the breathing passages. The kinds that are inhaled work fastest.
- Hospitals may give oxygen to help a person breathe more easily.
- Home-made cough syrup can reduce painful coughing. Mix:

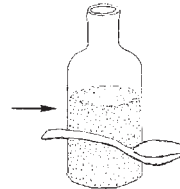


1 part honey

+



1 part lemon juice



Take a teaspoonful every 2 or 3 hours

- Some people believe dairy foods like milk, cheese, and butter make mucus thicker and more difficult to cough up. If eating these foods makes you feel worse, avoid them as long as you can get good nutrition from other foods.

IMPORTANT: It is **not true** that drinking alcohol clears the lungs of dust. Drinking alcohol only makes health problems worse.

Related health problems

People with black lung disease or silicosis have a higher risk of developing other health problems such as:

- tuberculosis (TB) (see pages 356 and 481)
- chronic bronchitis (see page 331)
- heart disease
- lung cancer
- pneumonia
- asthma (see page 331)
- rheumatoid arthritis
- lupus
- rheumatic fever
- sclerosis

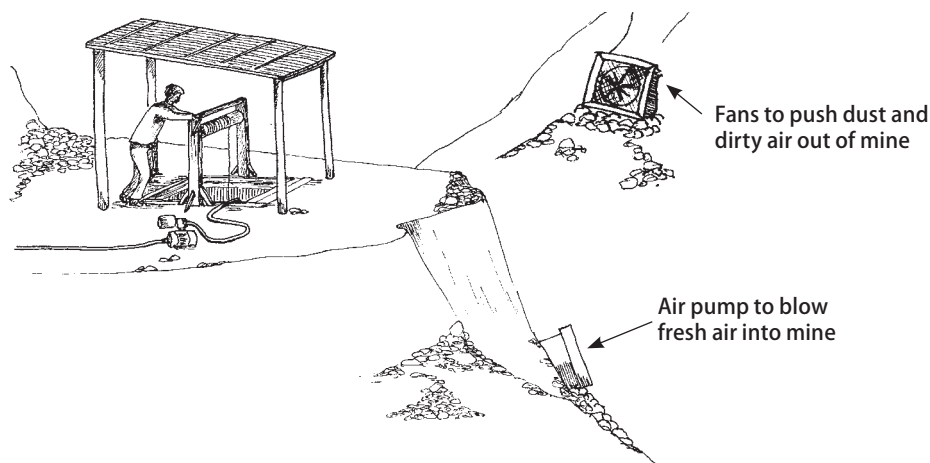
See a general health book like *Where There Is No Doctor* for more information.

Preventing harm from dust

By limiting the amount of dust you breathe in, lung damage can be prevented.

Mine operators should provide equipment to reduce dust in mines

- Pump fresh air into underground mines. Mines should have many openings to the surface. Air pumps and fans can bring fresh air in and push dust and dirty air out.



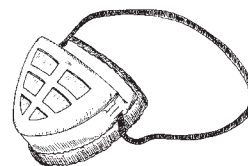
- Provide water sprinklers to damp down dust. Store water in a tank above, and pump it or let it run down into shafts and tunnels through pipes with small holes or shower heads. “Sour water” not fit for drinking works fine. However, miners need plenty of fresh water to drink.
- Provide cutting and grinding equipment that sprays water to trap dust.

Mine operators should provide materials to protect miners from breathing dust

- Provide supplies such as crushed limestone and blankets to cover blasting areas.
- Provide proper masks and make sure they are cleaned and maintained (see Appendix A).

Workers need a place to change out of dusty clothes and bathe before leaving the mine site, and a clean area to store clothes. Mine operators also have a responsibility to find ways to keep dust from mining operations out of the surrounding communities.

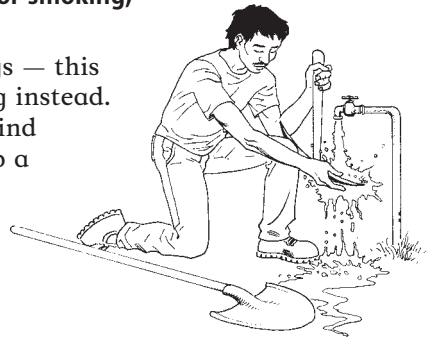
IMPORTANT: Dust kills. Miners have a right to demand that all possible methods are used to reduce dust, including protective equipment provided by the company. Dust masks prevent lung damage only if they fit tightly and are cleaned often. If you use a paper mask, change it often. If you use a plastic or cloth mask, or a bandana, wash it often.



Regular use and cleaning of dust masks can prevent lung damage.

