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Title of the work: TOWARDS MANAGEMENT AND REGULATION OF GRAVEL MINING IN URBAN AREAS OF SANTIAGO, CHILE: AN INTEGRAL ANALYSIS IN THE MAIPO RIVER

Overall project: Risk Habitat Megacity

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Last update: September 2009

Gravel extraction from a natural streambed combined with changes in water resource usage may induce modifications of a stream's sediment transport characteristics. Reduced transport capacity and river bed overdraft can bring a system off its natural equilibrium, resulting in decreased sediment replacement rates downstream from the extraction area, which in turn may affect civil works founded in the river bed, as well as water catchment infrastructure designed upon minimum river stages. In this work, we aim at understanding the relationship between gravel extraction and costs related to damages to existing infrastructure, as well as to shed light on the problem of defining desirable water and sediment extraction rates for the entire system by implementing an integrated resource management approach. A management model in the form of a mathematical programming problem, coupled with two sediment transport simulation models, are used to estimate the sediment production rates in the Maipo river (Central Chile). The models are calibrated using field data representative of current sediment and water use/extraction rates. The simulation model evaluates the changes in sediment availability due to changes in gravel extraction rates and water use upstream of the urban area of Santiago, and the management model is used to determine the expected costs due to streambed evolution, in order to find the optimal tradeoffs between different economic activities within the river system.

Keywords: Gravel mining regulation, Maipo River, Santiago, sediment budget, sediment transport.