

**Testimony of Dr. Steven H. Emerman to the European Parliament Public Hearing on
Environmental and Social Impacts of Mining in the EU**

December 2, 2021

Thank you very much for the honor of addressing the European Parliament Public Hearing on “Environmental and Social Impacts of Mining in the EU.”

My name is Dr. Steven H. Emerman. I have an M.A. in Geophysics from Princeton University and Ph.D. in Geophysics from Cornell University. I have 31 years of experience teaching hydrology and geophysics, including teaching as a Fulbright Professor in Ecuador and Nepal, and I have 70 peer-reviewed publications in these areas. I am the owner of Malach Consulting, which specializes in evaluating the environmental impacts of mining for mining companies, as well as governmental and non-governmental organizations. I have evaluated proposed and existing mining projects in North America, South America, Europe, Africa, Asia and Oceania, and I have testified on mining issues before the U.S. House of Representatives Subcommittee on Indigenous Peoples of the United States and the United Nations Permanent Forum on Indigenous Issues. I am the Chair of the Body of Knowledge Subcommittee of the U.S. Society on Dams and one of the authors of “Safety First: Guidelines for Responsible Mine Tailings Management.”

Mining is an ultraconservative industry, out of necessity. Mining is ultraconservative because the consequences of being wrong are so great. The most serious way in which a mining project can go wrong is to incorrectly predict the consequences of the project for human life and for the environment. Mining is based upon the Precautionary Principle, which states that, in the face of great danger and great uncertainty, we should exercise great caution, that is, we should be ultraconservative. Leaps into the unknown are not appropriate in the mining industry. It is the duty of the proponents of a mining project to convincingly demonstrate that the project will not harm people or the environment. It is not the duty of those who are concerned about a project to demonstrate that the project will harm people or the environment.

On November 24, the European Parliament adopted a resolution entitled “A European Strategy for Critical Raw Materials.” Paragraph 42 of the resolution states that “primary and secondary sourcing in the EU is subject to the highest environmental and social standards worldwide.” That statement is not true. It is not true in theory and it is not true in practice. I am going to explain this point using four proposals for creation or expansion of mines in Spain and Portugal. I am not singling out Spain and Portugal, but these are the two countries with which I am most familiar.

The proposed Touro copper mine in Galicia, Spain, would be 20 kilometers east of Santiago de Compostela. The tailings dam would be 81 meters high and would be located less than 200 meters on a steep slope above the village of Arinteiro. By contrast, the mining legislation in the state of Minas Gerais, in Brazil, includes the concept of the “self-rescue zone.” The self-rescue zone is the zone in which no help can be expected from the outside in the event of failure of a tailings dam. The legislation defines the self-rescue zone as the zone extending 10 kilometers downstream from the dam along the course of the valley, or the zone that can be reached by the tailings flood within 30 minutes, whichever is farther. The regulatory authorities can extend the zone up to 25 kilometers depending upon the population density and the natural and cultural heritage. It is illegal to construct or expand a tailings dam where there is a population residing

within the self-rescue zone. Ecuador has the same legislation, although without the option of extending the zone up to 25 kilometers. In China tailings dams are prohibited within one kilometer of a populated area. It should be a cause for reflection that a mining project is being seriously considered in Spain that would be illegal in China. I would like to add that last week's resolution by the European Parliament mentions China in a derogatory context in six places.

One of the most important design criteria for a tailings dam is the design flood, that is, the largest flood that a dam should be able to withstand. The design flood depends upon the consequences of dam failure. In the case of the proposed Touro mine, failure of the tailings dam will result in the potential loss of the entire village of more than 100 people. According to the U.S. Federal Emergency Management Agency, the U.S. Army Corps of Engineers, and the Canadian Dam Association, the tailings dam should be designed to withstand the Probable Maximum Flood or PMF. The PMF is the largest flood that is even theoretically possible at a given location. It has no defined return period, but is generally regarded as significantly rarer than a 10,000-year flood. The application of the Global Industry Standard on Tailings Management, which was released in August 2020 by the International Council on Mining & Metals, the United Nations Environment Program, and the Principles for Responsible Investment, would require design to withstand the 10,000-year flood. By contrast, the proposal for the Touro mine includes no mention of any design flood. In fact, Spain and Portugal require design of dams to withstand only the 500-year flood, which gives these two countries the weakest dam safety regulations of any jurisdiction that has dam safety regulations. There have been efforts by the Spanish Ministry for the Ecological Transition to bring the dam safety legislation in Spain into alignment with the rest of the world, but they have thus far been unsuccessful.