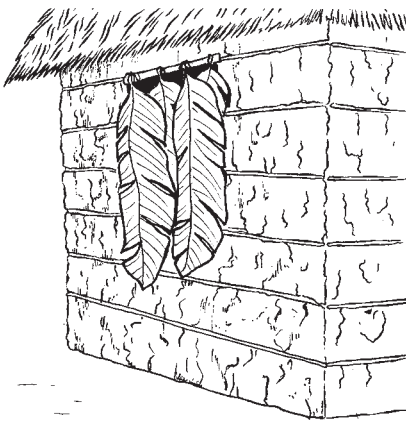
Miners can reduce the amount of dust they breathe in

- **Wet surfaces before cutting or drilling** to prevent dust from rising.
- **Spread crushed limestone** to prevent silica or coal dust from rising into the air.
- **Cover blasting and grinding areas with a wet blanket or tarp** to trap dust. After blasting or grinding, spray the area with water.
- **Let dust settle** after blasting and before entering an area.
- **Wear protective clothes and equipment.** The best mask for miners is a rubber respirator that fits tightly and has filters for the materials you work with. Miners should receive training in how to choose, use, and maintain masks. If no dust mask is available, wear a cloth around your mouth and nose, and wash it daily. Glasses or goggles will protect your eyes. (For more information on protective equipment, see Appendix A.)
- **Wash hands and face before eating, drinking, or smoking, and during and after work.**
- **Wash gear often.** Do not shake out dusty bags — this throws more dust into the air. Wash the bag instead. If you must shake the bag, make sure the wind carries dust away from you. Cloth bags trap a lot of dust — use plastic bags if you can.



Prevent mine dust from entering your home

- Wash after work and before entering the house.
- Leave dusty work clothes at the mine, or change out of them before entering your home.
- Clean floors with a damp mop to remove dust. Sweeping will put dust in the air.
- If it is dusty outside, keep doors and windows closed. If your house does not have doors and windows that close, hang curtains or large banana leaves in doors and windows.



Treatment for miners with silicosis

Lal Kuan is a village in India dedicated to mining and stone crushing. Everything in Lal Kuan is covered by a thick layer of dust. The dust is so bad it is difficult to see. For many people, the dust has also made it difficult to breathe.

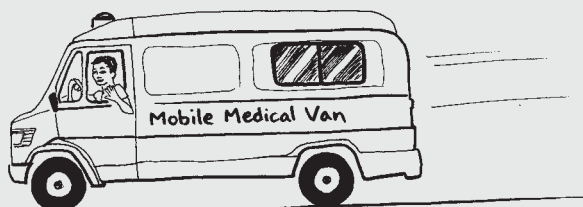
Budh Ram came to Lal Kuan 20 years ago to operate stone-crushing machines. After 10 years of work, he began to have difficulty breathing. He was treated for TB by a government clinic. The TB drugs helped him for a year, but after that he began to get sick again. Budh Ram was not alone in his illness. Despite getting treated many times for TB, many workers and villagers died with terrible pain in their chests, unable to breathe.

When S.A. Azad, coordinator of an organization called People's Rights and Social Research Centre, came to Lal Kuan, his goal was to teach the villagers to read and write. But when he saw they were dying in great numbers, he took on a different task: to help the villagers get treatment and compensation for their illness.

Azad realized that workers were being treated for TB, but they were dying of silicosis. Most workers, like Budh Ram, did not even know what silicosis was. And mine operators did not want to know about silicosis, because under Indian law they were responsible for illnesses caused in the workplace. For mine operators, it was best if no one knew the workers were dying of silicosis.

Azad contacted other organizations to build support for the people affected by silicosis, and to demand compensation and health care. After several years of organizing, the Chief Minister of Delhi agreed to hold a meeting to hear of the misery in Lal Kuan. The meeting resulted in a great victory when the Chief Minister agreed to meet the demands of Azad and the people of Lal Kuan.

Now, after many years of suffering, the people of Lal Kuan have a community center for the treatment of work-related diseases. A mobile medical van visits the area 4 days a week giving free medical care. The government has promised to do a health survey in Lal Kuan and to give a pension to all victims of silicosis, as well as training and support to help them find other ways to earn money and support their families.



This victory has given the miners and villagers a new sense of empowerment. The air in Lal Kuan is still full of dust. But it is also full of possibility for a better future.

Tuberculosis (TB)

Because miners often live in crowded conditions, work long hours without enough food, and have little access to health care or medicines, they have a high risk of getting TB. Signs of TB include a bad cough that will not go away, fever, coughing up blood, feeling weak, weight loss, and night sweats. Without proper treatment, a person can spread TB to others and can die.

TB can be fatal to anyone, but is especially dangerous for people weak from hunger or other illnesses like HIV and AIDS. Lung damage from dust increases the risk of TB even more.



When people live in crowded conditions, like mining dormitories, TB can spread rapidly.

Good **ventilation** will reduce the chance of TB spreading through a mine, miners' dormitories, or homes. The best way to prevent TB among miners, or any workers, is to create the conditions for good health through:

- better pay
- shorter work hours
- safer work conditions
- safe, clean living conditions
- clean water
- healthy food
- good health care

To prevent the spread of TB, it is important to make sure everyone with TB gets proper treatment and medicine. Many governments provide free TB treatment; to get medications, see a health worker. (For more information on TB, see page 356 or a general health book such as *Where There Is No Doctor*.)

Contaminated Water

Mining uses large amounts of water and leaves large amounts of waste, contaminating water sources and the people who depend on them. While all mining operations tend to pollute water, big companies usually cause the biggest problems. Surface water and groundwater in mining areas may remain contaminated for many years. Water loss can leave the land barren and unusable for farming or raising animals. The long-term damage of water contamination will last much longer than the short-term economic gain from mining.



Preventing and reducing water pollution

Leaking waste ponds are one of the main causes of water pollution from mining. To prevent pollution, waste ponds should be:

- built away from water sources or watershed drainage areas.
- lined to prevent leaks into groundwater.
- built according to the best international standards.
- monitored to prevent leaks and spills.
- emptied of wastes and safely closed when mining operations end.

