

Fact Sheet

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What is Sodium cyanide?

Sodium cyanide is a highly toxic chemical substance, also known as the sodium salt of hydrocyanic acid. **One teaspoon of a 2% solution can kill a person.** In general, fish and other aquatic life are killed by cyanide concentrations in the microgram per litre (part per billion) range; whereas bird and mammal deaths result from cyanide concentrations in the milligram per litre (part per million) range.

What is sodium cyanide used for?

First used on a large scale in the 1970s, cyanide mining allows miners to coax microscopic **gold** flecks from low-grade ore. Sodium cyanide now is the chemical of choice in the gold mining industry throughout the world and mining is the main sodium cyanide consumer worldwide, with **180 000 tonnes annually**. More than 90% of the 2500 tons of annual global gold production is extracted using this chemical. The cyanide waste that is left over after gold processing is stored in large ponds. It is not unusual to have spills of the cyanide solution and the heavy metal-laced waters stored in the pond.

Throughout the world the cyanide process is left largely under-regulated which is why it tends to cause accidents which in return poison the environment and affect human health. When sodium cyanide and the heavy metal-laced waters escape into the environment, they may contaminate ground water and surface water sources and kill fish and waterfowl. Cyanide also breaks down into compounds that are toxic to fish and it can bio-accumulate in plants and fish tissue.

How is cyanide used in mining?

Cyanide-leaching allows mining companies to develop new mines and expand old mines what were previously considered economically unfeasible. There are two methods (heap leaching and vat leaching) which involve:

- Digging enormous pits (often miles wide); crushing and piling the extracted ore into heaps that would cover many football fields and are several hundred feet high (heap-leaching); or placing the crushed ore in large vats (vat-leaching)
- Spraying a cyanide solution over the heaps (or into the vats) so that the cyanide trickles down through the ore, bonding with gold, including particles of gold that are too small to be seen by the naked eye;
- Collecting the cyanide-gold solution in ponds; then piping it to the processing plant where the gold is removed and the cyanide solution is re-circulated.
- Transporting the gold to a smelter/refinery to remove further impurities.
- Cyanide releases may occur in a number of ways, such as: process pond overflows, faulty liners, pipeline breaks, transportation accidents, and tailings impoundment or heap leach failures,
- As little as 2g of gold is extracted from one tone of low grade ore.

Toxicity

Cyanide is known to be one of the most active poisons as it is readily absorbed by oral and dermal routes of exposure. The central nervous system is the primary target organ for cyanide toxicity. Short-term exposure to high concentrations (100-200 mg) produces almost immediate collapse, respiratory arrest and death.

The lethal dose for humans is **1 mg CN⁻/kg**. This means that a rice grain size of cyanide is sufficient to kill a human being. Concentrations of **0,03 mg CN⁻/l** cause the death of many fish species and at a concentration of **3 mg CN⁻/l** a river is considered dead. Chronic cyanide exposure may affect reproduction, physiology, and levels of activity of many fish species and may render fishing sources non-viable.

During the Second World War, cyanide salts were used as fast-acting suicide devices. In its gaseous form cyanide (Hydrocyanic acid) was released from Zyklon B pellets in the gas chambers of the Auschwitz and Maidanek concentration camps.

What are the dangers of using cyanide?

Complex Chemical Behaviour

The general term `cyanide` refers to various compounds which belong to the **CN** chemical element. Several plants, some soil bacteria produce natural cyanide and related compounds. Because cyanide is carbon based—an organic compound—it reacts readily with other carbon-based substances; including living organisms. Despite this complexity, regulators generally require that mine operators monitor for only three categories of cyanide: free cyanide, weak-acid-dissociable (WAD) cyanide, and total cyanide.

Cyanide spills and accidents

In recent years a number of cyanide-related leaks, discharges and cyanide transport accidents in the U.S. and throughout the world have been reported by the press. These accidents raise questions about the current operating practices, monitoring, and regulation at cyanide-related mine sites worldwide.

