

Dirty Metals

Mining, Communities and the Environment



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The Metals Mining Industry

A Few Highlights:



Tintaya mine, Peru

- 96 percent of US arsenic emissions
- 50 percent of all newly mined gold taken from native lands
- Groundwater thousands of times more acid than battery acid
- Implication in human rights abuses
- 79 tons of mine waste for every ounce of gold
- Employs only 0.09 percent of the global workforce
- Up to 10 percent of world energy consumption
- Craters blasted into officially protected natural areas

Photo: CONACAMI

About This Report

The purpose of this report is to show you how much metal there is in your life—from the gold in your jewelry to the aluminum in your automobile—and to explain how it was produced. If you live in the United States, your annual consumption of “newly-mined” minerals (as opposed to those produced from recycling) comes to 21 metric tons*—just over 57 kilos a day.¹ This report will show you what lies behind that stupendous lode of copper and tantalum, gold and platinum. We’ll explain how the mining of these and other metals damages landscapes, pollutes water, and poisons people. We’ll show you why modern, industrial mining is one of the world’s most destructive industries. And finally, we’ll show you what we as consumers and concerned citizens can do to clean it up.

*All references to tons in this report are to metric tons.

From Open Pit to Wedding Ring

How Gold Is Produced

A golden wedding band, or some other piece of gold jewelry—for many people, these things are almost too valuable to put a price on. Perhaps you own such a ring yourself. But while the ring as a symbol may indeed be priceless, the gold certainly is not. Gold comes with a price—a heavy one. Gold mining costs the planet and its peoples far more than the metal itself is worth.

3. CYANIDE LEACHING: Once it's extracted, the ore is crushed, piled into huge heaps and sprayed with cyanide, which causes the gold to leach out of the ore. Some mines use several tons of cyanide per day. A rice-grain sized dose of cyanide can be fatal. The cyanide-contaminated waste ore is usually just abandoned. To produce enough gold for a ring, about 18 tons (20 short tons) of waste ore are created.

2. WASTE ROCK: An open pit mine generates huge piles of waste rock, which leach toxic metals and acid. Mine waste has turned groundwater thousands of times more acidic than battery acid. For more on waste rock, [see page 9](#).

1. EXTRACTION: Of all the gold in use or in storage today, two-thirds is newly mined—it came directly from the Earth. (The other third came from scrap or recycled sources.) Of that newly mined gold, two-thirds was extracted from immense, open-pit mines. Several of these craters have grown so large that they are now visible from outer space. For more on open-pit mining, [see page 4](#).

4. SMELTING & REFINING: The separated gold is then shipped to a smelter, where remaining impurities are removed under intense heat. The metals smelting industry (of which gold is but a small part) is a major consumer of energy and a major air polluter. For more on smelting, [see pages 6 and 13](#). For energy consumption, [see page 12](#).

5. TRADE: Once the gold has been purified, it can be traded. More than 80 percent of gold is used for jewelry; most of the rest is bought by investors or used in electronics.

6. A RING MORE COSTLY THAN GOLD: Jewelry manufacturing can be a lucrative business. In the United States, a piece of gold jewelry typically sells for four or more times the value of the gold it contains. Few jewelers are likely to be able to tell you where the gold in their products came from. There is a business that has yet to hold itself accountable for the damage done in creating its merchandise. The time has come to change that, and as a consumer, you can help make that happen. Please visit our website, at www.nodirtygold.org, to learn more about what you can do.²



Copper smelter site near Butte, Montana

Ruined Lands, Poisoned Waters

The first step in mining is to locate a subterranean ore deposit and bring it to the surface. Increasingly, mining operations find that it's cheaper to do this by blasting away the soil and surface rock, called "overburden," rather than by digging underground shafts. The resulting open-pit mines essentially obliterate the surrounding landscape and open up vast craters. The world's largest open pit, the Bingham Canyon mine in Utah, measures 1.5 kilometers (1 mile) deep and 4 kilometers (2.5 miles) wide. Open-pit mines produce 8 to 10 times as much waste rubble as underground mines. This rubble is generally piled into enormous mounds, some of them reaching heights of 100 meters, which is nearly as tall as a 30-story building. In the United States, 97 percent of all metals are now mined in open pits. Globally, that figure is two-thirds and it's rising.³

Once the ore is brought to the surface it must be processed to extract the mineral. The processing varies depending on the metal being mined, but it too generates immense quantities of waste. That's because the amount of recoverable metal in even high grade ores is generally just a small fraction of their total mass. The amount of waste created per unit of recovered metal has tended to increase as more and more high-grade deposits are exhausted and the industry turns increasingly to lower grade ores. In the United States, for example, the copper ore mined at the beginning of the 20th century consisted of about 2.5 percent usable metal by weight; today that proportion has dropped to 0.51 percent. In gold mining, it is estimated that only 0.00001 percent (that's one-hundred thousandth of 1 percent) of the ore is actually refined into gold. Everything else is waste.⁴

The cumulative amounts of solid waste produced by these processes are so large as to be almost incomprehensible. As a global average, the production of 1 ton of copper results in 110 tons of waste ore and 200 tons of overburden. Every

year, mines in the United States generate an amount of solid waste equivalent in weight to nearly nine times the trash produced by all US cities and towns combined. The total amount of waste ore (not including overburden) that has been generated to date by the US metals mining industry probably exceeds 90 billion tons.⁵

But to understand why the waste is so dangerous, you have to look at more than just the amount of it. You have to look at what the waste contains—and a lot of the contents are toxic. When it comes to toxic emissions, metals mining is one of the leading industries. In the United States, where companies are required to report such emissions, the industry's own data have earned it the dubious distinction of being the country's top polluter. In 2001, the most recent year for which data were available, metals mines produced 1,300 tons of toxic waste—46 percent of the total for all US industry combined—including 96 percent of all reported arsenic emissions, and 76 percent of all lead emissions.⁶

Some of these toxics are contaminants of the ore itself—for example, heavy metals such as mercury, arsenic, selenium, and lead often drain out of the piles of waste rock. But other toxics are introduced intentionally during the extraction process. Gold, for instance, is commonly extracted through a technique called “heap leaching.” The ore containing the gold is crushed, piled into heaps, and sprayed with cyanide, which trickles down through the ore, bonding with the gold. The resulting gold-cyanide solution is collected at the base of the heap and pumped to a mill, where the gold and cyanide are chemically separated. The cyanide is then stored in artificial ponds for reuse. Each bout of leaching takes a few months, after which the heaps receive a layer of fresh ore. Given the scale and duration of these operations (usually decades), contamination of the surrounding environment with cyanide is almost inevitable. A rice-grain sized dose of cyanide can be fatal to humans; cyanide concentrations of 1 microgram (one-millionth of a gram) per liter of water can be fatal to fish.⁷

Wasting Rivers and Seas

Toxic emissions can be insidious—largely invisible until their effects are widespread. But there’s another kind of mining pollution that’s impossible to miss: tailings dam failures. A by-product of extraction, tailings are usually a soupy to semi-solid suspension of pulverized rock in water, generally

laden with toxics. On-site tailings disposal generally consists of bulldozing some of the dried tailings into a dam which can then retain the more fluid material. The dam is periodically enlarged as the level of the tailings reservoir rises.

Despite its name, a tailings dam bears little structural similarity to an ordinary river dam. A conventional dam is generally constructed as a single project, to a single set of predetermined standards. On the other hand, the “construction” of a tailings dam usually occurs over the life of the mine, which makes it much more difficult to maintain structural integrity. Over the past quarter century or so, tailings dam failures have accounted for three-quarters of all major mining accidents.⁸

Consider, for example, the failure at the Omai gold mine in Guyana. A project of the Canadian mining corporation Cambior, the Omai is one of the largest open-pit mines in the world. Its tailings dam failed in 1995, releasing some 3 billion cubic liters of cyanide-laden tailings into the Omai River, a tributary of Guyana’s largest river, the Essequibo. Following the spill, the President of Guyana declared all 51 kilometers (32 miles) of river drainage from the mine to the Atlantic Ocean—home to 23,000 people—an official “Environmental Disaster Zone.” Initial government reports estimated the cyanide concentration in the Omai to be 28 parts per million, which is 140 times the level that the US Environmental Protection Agency (EPA) considers lethal.⁹

Photo: Tibor Kocsis

Fish kill at Baia Mare, Romania



To get around the problems of managing tailings on site, some mines pump them directly into nearby bodies of water. “Riverine tailings disposal”—a euphemism for dumping mine waste into rivers—poisons aquatic ecosystems, clogs rivers, and can disrupt the hydrology of entire watersheds. Once a common practice around the world, it has now been effectively banned by most developed countries, including the United States and Canada. Elsewhere, the practice is not common, at least officially. Today, only three mines in the world, all located on the giant Pacific island of New Guinea, openly use this disposal method: the Ok Tedi, Grasberg, and Porgera mines. (For more on Ok Tedi, see page 7; for Grasberg, see pages 14, 19, and 24. Porgera is a gold mine run by Placer Dome, a Canadian corporation; it has been dumping all its tailings directly into the Porgera River since 1992.) To date, only three companies (the Canadian firm Falconbridge and Australian firms Western Mining Corporation and BHP Billiton) have publicly pledged not to dump waste into rivers.¹⁰

Riverine disposal is, however, practiced illegally at many other mines. In Ilo, Peru, for example, two mines and a smelter operated by the Southern Peru Copper Corporation (controlled by the Mexican firm Grupo Mexico) have caused severe environmental degradation through this kind of dumping, which the company practiced for decades, in violation of Peruvian law. Between 1960 and 1992, the company dumped an average of 2,100 tons of smelter slag per day onto beaches north of Ilo; until 1995, it pumped an average of 107,000 tons of tailings per day into nearby Ite Bay. Between 8 and 9 million tons of accumulated slag now form artificial beaches along the coast. The mine tailings are now pumped into inland tailings ponds, but these are still contaminating the Locumba River, which flows into the bay.¹¹

Ocean dumping is a form of water disposal that is less conspicuous than the river option, and the Ilo mines are hardly the only coastal mines to have used the sea as a waste disposal site. Coastal dumping is a grave ecological concern because coastal waters are biologically the richest parts of the oceans, and because they support ocean life elsewhere as well: many open-ocean species depend on coastal habitat for part of their life cycle. Coastal dumping is a menace to public health as well. For example, in Northern Sulawesi, Indonesia, the Minahasa Raya gold mine, operated by the US-based Newmont Corporation, dumped over 4 million tons of tailings into Buyat Bay during the mine’s seven-year life, from 1996 to 2003. Local people have reported skin rashes after contact with seawater, and a toxicologist has found heavy metals in fish and plankton.¹²