Cleaning water once it has been polluted by mining is difficult, costly, and not always successful.

Community action saves a river

In the northern Philippines, the Abra River runs from high in the mountains through lowland farms and into the China Sea. For many generations, communities along the Abra River made their living from farming, fishing, handicrafts, and small-scale mining of gold and copper. In recent years, large corporations have begun mining the area's gold, causing great harm to the river, the wildlife, and the people who live there.

Mining companies cleared forests to dig the mines, causing the river and the streams that feed it to fill with silt and dry up. Many kinds of birds, animals, and plants have disappeared. The river has been poisoned by chemicals spilled from waste ponds and from acid mine drainage. People living along the Abra River suffer from headaches, dizziness, coughing, chest pain, nose and eye irritation, skin rashes and diarrhea, as well as long-term problems like hunger from crop loss year after year.



In response to these problems, local people formed a group called Save the Abra River Movement (STARM). STARM protects land and water rights in many ways. STARM educates communities and government officials about the dangers of mining. It organizes petitions and rallies to make local demands known. It monitors water quality through a partnership with local universities, which contribute equipment and scientists, and local people's organizations that act as witnesses, guides, and water collectors.

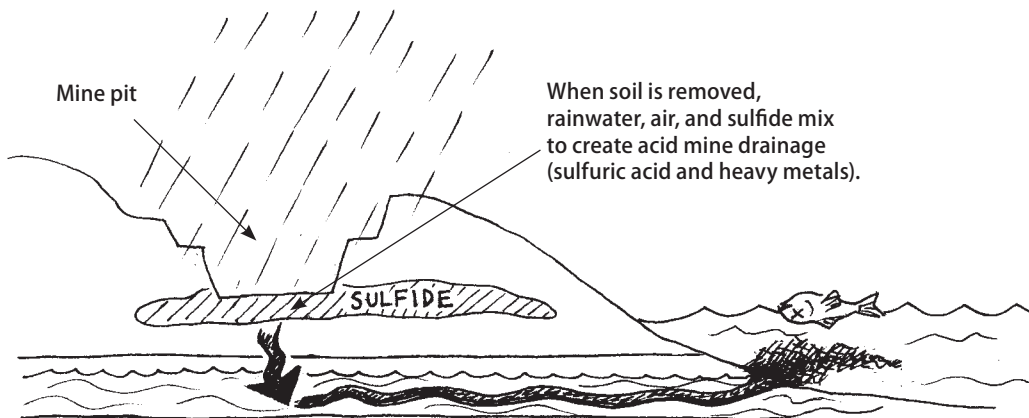
Armed only with cell phones and cameras, community-based water monitoring teams alert each other about unusual events. For example, when a lot of fish started dying downstream, community leaders upstream investigated and found that an a strange chemical smell was coming from the mine drainage. University scientists were alerted and quickly sent water containers so they could sample river water for toxics.

Dangerous mining continues along the Abra River. But the Save the Abra River Movement is forcing mining companies to stop the most harmful practices, and the communities are asserting their rights to a safe and healthy environment.

Acid mine drainage

Acid mine drainage happens when water and air mixes with the sulfur deep in the ground (sulfide) to create acids that dissolve heavy metals and other toxic mine wastes. This toxic mixture eats away at rocks and goes into the soil, groundwater, rivers, and lakes. At first, there may be few signs of danger, but slowly the poisons in the water sicken people, plants, fish, and animals. Acid mine drainage destroys life downstream from a mine for hundreds or even thousands of years.

Any mine can create acid mine drainage. Because it is nearly impossible to stop, **companies should prove before opening a mine that there is no sulfide in the ground so there will be no acid mine drainage.** Clean-up or containment of acid mine drainage is so costly and difficult that even in countries with strong environmental laws, thousands of kilometers of river are contaminated. A campaign against acid mine drainage may prevent a company from opening a mine in the first place.



Acid mine drainage poisons water downstream and is nearly impossible to clean up.

Take action against acid mine drainage

- Identify abandoned mines and have them tested by trusted scientists. Do not let the mining company do the tests and simply tell you the results. They lie.
- Demand the mining company provide an Environmental Impact Assessment report that includes acid mine drainage (see page 560).
- Learn how mines can be monitored, and involve the community in making sure they are safe (see Resources).
- Insist that the only safe way to deal with acid mine drainage is to prevent it in the first place.

Chemicals Used in Mining

Chemicals used in mining and processing minerals contaminate the land, water, and air, causing health problems for workers and people living near mines. Toxic chemicals used in mining include:

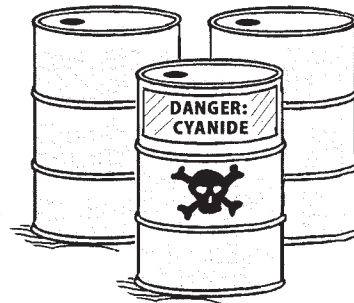
- cyanide, sulfuric acid, and solvents for separating minerals from ore
- nitric acid
- ammonium nitrate and fuel oil (“ANFO”) used in blasting tunnels
- heavy metals such as mercury, uranium, and lead
- gasoline, diesel fuel, and exhaust fumes from vehicles and equipment
- acetylene for welding and soldering

Cyanide

Cyanide is used to separate gold from ore. In its pure form, cyanide has no color and smells like bitter almonds. It may lose this smell when it combines with other chemicals. It can be used in powder, liquid, or gas forms.

