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# Chemical contamination: cyanide risks in the spotlight

In February, a landslide at Çöpler mine in Turkey again highlighted the issue of hazardous chemicals in mining. To counter the environmental risks of cyanide leaching, the industry is working on a range of safer alternatives.

[Smruthi Nadig](#) | April 16 2024



An open-pit iron mine in Kayseri, Türkiye. Credit: temizyurek via Getty Images.

In February 2024, nine Turkish rescue workers were swallowed by a [landslide](#) at the Çöpler open-pit gold mine in eastern Turkey, which was contaminated by cyanide.

The incident on 13 February dislodged 10 million cubic meters of earth across a 200m slope, leaving workers trapped under the soil, Interior Minister Ali Yerlikaya told reporters in February.

Local officials and experts said the search operation was made difficult by the presence of cyanide in the ground. Cyanide is a hazardous chemical element used to extract gold from ore. The Independent Mining Labour Union representative, Basaran Aksu, told Turkish media that the cyanide soil had collapsed at the location, according to a [statement by](#) Turkey's Ministry of Energy and Natural Resources.

Canada-based SSR Mining, which owns an 80% stake in mine operator Anagold Madencilik, suspended all operations at the mine. The search and rescue operations for nine workers who went missing after the incident are still ongoing. On 5 April, SSR Mining said the [body of one](#) of the missing personnel was recovered from the manganese pit.

SSR Mining has received notice that the environmental permit for Çöpler has been revoked, and consequently, the operation will be suspended until further notice. Government officials have instructed the company to plan for remediation efforts, with the initial focus being on moving heap leach material from Sabirli Valley to a permanent storage location.

Çöpler's history of cyanide contamination

Since the incident, the Turkish Ministry of the Environment, Urbanisation and Climate Change has regularly monitored the region's surface water, groundwater, soil, and air quality. As [updated](#) on 18 February, the ministry reported negative results regarding potential contamination in the monitored locations.

This was not the first incident at Çöpler Mine. Following a cyanide leak in 2022, environmental activists and local officials attempted to close down the open pit. Although the mine was closed briefly, it re-opened after its operator paid a fine. This decision prompted strong opposition from political parties and industry associations who accused the government of neglecting Çöpler's operations after the cyanide waste spill. Anagold Madencilik was fined 16.5m Turkish lira, equivalent to \$536,000. Despite the penalty, the mine has remained operational, [as reported by the BBC](#).

Turkish Energy Minister Alparslan Bayraktar said in a statement to the press after the 2024 incident that the site has been functioning since 2004 and received additional environmental permits in 2021.

The Union of Chambers of Turkish Engineers and Architects believes the mine should be permanently closed. Dersim Gul, the secretary-general, told the media: "We are facing a potential environmental disaster."

## **The safety record of cyanide use in the mining industry**

Cyanide is a rapidly acting, potentially deadly chemical. It easily combines with many metals, making it useful in

separating metals like gold from their ore. However, if released into the environment, cyanide can be highly toxic and can result in substantial environmental impacts and public health risks.

Cyanide spills have resulted in major fish kills, contaminated drinking water supplies, and harmed agricultural lands. “Industry claims cyanide is relatively safe because—even if it spills—it breaks down rapidly in surface water”, environmental organisation [Earthworks](#) says on its website. However, the compounds that cyanide breaks down into can be harmful.

Cyanide spills into groundwater can persist for long periods and contaminate drinking water aquifers. Cyanide-contaminated groundwater can also pollute hydrologically connected neighbouring streams. Some places have recognised the environmental impact of cyanide in the mining industry and have introduced new legislation to limit its use. In December 2023 in the US, Delegate Shelly Simonds from House District 70 introduced two bills to safeguard the health of US State Virginia communities from a hazardous toxin commonly used in large-scale metal mining.