Environmental pollution

Minuscule amounts of cyanide may kill the aquatic life of a river, turning the whole ecosystem into a dead water course. The mine ponds can leak or overflow, posing threats to underground drinking water supplies and the wildlife otherwise thriving in lakes and streams. Birds as well as other animals are poisoned by drinking the polluted water.

Example: The cyanide solution (120 tons) that escaped in 2000 from a gold processing plant at Baia Mare in Romania destroyed almost all aquatic life from 700 km of river waters in Romania and Hungary. Numerous bird kills were also reported.

Lessons from the Baia Mare Spill

In January 2000, an estimated 100,000 cubic meters of cyanide and metal-laced waste water spilled from a Romanian gold-processing facility situated near the town of Baia Mare. It killed much of the aquatic life in the Tisza River; a tributary of the Danube River. Fish were killed for hundreds of kilometres downstream the rivers; all the way from Romania, to Bulgaria, to Hungary and into Serbia. A preliminary report entitled ***Cyanide Spill at Baia Mare, Romania*** was prepared by the UNEP in March 2000 (see <http://www.naturalresources.org/environment/baiamare>).

The three most important conclusions of the UNEP report were:

- The breach in the retention dam was probably caused by a combination of inherent design deficiencies in the process, unforeseen operating conditions and bad weather.
- Hungarian officials estimated that 1,240 tons of dead fish were present along the Tisza River after the spill.
- The cyanide plume was measurable at the Danube delta, four weeks later and 2,000 km from the spill source.

Accidents and Spills (1998 - 2006)

Ghana – A cyanide spill at the Bogoso Gold Limited (BGL) tailings dam in June 2006 polluted the so-called Ajoo stream; killing fish and lobsters. A joint of the main tailings pipe got loose and cyanide-laden tailings poured into the external environment. It has been reported that 30 community members who drank the water or ate the fish and lobsters needed medical care (source: Mineral Policy Institute, June 2006)

Romania – A cyanide spill from the Baia Borsa mining exploitation in Romania is suspected to have contaminated the Hungarian part of Tisza River on 28 November 2005. (source: Bucharest Daily News). No news was reported regarding the contamination this accident might have caused to relevant Romanian river basins.

Philippines – Lafayette's Rapu Rapu polymetallic project in the Philippines had two spills of process treatment water allegedly causing cyanide contamination of nearby waters with the first causing a small fish kill on 31 October 2005 (source: www.minesandcommunities.org).

Laos – A cyanide spill occurred at the Phu Bia gold mine in Laos, operated by the Australian company Pan Australian Resources. The cyanide killed fish in the nearby rivers and poisoned villagers within at least 3km of the mine site. Numerous sources in Laos, including government officials have reported that at least 60-100 villagers fell ill as a result of eating contaminated fish and drinking contaminated water (source: Mineral Policy Institute, 20 June 2005).

Australia – A report commissioned by the Western Australian government into the tailings dams at the Kalgoorlie Gold mine confirmed that the mine had for numerous years been leaking cyanide into surrounding groundwater sources. Surrounding community members had been complaining of such impacts for over a decade but the company had previously denied the allegations (source: Robin Chapple, MLC, WA Legislative Council, 30 January 2004).

Papua New Guinea – Cyanide discharged from the Misima mine, a subsidiary of Placer Dome, during the decommissioning of the mine site polluted ocean waters around the small island. The discharge resulted in poisoning of marine life, with reports of dead fish found floating in the oceans. These confirmed by the company as being linked to the discharge (source: 'The National', PNG, 11 August 2004).

China – The State Council of China reported seven cases of leaks of lethal chemical products for over a week in June 2004, which claimed a total of 21 lives across the country. The latest was a hydrogen cyanide gas leak from a gold mining plant in Beijing's suburban district of Huairou which killed three people and left another 15 hospitalized (source: 'People's Daily Online', 25 June 2004).

New Zealand – About thirty-five people were evacuated from the Lower Hutt transit depot as emergency services mopped up a toxic chemical spill. Two 180-litre drums of cyanide solution were damaged inside the main freight depot, possibly by a forklift (24 March 2004).