Cyanide is deadly when swallowed. An amount the size of a grain of rice is enough to kill a person. Exposure to low doses over a long time may cause a swelling in the throat (**goiter**), which can also be caused by malnutrition.

Cyanide is often spilled into waterways during gold mining, and when ponds filled with mine wastes burst and spill. Mining companies say that cyanide in water quickly becomes harmless. But this is true only when there is lots of sunlight and oxygen. Even then it leaves behind other harmful chemicals. If cyanide is spilled underground, or if the weather is cloudy or rainy, it can remain harmful for a long time, killing fish and plants along rivers and making water unsafe for drinking and bathing. Cyanide is so dangerous that it has been banned in some countries.



Sulfuric acid

Sulfuric acid is a toxic chemical used in copper mining. It is also a byproduct of many kinds of mining, mixing with water and heavy metals to form acid mine drainage. Sulfuric acid smells like rotten eggs. Contact with sulfuric acid can cause burns, blindness, and death.

Treatment

Chemicals used at mine sites can spill on the skin and clothes, splash in the eyes, or be breathed in as fumes. If someone is hurt, get medical help as soon as possible. (To learn how to treat chemical spills and chemicals burns while waiting for help, see Appendix A.)

Prevention

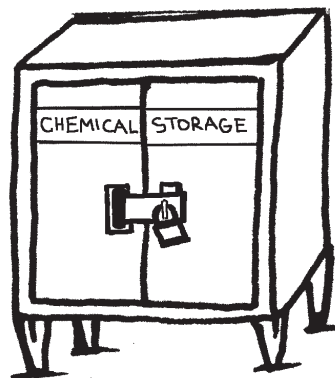
The best way to prevent harm from toxic chemicals, including heavy metals, is to not use them. But there are also ways to prevent and reduce harm if toxics are still being used.

- Use protective equipment whenever possible (see Appendix A).
- Wash your hands many times a day. Do not touch your face, smoke, or touch other people while working with or near toxics unless you wash your hands first.
- Demand that mine operators reduce dust and water pollution.
- Never eat where chemicals are being used, mixed, or stored.
- Store chemicals safely.

Storing chemicals

Many chemicals can cause fires, explosions, or release of toxic gases. Safe storage of chemicals can help prevent accidents and reduce harm at mine sites. Store chemicals:

- away from explosives, electrical sources, all sources of water, and motor vehicles.
- away from where people eat.
- in containers that are clearly labeled. If you move chemicals from one container to another, label the new container. **Never** put chemicals in containers used for food or drinks — someone may accidentally eat or drink the chemical. After a chemical container is empty, it should never be used for food or drinks, even if you wash it out.
- in strong, locked cabinets designed and labeled for chemical storage.



Heavy Metals

Heavy metals such as arsenic, mercury, cadmium, uranium, and lead are harmful to people even in very small amounts (see page 337). Because many metals are found together at mine sites, it is often hard to know which metal may be causing health problems.

If you know what metals are likely to be found in your area and the health effects of these metals, this will help you know if you have heavy metal poisoning. Some miners demand testing from the mine operator to know what heavy metals they are exposed to, and training about ways to reduce harm.

Mercury is mined on its own and is also used to separate gold from ore.

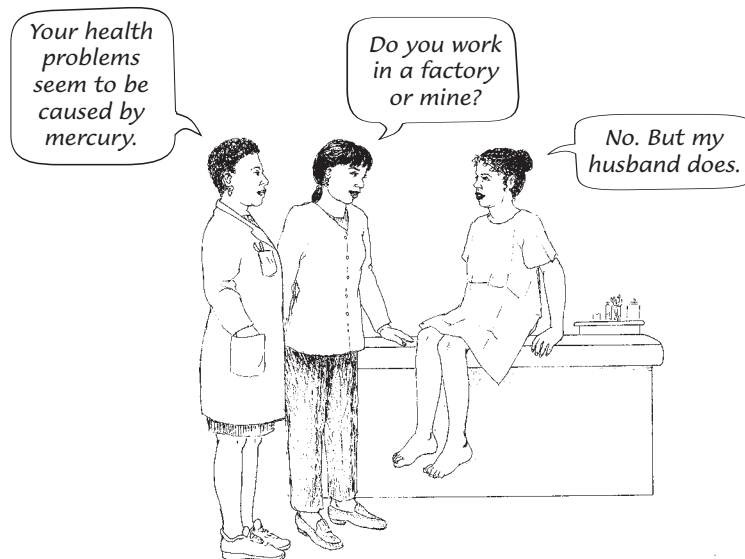
Lead is often found with copper, silver and zinc.

Copper is found with silver and zinc.

Arsenic is often found with gold, copper, and zinc.

Cadmium is found with silver, copper, and zinc.

IMPORTANT: If you are exposed to heavy metals day after day, medicine will not stop the poisoning. The only way to stop the poisoning is to stop being exposed. If you have heavy metal poisoning, it is likely that others in your community do as well.