In the upstream method of tailings dam construction, the dam is built on top of the uncompacted tailings that are being confined. These dams are highly vulnerable to failure because, if the tailings liquefy, the dam can fail by falling into or sliding over the liquefied tailings. The recent tailings dam failures at Mount Polley in Canada in 2014, at Samarco in Brazil in 2015, and at Brumadinho in Brazil in 2019, were all failures of upstream dams. As a consequence of their vulnerability to failure, upstream tailings dams are illegal in four Latin American countries, which are Brazil, Chile, Ecuador and Peru. Even without legislation, the global mining industry has been moving away from upstream tailings dams. According to a study in *Nature* that was published in 2021, "While upstream facilities make up 37 per cent of the total, they have declined from a peak of 85 per cent of new facilities in 1920–1929 to 19 per cent of new facilities in 2010–2019." Spain has been an exception to the trend in the global mining industry. According to the Geological and Mining Institute of Spain, more than 99% of the tailings dams in Spain are upstream dams. I do not mean to single out Spain in this regard. No other country in Europe even has a national database of active tailings dams.

In June 2019 I evaluated two upstream tailings dams at the Riotinto copper mine in Andalusia, Spain. Both the dam and the tailings deposit were almost entirely saturated with water. The water table was visible three meters below the surface of the tailings and water was flowing out of the dam at the same level. The high degree of saturation made the tailings dams highly vulnerable to failure by liquefaction. I estimated the annual probability of failure as 15%, essentially equivalent to an annual round of Russian roulette. Instead of addressing the current problems, there is a proposal to raise the heights of the dams by another 25 meters.

There is a proposal to re-open the underground San Finx tungsten and tin mine in Galicia, Spain, which has been closed since 1990. The mine is currently flooded to a depth of 70 meters below the surface and re-opening would require dewatering the mine down to a depth of 206 meters below the surface. A single sample of water from the mine showed elevated levels of cadmium, copper and zinc, which would be harmful to aquatic life. The plan is to pump water out of the flooded mine, treat it for removal of cadmium, copper and zinc, and release it into the Pesqueira river, which empties into the Muros e Noia estuary.

The water treatment plan for the re-opening of the San Finx mine is based upon a pilot water treatment project that ran for 11 weeks. During the 11 weeks, the pilot project was out of control and failed to reduce cadmium, copper and zinc to acceptable levels in a stable manner. The only exception was a one-week period during which the pilot project was apparently working before the zinc concentration in the output water spiked out of control. The water treatment plan was based entirely upon data from the one week of successful operation and did not mention even the existence of 10 additional weeks of data. There might not be any regulations that state that one sample of mine water is not sufficient or that you should not throw out 10 weeks of data from an 11-week pilot project without explanation, but such practices certainly do not show the “highest environmental and social standards worldwide,” as stated in the recent resolution by the European Parliament.

Because of the rush to open new lithium mines in Europe, I would like to focus the rest of this testimony on the proposal for the Barroso lithium mine in northern Portugal. The diagrams in the proposal show an upstream tailings dam, which as I have said, is illegal in four Latin American countries. The proposal never once uses the word “dam.” Thus, there is no consideration of dam safety criteria, such as the design flood, no consideration of dam safety standards, and no consideration of the consequences of dam failure. There is no consideration of the potential loss of human lives, the potential impacts on aquatic or wildlife habitat, the potential impacts on livestock, the potential economic losses, or any other kinds of impacts. Instead, the Environmental Impact Study simply dismisses the possibility of failure by writing “the loss of human life is not expected, as the structural integrity and proper functioning of the waste facility are assured.” Simply writing the above sentence should be sufficient cause to reject the proposal.

The proposal for the Barroso lithium mine is an example of what is called “Reckless Creativity.” Reckless Creativity is highly discouraged in the ultraconservative mining industry because of the consequences of being wrong. The most important characteristic of Reckless Creativity is the absence of any scaffolding, meaning that the new innovation does not build upon previous innovations through a series of intermediate steps with proper testing and verification of each step. The proposal for a hard-rock lithium mine with a tailings facility that stores a homogeneous mixture of waste rock and filtered tailings with a final height of 193 meters is highly experimental. To the best of my knowledge, there is no operating lithium mine that stores filtered tailings, the height of the tallest filtered tailings storage facility for a proposed lithium mine is 107 meters, there is no operating mine that stores a homogeneous mixture of waste rock and filtered tailings, and the tallest operating filtered tailings storage facility of any kind has a height of 70 meters.

In this testimony, I have not said one word against mining. I have said that the mining industry is ultraconservative because the consequences of an ill-considered project are so severe. This means that any mining project must follow the strictest environmental and social standards from the conception to the closure and well into the post-closure phase. I can easily tell you where to find these standards. They are contained in the document of which I was one of the authors, released in June 2020 and entitled “Safety First: Guidelines for Responsible Mine Tailings Management.” I have criticized the claim in last week’s resolution by the European Parliament that “primary and secondary sourcing in the EU is subject to the highest environmental and social standards worldwide.” I have criticized the claim only because it is not yet true. The claim is a lofty goal and I want to see the claim become the reality.

Do not rush into opening new mines or expanding existing mines or re-opening closed mines in Europe without a convincing demonstration that there will be no adverse impacts on human life or the environment. I can summarize all of mine planning in three words: Stop and think.

Thank you very much for your attention.