Romania – Romania's Siret River, a tributary of the Danube, was reported to be contaminated by cyanide. The chemicals involved in the spill leaked from a deactivated chemical processing plant, where storage conditions may not have been up to international standards. Estimates are that "10 tons of toxic substances leaked into the river" (source: Reuters, March 2004).

Nicaragua – A cyanide spill at the Greenstone/Bonanza mine in the North Atlantic Autonomous Region operated the Canadian gold-mining company Hemconic lead to cyanide leaking into the so-called Bambana River. Health workers from local Indigenous communities reported the deaths of twelve children who were suspected of having been poisoned by drinking water from the Bambana River (source: WRM's bulletin N° 74, September 2003).

Honduras – A massive cyanide spill at the San Andrés mine in January 2003, in the Copán region, Western Honduras, contaminated the Lara River, which feeds into the river providing drinking water for the town of Santa Rosa de Copán. Even though local inhabitants reported witnessing company employees hauling away evidence, they managed to amass some 18,000 dead fish; a testament to the environmental destruction caused to the now lifeless river and to the ecosystems it nourished.

Nevada, USA – Twenty-four thousand gallons of cyanide solution were spilled at the Twin Creeks Mine owned by the US giant miner Newmont Mining. A Nevada official said 10,000 gallons entered a creek. In recent years, the owner of the proposed Crandon mine spilled cyanide twice, including a 13,000 pound spill of cyanide in Arizona. In another accident, 300,000 cubic yards of mine wastes were spilled into an Arizona creek (source: Humboldt County News - 16 May 2002).

China – In November 2001 eleven tons of liquid sodium cyanide leaked into a tributary of the Luohe River in Henan province, China after a transport accident. The Luohe River is a shallow tributary of the Yellow River.

Ghana – Villages in the Wassa West District of Ghana's western region were hit by the spill of thousands of cubic metres of mine wastewater contaminated with cyanide and heavy metals when a tailings dam ruptured at a mine operation owned by the South African company, Goldfields (October 2001).

Papua New Guinea – Rio Tinto's Lihir mine spilled cyanide into the ocean. The Australian Government's Export Finance and Insurance Company (EFIC) provided \$US250 million in finance guarantees to this mine (June 30, 2001).

Nevada, USA - The Gold Quarry mine released about 245,000 gallons of cyanide-laden waste into two local creeks. In 1989 and 1990, a series of eight cyanide leaks occurred at the McCoy/Cove gold mine, releasing almost 900 pounds of cyanide. Source: Mineral Policy Center Issue Paper "Cyanide Uncertainties" 1998, Robert Moran Ph. D.

South Dakota, USA - In 1998, 6-7 tons of cyanide-laced tailings spilled from the Homestake Mine, killing fish in Whitewood Creek, Black Hills. Source: Mineral Policy Center Issue Paper "Cyanide Uncertainties" Robert Moran Ph. D. 1998.

Idaho, USA - The Grouse Creek gold mine, operated by Hecla with "state-of-the-art" technology in 1993-97, polluted surface and groundwater with cyanide due to a leaking tailings impoundment. Signs were posted to warn the public not to drink the water. Source: U.S. EPA, "Removal Action Memorandum: Grouse Creek Mine Tailings Impoundment Dewatering" May 2003.

Guyana - In 1995, over 860 million cyanide-laden tailings were released into a major river when a dam collapsed at the Omai gold mine. Source: "Cyanide Uncertainties" Robert Moran Ph.D. 1998.

Australia - The Northparkes copper-gold mine in New South Wales killed 2700 birds in 1995. Source: East Australia Department of the Environment, "Cyanide Management" 1998.

Kyrgyzstan - A truck transporting solid cyanide to the Kumtor mine plunged off a bridge in 1998; spilling 2 tons of cyanide into local water ways. Within days after the spill, hundreds of local residents sought treatment at medical .
"Cyanide Uncertainties" Robert Moran Ph.D. 1998.

South Carolina, USA - In October 1990, following heavy rains, 10 to 12 million gallons of cyanide solution (100 ppm cyanide) and several tons of sediment spilled into Little Fork Creek and the Lynches River in South Carolina from the Brewer Gold Mine. During the same storm, debris blocked a collection channel and caused a 420,000-gallon spill containing 170 ppm cyanide. The spill resulted in a fishkill for 49 miles down Lynches River (Doyle 1990; South Carolina Department of Health and Environmental Control 1990).