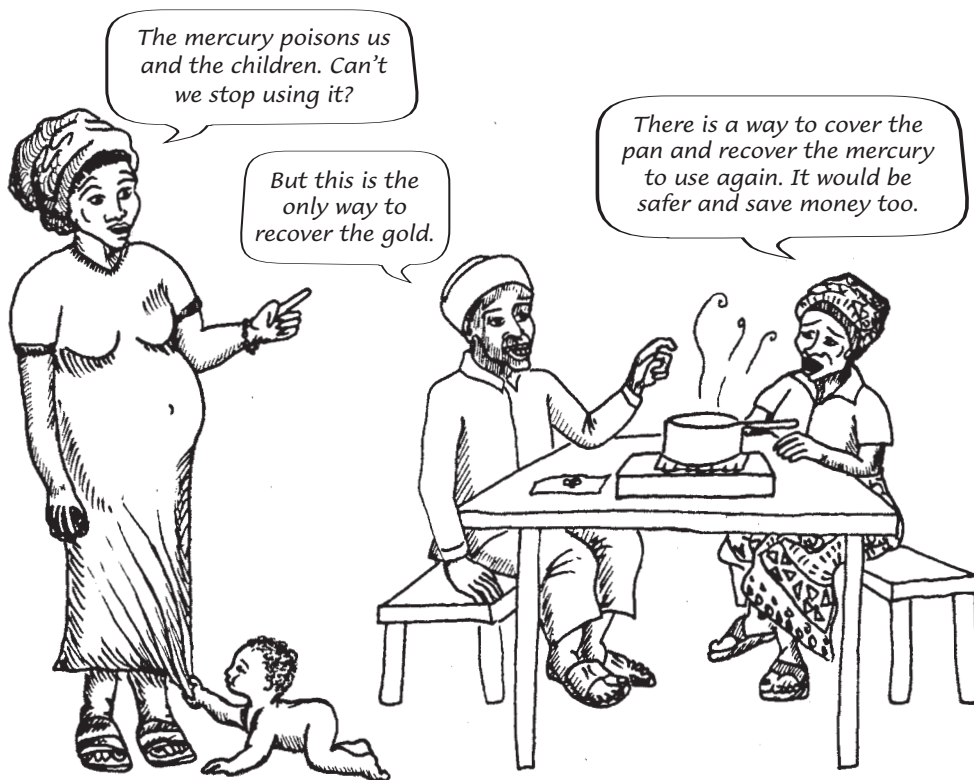


Mercury poisoning

When artisanal miners process silver or gold ore, they often mix the ore with mercury to make a soft substance called amalgam. When burned off to collect the gold, the mercury turns to a gas that can be breathed in by anyone nearby. Mercury can also become a gas if it is spilled or left in an open container. Breathing in mercury fumes is very dangerous. Mercury is also dangerous if it is absorbed through the skin or eaten when it passes from someone's hands to food (see page 338).

Some signs of mercury poisoning are easy to confuse with malaria. If you live in a gold mining community and malaria medicine does not seem to work, talk to a health worker about the possibility of mercury poisoning.

Mercury poisons the environment by settling into the water and soil, where it can remain for many years. Lakes and rivers in California, USA, are still poisoned by mercury from gold mining over 100 years ago. (To learn more about mercury poisoning in water and fish, see page 339.)



Prevent mercury poisoning

Artisinal gold (or silver) miners can prevent mercury poisoning by using a **mercury retort**. A mercury retort captures mercury gas before it gets into the air. This prevents miners and others from breathing the poison, and allows miners to save money by reusing mercury rather than losing it to the air.

Always separate gold from mercury in the open air or in a well-ventilated area. This will reduce the amount of mercury fumes that collect on, and in, the bodies of people nearby. Wear thick gloves when handling mercury.

Some gold miners simply put a banana leaf over the gold heating pan to capture mercury. When heated, the mercury turns to gas, and turns back to liquid on the leaf. Covering the heating pan with a leaf is much better than leaving it uncovered. But this still allows the mercury to poison the worker and the environment, and the mercury is not recovered. A better solution is to use a closed retort.

There are many kinds of mercury retorts. All of them require strong, directed heat. A blowtorch or a fire with an air blower will help to recover all the gold as quickly as possible.

How to make a bowl-style retort

Large stainless steel bowl with a hole in the bottom

Enamel bowl to hold amalgam sits in the hole in the outer bowl

Put a bed of sand in the steel bowl and around the enamel bowl

Glass bowl upside down over enamel bowl in the bed of sand

Amalgam is placed in the enamel bowl before heating

Aim torch at the bottom of the enamel bowl to heat the amalgam

The heat will turn the mercury to vapor, which will rise to the glass bowl, and then turn to liquid and run down the sides into the sand. The gold will be left in the enamel bowl.



Fireproof stand to hold retort

How to make a galvanized pipe retort

This retort is made from standard pipes and plumbing connections. Wear gloves, glasses, and a mask when using it.

- 1 Form gold amalgam into little balls. Always wear gloves (or plastic bags) on your hands while doing this. Put the little balls into the pipe cap.
- 2 Screw the retort together tightly so that no mercury escapes.
- 3 Put the body of the retort into a bed of hot coals, with the bent pipe in a glass or bowl of cool water. This retort works best if it is heated evenly.

First put amalgam balls into the pipe cap...

