

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



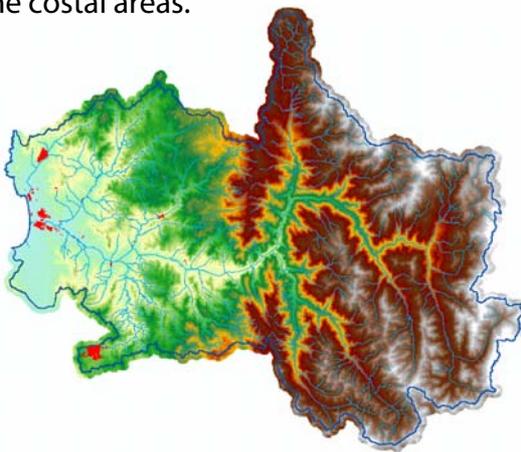
## Project Brief 11

### GIS (geographic information system) and DSS (decision support system) for the Elqui River basin, Chile

#### Introduction

CAMINAR has the aim of contributing 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, using Peru, Bolivia and Chile as 'demonstration' countries. One of the project's aims is to develop decision support tools to facilitate participatory water management planning.

The Elqui river basin (La Serena, Coquimbo region) is located between 29°35' and 30°20' of latitude S, with an extension of approximately 9.422 Km<sup>2</sup>. Average annual precipitation is 126 mm and temperatures range from an average of 0°C in the *cordillera* area to an average of 16°C in the costal areas.



Although climatic conditions correspond to an arid to semi-arid region, and in spite of the small water flow, the regularity of water courses in the valleys explain the development and concentration of human activities along the valleys.

#### Environmental Assessment



The main economic activities developed in the basin area are agriculture and mining.

Agriculture is mainly practiced in the Elqui river margins and main production is fruit, such as grapes for "pisco", and horticulture.

Major mining activity is represented by the mines of Andacollo, located in the south border of the basin, and San Jerónimo. Also, of particular relevance to the CAMINAR project, is the abandoned mine of El Indio, located in the upper northeast side of the basin, which stopped its production in February 2002.

Along with this more developed mining, there are several hundred other smaller mines, dispersed along the area, some of which of more artisanal nature.

#### Decision Support System

In the case of the Elqui River basin, the integration of water quality modeling applications was considered of particular interest for the development of a DSS, in order to assess the type and degree of possible contamination from either active or abandoned mines, considering both punctual or diffuse pollution sources.



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### GIS (geographic information system) and DSS (decision support system) for the Elqui River basin, Chile (cont.)

#### Decision Support System (cont.)

Nevertheless, the proposed system will be flexible enough to accommodate other types of assessment of the river basin, since different types of uses coexist in the area.

Agriculture is very important in the area, with intensive agriculture being practiced over large portions of the territory, using a well developed and intricate irrigation system. This type of economic activity has an impact on both water availability and water quality issues, and can't be discarded from the overall managerial process.



A successful effort was made in gathering and integrating historical information from climate time series, water flows,

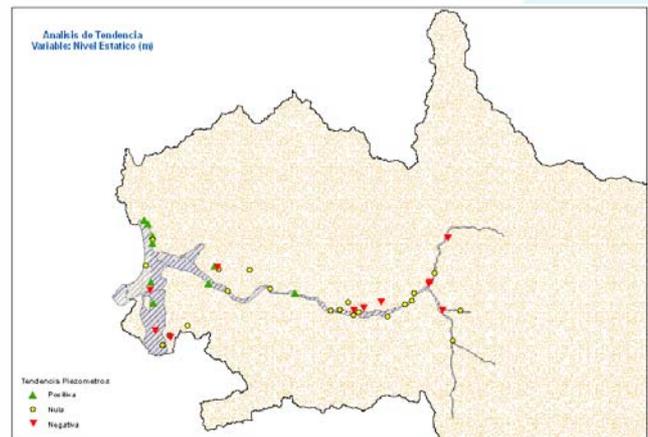
reservoir levels and water quality monitoring. This allows for a solid development of hydrodynamic models that can be used as a support for more detailed hydrochemical modeling.

Such models can be used to assess the effects of land-use changes, reservoir operations, point or nonpoint source contamination, treatment alternatives, or flow diversions, among others.

Another important aspect to be addressed by the system is integrated watershed analysis. It concerns the groundwater system present in

the adjacent basin of Pan de Azucar, located to the southwest of the Elqui, and where it is planned to develop a groundwater flow model.

This area presents a very intensive agricultural activity, and due to the nature of its geology, surface water is almost non-existent. In this case, most of the water supply is provided by a large number of wells that were drilled into the underlying aquifer.



Located in the Elqui River basin, the previously mentioned Andacollo mine is presently planning to obtain more water to sustain an increase in production, by extracting water from the Pan de Azucar aquifer, and transferring this water to their concession, in the Elqui basin.

Since presently there is limited knowledge to characterize this aquifer or to produce reliable estimates of its storage capacity and its dynamic behavior, there is a comprehensible concern that this might affect the groundwater availability to the irrigated lands in the Pan de Azucar area, thus impairing agricultural development.

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