It’s especially unfortunate that coastal dumping is practiced in parts of the Pacific that are home to some of the world’s richest coral reef communities—places like the coastal waters of Marinduque island in the Philippines. Those are the waters where the Marcopper copper mine pumped 200 million tons of toxic waste rock over a period of 16 years, carpeting 80 square kilometers of seabed, suffocating coral reefs, and poisoning reef fish. In the island’s fishing communities, children have tested dangerously high for lead and cyanide.¹³

In response to public health and ecological concerns over shallow sea disposal, the industry is turning increasingly to deep-water disposal, a practice in which a pipe conducts the tailings to a depth of at least 100 meters before releasing them into waters considerably deeper than 500 meters. The industry argues that this is a “best practice” because deep seawater has low levels of dissolved oxygen—a necessary ingredient for the chemical reactions that release heavy metals from the rock. (See page 9.) But deep-water disposal remains highly controversial because so little is known about the ecology of the ocean floors, and because of the possibility that broken pipes, deep-water currents, or geologic activity could disperse the waste into shallower waters.¹⁴

A growing awareness of the risks of marine tailings disposal has led the United States and Canada to effectively ban the practice. And in December 2003, the World Bank’s Extractive Industries Review recommended that the Bank not finance mines that dump their tailings at sea. But it remains to be seen whether such moves are the beginnings of a broader ban, since other mines that use marine disposal continue to be developed. For example, BHP-Billiton has proposed a nickel mine on Indonesia’s Gag Island, which contains the third-largest nickel deposit in the world. If the project is approved in its present form, all waste would be dumped at sea—even though the coral reefs off the island are among the most biologically diverse in the world.¹⁵

Metal Smoke, Acid Air

The ore processing at the mine does not yield a metal that is pure enough to use. Further refining is necessary. For some metals, such as aluminum, nickel, and copper, this takes place at a smelter, a kind of furnace in which very high temperatures release the metal from other materials in the ore. Smelting technology has improved considerably over the past half century, but smelters still produce a great deal of air pollution, especially oxides of nitrogen and sulfur, components of smog and acid rain.

Continued on page 8

Facts on the Ground: The Ok Tedi Mine

The Ok Tedi mine, on the banks of the Ok Tedi river in western Papua New Guinea, began producing copper and gold for the giant Australian mining corporation BHP (Broken Hill Properties Ltd.) in 1984. Because the mine's tailing dam was destroyed during construction by a massive landslide, the company convinced the government to allow it to dump waste directly into the river.

Currently the mine discharges, on a daily basis, 80,000 tons of ore and 120,000 tons of waste rock into the Ok Tedi river. One industry-funded study predicts that if the dumping continues at that rate until the mine is scheduled to close in 2010, the total amount of sediment in the river would be 1.72 billion tons, or the weight of 4,712 Empire State Buildings.

The dumping has contaminated the river with toxic metals and caused an enormous, permanent flood. Nearly all the fish in the river have been poisoned, and some fish species appear to have gone extinct. Vast tracts of forest

have been drowned. A 1999 estimate put the amount of forest damaged in that year alone at 176 square kilometers, an area nearly three times the size of Manhattan. Most of the wildlife has disappeared from the region. Plantings of sago palm and other staple crops have died, and some 30,000 to 50,000 people have been displaced. One anthropologist studying the situation coined a new term to describe it: "ecocide."

The people affected were unable to negotiate a settlement with BHP directly, so a delegation of them addressed their concerns to the International Water Tribunal in The Hague. Although the tribunal had little power to enforce change, its involvement drew international attention. In 1996, an out-of-court settlement was reached: BHP was required to pay compensation and reform its waste disposal practices. But even the industry and its funders were beginning to wonder whether the mine was worth the damage it was doing. In 2000, the World Bank publicly suggested

that the mine be closed. In 2002, the CEO of BHP Billiton (the successor company to BHP) called the project "an environmental abyss" and said it should never have been built.

In the same year, BHP Billiton handed over its 52 percent share of the project to a government-controlled local corporation, in exchange for indemnity from future legal claims. In an effort at remediation, the government has begun dredging the river to remove about 20 million tons of sediment per year. The dredging has begun to reverse the flooding, and vegetation is slowly returning to some areas. Ultimately, however, up to 6,600 square kilometers of vegetation may be destroyed during the life of the mine.¹⁹

Discharge from the
Ok Tedi mine, Papua
New Guinea



Close-Up: Your Computer

Your personal computer contains a medley of metals, including gold, silver, aluminum, lead, copper, iron, zinc, and tin. Many of these materials could be salvaged at the end of the computer's life and recycled. But currently, most discarded computers are dumped in landfills or incinerated. Incineration of electronic waste, or e-waste, releases heavy metals and dioxin into the atmosphere. The landfill option is also polluting. In the United States, about 70 percent of the heavy metals in landfills come from e-waste. These metals can leach into the soil and groundwater. Exposure to them

has been shown to cause a range of injuries, including abnormal brain development in children, nerve damage, disruption of the endocrine system, and damage to various organs.

Because it contains substantial quantities of valuable metals, e-waste is an internationally traded commodity. Many junked computers make their way to developing countries, mostly in Asia, where some of the metal is salvaged. These salvaging operations are usually very crude and operate outside any environmental or labor regulations. An investigation

of one such operation, in Guiyu, a village in China's Guangdong Province, found workers dismantling computer equipment with hammers, chisels, screw drivers, and their bare hands. Only the most readily extracted metal components were recovered. For example, workers would crack open monitors, extract the copper "yoke," then dump the smashed equipment in a field or push it into a river. Area residents say the local water is now too foul-tasting to drink; drinking water is now trucked into the area from 30 kilometers away.²⁰

Sketch: Chris Engnoth

Some of the larger and older smelters have done extensive ecological damage, primarily from heavy sulfur dioxide emissions. For example, nickel and copper smelters near Sudbury in Ontario, Canada, rendered the soil practically lifeless within 3 kilometers and badly damaged forests, lakes, and wetlands up to 30 kilometers away. Although the original Sudbury operation shut down in the 1970s, other smelters in the region continue to number among the top air polluters in Canada. Close by Sudbury, for example, is Inco's Central Mills smelter. By far the worst air polluter in the Canadian metals mining sector, Central Mills released nearly 622 tons of sulfur dioxide and other toxic pollutants in 2001. A more extreme but less studied case involves the nickel smelters at Norilsk, in northeastern Russia. Acid emissions from these smelters, which are still operating, have destroyed an estimated 3,500 square kilometers of forest and injured the respiratory health of thousands of people. Worldwide, smelting adds about 142 million tons of sulfur dioxide to the atmosphere every year. That's 13 percent of total global emissions.¹⁶

Smelting releases a range of other pollutants as well. Emissions of metals such as lead, arsenic, cadmium, and zinc are common and can pose serious health risks. In the town of Herculaneum, Missouri, emissions from the 110-

year-old lead smelter operated by the Doe Run lead company have caused lead poisoning in 30 percent of the town's children. In the Peruvian town of La Oroya, where another Doe Run smelter operates, a study by the Peruvian Ministry of Health revealed that 99 percent of the children have severe lead poisoning, and 20 percent of these children needed hospitalization. Yet another type of pollutant detected in the emissions of some smelters, such as Noranda's Horne copper smelter in Quebec, Canada, is "persistent organic pollutants," or POPs. These compounds do not break down readily and they tend to bioaccumulate—that is, they build up in the fat of animals in increasing concentrations at higher links of the food chain. ("Organic" means they're carbon-based.) POPs can disrupt a broad range of physiological processes in animals and people.¹⁷

And since smelters burn huge amounts of fuel (see page 12), they also release substantial quantities of greenhouse gases, such as carbon dioxide and perfluorocarbons (PFCs). Aluminum smelters, for example, release 2 tons of carbon dioxide and 1.4 kilos of PFCs for every ton of aluminum produced. PFCs have up to 9,200 times the heat-trapping potential of carbon and will linger in the atmosphere for tens of thousands of years.¹⁸ ■

Acid Mine Drainage: Pollution on a Millennial Scale

Gold, copper, silver, and other valuable metals are often found in rocks rich in sulfide minerals, such as pyrite, or “fool’s gold,” and pyrrhotite. Mining often exposes these rocks to the elements for the first time since the rocks were formed. Once they are dumped as heaps of waste rock or pumped into impoundments as crushed tailings, their sulfides are exposed to oxygen and water. The result is a chemical reaction that produces sulfuric acid, a component of acid rain. But in comparison to acid rain, the acid in mine waste is 20 to 300 times more concentrated.

As it leaches through the mine waste, the acid liberates various metals from the rock—for example, arsenic, cadmium, mercury, and lead. These metals are not dangerous when embedded in the rock, but once they are freed, they are highly toxic to a broad range of living things. In humans, chronic exposure to arsenic, for example, is associated with skin cancer and tumors. Cadmium has been linked to liver disease, mercury to nerve damage, and lead to growth retardation in children.

Eventually, this toxic, acid leachate finds its way into streams and rivers, where the acid releases still more metals from exposed rock.

As they flow downstream, the acid and toxic metals can kill virtually all aquatic life for several kilometers and badly degrade downstream environments many times farther than that.

This process, known as acid mine drainage, or AMD, is the most widespread and persistent form of water pollution caused by mining. The signature of AMD is a slimy, orange coating that builds up in the beds of affected rivers and streams. This is caused by metals, especially iron, settling out of the water column. For all practical purposes, AMD is irreversible. There is evidence, for example, that some AMD in the Rio Tinto mining district of southern Spain is coming from ancient Roman or even Phoenician mines.

But ancient mines are small compared to those of our own day. Take the 17.8 square kilometer Iron Mountain mine in northern California. During nearly a century of operation, the mine produced iron, silver, gold, copper, and zinc. Iron Mountain was closed in 1963, but 40 years later, AMD continues to poison fish and other aquatic life in the Sacramento River, which drains the region. The Sacramento flows into the immense San Francisco Bay and there too, the AMD is endangering aquatic life.

Groundwater near the mine has registered pH levels as low as minus 3, which is 10,000 times more acidic than battery acid. And experts predict that Iron Mountain will continue to poison its watershed for at least 3,000 years.

