



COMMITTEE ON THE ENVIRONMENT, PUBLIC HEALTH AND FOOD SAFETY  
– SECRETARIAT –

## **BACKGROUND NOTE ON CYANIDE IN GOLD MINING**

*On 5 September 2013, the Coordinators instructed the secretariat to draw up a background note on the use of cyanide mining technologies, ahead of the exchange of views with the Commission on 25 September 2013.*

### **Cyanide and its environmental and health concerns**

Cyanide is a chemical group consisting of carbon and nitrogen. Cyanide compounds, such as hydrogen cyanide gas and the simple cyanide salts (sodium cyanide and potassium cyanide), can occur naturally or be man-made and many are powerful and rapid-acting poisons. The predominant users of cyanides are the steel, electroplating, mining, and chemical industries.

Cyanide toxicity in humans most commonly occurs from inhalation of cyanide gas or ingestion of cyanide salts. Small exposures can lead to symptoms and symptoms typically evolve over minutes to hours. Ingestion of 200 mg and airborne exposure of 270 ppm (parts per million = mg/l) of cyanide are rapidly lethal.

Many of the cyanides in soil and water come from industrial processes. Major sources of cyanides in water are discharges from metal mining processes, chemical industries, iron and steel plants, and wastewater treatment facilities. Although cyanide reacts readily in the environment and degrades or forms complexes and salts of varying stabilities, it is toxic to many living organisms at very low concentrations. Fish and aquatic invertebrates are particularly sensitive to cyanide exposure. Concentrations of free cyanide over 20 µg/l cause the death of many species, and concentrations in excess of 200 µg/l are rapidly toxic to most species of fish. Cyanide tends not to accumulate in living organisms or biomagnify in the food chain.

### **Cyanide use in mining**

Gold typically occurs at very low concentrations in ores – less than 10 g/ton. The most used process for gold extraction is hydrometallurgical recovery (gold cyanidation), which involves a “leaching” step during which the gold is dissolved in an aqueous medium, followed by the separation of the gold bearing solution from the residues. Gold is one of the noble metals and as such it is not soluble in water. Cyanide, which stabilizes the gold species in solution, and an oxidant such as oxygen are required to dissolve gold. The first step in the process is to prepare the ore by crushing and grinding. Cyanide solution is then introduced to an ore heap by sprinklers or a drip irrigation system and the resultant gold bearing solution is collected on an impermeable membrane. Alternatively, milled ore is agitated in leach tanks. Gold is recovered from the solution using either cementation on zinc powder or concentrating the gold using adsorption on activated carbon.

More than half of all gold and silver mines in the world rely on the use of cyanide (including gold mines in Sweden and Finland). The use of cyanide in mining is however controversial, as spills have the potential to inundate an ecosystem with toxic levels of cyanide: recent cyanide-related disasters in the EU include Stava (Italy, 1985), Los Frailes (Spain, 1998) and Baia Borsa (Romania, 2000). The worst accident took place in 2000 at a gold mine in Baia

Baia Mare, Romania, where heavy rain, ice, and snow caused a breach in a tailings dam (tailings are the cyanide-treated ore wastes, from which gold has been removed), resulting in the release of 100.000 cubic meters of cyanide-rich waste into the surrounding watershed. Drinking water supplies were cut off for 2,5 million people in neighbouring Hungary and Serbia and hundreds of tons of fish in the Szamos-Tisza-Danube River system were killed.

Various alternatives to cyanidation have been considered, such as thiosulfate, thiocyanate and thiourea, polysulfide, ammonia and ammonium copper-cyanide<sup>38</sup>, chlorine, bromine and iodine. Many alternative lixivants are however more hazardous and persistent than cyanide and require more aggressive reagents to dissolve the gold. New research into alternative processes suitable for replacing toxic cyanide compounds is ongoing. It has been suggested that gold recycling may also satisfy demand without additional pressures on the environment. Cyanidation remains by far the most widely used technique because of its cost-effectiveness.