... then screw the retort pipe onto the metal pipe cap.



glass or bowl of cool water

- 4 The mercury will escape through the pipe into water. The water will prevent mercury fumes from releasing into the air, and will cool down the mercury so it becomes liquid again.
- 5 When no more mercury is collecting in the water, all the gold has been extracted and all the mercury has been recovered. Tap the pipe to make sure all the mercury falls into the water.
- 6 Let the retort cool, and then open it. Pure gold is left behind in the pipe cap.

One problem with this retort is mercury may stick to the inside the first several times it is used. Be patient, and do not touch the mercury. Over time, all the mercury will come out.

Another problem is the gold may stick in the bottom of the retort. To avoid this problem, unscrew the bottom piece before using the retort and hold it upside down over a lit candle until it is coated black. The grease from the candle will prevent gold from sticking.

Uranium radiation

Uranium is a metal that releases harmful **radiation** (see page 342). Radiation causes cancer, skin diseases, and other serious health problems. People are exposed to uranium through mining it, processing it, or living near uranium mines or waste dumps.

Uranium is used to make 2 things: nuclear weapons and nuclear energy. Both are costly, dangerous, and not needed. No country can trust its leaders or military with nuclear weapons built to kill huge numbers of people. What we need is peace.

Nuclear energy is also dangerous, and accidents in nuclear power plants can kill thousands of people. The waste from nuclear energy remains very harmful for thousands of years and cannot be disposed of safely. Electricity can be made in safer ways (see Chapter 23).



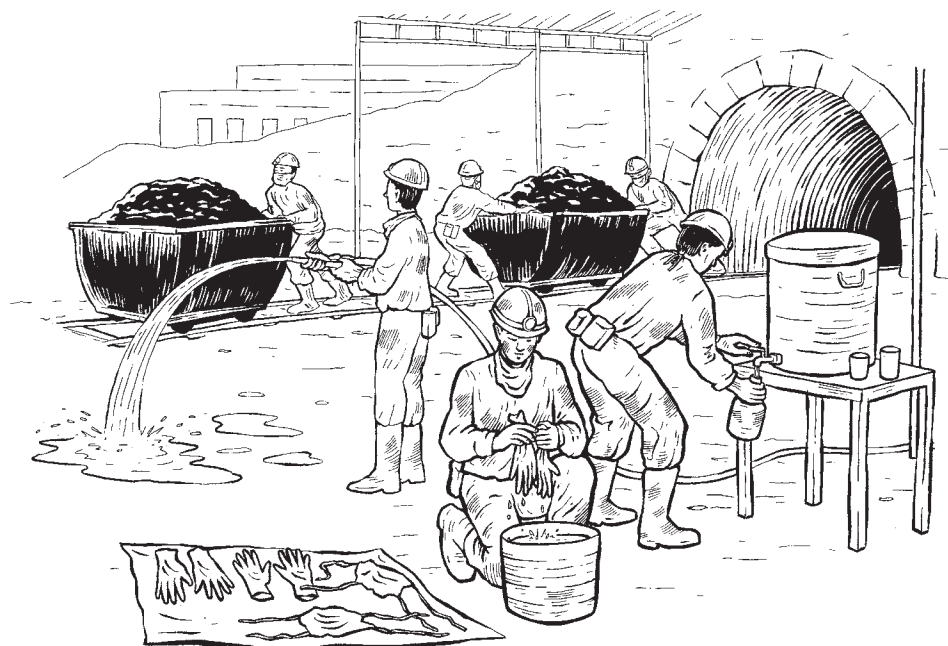
Safety at Mine Sites

Mining companies are responsible for making mines operate safely. Governments, miners, and their unions are responsible for making sure the companies do that. Unfortunately, many governments do not enforce health, safety, and environmental regulations. (For information about how laws protect the human and environmental rights of miners, see Appendix B.)

Workers and communities need the right to protect themselves from harm, information, and equipment and training to reduce exposure to harmful materials. Miners and communities often form safety committees to make sure conditions are as safe as possible. Safety committees can also prepare for emergencies with plans to transport hurt workers and evacuate anyone in danger.

Mine operators should provide protective equipment for all workers and maintain it in good condition. Mine operators should also make sure every mine operation has first aid supplies, and that all workers have access to them (see Appendix A). Most importantly, all workers should be trained about mining dangers, such as chemicals, using explosives, and landslides.

To make sure mining does as little harm as possible to the environment, communities and their allies should monitor water and air near mine sites for signs of pollution. People who may be exposed to toxic chemicals, excessive dust, or other dangers should be tested by health workers on an ongoing basis, and be given treatment at the first signs of health problems.



Organizing to improve miners' lives

Miners around the world have improved their lives, safety, and health by forming labor unions and cooperatives, and by pressuring mining companies to obey laws and the government to enforce them. They have also organized campaigns to enforce international treaties to regulate mine health and safety. Miners and others have also used strikes, demonstrations, and blockades to stop mining operations when they are unfair, unsafe, or destructive to the environment.



**Miners know that by working together,
we can move mountains!**

Women miners organize a cooperative

In Bolivia, women collect scraps of gold, silver, and tin from waste piles dumped near the mines. Many women are forced to do this difficult work after their husbands die in mining accidents or from silicosis. The women work long hours, often in contaminated water, and with no protection. They earn very little money. In the past, they were not even recognized as workers by the government. They were like invisible people.

One day, a mining company began blasting a road through the waste dump where a group of women were working. The women climbed to the top of a hill to protest the destruction of their only source of income. They were not able to stop the blasting, but they continued to fight for their rights.

