# Contamination Mechanisms and Hazards of Mine Waste-affected Surface Waters on the Bolivian Altiplano

E. GUERRERO MORENO[1]*, K.A. HUDSON-EDWARDS[1], S.J. EDWARDS[2], G. ZAMORA ECHENIQUE[3] AND N. ALEM[4]

[1] Department of Earth and Planetary Sciences, Birkbeck, University of London, Malet St., London WC1E 7HX, UK. (*presenting author: elisaguerreromoreno@gmail.com)

[2] UCL Hazard Centre, Department of Earth Sciences, University College London, Gower Street, London, WC1E 6BT, UK.

[3] Ingeniería Metalúrgica y Materiales, Facultad Nacional de Ingeniería, Universidad Técnica de Oruro, Ciudadela Universitaria Zona Sud, Oruro, Bolivia.

[4] Centro de Comunicación y Desarrollo Andino, Avenida Tadeo Haenke No. 2231, Cochabamba, Bolivia.

Mine wastes are present on the Bolivian Altiplano in vast quantities as a result of several centuries of mining of metallic deposits (mainly Ag, Sn, Pb, Zn) that carries on today. This legacy, together with the relatively high prevalence of rudimentary artisanal mining techniques and the poor application of environmental law in mine waste disposal, has had, and continues to have, major impacts on river ecosystems and on the scarce water supplies to rural communities in this arid to semi-arid region.

This work aims to study the mechanisms and evaluate the hazards arising from the release of contaminants from mine wastes to waters in the north-east area of the Lake Poopó Basin. A considerable degree of diversity is observed in the mineralogy, geochemistry and grain size of tailings and river sediment from selected mining sites. However, both tailings and sediments are in general enriched in S and they have high concentrations of potentially toxic elements when compared to the regional background in this naturally mineralised area (averages of 170 mg/kg Cu, 795 mg/kg Zn, 1,015 mg/kg As, 8 mg/kg Cd, 1,400 mg/kg Pb). The generally low pH (< 4) river waters that are enriched in metals and metalloids may be formed by the weathering of mine wastes which are sulfide and sulfosalt mineral-rich, yet the conribution from natural thermal springs has to be considered.

The main mine waste-related water management issues facing affected communities and local authorities are the discharge of tailings directly to rivers and the high metal and metalloid concentrations and acid-generating potential of the tailings.