### **Legislative framework and Parliament's call for a general ban**

Directive 2006/21/EC of 15 March 2006 on the management of waste from extractive industries (Mining Waste Directive) was adopted after the Baia Mare accident and was aimed at directly addressing the circumstances that led to the accident. In particular, Article 13(6) of the Mining Waste Directive states:

*“In the case of a pond involving the presence of cyanide, the operator shall ensure that the concentration of weak acid dissociable cyanide in the pond is reduced to the lowest possible level using best available techniques and, in any case, at waste facilities which have previously been granted a permit or have already been in operation on 1 May 2008 that the concentration of weak acid dissociable cyanide at the point of discharge of the tailings from the processing plant into the pond does not exceed 50 ppm as from 1 May 2008, 25 ppm as from 1 May 2013, 10 ppm as from 1 May 2018 and 10 ppm at waste facilities which are granted a permit after 1 May 2008.”*

In addition, discharges in water must comply with Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive), which includes cyanides among the main pollutants listed in Annex VIII. That Directive prohibits direct discharges of pollutants into groundwater and requires the achievement of good ecological and chemical status of surface waters.

Nevertheless, some EU Member States, such as Hungary and the Czech Republic, have banned cyanide leaching processes, and shortcomings in the implementation of the Mining Waste Directive and concerns about the environmental and health effects of cyanides have led Parliament to call for a general ban on the use of cyanide in mining. The European Parliament's resolution of 5 May 2010 on a general ban on the use of cyanide mining technologies in the European Union, noting that *“over the past 25 years more than 30 major accidents involving cyanide spills have occurred worldwide”*, and that *“there is no real guarantee that such accidents will not occur again, especially taking into account the increasing incidence of extreme weather conditions, inter alia heavy and frequent precipitation events”*, called on the Commission *“to propose a complete ban on the use of cyanide mining technologies in the European Union before the end of 2011”*.

The Commission has not proposed such a ban, stating, in its response to Parliament's resolution, that a general ban on cyanide use *“is not justified from environmental and health perspectives”*. According to the Commission, the Mining Waste Directive *“includes precise and strict requirements which should ensure an appropriate safety level of the mining waste facilities. The limit values for cyanide storage as defined in the Directive are the extremely low and imply in practice the need to destroy most of the cyanide used before its storage.”*

The Commission's statement adds: *“Due to the lack of affordable alternative technologies, a general ban on cyanide use would imply the closure of existing mines operating on the basis of the stringent standards as defined in the Directive, which would be detrimental to employment without additional environmental and health added value. The Commission intends to continue to closely follow the possible technological developments in this sector in order to ensure that “best available techniques” are applied in practice as required by the Directive.”* The Commission services are currently developing [guidelines for inspection of mining waste facilities](#) following a study finalised in 2012.

## **Recent developments and controversies**

About 1% of world gold is mined in the EU. In recent years, due to the rise in gold prices that has made extraction from low-grade ores economically viable, there has been increasing investment in gold exploration throughout the EU. Precious metal mining companies are proposing large-scale open-cast cyanide-based gold/silver mining operations in inhabited areas along the Carpathian basin (Slovakia, Hungary, Romania, Bulgaria and Greece) and in other areas such as the district of Corcoesto, Galicia (Spain).

In particular, Canadian company Gabriel Resources plans to develop the [largest gold mine in Europe in Roşia Montană, Romania](#), starting operations in 2016. Roşia Montană has been a mining site since Roman times, and mining operations took place there until 2006. The project aims to extract about 300 tons of gold and is planned to create about 2.300 jobs during construction and 900 during the operational phase.

The origins of the project date back to 1995, and a mining license has existed since 1999-2000, but full authorization for the project has not yet been obtained, as permits granted by state authorities were later annulled by the courts following appeals by environmental groups. The environmental impact assessment procedure started in 2004 but has not yet been finalised. At the end of August 2013, the Romanian government submitted a law to Parliament that designates Roşia Montană as a project of national interest that would mandate authorities to give the company the necessary permits for construction and exploration by set terms. The vote in the Romanian Parliament has not yet taken place.

The draft legislation spurred several protests in Romania, from civil rights groups, environmentalist organizations, and local residents against the reopening of the Roşia Montană mine. The government of Hungary, worried of transboundary consequences, opposes the use of the cyanide-leaching technology.

## **Links**

- [Directive 2006/21/EC of 15 March 2006 on the management of waste from extractive industries](#)
- [Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy](#)
- [European Parliament resolution of 5 May 2010 on a general ban on the use of cyanide mining technologies in the European Union](#)
- [EUROSTAT study on the impacts of gold extraction in the EU", April 2010](#)
- [European Commission Study on the establishment of guidelines for the inspection of mining waste facilities, April 2012](#)