MALACH CONSULTING

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BAKUMSU
Medan, North Sumatra
Indonesia

IDI (Inclusive Development International)
Asheville, North Carolina
USA

Dear BAKUMSU and IDI,

I am writing in response to your request for my professional opinion regarding a lead-zinc-silver mine owned by Dairi Prima Mineral (DPM) in the North Sumatra province of Indonesia. I understand that the mining project has already been approved by the Indonesian government and is currently seeking financing. My professional opinion is based upon information provided by you and my general knowledge of the mining industry. I have not at this stage tried to carry out any of my own research on this mine.

Before giving you my professional opinion, I would like to summarize my background and philosophy. I have a B.S. in mathematics from The Ohio State University, M.A. in geophysics from Princeton University, and Ph.D. in geophysics from Cornell University. I have 66 peer-reviewed publications in the areas of hydrology and geophysics. I was a university professor of hydrology and geophysics for 31 years, during which time I also worked as a part-time mining consultant. I retired from university teaching in June 2018 and have been doing full-time mining consulting since then. My recent clients have included mining companies, investment management companies, and shareholder groups, as well as community, environmental, human rights and indigenous organizations.

I am not opposed to mining. I am not opposed to large-scale mining or lead-zinc mining or mining in Indonesia. In fact, if I were opposed to mining in general, I would have no credibility in terms of critiques of particular mining projects. On the other hand, I am opposed to the following:

1) mineworker and community accidents and fatalities
2) violations of human rights
3) environmental disasters
4) financial catastrophes

I hope that this distinction makes sense to you.

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Everything about the ability of a mining project to protect human life and the environment depends upon the following:

1) the physical data (such as risks of earthquakes, floods and landslides) that are the basis for the mining plan
2) the mining plan that is a response to the physical data
3) the financial ability and willingness of the mining company to carry out the mining in a manner that protects human life and the environment
4) the ability and willingness of the regulatory agency to evaluate the mining plan
5) the ability and willingness of the regulatory agency to enforce the mining plan
6) the ability and willingness of the mining company to follow the direction of the regulatory agency

Based on the above, it should be clear that the best-case scenario would be a combination of low physical risk factors (such as low risk of earthquakes, floods or landslides), a technically competent mining company with adequate financial resources, a technically competent regulatory agency with adequate financial resources and no conflicts of interest, together with the willingness of both the mining company and the regulatory agency to work together for the protection of the public and the environment. Of course, the worst-case scenario would be a combination of all of the opposites.

In terms of a lead-zinc-silver mine, there are three principal risks that must be addressed by the mining plan and the regulatory agency. In order of priority (1 = highest priority), those risks are:

1) the catastrophic failure of the tailings dam resulting in probable fatalities and the sudden release of, typically, hundreds of millions of tons of toxic mine tailings into the environment
2) the contamination of downstream surface water and groundwater through acid mine drainage from the tailings storage facility
3) the airborne transport of toxic dust from the mining operation and the tailings storage facility

Acid mine drainage is the phenomenon in which sulfide minerals (which are the host for lead, zinc and silver) combine with oxygen once they are exposed on the surface as mine tailings. This combination with oxygen generates sulfuric acid, which by itself can be detrimental to public water supply and aquatic organisms. However, it is often more important that the released sulfuric acid will cause heavy metals that are attached to soil particles and river sediments to migrate from those attachment sites into water. Without the introduction of sulfuric acid, these heavy metals would remain fixed onto soil and river particles without detriment to water supply or aquatic organisms. In volcanic areas such as Indonesia, it would be expected that there is a considerable quantity of potentially toxic metals that, for now, is fixed onto soil and river particles.

After this introduction, I am now turning to the particular aspects of the DPM lead-zinc-silver mine. I would like to analyse some version of an Environmental Impact Study (EIS), which

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should contain the mining plan, as well as the physical data that was the basis for the mining plan. The first thing that I would look for in the EIS would be the determination of the Probable Maximum Flood (PMF) and the Maximum Credible Earthquake (MCE). The PMF and the MCE are the largest flood and earthquake, respectively, that are even theoretically possible at a given location. According to generally-recognized international standards, the ability to withstand the PMF and the MCE are the design criteria for the tailings dam. In other words, the catastrophic failure of the tailings dam should be almost impossible under even the worst credible conditions. The possibility of a catastrophic landslide into the tailings facility, possibly as a response to the PMF or MCE, would also have to be taken into account in the design of the tailings dam. Obviously, in Indonesia, the PMF, the MCE and the landslide risk are probably quite high, especially in the province of North Sumatra. They are also probably not very well-known, due to the lack of precipitation records, long-term seismic monitoring, geologic fault mapping, and landslide hazard mapping that is common in many developing countries. On that basis, there could be considerable uncertainty in the assessment of the flood, earthquake, and landslide risk, and the design criteria for the tailings storage facility would need to take this uncertainty into account.

The problem is that DPM has managed to obtain the necessary mining permits from the Indonesian government without ever releasing a detailed EIA for the exploitation phase of the mine. This fact, combined with the high physical risk factors present in Indonesia, should put the DPM lead-zinc-silver mine into the category of worst-case scenario without any further information. In other words, I am not confident that there has been an adequate assessment of the physical data. I am not confident that DPM has an adequate mining plan, that they have the financial ability and willingness to carry out the mining in a manner that protects human life and the environment, and that they have the willingness to follow the direction of the regulatory agency. I am not confident that the regulatory agency has the ability and the willingness to evaluate the mining plan and enforce an adequate mining plan. If an EIS were to be released, I would be happy to evaluate it. However, the simple fact that a mining permit could be issued without the release of a detailed EIS for the exploitation phase would keep this particular mining project in the category of worst-case scenarios.

I would now like to turn to a statement about the mining plan by DPM (which seems to be a rare occurrence). According to DPM (2019), “Much of the bulk tailings from the processing plant will be sent to a paste plant for blending with cement to form a paste which will be injected back underground as backfill for empty mine workings. The remaining tailings will be sent to a tailings storage facility (TSF) located around two kilometers from the plant site.” Returning the tailings to the underground mine is a feature that would be protective of the environment. Reducing the volume of tailings stored on the surface would reduce the consequences of the catastrophic failure of the tailings storage facility. On the other hand, if the tailings will have

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high arsenic content, then the cement paste will mobilize the arsenic (with the potential for migration of the arsenic into groundwater) by increasing the alkalinity of the tailings. Of course, an adequate lining system will be necessary to prevent the seepage of contaminants out of the abandoned underground mine, regardless of the potential for mobilization of arsenic. All of this should have been discussed in a detailed EIS that has not been released.

In summary, my recommendation would be that any further progress of the DPM lead-zinc-silver project should be opposed. Please let me know if I can help with anything else.

Reference

DPM (PT Dairi Prima Mineral), 2019. Ore Processing & Transportation. Available online at: https://www.ptdpm.co.id/index.php?option=com_content&view=article&id=35&Itemid=53

Best wishes,

Steven H. Emerman