

**USE OF A RIVER BASIN SIMULATION MODEL AND DECISION SUPPORT SYSTEM
TO EVALUATE WATER SUPPLY ALTERNATIVES FOR A PLANNED MINE EXPANSION
IN AN ARID REGION OF SOUTHERN PERU**

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ABSTRACT: A hydrologic study was performed in Southern Peru to evaluate potential development of water supplies to support expansion of the Cerro Verde copper mine. The study area is the Rio Chili watershed that supplies water for Arequipa, the third largest City in Peru, surrounding agricultural regions, and the mine. The system hydrology is very complex due to operation of multiple water supply projects, transbasin diversions, extreme annual variations in precipitation, and substantial unmeasured return flows to the river from municipal sewage and irrigation. Seven reservoirs comprise the regulated system to collect and store runoff from the Andes during a four month wet season. Water licenses have been issued for municipal, agricultural, and mining uses and the supply is nearly fully allocated. To assess potential remaining supply a river basin simulation model and Rio Chili Decision Support System (CBDSS) was developed for existing hydrology, infrastructure, demands, and water allocation principles using MODSIM to evaluate system operations, various water supply alternatives and long term reliability. The data-centered CBDSS simulated system operations for historical and stochastic hydrology, and included a graphical user interface and scenario manager. Implementation of the CBDSS facilitated refinements of the water accounting in the basins, especially improving the water accounting in the Lower Chili Basin where intense municipal, agricultural and industrial use of water takes place. The refined water accounting in CBDSS was used to estimate additional water available under the current water allocation policies. In addition, the CBDSS was used to evaluate a set of structural and non structural alternatives to supply the mine expansion water needs, including new reservoirs, current reservoir enlargements, lifting current storage restrictions through dam foundation surveillance/rehabilitation, conveyance infrastructure improvements, improved multi-reservoir operation policies and construction of a wastewater treatment plant. The proposed solution, which includes the construction of a wastewater treatment plant, factors in the mine expansion, the environmental benefits to the river system and the social acceptance. The CBDSS was used to evaluate impacts of the alternatives to water users in the basin and compliance with the current water licenses.