The first bill seeks to prohibit the use of cyanide in metal mining operations, whereas the second mandates public notification requirements for metal mining exploration activities. According to the non-profit [Appalachian Voices](#), no current mining operations use cyanide in the state, and the legislation is designed to have no impact on any existing industries.

In 2000, Romanian mining company [Aurul released](#) 100,000 m<sup>3</sup> of wastewater containing cyanide and heavy metals from the Nagybánya facility into the Tisza River

in Europe, causing a decade-long environmental disaster. In response, the European Parliament proposed a ban on cyanide mining technologies in the European Union. However, [no action](#) has yet been taken regarding the legislation.

The International Cyanide Management Code came into force following the Tisza River incident on 30 January 2000. As reported by [Mining Technology](#), several companies have voluntarily adopted this framework. Major gold mines employ the code to regulate sodium cyanide usage, handling, and disposal.

Strict laws are necessary to limit the use of cyanide in mining. Current mining processes carry the risk of regular cyanide spills, which has resulted in billions of gallons of contamination released into the environment since the 1970s, Earthworks said. If cyanide spills are not taken seriously, they will continue to contaminate water and soil, affecting the environment and living organisms, including humans.

## **Sustainable alternatives of cyanide leaching in mining**

The industry has recognised the risks of cyanide leaching, especially in gold mining, and some companies have introduced new technologies to tackle this issue. The challenge is that some alternatives to cyanide in mining can be costly or hard to find.

Canada-based metallurgy company Dundee Sustainable Technologies has [introduced](#) an improved method for extracting gold. Unlike traditional methods that use cyanide and produce harmful liquid and gaseous byproducts, the CLEVR Process is said to be cleaner,

more efficient, and cost-effective. “Solid residues remain inert, stable, and non-acid-generating,” Dundee said on its website.

The CLEVR Process is a chemical approach that dissolves gold faster than traditional gold recovery circuits. The company said this process reduces contact times from over 36 to two hours. Additionally, the process is a closed loop, meaning all reagents are reused, eliminating the need for tailings ponds. This minimises failure risks and environmental impact.

Last June, Draslovka, a specialty chemicals company, partnered with Barrick Gold to launch a worldwide testing and implementation program for Draslovka’s advanced proprietary gold leaching product, GlyCat, across various mines. According to [the company](#), adopting this technology can generate substantial savings and create value for Barrick’s operations while improving its environmental impact.

“GlyCat will enable a major shift in the mining industry’s sustainability profile by substantive replacement of cyanide used in the processing of gold ores with a non-toxic, food-grade reagent that is recyclable,” Draslovka said. Depending on the type of ore, using GlyCat in existing leaching circuits allows for a 20% to 80% reduction in cyanide usage while reducing or eliminating cyanide detoxification requirements. [As of March](#) this year, the company has reportedly achieved its goal of reducing 80% of cyanide use.

In 2021, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), an Australian government agency, developed a cost-effective and

environmentally friendly gold recovery process called 'Going for Gold'.

“The solution replaces cyanide with a safe, alternative reagent known as thiosulphate. Thiosulphate dissolves the fine gold out of ores at rates similar to conventional techniques. It's safe and lowers environmental impacts,” [CSIRO said](#).

CSIRO has built on its previous success at Barrick Gold's Goldstrike mine, which has operated since 2014, with its Going for Gold initiative, which tailors a cyanide-free solution for the mining industry.

Simon Bottoms, mineral resource management and evaluation executive at Barrick, said in June last year: “Rates of major gold and copper discoveries have been in steady decline over the last decade, which, when combined with a rapidly evolving set of global challenges, is resulting in global supply challenges to meet the growing global demand for such critical metals. As a result, it is imperative that the industry takes the necessary steps to maximise the value from existing mines that are already operational or currently under development.”

Researchers and developers continuously explore new methods, such as bioleaching and electrochemical approaches, each with distinct advantages. These innovative technologies, including glycine leaching, promote a safer and more sustainable approach to gold processing.

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