

**Use of Sustainable and Innovative Techniques for Heavy Metal Reduction in Andean
Water Streams Affected by Artisan Mining Activities
Case Study: Ponce Enriquez – Ecuador**

Mining activity in developing countries like Ecuador is mostly artisan. This type of mining is very invasive and derives in a series of environmental impacts, specially on water ecosystems. Rivers in the Andean region of Ecuador have been severely affected and degraded by mining activities. Acid Mine Drainage (AMD) is one of the biggest environmental challenges occurring in this part of the country due to direct discharge of mining residuals into water streams. Three rivers, Gala, Tenguel and Siete, located on the southern province of Azuay and nearby the mining district of Ponce Enriquez were monitored for this study. A total of 29 sites were selected and sampled among these rivers during two different times of the year, dry (december) and wet (february) seasons of 2015 and 2016 respectively. Physico-chemical parameters like pH, temperature, Disolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), nitrates, alkalinity as well as heavy metal concentrations were measured to enable the environmental characterization of the study area. Heavy metal analysis revealed high concentrations of Al, Cd, Cu, Fe, Pb and Zn in most of the sampled sites specially in River Siete which is one of the most polluted in the area. High concentrations of these heavy metals are considered to be very pollutant in water ecosystems and could be easily transferred to human beings through direct consumption of local fish and use of water for irrigation. Agricultural crops like cocoa, coffee and banana have been affected by the high concentrations of Cd in the water. This study is aim to find a sustainable mechanism for heavy metal reduction in water using biorremediation techniques and agricultural by-products like sugarcane bagasse.