Treatment procedures for AMD do exist, but they are costly and difficult to implement. There are basically two options: either preventing water and oxygen from reaching the sulfide-laden waste rock, or applying alkaline materials such as limestone to the leaching runoff to counteract the acidity. The first option generally requires a massive and very difficult revegetation effort; building soil on barren, poisonous rock and then getting plants to grow in that soil is not a simple matter. Treating the acid runoff might seem more feasible, but to produce a stable result, the treatment would have to be maintained as a matter of routine indefinitely—that is, for thousands of years. And the limestone treatments produce a metal-contaminated, toxic sludge that presents additional remediation problems. In many developing countries, a lack of resources and political interest makes treatment through either option an unlikely prospect.²¹

Porgera gold mine, Papua
New Guinea

Facts on the Ground: The Yanacocha Mine

On June 2, 2000, a truck from the Yanacocha gold mine in northern Peru spilled 150 kilograms of mercury out of some poorly sealed containers and onto a 43-kilometer stretch of road running through the towns of Choropampa, Magdalena, and San Juan. (Mercury is a secondary product of the mine.) Many local people, not knowing what the material was or that it was toxic, collected it in the hope that it might be valuable. Other villagers were hired by the mine to clean up the spill—but were not provided with any protective gear. Mercury can damage the lungs, kidneys, and nervous system. It can also cause birth defects.

The spill affected an estimated 925 people; 400 of them were treated for mercury poisoning and over 130 were hospitalized. The Newmont Mining Company, the US-based corporation that co-owns the mine with Buenaventura Mining of Peru and the World Bank's International Finance Corporation (IFC), spent \$12 to 14 million on the clean-up, but was unable to account for nearly 15 percent of the spilled mercury. In exchange for agreeing not to sue the mine, some of the spill victims were offered small cash settlements and medical care. But many residents continue to report health

problems and some have attempted to press their case against Newmont in US courts.

Yanacocha, located high in the Andes, is the most profitable gold mine in South America and the second largest gold mine in the world (after the Grasberg mine in Indonesia). Newmont insists that it has been a good corporate citizen of the Yanacocha region. The communities affected by the mine, the company argues, receive a share of the mining wealth. The company also claims that it has created over 1,600 jobs in the area, and helped build schools and clinics.

But many area residents worry about the mine. Some argue that by causing local inflation and driving people off their land, it has deepened their poverty. They also worry about the condition of their streams. "The water that comes down from the mountains is now brown, full of sediments," says one resident. "The trout are dying." They worry about the cyanide used to leach the gold out of the ore; they fear it has contaminated the water and is sickening their livestock. And they worry about what's in the dust that blows off the tailing piles and into their homes.

They have reason to worry. According to

tests done by both the government and the mine, many local river and stream sites exceed the World Health Organization (WHO) limits for acidity and concentrations of various metals, such as mercury and arsenic. One site had an aluminum concentration 20 times the WHO limit. (Free aluminum is toxic to a wide range of plants and animals, including people.) The tailings dust is also contaminated with toxic metals. And a study recently commissioned by the IFC found that acid leaching from the mine could further degrade local waters.

Since the mercury spill, Newmont has proposed expanding the mine to Quilish Mountain, the sixth mountain in the area the company would be leveling for gold. Quilish is a critical source of water for over 100,000 people in and around the nearby city of Cajamarca. Many local residents, concerned about the risks of water pollution, oppose the plan. There have been mass protests, including one in April 2003 that drew thousands of people to Cajamarca's main square. "I'm aware that Peru is a country that relies on mining," Jorge Hoyos, the Mayor of Cajamarca, told a Reuters reporter in 2002. "But we can't sit by and wait for our water supply to be ruined. We can't swap gold for lives."²²



Protest in Esquel, Argentina

Tambogrande and Esquel: Two Communities Stand Up to the Companies

Two rural Latin American communities, each faced with a large-scale mining project, are demonstrating the power of direct, peaceful opposition.

The small farming community of Tambogrande, located in Peru's sub-tropical San Lorenzo Valley, is sitting on deposits of gold and copper worth millions of dollars. It's also sitting in the midst of prime orchard country: the San Lorenzo Valley is Peru's top fruit-growing region. Tambogrande produces close to half of Peru's citrus crop.

In 1999, the Canadian mining company Manhattan Minerals proposed to relocate half of the town's 16,000 residents, demolish most of the town itself, and create an open-pit mine in its place. The proposal included a promise of new jobs and housing. But the people of Tambogrande, fearing that the mine would poison streams and farmland, said no deal.

That message was delivered in a referendum held in June 2002, in which 93 percent of the voters opposed the mine. (About 75 percent of the town's residents participated in the referendum.) The referendum was not legally binding—the mine proposal was put to

the Peruvian government not the local community—but the vote attracted considerable international attention. It was followed by frequent protests against the mine, and a peaceful, three-day general strike in November 2002. Local activists also began working with their counterparts in other countries to keep Tambogrande in the public eye. Finally, in December 2003, the Peruvian government turned down Manhattan's proposal. The official reasons for the rejection included an inadequately researched environmental impact assessment, as well as insufficient proof of assets and processing capacity. Citizen activism, however, had created a political context in which the proposal's social and environmental deficiencies could count against it.²³

A similar scenario has emerged in Esquel, a town of about 30,000 in the still largely unspoiled Patagonian region of Argentina. Meridian Gold, a mining company based in the United States and Canada, is proposing to mine a silver and gold deposit about 7 kilometers outside the town. The mine would be an open-pit operation using 2.7 tons of cyanide per day. The company proposes to operate

the mine for 8 or 9 years, but it does not propose to guarantee the remediation costs up front.

Esquel is an ecotourist destination; it is located near the Los Alerces National Park, home to gigantic, 2,000-year-old *alerce* trees, a kind of conifer that grows only in that region. Esquel is also a farming and fishing community. So it's not surprising that when the town held its own mining referendum, in March 2003, the response was similar to what it had been in Tambogrande: an overwhelming No. Eighty-one percent of the voters opposed the mine. (Seventy-five percent of Esquel's residents voted.) Esquel's referendum isn't legally binding either—although it was called by the provincial government—but the project has been stalled since the vote.²⁴

In both Esquel and Tambogrande, the message to the mining industry is essentially the same. Increasingly, the communities directly affected by mining proposals are demanding a say in decision-making about their future. That right imposes a basic obligation upon any form of extractive project: the obligation to obtain the free, prior, informed consent of the communities concerned.

Pouring Energy and Water into a Bottomless Pit

Mining is one of the most energy-intensive industries in the world. The mining sector is thought to consume 7 to 10 percent of annual global energy production. In the United States alone, mining uses 2.3 quadrillion (that's 2,300,000,000,000,000) BTUs of energy per year—enough power to supply over 25 million single-family American households for a year, roughly 23 percent of the country's population. Most of the energy consumed by mining comes from fossil fuels, primarily coal and oil. (Nearly all of the rest comes from the hydro-electric power used in aluminum smelting.)²⁵

Mining also requires gargantuan quantities of fresh water. (Salt water cannot be used because it corrodes equipment.) Large amounts of water are needed for virtually every aspect of the operation—drilling, dust control, grinding ores, and so forth. At many mines, water is recycled—that is, it is fed through the same operation repeatedly. But the systems leak. Tailings disposal, especially, results in a high volume of water loss, so more water must be regularly pumped into the system.

Paradoxically, given the huge water demand, mining is also frequently challenged with the problem of *too much*

water. Constant pumping can be necessary to keep the mine accessible as it drops below the water table. The pumping sometimes dries up streams and other surface waters. This type of disruption can outlive the operation itself: once a mine has closed and the pumping ceases, the pits may fill with water, drawing flow from natural sources. Evaporation and seepage from the pits can permanently alter groundwater movement—and the seepage is frequently contaminated with sulfuric acid and other pollutants.

There are no comprehensive estimates of the water volume that flows through the industry. (In the United States, pumping water out of mines is not defined as a “use” of that water, so there is no requirement to measure that at all.) But it is clear that mining can cause substantial hydrological disruption. In Nevada, for example, the US Geological Survey has found a decline in water tables by as much as 300 meters around some of the state's largest open-pit gold mines. One of these mines, Barrick's Betze mine, pumps out 380,000 cubic meters (100 million gallons) of groundwater per day.²⁶ ■

Close-Up: An Aluminum Can

When was the last time you drank something from an aluminum can? If you're living in the United States, chances are it was sometime today—on average, an American consumes 350 single-serving canned beverages per year.

What went into the creation of those cans? Aluminum begins as bauxite ore, which is 45 to 60 percent aluminum oxide. Bauxite is formed deep underground, and is typically mined in open pits, a process that produces vast amounts of waste rock. After it's extracted, the bauxite undergoes extensive cleaning and processing, after which it is dissolved in a caustic solution under high temperature and pressure to produce a fine, white powder called alumina.

The dried alumina is then shipped to a smelter, a metal-working furnace, where it is reduced to molten aluminum. This is done by liberating oxygen from the alumina, a change that occurs only at a very high temperature—over 1,200 degrees Celsius—so the process is extremely energy intensive. Primary (that is, non-recycled) aluminum production demands more energy per unit mass of finished metal than does the production of any other metal. According to the Container Recycling Institute in Washington, DC, the amount of energy needed to produce enough aluminum for one beverage can is equivalent to about one-quarter of that can filled with gasoline. In 1999, aluminum production accounted for 2 percent of the world's energy use.

Because aluminum smelting is so energy intensive, mining compa-

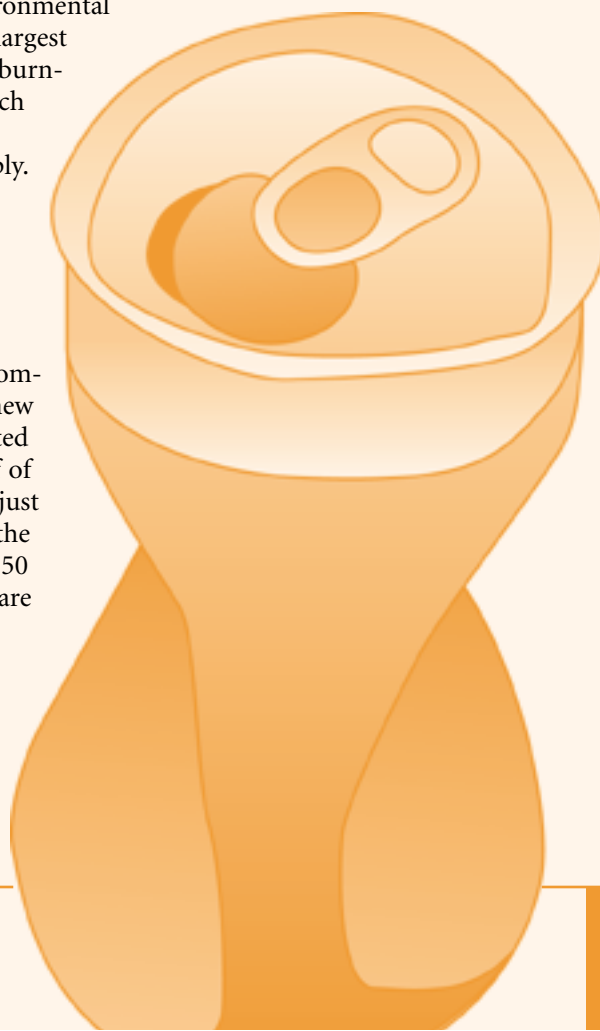
nies look for the cheapest energy they can find, and that usually means shipping the alumina great distances. The aluminum in your soda or beer can probably originated as bauxite in Australia, Brazil, Guinea, or Jamaica—the countries that produce three-quarters of the world's bauxite. The smelters themselves are often sited next to power plants—and indeed, many power plants are built especially to supply aluminum smelters. (Virtually all aluminum smelting is done with electricity.)

