



Mercury pollution by mining activities in Rayo Rojo mining district, Apolobamba (Bolivia)

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In Bolivia, metal mining activities since historical times have been one of the most important causes of the environmental degradation. This is the case of the Natural Integrated Management Area of Apolobamba (Department of La Paz, Bolivia), where intense gold mining activities have been carried out from former times to present days, with very little gold extraction and very scarce mineral processing technology. In Apolobamba mercury is still being used in the amalgam processes and this might conduct to high Hg contents. Inhabitants of this area consume fish from lakes and rivers, and use the waters for the livestock, domestic use, and irrigation. The aim of this work was to evaluate mercury impact into the soil-plant-water system.

The Technical University of Cartagena, Spain, through the Research Group “Sustainable Use, Management and Reclamation of Soil and Water”, carried out a research, in the most intense affected gold extraction zones in Apolobamba, among them Rayo Rojo, where mining activity is mainly gold extraction, although the extracted mineral volume and technology used is low. Rayo Rojo is located in the central part of ANMI – Apolobamba (in the andean region), inside of Pelechuco municipality; the area belongs biogeographically to the Altoandina and Puna. This district, located in Apolobamba mountain-range, where altitudes above 5.000 m.a.s.l are reached.

Water, soil, sediment and plant samples were taken around the operations mining sites and total mercury analysed. Mercury content was determined by AMA-254 model, based on the thermal decomposition of the sample and collection of the Hg vapour on a gold amalgamator. The analysis is performed from solid samples without any further preparation. Samples are initially dried at 125°C and then thermally decomposed at the temperature of 550°C. Mercury vapour is then trapped on the gold amalgamator. AMA-254 method certificated standards were BCR 62-BCR 281.

Preliminary results show high Hg concentrations in soils (0.6 - 113.0 mg/kg). It stands out the high Hg values; in some cases surpass one hundred times threshold levels according to the Spain regulation (0.3 mg/kg); however, Hg levels in water present low values. Hg values in plants are above all reference values of other similar studies (0.1 – 0.6 mg/kg); roots present values between 1.0 mg/kg and 28.3 mg/kg while Hg concentrations of the leaves are between 4.0 and 17.3 mg/kg. The concentrations look higher in leaves than in roots mostly due to the atmospheric deposition.

The most polluted soils and plant are located in mercury burn areas with very high levels of mercury, where workers and population are in close contact with these soils without any type of protection. On the other hand, mercury coming from the mining processing plant is dumped into the rivers, where sediments are enriched in these metals. They could also be incorporated in their bio-available and soluble forms in the trophic chain, through the flora and the fauna so that further studies are needed and recommended.