They formed a cooperative to demand more money from the companies who bought their scraps. The companies refused to pay more. But the government recognized their struggle and passed a law that made the companies pay the women when they missed work because of illness. This was a small step, but it was the first time the women's work was recognized by the government. This small victory inspired the women and other mine workers to continue building cooperatives and unions, and organizing for justice.

Holding corporations accountable

Many mining operations are run by multinational corporations whose headquarters are in countries far from the mine site. This makes it difficult to pressure them for change. But people around the world have organized and forced corporations to change their practices and even to abandon mining projects.

Asbestos miners finally win in court

When Audrey was a child, she worked at a mine in South Africa for the Cape Mining Company of Britain. Her job was to step up and down on piles of asbestos powder so that it could be packed into bags for shipping. A supervisor watched her and the other children to make sure they never stopped working. If she stopped, he would whip her. Audrey became very sick from breathing in asbestos, and so did many other workers.

Thirty years later, Audrey joined thousands of other South Africans to sue the British company for causing her health problems. The company spent 3 years arguing that the South African courts should hear the case. Audrey and the people she worked with believed a South African court would not give them a fair trial against a big company that brought a lot of money into the country. Audrey and others traveled to other countries to tell people about their struggle and win support. Finally the courts agreed to hear the case in Britain, the home base of the asbestos company.

After almost 5 years of legal battle, the company gave up. They paid the miners tens of millions of dollars for the harm they caused. Today, most countries ban asbestos mining and many countries ban the use of asbestos altogether. Finally in 2008, South Africa went from being one of the world's largest producers of asbestos to prohibiting the use or manufacture of asbestos or any asbestos product.

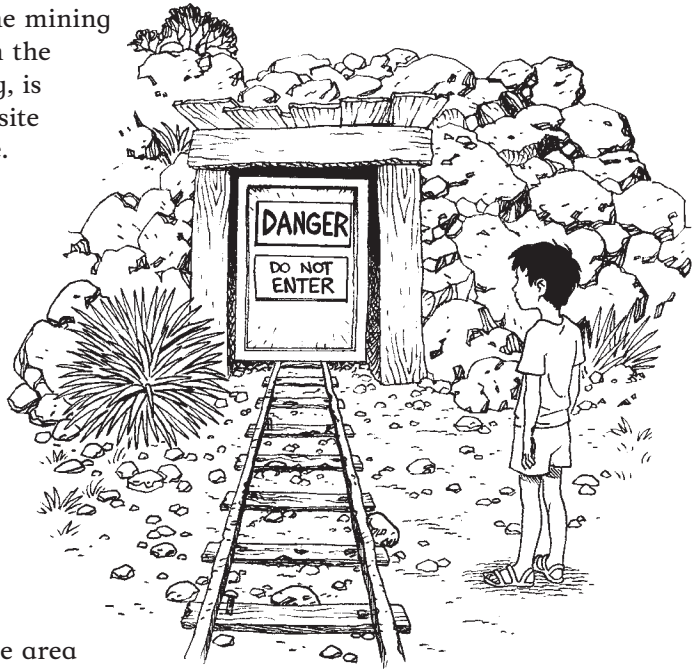


When a Mine Closes

Before a mining operation begins, the company must study what the environmental and social effects of the mine will be. This study, called an **Environmental Impact Assessment** or **EIA** (see Appendix B) should plan for ways to reduce harm and to clean up the site when the mine is closed. It should also make sure that people and communities harmed by mining activities are paid for any damage they suffer.

When a mine is closed, the mining operator, with oversight from the government mining authority, is responsible for restoring the site to make it safe for future use. Mining companies and mine operators should:

- remove toxic materials, machinery, and mining structures.
- fill holes, close off tunnels, fence dangerous areas, and clearly mark these areas with signs.
- stabilize cliff faces, pit walls, and waste dumps to reduce erosion and prevent collapse.
- restore soil and cover the area with healthy soil and plants.
- restore damaged waterways.
- treat polluted water for as long as necessary.

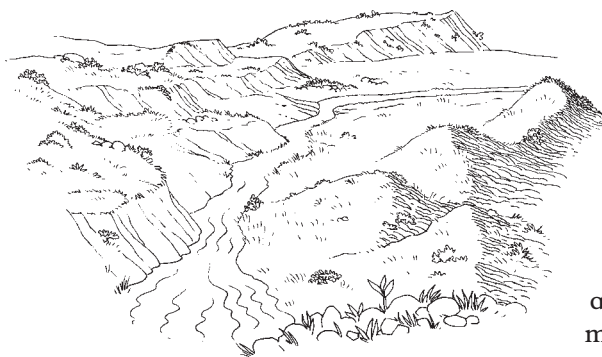


In some countries, mining companies are required to put up money (called a bond) before they begin work. The bond is a way to make sure that the company cleans the site after the mine closes. The bond money is used if the company goes bankrupt or does not have enough money to restore the area. If the amount of the bond is less than the costs of restoring land and paying for damages from mining, the company may not fulfill its responsibilities. To make sure that companies fulfill their responsibilities, communities or governments need to negotiate for a bond that is high enough. It is usually better to demand one large bond for an entire project, rather than smaller bonds for each separate part of the project.

