

Catchment Management and Mining Impacts in Arid and Semi-Arid South America



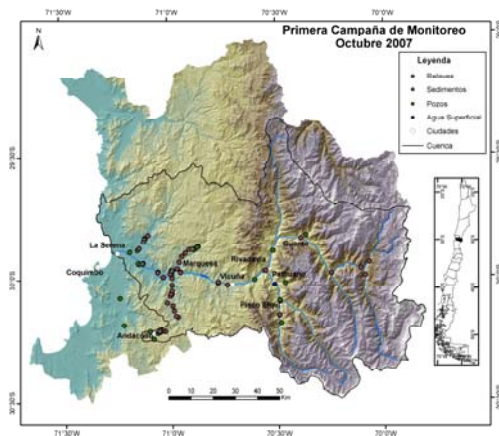
Project Brief 7

River-basin case study – Elqui River, Chile

Introduction

The CAMINAR Project is an initiative co-funded by the European Commission within the 6th Framework Programme. Its general objective is to contribute to the establishment of policy options, management strategies and technologies for the sustainable management of ecosystems in river-basins of arid and semi-arid South America which are subject to impacts from mining. Three pilot basins have been selected in the South American countries participating in the Project: Bolivia, Perú and Chile. In the Chilean case study, the considered watershed is the Elqui river basin in the Coquimbo Region.

The Elqui River Basin



The Elqui river basin was selected as the pilot basin in Chile for CAMINAR based on the following elements:

a) The presence of active mining operations (Talcuna-Quebrada Marquesa District), mines in closure phase (El Indio District), and growing mining activity (Andacollo District).

b) The availability of previous studies regarding water resources, environmental and mining issues.

Monitoring Campaigns

One aim of the case study is to complete the already available environmental information for the basin, in terms of both surface and ground waters quality, chemical composition of sediments (in both permanent and ephemeral creeks), tailing deposits. Also, the relationships between surface water and groundwater based on isotope data have been addressed. Three field campaigns have been carried out (November 2007, May 2008, December 2008). In each campaign about 50 samples of surface waters, 50 samples of groundwaters (mainly from the rural areas drinking water systems, "APRs"), and 44 sediment samples were collected. In November 2007, 14 tailing deposit samples were also taken.



Additionally, a preliminary survey and monitoring of macro-invertebrates as bio-indicators was performed in the Elqui river around the confluence with the Quebrada Marquesa gulch.



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River-basin case study – Elqui River, Chile (cont.)

Preliminary Results

The preliminary analysis of the available results show that, in the case of surface waters and groundwaters, there is a clear influence of the El Indio drainage area in the headwaters of the basin. These samples exhibit high Cu, Zn, Fe, As and SO₄. Also, groundwaters consistently show lower values of Cu, Zn, and Fe compared to surface waters.



With respect to the APRs and Andean rivers not affected by El Indio, the Cu, Zn, Fe, As, SO₄ and NO₃ levels are low, with the exception of NO₃ in some APR samples that are slightly higher than the allowed values according to the Chilean Drinkable Water Regulation. Finally, in the case of river waters and APRs in the Western part of the basin (Cordillera de la Costa domains), samples show low Cu, Fe and SO₄ contents. There are some moderate values of Zn, and NO₃ is high in selected samples of the Quebrada Marquesa (Talcuna District) area. Also, Na and Cl contents increase westward, near the coast.

Concerning the geochemical data on alluvial sediments and tailing deposits, the alluvial sediments display high concentrations of Cu, Zn, and, to a lower extent, of As (which is in agreement of previous studies in the basin). Also, the similarities between metal contents in alluvial sediments and tailing deposits are striking.



Regarding the use of bio-indicators of water quality, a preliminary analysis of the available results shows that there is no apparent effect of mining in the Quebrada Marquesa District on the water quality in the nearby Elqui river, in terms of macro-invertebrates communities. However, it is important to recognize the dry conditions of 2007, that did not allow surface water flows through the gulch towards the river. In any case, these results constitute a base line of macro-invertebrate communities in the Elqui river basin, information that is new for the area, a topic on which CONAMA (the Chilean National Commission for the Environment) has shown great interest lately.

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