Worldwide, over half the aluminum industry's energy supply comes from hydroelectric dams, and the industry is a powerful lobby for dam construction. Like mines, these dams cause enormous social and environmental disruption. The next largest energy source is coal-burning power plants, which account for about a third of the total supply. Coal combustion is a principal source of greenhouse gas emissions.

Fortunately, used aluminum cans can be completely recycled into new metal. But in the United States, more than half of all aluminum is used just once and tossed into the trash. Currently, over 50 billion beverage cans are wasted in the United States every year—that's a quarter of a million tons of scrap metal valued at \$750 million. Laid end to end, these

wasted cans would encircle the globe at the equator 153 times.

Recycling aluminum cans consumes only 5 percent of the energy needed to make them from virgin ore. In the United States, the energy wasted by not recycling all those cans is equivalent to the annual electricity use of 2.7 million American households. During the 1990s, Americans discarded 7 million tons of cans—enough aluminum to make 316,000 Boeing 737 airplanes. That's a fleet 25 times the size of all the world's commercial airlines combined. Think about that the next time you finish a beer or a soda, and make sure that can finds its way into a recycling bin!²⁷



Sketch: Chris Engnoth



Mining the Parks

The Cabinet Mountains Wilderness Area in Montana is threatened by a proposed copper and silver mine.

- 1872:** The Yellowstone Lake basin in Wyoming, Montana, and Idaho becomes the world's first national park in the modern sense of the term. The area merits this distinction because it is home to one of North America's most spectacular assemblages of megafauna, including grizzly bears, wolves, elk, and bison, and because it contains two-thirds of all the geysers in the world.
- 1978:** Yellowstone is declared a World Heritage Site by UNESCO.
- 1990:** Crown Butte Mining Resources Ltd. decides to site a gold, silver, and copper mine 4 kilometers (2.5 miles) from the park boundary. Park officials warn of the possibility of permanent damage to the landscape.
- 1995:** Yellowstone is placed on the *List of World Heritage Sites in Danger*.
- 1996:** The US government agrees to a land-swap with the company in order to stop the project.²⁸

Yellowstone was spared, and withdrawn from the list of endangered World Heritage Sites in 2003. Unfortunately, however, this is not a typical scenario: the mining industry has a long and dismal record of damaging officially protected natural areas. Consider the following cases, each involving an area that, like Yellowstone, has been declared a World Heritage Site.

West Africa's Mount Nimba Strict Natural Reserve, which straddles the border between Guinea and Côte d'Ivoire, was included in the World Heritage list in 1981. In 1993, a consortium of mining companies, including BHP-Billiton and Guinea-based EuroNimba, acting in concert with the Guinean government, persuaded UNESCO to redraw the boundaries of the reserve on the Guinean side to allow for the development of an iron mine. (According to the government, the mine site wasn't supposed to have been included in the Reserve to begin with.) But redrawing the boundaries

obviously hasn't eliminated the danger to the Reserve. In 1999, the Global Environmental Facility (GEF), a multilateral grant-making agency run by the United Nations and the World Bank, awarded Côte d'Ivoire \$16.5 million to protect its share of the Reserve, citing mining operations in the region as among the threats the forest faced.²⁹

Indonesia's province of West Papua (the western half of the island of New Guinea) is home to Lorentz National Park, the largest protected area in Southeast Asia. This 25,000 square-kilometer expanse—about the size of Vermont—was declared a National Park in 1997 and a World Heritage site in 1999. But as early as 1973, US-based mining giant Freeport McMoRan Copper and Gold had begun chasing veins of gold through nearby formations. This operation eventually led to the discovery of the world's richest lode of those metals, lying close to the park boundary. The resulting open-pit mine, the Grasberg (operated by Freeport's local subsidiary, PT Freeport Indonesia), has already ruined its immediate environment. The mine dumps 110,000 tons of tailings per day into the Ajikwa river, and by the time it closes

in 30 years, it will have excavated a 230 square-kilometer hole in the forest that will be visible from outer space.³⁰

Overall, one-quarter of World Heritage Sites listed for natural value (other Sites are listed for cultural value) are at risk from past, current, or planned mining or oil and gas drilling. (See Table.) Perhaps this threat will eventually decline as a result of the agreement reached in August 2003, in which 15 of the world's largest mining companies pledged not to explore or mine in existing World Heritage Sites. (The agreement was brokered by an international agency, the IUCN-World Conservation Union.) There are, however, many important parks that are not on the World Heritage list and that remain vulnerable to mining. A recent analysis examined all the parks, reserves, and other official natural areas that meet IUCN criteria for "strictly

protected" (IUCN protected area management categories i-iv), and found that more than a quarter of active mines and exploration sites overlap with or are within 10 kilometers (6 miles) of such areas.³¹

Some countries are attempting to tighten up on mining incursion into protected areas. In 1999, for example, Indonesia passed a law banning open-pit mining in protected forest areas. But the government is looking for foreign investment to bolster a weak economy; it is also under intense pressure from the industry and foreign governments to override the law and grant mining permits. In July 2003, 15 mining companies were granted leases to mine in Indonesian protected areas, in apparent violation of the law. Some of these companies are signatories to the World Heritage pledge—indicating their apparent disregard for protected areas that fall outside the World Heritage category.³²

One reason that it's difficult to keep mining out of protected areas is that the boundaries of these areas are often poorly defined. This is a common problem in some parts of the Pacific region, which has relatively few protected areas and many major mines. In the Philippines, for example, mining is prohibited in intact forests and protected areas, yet approximately a third of all mining concessions overlap with these areas. (That figure covers both exploratory and active concessions.) Vague park boundaries have contributed to this situation; another factor is uncertainty over what constitutes an "intact forest." Papua New Guinea has a much larger version of the same problem. Nearly 90 percent of this island nation is still forested, but more than a third of its forests are already allocated to oil, gas, or mining concessions. Establishing formal protected areas has been a challenge in Papua New Guinea because most of the country's land is owned communally. Forty-seven protected areas have been established, but even these suffer from poor management. Of the country's highland "fragile forests," deemed especially vulnerable to human disturbance, 26 percent now lie within oil, gas, and mining concessions.³³

There is an urgent need to stop the industry from making further inroads into protected areas, but this objective alone would not make for adequate conservation policy. That's partly because many major ecosystem types are still poorly represented within protected areas. This is true, for example, of prairie, coastal, and marine ecosystems. It's also because legal protection is difficult to implement on the vast scales at which nature operates. To be effective, conservation has to extend well beyond park boundaries—and for that reason, conservation is not likely to be compatible with mining as it is currently practiced. ■

Selected World Heritage Sites Affected by Metals Mining³⁴

World Heritage Site	Metal Mined
Okapi Wildlife Reserve, Democratic Republic of Congo	Gold
Mt. Nimba Strict Nature Reserve, Guinea and Côte d'Ivoire	Iron
Wet Tropics of Queensland, Australia	Tin
Southeast Atlantic Forest Reserves, Brazil . . .	Gold, Lead
Talamanca Range, Costa Rica and Panama	Copper
Tai National Park, Côte d'Ivoire	Gold (illegal)
Sangay National Park, Ecuador	Gold
Lorentz National Park, Indonesia	Gold, Copper
Kinabalu National Park, Malaysia	Copper
Huascaran National Park, Peru	Gold
Volcanoes of Kamatchka, Russia	Gold
Pantanal Conservation Complex, Brazil	Gold (small-scale)
Doñana National Park, Spain . . .	Lead, Silver, Copper, Zinc
Central Suriname Nature Reserve, Suriname	Gold
Bwindi Impenetrable National Park, Uganda	Gold
Kahuzi-Biega National Park, Democratic Republic of the Congo	Gold

Mining Hotspots

Thousands of metals mines now pockmark the surface of the planet, displacing communities, poisoning rivers, and ruining the lands of indigenous peoples. This map shows a small sample of the industry's activities.

Alaska: Red Dog

The world's largest zinc mine, Red Dog, is also the largest polluter in Alaska, releasing 196,000 metric tons of toxic pollutants a year.

Nevada: Carlin Trend

The mining of Nevada's Carlin Trend, the world's second largest gold deposit, has damaged Western Shoshone lands while making the state the world's third largest gold producer.

Utah: Bingham Canyon

This copper and gold mine is now the world's largest open pit, measuring 1.5 kilometers deep and 4 kilometers across. The company is responsible for mass layoffs in violation of its contract with the employees' union.

Honduras: San Martin

This open-pit gold and silver mine, run by Canada's Glamis Gold, is destroying forests and drying up local farmland. The mine consumes 1.5 million liters of water a day.

Peru: Tambogrande

A proposed gold mine was rejected by this rural community in Peru's top fruit-growing region.

Peru: Yanacocha

Residents of Choropampa, a town near the Newmont-owned Yanacocha gold mine, still suffer the effects of a mercury spill in 2000.

Argentina: Esquel

In a 2003 referendum, 81 percent of this Patagonian town's residents voted against a proposed open-pit gold mine.

Montana: Zortman-Landusky

Gold mining has destroyed Spirit Mountain, a sacred site for the Assiniboine and Gros Ventre tribes. The most recent mine was abandoned by the Pegasus Gold company in 1998, when it went bankrupt.



Romania: Rosia Montana

If built, this proposed gold mine would create Europe's largest open pit, displacing 2,000 people and destroying Roman archeological sites.