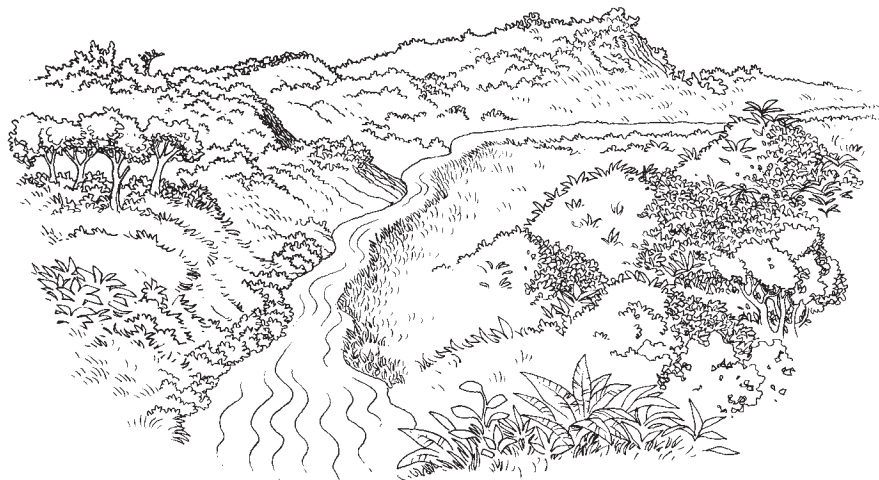
Restoring damaged land

If land is damaged by erosion and loss of topsoil, it can be restored over time (see Chapter 11). But land that is badly damaged by mine waste and chemicals may be very difficult and costly to restore, if it can be restored at all. It is so difficult, in fact, that few mines have been completely restored.

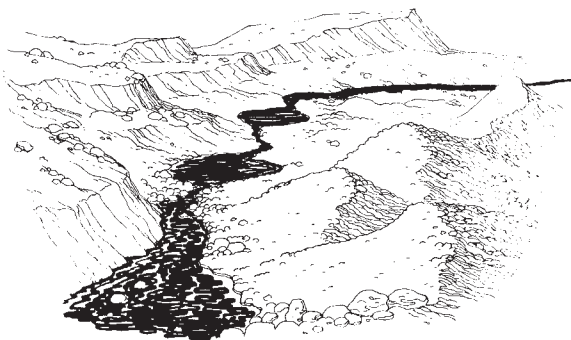
Restoring and replanting damaged land should be the responsibility of mine owners and operators. But mining communities, with or without support from government, usually must pressure the mining companies to make sure they fulfill this responsibility.



New plants growing 5 years after replanting



Full plant cover 20 years after replanting



After mining and before restoration

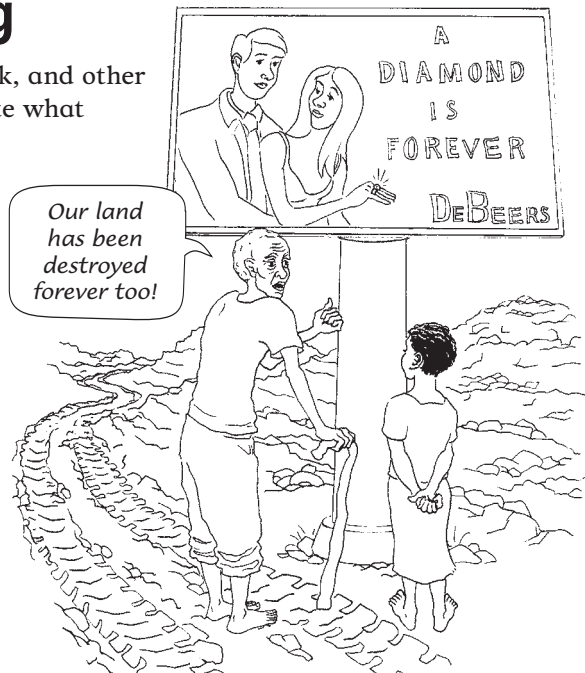
To restore and replant mined lands, toxic waste must be prevented from washing or blowing away, and acid mine drainage must be prevented. It takes a lot of work over many years to bring land back to a healthy state.

If land cannot be mined safely and responsibly, it should not be mined at all.

Responsible Mining

Mining companies, the World Bank, and other international agencies now promote what they call “sustainable mining.” But large-scale mining is always destructive and the amount of minerals that can be mined safely is limited. Mining is a “boom and bust” industry, meaning there may be great wealth when a new mineral deposit is discovered, but this is followed by great poverty when the minerals are gone. As yet, there has been no such thing as “sustainable mining” and since minerals are not a renewable resource, truly “sustainable mining” is an impossibility.

However, mining can be done in ways that are less destructive to workers and communities.



Develop environmental and social plans

All mine operations should include a plan to protect the environment and support community needs. Mining companies want to take out as much wealth as possible with as little cost, so community pressure will be necessary to force mining operations to develop these kinds of plans. For any plan to be effective, people from nearby communities must be involved in all decision-making. A responsible plan will include:

- an environmental impact assessment (EIA) carried out with the participation of the communities that will be affected (see Appendix B).
- social services such as health clinics and schools, and providing safe drinking water, sanitation, and other necessary services.
- long-term, comprehensive health care for miners, their families, and affected communities.
- a plan for closing mines, restoring land, and providing job training and safe, sustainable work for those who worked in the mines.