

Zurich/ St. Niklausen July 14 2025¹ BW**Short review of the Environmental Causality Assessment regarding surface waters, sediments, hydrobiology, wetlands and groundwater in the proximity of the Compania Minera Antapaccay S.A. in 2022 by Oefa, the Peruvian Organismo de Evaluacion y Fiscalizacion Ambiental****Objectives and reviewer's expertise.**

The following short review represents a brief desk review of the detailed environmental assessment conducted by the Peruvian authority Oefa in the rainy and dry seasons 2022 with the objective of identifying potential negative environmental impacts of mining operations and other sources in the Antapaccay area on surface water, sediments and hydrobiology. This assessment was reported as "Informe 00095-2023 by OEFA/ DEAM-STECC" and is part of a much larger assessments of other environmental compartments such as soils, vegetation, animals and the atmosphere. The short review provides an independent expert judgement of the merits and potential shortcomings of this analysis of the links between mining operations and water pollution.

A second water-related assessment was conducted by Oefa under the objective of assessing the causality of the potential impact of mining operations and other risk factors on wetlands, groundwater and soil in the Antapaccay area in 2022 (Informe 00144-2023).

The reviewer has about forty years of expertise in research, teaching and expert advice in aquatic (geo)chemistry. Together with his team, he conducted field studies on water quality and aquatic systems analysis on four continents. Under his direction 57 doctoral projects were successfully completed. He served in an advisory role for different public institutions such as the Swiss National Science Foundation, the German Helmholtz Association and the International Continental Drilling Program. He declares no conflicts of interest in this case and the review was conducted in a scientific manner, i.e. without compensation.

Available documents

The reviewer had access to the Oefa Informes 64, 67, 95, 144, 146, 167, 184, 438, but the focus of the following assessment is on the documents associated with Oefa Informe 95 on water quality (approved April 2023, 27 pages) and the more detailed report in Annex 1 with 424 pages. The maps and reports of the field campaigns and their results in the wet- and dry season were consulted for clarification. Additional documents on statistics, ecotoxicological assessment, and biodiversity analysis were scanned quickly. Together, the 189 files associated

with Informe 95 take up more than 900 MB of disk space. A similar procedure was used to analyze the documents associated with the wetland and groundwater report (Informe 144) included 85 files with a total of 1.8 GB.

The reviewer also critically read the summary for stakeholders “Contaminacion en Espinar: Causalidad comprobada” (28 pages) published in Sept. 2024 by Copper Accion, DHSF and IDL. By careful comparison of this document with the original reports by Oefa he concludes that the summary represents an accurate and fair synopsis of the detailed analysis by the government agency.

General comments

Methodology

The Oefa study started with a clear environmental model (Fig. 5.1 in Annex 1 to Informe 95) and was based on an extensive set of sampling and analysis stations covering 386 sampling points (Tables 5.3 – 5.8 in Annex 1). Documentation of the study sites, sampling procedures, analytical methods and data analysis shows high professional and scientific standards that allow back-tracking of each numerical fact of this study. The evaluation and interpretation of data in terms of water quality assessment was based on accepted national and international standards for water and sediment quality and aquatic biodiversity. Together with the monitoring of groundwater wells and hydrological information on flow paths of surface- and groundwater, the data allow drawing cause-effect relations between mining activities in the area and mining-related water pollution.

Answering the key question

While the broad sampling and analysis approach provides a wealth of information, the main objective of the water-related Oefa analyses calls for answers to a key question:

- Is there a clear link between the mining activities and their legacies such as open pits or tailing deposits and the pollution of aquatic resources?

The detailed information available in Informe 00095 and 00144 forces this review to answer with a clear yes. To cite a few examples:

- In the Tintaya mill sector, waters are contaminated with very high salt concentrations in the the range of 0.6 – 1 g/L, making the water unsuitable for drinking water supply or irrigation. (Informe 95, p. 18)
- The dump sites 20 and 23 contain elevated concentrations of toxic elements such as arsenic, copper, manganese and mercury and meteoric water percolating these open deposits are leaching pollution towards the Rivers Tintaya and Salada (Informe 144, p 24). These pathways are supported by geochemical considerations as well as the main groundwater flow documented in Annex 1 of Informe 144, page 265 and among others, the elements arsenic, copper, mercury and lead show up in downstream piezometer.
- The Ccamacmayo deposits are well documented sources for groundwater pollution at downstream piezometer stations PZ-01 and PZ-02 with high manganese concentrations, that are typically leached from suboxide zones.
- In addition to these examples, there is evidence that mining operators were actively creating unnecessary contamination pathways: Analyses showed that road materials consisted of mining waste, that is prone to further contamination of groundwater and streams (Informe 144, p. 20).

As mentioned, these are just examples of a large body of information documenting the cause-effect relations between mining activities and the actual and potential pollutions of aquatic water resources. Oefa provided additional evidence for lowering groundwater levels which lead to the disappearance of critical wetlands and the pollution of soil, vegetation with high levels of copper and of amphibians with selenium.

Next steps

The Oefa authority is commended for one of the most comprehensive and thorough environmental assessments this reviewer has encountered. The excellent insights into mining related water pollution at Antapaccay raises demands for additional study and coherent action in two fields

- There is a lack of official data on potential health effects for the local population. The Oefa reports show that a state-of-the art health impact assessment of the mining operations near Espinar is urgently needed.
- Proving cause-effect relations of mining-related water and soil pollution by Oefa can just be a first step. To bring the mining operations in this sensitive environment to international standards, best practices for tailings management, confinement and environmental restoration of the dump sites, improved mine-water treatment and recycling need to be implemented by the operators and critically monitored by public authorities. An inclusive dialogue with local population is now standard in many countries where mining operations are conducted in the vicinity of indigenous communities.

If needed this reviewer is happy to provide more detail on his insights of the Oefa studies and on options for improving water and tailings management



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