Spain: Los Frailes

A 1998 accident from this lead and zinc mine sent toxic sludge into the Guadiamar river and contaminated portions of the Doñana National Park.

Guyana: Omai

A 1995 tailings spill sent 3 billion liters of contaminated effluent from this gold mine into the Essequibo, Guyana's largest river.

Brazil: Small-Scale Mining

Tens of thousands of small-scale miners work the Amazon region for gold, using mercury and little protective equipment.



Bolivia: Don Mario

Indigenous communities are protesting the development of this gold and silver mine in the Chiquitano Forest.

Mali: Syama

The first large-scale mining operation in Mali, this gold mine is responsible for extensive groundwater contamination.

Ghana: Tarkwa

Between 1990 and 1998, more than 30,000 people in Tarkwa were displaced by gold mining operations.

Zambia: Copperbelt

Local communities suffer from asthma, lung diseases, and other health problems caused by pollution from copper mines and smelters run by Anglo-American and other companies.

South Africa

The world's largest gold producer, South Africa laid off nearly half its mining workforce between 1985 and 2000.

Romania: Baia Mare

In 2000, the tailings dam from this gold mine spilled 100,000 metric tons of toxic wastewater, killing fish and poisoning the drinking water of 2.5 million people.



Kyrgyzstan: Kumtor

Cyanide spills and worker injuries and deaths have raised concerns about this enormous, World Bank-financed gold mining project.

Mongolia: Turquoise Hill

Ivanoe's proposed copper mine is part of a mining boom in Mongolia, where the number of prospecting licenses has tripled to 3,000 in two years.

Burma: Monywa

The infrastructure for this copper mine, run by Canada's Ivanhoe company, was built by nearly a million forced laborers.

Laos: Sepon

This gold and copper project straddles a tributary of the Mekong river, threatening local forests and the traditional livelihoods of indigenous peoples.



Papua New Guinea: Ok Tedi

This mine sends 200,000 tons of waste into the Ok Tedi river each day.

Marinduque, Philippines: Marcopper

This copper mine dumped 200 million tons of waste rock directly into the sea over a 16-year period.

Indonesia: PT Kelian

Hundreds of families were forcibly evicted to make way for this gold mine in Kalimantan.



West Papua, Indonesia: Grasberg

The operators of this giant gold and copper mine, owned by US-based Freeport McMoRan, have been implicated in human rights violations, including forced evictions and murders.



Endangering Communities

Choropampa residents demand clean-up and compensation after mercury spill.

When a large mining operation begins, the area around the ore deposit often sees a sharp boost in economic activity. New roads are built; housing goes up for the miners; smaller businesses set up shop to serve the mine and its workers. And indeed, such operations are typically presented as the ticket to local prosperity. But the economies that grow up around large mines usually suffer from the “company town” syndrome: there is generally little economic activity that is independent of the mine. This high degree of dependency has not proven to be a good way to build long-term economic stability.

Even over the short term, the local mining economy tends to create some very powerful social deficits. The damage may begin with the displacement of local peoples from their traditional lands. In the developing world and in many indigenous communities in the industrialized world, many people lack legal title to the lands they live on, even though they may have occupied the same lands for many generations. Such people are vulnerable to eviction when a mining lease is granted, and the eviction may be imposed without prior consultation, meaningful compensation, or the offer of equivalent lands elsewhere.

In the Indonesian province of Kalimantan, for example, a 2001 investigation by the country’s National Human Rights Commission substantiated claims of forced evictions around the PT Kelian gold mine, operated by the giant British and Australian mining company, Rio Tinto. The Commission found that from 1989 to 1992, military forces, along with Rio Tinto security personnel, had burned villages around the mine and forcibly evicted small-scale

miners from their claims. The 440 families displaced by the mine received only minimal compensation for their losses; the miners received nothing. Sometimes these evictions are imposed on an enormous scale; between 1990 and 1998, for instance, mining displaced more than 30,000 people in Ghana’s Tarkwa District.³⁵

Even where there is no direct displacement of the people themselves, there is frequently a displacement of their traditional livelihoods. Large-scale mining is so destructive to the landscape that little in the way of traditional rural life is liable to survive in its vicinity. Industrial mining generally eliminates farming, fishing, small-scale forestry, and even—as is apparent from events in Kalimantan—any previous artisanal mining.

Despite the usual promise of jobs, the mining economy typically creates little employment for those who lose their livelihoods to the mine. In large operations, most workers are not likely to come from local communities, since the mining companies are usually looking for skilled labor. The

former Panguna copper mine on the island of Bougainville, part of Papua New Guinea, is a case in point. Virtually all its workers came from off the island; during a single four-year period, the mine imported 10,000 workers—to an island whose total native population numbered just 80,000.³⁶

A host of subsidiary problems tends to follow all the initial disruption. The loss of traditional ways of life and an influx of male migrant workers, usually living away from their families—in many places, this scenario has led to an increase in alcoholism, drug abuse, prostitution, crime, and domestic violence. A recent World Bank investigation identified such problems around the giant Yanacocha gold mine in northern Peru, an area formally inhabited by traditional farmers and herders. (See page 10.) The Bank found that “people are troubled about their future and a heavy cloak of anxiety and profound concern darkens the spirit of the place and threatens any meaningful sense of well-being.” In Bougainville, the massive influx of mine workers spurred an increase in crime and alcohol abuse, which eventually led to riots and finally to a civil war.³⁷

The mining economy is also likely to produce a major public health deficit. A part of that deficit is generally the result of

recurrent accidents—sometimes so recurrent, the term “accident” may be something of a misnomer. For example, in the Tien Shen mountains of Kyrgyzstan, at the Kumtor gold mine operated by the Canadian company Cameco, trucks delivering nitric acid, ammonium nitrate, and cyanide nitrate have on at least three occasions spilled part of their cargo into streams, poisoning more than 2,500 local residents. And beyond these immediate dangers, there looms the threat of injury from long-term exposure to toxics.³⁸

The Violence of Metals

Community opposition to mining may encounter violent suppression by the companies themselves or by government forces working in concert with them—indeed, as a practical matter, it can be difficult to distinguish between these two entities. Especially in parts of Africa and the Pacific region, large-scale mining tends to become “militarized.” In such situations, the actions of the police, the military, or persons unknown have often resulted in the death or disappearance of mining opponents. For example:

In West Papua, Indonesia, where Freeport McMoRan operates the giant Grasberg gold and copper mine, human

Photo: Oxfam Australia



An Australian mining company in Indonesia entertains military officials.



Jailed mining activists, Ghana

rights investigators have documented numerous human rights violations—including rape, torture, extrajudicial killings, and arbitrary detention—committed by the Indonesian military against indigenous communities living near the mine. During 1994 and 1995, according to the Australian Council on Overseas Aid, the Indonesian military, with the assistance of the mine's own security forces, “disappeared” or killed 22 civilians and 15 other people they alleged were “guerillas.” Human rights advocates have long suspected that Freeport was paying Indonesian soldiers directly—an arrangement that would make the company complicit in the military's abuses. And in 2003, a document requested by Freeport's shareholders confirmed that the company was indeed doing this: Freeport paid the Indonesian military \$4.7 million in 2001 and \$5.6 million in 2002. In August of that year, the military shot and killed two American schoolteachers working near the mine, and one Indonesian mine employee.³⁹

In the west African nation of Ghana, a country with extensive gold mines, the Ghanaian Commission on Human Rights and Administrative Justice issued a report in 2000 that found “overwhelming evidence of human rights violations occasioned by the mining activities, which were not sporadic but a well established pattern common to almost all mining communities.” An investigation by the Ghanaian community group WACAM (Wassa Association of Communities Affected by Mining) supports that conclusion. WACAM found that the Ashanti Goldfields Company (AGC) was committing human rights abuses against the Sansu community, which has a long history of artisanal mining in an area that AGC itself has recently begun to mine. The group found evidence that between 1994 and 1997, AGC security personnel, acting in conjunction with the police and the military, had killed three artisanal miners. In one incident in January 1997, 16 artisanal miners were severely beaten by AGC security personnel. WACAM also collected testimony from six other artisanal miners who say they were beaten and attacked by AGC security's guard dogs.⁴⁰

Eventually the boom goes bust, as ore deposits are exhausted and the jobs generated by the mine disappear. Most large-scale projects have a lifespan of between 10 and 40 years, after which the mining companies close up shop and move on to new projects. Any schools, clinics, and other services established by the companies usually lose their funding.

When this happens, the miners and communities are generally left to fend for themselves. Since mining is specialized employment, miners typically have few other marketable job skills, nor do many governments or companies make much of an effort to provide those skills. There are few “just transition” programs, in which former mineworkers are retrained for other work. For these reasons, laid-off miners are likely to stay unemployed for long periods. The social effect of these layoffs is often profound, because the miners generally have a large number of dependents (although the majority of them may not be in the mining communities themselves). According to an estimate by the South African Chamber of Mines, one in every eight people in southern Africa is economically dependent on mining. In South Africa itself, the gold mining industry laid off some 400,000 workers between 1985 and 2000—nearly half its workforce.⁴¹

This is the end game of the local mining economy: the destruction of the traditional employment base, followed by the loss of the mine itself. It's little wonder that even in the United States, mining areas exhibit some of the highest poverty and unemployment rates in the country.⁴² ■

How Mining Injures Women

In the mining communities of the developing world, it is the women, already disadvantaged, who bear some of the most difficult burdens. A profile of their lot:

In many countries, women are not permitted to own land or their land rights are restricted. Lack of title often excludes women from land compensation payments. Even when women have title, they may be excluded from negotiations anyway because such matters are frequently seen as a male prerogative. In Papua New Guinea, for example, women were excluded from formal compensation negotiations with the Rio Tinto subsidiary that owns the Lihir gold mine.

Large-scale mining creates very few employment opportunities for women, and it displaces economic activities, such as agriculture or artisanal mining (see page 25), in which women often play major roles. These changes tend to concentrate economic power in the hands of men, increasing women's dependence on their husbands or male relatives. That's what has happened, for example, in the

Antamak region of Luzon, in the Philippines, around the Philippines-based Benguet Corporation's open-pit gold mine. As small-scale mining and farming have disappeared, women have been leaving town to look for work elsewhere, often withdrawing their children from school to take with them.

Women who do find work in mining companies may face severe discrimination—or worse. In East Kalimantan, Indonesia, for example, women employees of the PT Kelian Equatorial Mining company report being sexually abused by male supervisors.