Regions and countries where the use of cyanide in mining has been contested, regulated or banned outright

Source: *Rainforest Information Centre*

1) **Montana** - In 1998 a citizen's initiative banned open-pit cyanide leaching in gold and silver mining at new mines and mine expansions.

2) **Colorado** - Five counties have banned open pit cyanide heap and vat leach mining. On 27 January 2004, Commissioners of the Summit County voted to ban cyanide to protect the future public health and safety from this controversial mining process.

3) **Wisconsin** – On 5 November 2001 the Wisconsin State Senate approved two mining-related environmental bills – one to ban cyanide at all Wisconsin mines to have "No Special Treatment" for the mining industry.

4) **Turkey** - In 1997 the Turkish State Council decided not to allow gold production through cyanide leaching, on the basis of article 56 of the Turkish Constitution which guarantees the right of people to live in a healthy environment (nr. 1996/5348, decision nr. 1997/2311).

5) **Turkey** – On 17 November 1994, the European Parliament ruled against gold mining projects near the archaeological sites of Pergamon and Adramyttion, Turkey (ABL C 341, December 5 1994, page 1696)

6) **Honduras** - In March 2001, seventy-five people representing 15 communities located adjacent to 8 mines attended a meeting in Honduras to launch a national anti-mining

campaign called "Honduras Is Worth More Than Gold." The meeting took place on March 9 and put forward several goals, including the prohibition of the use of cyanide in mining operations, the prohibition the expropriation of farming and indigenous lands , and the strengthening of mining and environmental laws.

7) **Czech Republic** – In August 2002, the Czech Parliament voted a ban for any metal mining using the cyanide heap leach method on Czech territory.

8) **Argentina**, 9 February 2003 - The Esquel City Council passed ordinances that ban the use and transport of cyanide within city limits; revoking a city ordinance that accepts national laws on mining investment. They equally call for a referendum on the proposed Esquel gold mine owned by Canadian Meridian to be held. Argentina's Chubut Province passed a moratorium on open-pit cyanide-leach mining in 2003.

9) **Germany** passed a decree in 2002 prohibiting cyanide-leach mining.

10) **Costa Rica** passed a moratorium on open-pit cyanide-leach mining in 2002.

11) **Peru:** On 8 September 2004 over 4,000 Peruvians marched through the northern town of Cajamarca, demanding a ban on a gold exploration project which they claim is contaminating and drying up their water supplies. The strike shut down banks, markets and public transportation in Cajamarca, 535 miles (856 km) northeast of Lima.

12) **The European Union's** "Baia Mare Task Force" recommended that cyanide and other toxic substances such as heavy metals contained in tailings from the production process should be removed before disposal and that waste disposal facilities and tailings ponds of inadequate capacity or lacking emergency drainage systems for excess water should be forbidden. (Report of the International Task Force Assessing the Baia Mare Accident, presented in Brussels, 15 December 2000).

13) **Philippines:** In April 2002 the island province of Oriental Mindoro placed a 25 year moratorium on all mining projects in the region

14) In January 2005 in response to mining threats, **Alaskan** village and traditional councils as well as village corporations began to pass strong resolutions in opposition to mines that they believe are a) environmentally unsound b) foreign owned c) in conflict with their desired future vision for their communities and d) a threat to their traditional way of life.

15) **Argentina:** On 21 July 2005 the **Rio Negro** legislative chamber passed a bill banning the use of cyanide and mercury in mining.

16) **Argentina:** On 4 October 2007 the lower house of congress in Argentina's La Pampa province approved a law banning the use of hazardous chemical substances like cyanide and mercury to treat or industrialize metallic minerals, according to the province's official gazette. The law also prohibits open pit metallic mining, the report said.

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This Fact sheet has been prepared by the 'Cyanide Free Romania' Coalition. For more information and contact details, visit our website at www.bancyanide.ro