The drinking, drug use, and prostitution typical of mining communities also aggravate some health risks that fall especially heavily on women, such as HIV infection. (Women are disproportionately affected by the spread of HIV/AIDS because they are anatomically at greater risk of infection than men.) For example, widespread infection of women has been found around the town of Timika, in Indonesia's Irian Jaya

Province, where there is a mine operated by the company PT Freeport Indonesia.

Environmental contamination from mining—especially water pollution—can greatly complicate the traditional role of women as providers of food and water to their families. In drier regions of the developing world, women must often walk considerable distances to collect the day's water. Mine pollution can lengthen that walk, reducing the time for everything else. And because it ruins farmland, mine pollution may also strain local food resources, as has happened, for example, around Placer Dome's gold mine on Misima Island, Papua New Guinea.

In January 1997, female mining activists from around the world gathered in Baguio City, in the Philippines, to look for ways to address these issues. The result was the establishment of the International Women and Mining Network—and a commitment to make the plight of women a central concern of mining activism.⁴³

Woman near gold and copper mine, Didipio, Philippines

The Toll on Indigenous Peoples

“IMK made us leave our gardens when the crops were ready for harvest.... IMK also destroyed our graveyards and sacred places that we have protected and respected.”

—Mumpung, testifying on February 6, 2003, before the South Jakarta State Court in Indonesia, in a lawsuit brought by the Dayak people against the PT Indo Muro Kencana (IMK) Gold Mining Company.

Around half of all the gold mined from 1995 to 2015 is likely to come from native lands—the traditional territories of indigenous peoples. Many indigenous peoples live in remote areas that until recently had not been accessible to the mining industry. And their relative isolation from mainstream society often leaves them without basic legal and political safeguards—a condition that lends itself to abuse. In many countries, for example, the law does not recognize indigenous peoples clearly as owners of their lands. Even when surface land rights are clearly titled to indigenous groups, governments frequently sell off the subsurface rights to mining corporations.

That’s why the Dayak complaint quoted above might sound very familiar to the Assiniboiné and Gros Ventre indigenous nations, whose traditional lands included parts of northern Montana. In 1895, the tribes were forced by the US government to abandon 16,200 hectares of what was then Spirit Mountain, a site sacred to both tribes. The government then opened the land to gold prospecting. Today, Spirit Mountain has been replaced by the Zortman-Landusky open-pit cyanide-leach gold mine. Although the mine was closed in 1998 when its owner, Pegasus Gold, declared bankruptcy, it continues to pollute what is left

of the landscape. Both surface and ground water have been extensively contaminated. The acid mine drainage (see page 9) has made water treatment a permanent necessity for people living downstream. Water quality problems and inadequate clean-up of damaged lands have prompted multiple lawsuits by the indigenous peoples against both the state and federal governments. Despite a \$37 million settlement, the problems persist.

In the United States and elsewhere, this same scenario is still being repeated. For example, Glamis Gold Ltd. has a proposal pending today in California for an open-pit cyanide-leach mine at Quechan Indian Pass. The mine would destroy or degrade over 50 known sites of cultural or religious importance to the Quechan Indian Nation, including graveyards, prayer circles, shrines, petroglyphs, and geoglyphs. To the south, in Bolivia, the Canadian company Orvana Minerals opened its Don Mario gold and silver mine in May 2003. The mine is in the heart of the formerly pristine Chiquitano Forest, home to numerous Chiquitano and Ayoreo indigenous communities. One month later, the regional indigenous federation filed a complaint with the World Bank’s International Finance Corporation (IFC), which is funding the mine. Alleged violations of the Bank’s environmental

and social policies have prompted an IFC investigation.

Some native communities have managed to negotiate acceptable agreements with mining corporations but so far, such negotiations are rare. As with violations of labor rights, (see pages 24 and 26), the key to progress may be the enforcement of international agreements. The International Labour Organization “Indigenous and Tribal Peoples Convention,” adopted in 1991, guarantees indigenous groups the right to decide on their own development priorities, and to be consulted in good faith before any development takes place on their lands. In Latin America, where most countries have ratified the Convention and written it into national law, some indigenous movements have used the Convention to defend themselves against the incursion of extractive industries into remote parts of Amazonia.

Another international agreement, the UN draft “Declaration on the Rights of Indigenous Peoples,” moves beyond consultation and requires the free, prior, and informed consent of the indigenous peoples concerned before any development can proceed. Indigenous groups around the world have invoked this right to defend their cultures, lands, and livelihoods against resource extraction operations. In December 2003, the Extractive Industries Review, an independent commission appointed by the World Bank, recommended that the Bank itself introduce this requirement for all its extractive industry investments.⁴⁴

Facts on the Ground: The Western Shoshone People

The story of the Western Shoshone is a long lesson in the ways that law can fail indigenous people threatened by mineral interests. The ancestral territory of this native American people encompasses an area stretching from southern Idaho, through eastern Nevada, to the Mojave Desert of California. Underneath this swath of over 240 thousand square kilometers (over 60 million acres) lie billions of dollars worth of gold. Nearly 10 percent of the world's gold production—and 64 percent of US production—comes from Western Shoshone land.

Prospectors hoping to strike it rich began entering Western Shoshone territory in the 1840s. Clashes with the Shoshone prompted the 1863 Treaty of Ruby Valley between the US government and the Western Shoshone Nation. The treaty allowed settlers to mine, establish ranches, cut timber, and extract other natural resources from Shoshone lands, but it also recognized the Western Shoshone people as the landowner, entitled to royalties for the extractive activities. But no royalties have ever been paid.

The gold rush continues today, but the prospectors have been replaced by corporate mining—a practice that has proved far more destructive to Western Shoshone lands, sacred places, and scarce water resources.

The failure to pay royalties is a treaty violation and the Shoshone have been attempting for decades to get the government to live up to its constitutional obligations. In 1979, the government tried to legislate a settlement that would have abrogated the treaty and awarded the Shoshone a one-time payment of \$26 million, or roughly 15 cents an acre, in exchange for relinquishing title to their land. The Shoshone refused the settlement, maintaining that the lands were never for sale in the first place. Even so, the government is acting as if it were the landowner.

Today, Shoshone ranchers are required to pay federal grazing fees to run cattle on their traditional lands, and the govern-

ment continues to hand over huge tracts of Shoshone lands to mining companies. Among the beneficiaries are Newmont, Placer Dome, and Barrick. Under the national mining law, which dates from 1872, corporations can purchase so-called public lands from the government for as little as \$5 a hectare (\$2.50 an acre), without owing a penny in royalties for the minerals they extract.

In December 2002, the Inter-American Commission on Human Rights, a part of the Organization of American States, found that the US government was violating the fundamental rights of the Western Shoshone to property, due process, and equality under the law. But the government has ignored the ruling and is moving forward with legislation that would open the territory up to a major new form of extraction, geothermal energy, and to additional mining. In September 2003, the Shoshone filed suit yet again, reasserting their claim to their ancestral territory and demanding payment of the royalties owed them under the treaty.⁴⁵

Sacred site of the
Western Shoshone,
Nevada

THE AREA ENCLOSED AND
SURROUNDING THIS FENCE,
SECTION 10, T28N R49E, IS
AN AREA OF CULTURAL AND
SPIRITUAL SIGNIFICANCE. NOT TO
BE DISTURBED BY MINING AND
ASSOCIATED ACTIVITIES BY
ORDER OF THE WESTERN
SHOSHONE NATIONAL COUNCIL



Undermining the Rights and Safety of Workers

On October 9, 2003, the south face of the Grasberg gold mine in West Papua, Indonesia, collapsed. Eight workers died and five others were injured. Government investigators turned up evidence that in the days leading up to the accident, seismic data had led mine operators to suspect that slippage was imminent, and that key machinery—but not workers—had been moved from below the unstable zone. These were not the first deaths at the Grasberg mine, the largest open-pit gold mine in the world. In May 2000, a landslide at the mine’s waste dump claimed four lives, prompting environmentalists and government officials to question the safety of recent production increases.⁴⁶

In 1983, the chief safety engineer of an unnamed South African mining corporation told the *Economist* that “production is more important than safety.” No one in a similar position would go on record with such a statement today. And it is true that over the past 20 years, health and safety conditions have improved in large-scale corporate operations in most countries. Between 1984 and 2001, for instance, the average annual death rate in South African gold mines fell from 1.23 per 1,000 workers to 1.05 per 1,000, while the reported accident rate declined by one-third. (For conditions at small-scale sites, see page 25.) But even so, mining remains one of the world’s most dangerous professions.⁴⁷

Rock falls, tunnel collapses, fires, heat exhaustion, and other dangers claim the lives of over 15,000 miners every year. (Miners in the notoriously dangerous coal mines of China may account for up to half of these deaths.) According to the International Labour Organization (ILO), deaths within the mining sector as a whole (both metals and coal) account for 5 percent of all worker deaths on the job, even though the sector employs just under 1 percent of all workers worldwide. But these are just the reported deaths; a substantial share of mining deaths go unrecorded. The data on injuries are even less reliable but it’s likely that hundreds of thousands of serious injuries are sustained

Mineworker in South Africa / Photo: ICEM

Small-Scale Mining, Large-Scale Risk

A fair share of the world's mining is done, not by big corporations, but by individual people, families, and collectives. This part of the industry, which is largely confined to the developing world, is known as “artisanal and small-scale mining,” or ASM. ASM covers a range of activities. At the high end are companies doing sophisticated but small-scale mechanized mining. But the overwhelming majority of the sector's workers are found at the opposite end of the spectrum: they are poor, untrained miners often working their claims together with their families. Some of these miners are organized into collectives of several hundred people. All told, there are enormous numbers of them: an estimated 13 million people are directly employed in the sector—as opposed to only around 2.75 million in industrial metals mining.

ASM produces a sizeable share of the world's gem stones and precious metals, especially gold. But these riches are produced at great cost to both the environment and human health.

On both counts, the single greatest threat within the sector is probably mercury poisoning. Artisanal extraction of gold is done through a process called amalgamation, in which gold ore is heated in the presence of mercury. The mercury “amalgamates” with—adheres to—the gold, thereby drawing it out of the ore. The gold remains in more or less pure form after the mercury evaporates in the heat.

But in both its liquid and its vapor forms, mercury is extremely toxic.

Mercury is a neurotoxin that has been shown to impair brain function in fetuses and children. People continually exposed to it may experience loss of coordination and memory, personality change, and stupor. Mercury has also been linked to increases in miscarriages and birth defects. In children, high levels of exposure correlate with lower intelligence and hearing loss. Mercury can also persist in the environment for decades in forms in which it is readily metabolized. And it bioaccumulates—it builds up in the fat of animals in increasing concentrations at higher links of the food chain, with the result that top predators (bears, for example, or people) tend to absorb the highest concentrations of it.

But in poor communities, where there is little information on such hazards, and where in any case, people cannot afford to buy safety equipment, few precautions are taken. Amalgamation is often done at home, by women and children, while the men are out on the claim digging more ore. The mercury is often handled with bare hands, and heated in the same pots used for cooking. Under such circumstances, it's virtually impossible to avoid inhaling mercury vapor, and contaminating food and drinking water with the metal. Much of the mercury eventually escapes into soil and water, and once released it tends to be mobile. In French

Guiana, for instance, the Wayana people live downstream from small-scale gold mining operations and suffer from mercury poisoning. Their hair sample tests show mercury levels two to three times higher than World Health Organization limits.

Overall health and safety data for ASM are sketchy, but the sector appears to experience a significantly higher accident rate than the industry as a whole. Lack of training and equipment lead to more frequent landslides, shaft collapses, and accidents with explosives. In matters of risk, ASM differs in another important way from large-scale mining: many injuries in ASM are suffered by women and children—a reflection of their widespread presence in the sector. Children, for example, are frequently employed underground because of their small size. Women make up an estimated 10 to 20 percent of the above-ground ASM workforce, and are often engaged in the amalgamation process.

This poor safety record is due in part to a lack of legal recognition. According to the International Labour Organization, about 80 percent of the world's small-scale mining is illegal. In many poor countries, the laws against ASM haven't successfully controlled it, but they have discouraged poor miners from seeking medical help and other forms of assistance. The miners' reticence, in turn, makes it difficult to understand their needs, or how the sector as a whole might best be managed.⁵⁴

every year in the mines. In 1996, Pik Botha, then South Africa's Minister for Mineral and Energy Affairs, estimated that in his country, each ton of gold mined costs 1 life and 12 serious injuries.⁴⁸

In addition to the deaths and injuries on the job, mining can cause a range of long-term disabilities, the most common of which are respiratory problems such as silicosis. Caused by the inhalation of crystalline silica dust, a common air contaminant in hardrock mines, silicosis can develop after only seven months of exposure to the dust, and can lead to complete loss of lung function. It also greatly increases its victims' susceptibility to other lung diseases, such as tuberculosis, bronchitis, and lung cancer. Deep mines, such as South Africa's gold mines, which reach depths of 3.5 kilometers (2 miles), present their own special set of risks. The extreme heat—up to 60 degrees Celsius (140 degrees F)—and the high atmospheric pressure put miners at risk for certain kinds of nerve damage and high blood pressure. South African gold mines sometimes also extract uranium, thereby exposing thousands of workers to unsafe radiation.⁴⁹

It's not surprising that in some countries, the lifespan of miners is substantially lower than that of the general population. In Bolivia, for example, the average miner in the tin mines of Potosí will live only 35 to 40 years, whereas the general population's life expectancy at birth is about 64 years.⁵⁰

Almost all governments have enacted health and safety regulations that apply to the mining industry. But these laws are often poorly conceived and enforced. To help bridge the regulatory gap, the ILO developed the "Convention on Safety and Health in Mines" in 1995. The Convention requires employers to "eliminate or minimize" safety and health risks in their mines. It requires governments to oversee and report publicly on the implementation of such measures, and to suspend mining when violations occur. And it guarantees miners' rights to form unions and to be informed of health and safety risks and precautions. But to date, only 20 countries have ratified the ILO Convention and have agreed to abide by its standards. Among the major mining countries that have not done so are Australia, Brazil, Canada, China, Indonesia, Peru, and Russia.⁵¹

Miners have tended to respond to this unfavorable regulatory climate by looking to each other for support. To increase their leverage with the multinational corpora-

tions that employ them, the unions themselves are globalizing. In 1998, for example, members of the 20-million-strong International Federation of Chemical, Energy, Mine and General Workers Union (ICEM) formed the Rio Tinto Global Network to confront the labor practices of the Rio Tinto Corporation. Rio Tinto operates in 40 countries and is the world's largest private mining company. The Global Network charges that the company has employed union-busting activities, some of which might

qualify as human rights abuses, at mines in various parts of the world. Among the charges are accusations that Rio Tinto fired HIV-positive workers in Zimbabwe; that in Brazil's Paracatu gold mine, it spied on and fired union leaders, and exposed workers to highly toxic levels of lead; and that it violated a two-day-old collective bargaining agreement with mass layoffs



Photo: ICEM

in Utah. Although the company has signed the United Nations Global Compact, a code of corporate responsibility, the Global Network points out that Rio Tinto's policies do not yet acknowledge basic ILO standards, such as protections for collective bargaining.⁵²

But even though it is growing more sophisticated, labor organizing in the mines remains a difficult and risky business. The International Council of Metals and Mining (ICMM), a confederation of the 25 largest mining companies, still does not recognize the rights of workers to bargain collectively in its guiding principles. In some countries, such as China, Burma (Myanmar), and Laos, organizing independent unions is illegal. In Burma, workers are not only prohibited from forming unions, but have sometimes even been subjected to forced labor, such as at the Monywa Copper Mine, operated by the Canadian corporation Ivanhoe Mines, where the ILO reports that in the mid-1990s, nearly a million people were forced to build the hydroelectric plant and railway servicing the mine. Even where unions are legal, they are often undercut in various ways. In 2001, for example, some 2,500 workers at copper mining facilities in Kazakhstan were forced by the management to join "house" unions—led by the director's right-hand man—or face dismissal. Sometimes the hostility to the unions turns deadly. In Colombia, which has the world's worst record for trade unionist murders (one killing every other day), 11 members of the metals, mining, and oil workers' union federation were killed in 2001.⁵³ ■

Metals and the Wealth of Nations

International agencies such as the World Bank and Asian Development Bank have often presented mining to poor countries as a key to development. Mining, in this view, can attract substantial foreign investment. Mining can drive economic growth. And indeed, there are some national mining sectors that would appear to support this idea in one way or another. Mali, for example, shifted its main export from cotton to gold after undergoing World Bank-supported mining reforms. In Chile, copper production has been an important driver of economic growth; in Botswana, diamonds have played a similar role.⁵⁶

But this apparent success can come at considerable cost. In Chile, as elsewhere, mining areas have suffered extensive environmental degradation. Success can also be very difficult to reproduce. Botswana's diamond production is closely linked to the DeBeers cartel, which keeps diamond prices artificially high. Very few if any other mined products have a similar history of high, stable prices.

When you look at the industry's general economic record, the picture is actually quite grim. For the most part, mineral-rich developing countries have some of the slowest growth rates in the world, and the highest poverty rates—a phenomenon economists call “the resource curse.” (See the table for examples pertaining specifically to mining.) Harvard economists Jeffrey Sachs and Andrew Warner studied 95 developing countries that had high ratios of natural resource exports relative to gross domestic product (GDP) for the period 1970 to 1990. They found that the higher the dependence on natural resource exports, the slower the per capita growth.⁵⁷

There are several reasons why mining is a poor bet for economic growth. In the first place, despite its

colossal environmental and social deficit, and its gargantuan appetite for energy (which claims, as noted earlier, up to 10 percent of the world's energy supply), metals mining accounts for only a very small share of world economic output—less than 1 percent.⁵⁸

And when it comes to particular deals, the tax breaks and other incentives awarded to large corporations for establishing mines are often so large that the industry is practically

exempted from contributing to national coffers. In the United States, for example, mining companies extracted \$11 billion worth of gold, silver, and other minerals from federal lands between 1993 and 2001, but paid the government only a tiny fraction of that in fees. In developing countries, it is often impossible to know how much revenue a mine is actually generating. In a recent study, the International Monetary Fund dryly noted “significant gaps” in the Malian government's accounting of gold exports.⁵⁹

Of course, mineral exports can generate some foreign exchange, but they do not usually do so in a very reliable way, because international metals prices fluctuate greatly. In many countries, these unstable trading

Mineral Dependence and Poverty Rates: Selected Countries, 1990s⁵⁵

Country	Share of Total Export Value from Non-Fuel Minerals (%)	Population Below National Poverty Line (%)
Guinea	71	40
Niger	67	63
Zambia	66	86
Jamaica	53	34
Chile	43	21
Peru	40	49
Democratic Republic of Congo	40	na
Mauritania	40	57
Papua New Guinea	35	na
Togo	30	32

na: not available

Close-Up: Your Cell Phone

The latest cell phones boast glowing screens, a multitude of ring tones, and face plates to match just about every shirt in your closet. But it's the materials behind the face plate that determine the phone's environmental impact. Among those materials are many different metals. The batteries, for example, contain cobalt, nickel, zinc, and copper. (There's more copper in the battery charger—that lode of copper is likely to be the largest mass of metal in the product.) But the biggest variety of metals is in the circuit board. About one-third of the circuit board is likely to be metal; another third is ceramic and glass; the remaining third is plastic. Among the metals on the circuit board are copper, gold, arsenic, cadmium,

lead, nickel, palladium, silver, zinc, and tantalum.

Tantalum production is a very troubled business. The electronics industry depends on this highly heat-resistant metal to make capacitors, tiny components that regulate the flow of current on circuit boards. Tantalum comes from coltan, short for columbite-tantalite, an ore that is mined in Australia, Canada, Brazil, and the mineral-rich Democratic Republic of Congo. Coltan mining in Congo's Okapi Reserve is destroying the habitat of the endangered lowland gorilla. It's also fueling regional conflict. During 1998 and 1999, Rwandan troops and their rebel Congolese allies took control of 1,000 to

1,500 tons of coltan stocks. They forced Congolese farmers off coltan-rich lands and arranged for Rwandan prisoners to mine coltan in exchange for reduced sentences. But coltan is hardly the only "conflict mineral." Armies in the Congo and elsewhere have fought over lands rich in gold, copper, cobalt, diamonds and other gemstones.⁶³



Sketch: Chris Engnoth

prices have contributed to a deepening of the national debt. When prices are high, governments can find it hard to resist pressure to borrow against the export revenue; when prices fall, as they inevitably do, it may become difficult to pay interest on the new debt.

Yet another shortcoming of the sector is its employment record. Metals mining is no longer a strong generator of jobs. The formal sector employs just 2.75 million people—just 0.09 percent of the global workforce—and that number is in rapid decline. According to the ILO, one-third of all mine workers in 25 major mineral-producing countries lost their jobs between 1995 and 2000. (The downsizing is due primarily to increasing mechanization.)⁶⁰

Nor is the industry very effective at stimulating production in other economic sectors. Almost all of the metal extracted in poor countries is exported as the ore itself. But most of that ore's economic value is realized in subsequent stages of processing and, of course, in manufacturing. These activities rarely take place in poor mining countries.

Heavy dependence on mining also correlates strongly with

a wide range of serious social problems, such as high levels of poverty, low levels of education, and poor health care. Nearly half of the world's poorest countries show this dependency: mining is their biggest export sector. And over the past couple of decades, the poverty in these mining-dependent countries appears to have deepened: according to the UN Commission on Trade and Development, the proportion of people living on less than \$1 a day in poor mineral-exporting countries rose from 61 percent in 1981–1983 to 82 percent in 1997–1999.⁶¹

And finally there is the link with corruption and violence. A study by the International Monetary Fund found a strong connection between heavy dependence on mining and government corruption. That finding correlates with the "Annual Corruption Index" of the UK-based organization Transparency International: the index rated 26 of 32 mineral-dependent countries as corrupt or highly corrupt. And a recent World Bank study found that countries with a high degree of dependence on primary commodities like minerals have a risk of civil war that is 40 times greater than countries with no primary commodity exports.⁶² ■

Paying for the Clean-Up: No Guarantees

The aftermath of a large-scale mining operation is generally a landscape of devastation: thousands of hectares of poisoned, rubble-strewn land drained by acidified streams that will likely remain too polluted to support their full complement of life for thousands of years to come.

In many developing countries, the companies that have enriched themselves through this destruction are under no binding obligation to attempt to mitigate it. The Meridian proposal for Esquel, mentioned on page 11, is typical: Argentinean regulations have not required the firm to plan for the mine's closure or to deposit any cash to cover the eventual clean-up.

Wealthier countries like the United States usually attempt to avoid this end game by requiring (at least in theory) that the mining company set aside a certain amount of money up front to cover expenses necessary to meet environmental standards—money for water treatment, tailings pond liners, and so on. But these funds have fallen far short of the actual costs of even basic reclamation work around defunct mines, some of which are among the world's most contam-

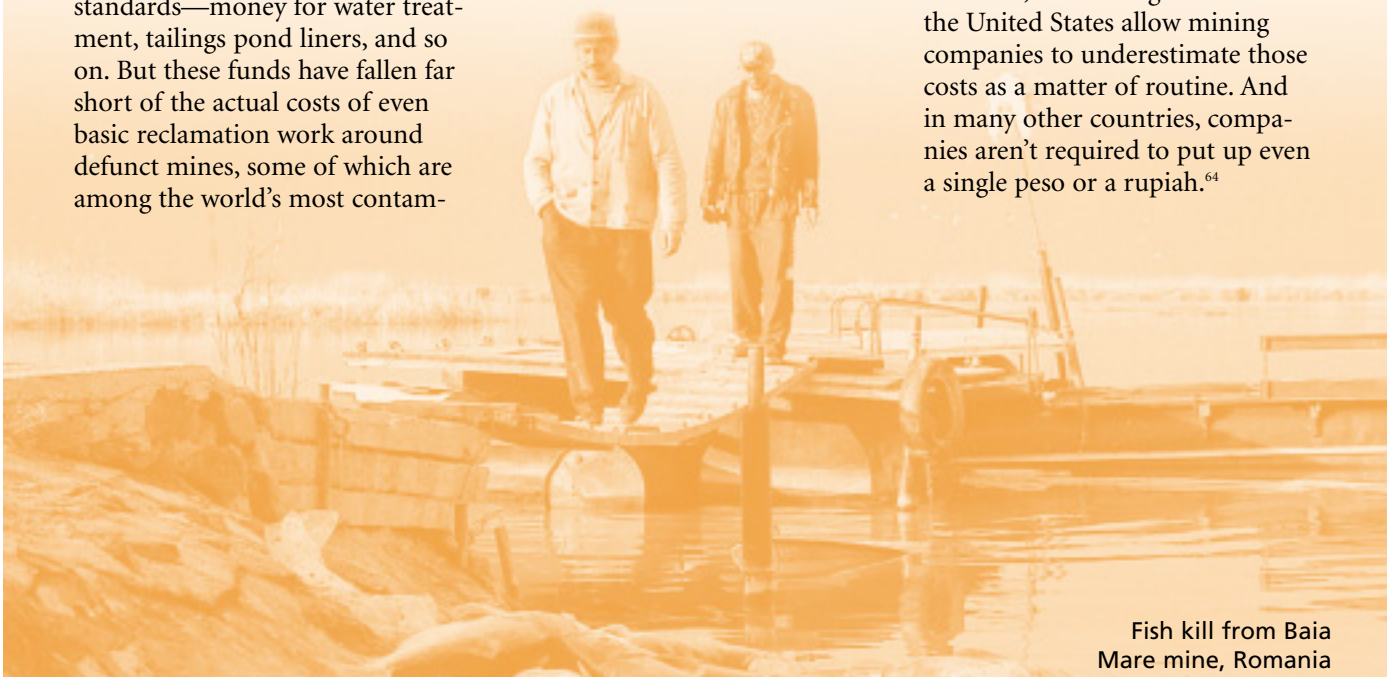
inated places. Mining companies in the United States, for instance, have thus far underestimated the costs of closing their operations by as much as \$12 billion, according to a 2003 estimate.

And when the deposit runs out, the taxpayers have to step in to pick up the tab. That's what happened in Colorado in 1992 at the Summitville gold mine, when the Canadian owner, Galactic Resources, declared bankruptcy and walked away, sticking US taxpayers with a \$200 million reclamation bill. The 3,300-hectare mine had been leaking cyanide into the Alamosa River since its first week of operation; by the time it closed, it had destroyed 25 kilometers of the river. Galactic had mined \$130 million worth of metals at Summitville—a sum so small it wouldn't even cover the mess it left behind.

Or consider what happened in January 2000, at the Baia Mare

mine in Romania, when a tailings dam failed, releasing more than 100,000 tons of wastewater laden with cyanide and heavy metals into the Tisza river. The toxic plume made its way into the Danube, killing 1,240 tons of fish and contaminating the drinking water of 2.5 million people. Faced with skyrocketing cleanup costs and only partially covered by its insurance, Esmeralda Exploration, the Australian company that held the principal interest in the mine, went into a form of bankruptcy to protect its shareholders. Unfortunately, the citizens of the countries affected received no such protection.

Taxpayer-funded reclamation is an enormous, hidden subsidy of the mining industry. "Subsidy" may not be the official term for such liability, but that's how it is treated, even in the mining regulations themselves. Despite decades of experience with reclamation cost overruns, current regulations in the United States allow mining companies to underestimate those costs as a matter of routine. And in many other countries, companies aren't required to put up even a single peso or a rupiah.⁶⁴



Fish kill from Baia Mare mine, Romania

Photo: Tibor Kocsis

Towards a **Saner** Strategy

“If humanity knew the truth about gold mining, and how much harm it generates, things would begin to change.”

—Mariano Fiestas, a citrus farmer in the San Lorenzo Valley, the site of the proposed Tambogrande gold mine in Peru.

In one way or another, metals underlie virtually every product and service in our economy—our food production, housing, transportation, medical care, you name it. And precious metals like gold can serve as symbols of our deepest commitments. But it's one thing to enjoy the benefits of metals. It's something else entirely to damage the lives of millions of people and ruin entire landscapes in the pursuit of minerals. The destruction and misery described in this report need not be inevitable byproducts of our need for metal.

Clearly, the time has come to reform our “metals economy,” and we already know what path reform must take. We must fundamentally reform the way we produce metals, find ways to use metals far more efficiently, and to *continue* using metals that are already in circulation. Some metals mining may always be necessary, but ultimately, our most important extraction operations should take place in scrap yards and recycling centers, rather than in nature reserves and native lands.

Those are the long-term goals. But there are also things that the mining industry can and should do immediately. Among them:

- Respect the basic human rights outlined in international declarations and conventions, such as the UN “Universal Declaration of Human Rights,” the draft “Declaration on the Rights of Indigenous Peoples,” and others.⁶⁵
- Provide safe working conditions and respect workers' rights to collective bargaining, in accordance with the eight core conventions of the International Labour Organization.
- Refrain from projects that have not secured the free, prior, and informed consent of the communities concerned.
- Fully disclose information about the social and environmental effects of its projects.
- Allow independent reviews of social and environmental management practices.

- Stay out of protected areas.
- Stop dumping mine waste into natural bodies of water.
- Refrain from projects that are expected to cause acid drainage.
- Provide guaranteed funding, before beginning a project, that will fully cover reclamation and closure costs.

Even from a conventional business perspective, the industry's current practices no longer make sense, because investors are growing increasingly concerned about the industry's failure to meet these rather obvious legal and moral obligations. In December 2003, the World Bank heard back from an independent commission it had appointed to review its investments in oil, gas, and mining; the commission recommended that the Bank refrain from financing any mining project that fails to meet a set of basic criteria, including those listed above. The growing field of Socially Responsible Investment (SRI) is also having a hard time supporting mining. As of January 2004, for example, the Calvert Group, an American SRI firm, had no holdings in any metals mining corporation because it could not find a single one that met its criteria for corporate responsibility. Insurance companies are growing wary of the industry as well, because of its heavy liability for workplace accidents, chemical spills, and unsecured clean-up expenses.⁶⁶

You can play an important role in driving this reform. A few, simple actions on your part could make an enormous difference. First, recycle products that contain metals, such as cell phones, cans, and appliances. Second, if you have investments—mutual funds, maybe, or a retirement account—make sure that you're not inadvertently a part of the problem you're trying to correct! And third, lend your voice directly to the reform effort by signing the consumer petition on our website, at www.nodirtygold.org. Your signature will help us convince retailers, manufacturers, and mining companies that consumers want to see real changes in the mining industry—and an alternative to irresponsibly mined metals. ■

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About the No Dirty Gold Campaign

Earthworks and Oxfam America are working with local organizations and communities around the world to end destructive mining practices. The No Dirty Gold campaign calls upon the mining industry to commit verifiably to full respect for all basic human rights and to full protection of the environment. And it urges manufacturers and retailers to ensure that the gold in their jewelry, electronic goods, and other products was not produced at the expense of communities, workers, and the environment. For more information about the campaign, visit www.nodirtygold.org.

This report was written using publicly available data and interviews. The information contained herein is believed to be accurate but does not purport to be complete.



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