

Impact of the Climate Change and Glacier Retreat on the Water Resources for Human Consumption in High Mountain Cities: Case of Bolivia

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The city of La Paz, administrative capital of Bolivia, is located at 3600 m a.s.l. with a population of one million inhabitants. An increasing migratory flow from the countryside has formed the city of “El Alto” (3800 m a.s.l.), also about one million inhabitants, that borders La Paz. In both cities, water supplies for human consumption comes from precipitation and the deglaciation of the Royal Cordillera. The dramatic glacier shrinkage of this Cordillera during the last 30 years and the modification of the precipitation patterns, as a result of the present climatic changes, is causing a loss of regulation capacity of the river basins. Applying remote sensing techniques and hydrological models, the sensitivity and vulnerability to climate change of the glacierized watersheds of Tuni-Condoriri and Huayna Potosí were studied. These catchments provide about 80% of water for human consumption and 90% of electricity to the cities of “El Alto” and “La Paz”. To quantify the glacial retreat, new tools in remote sensing were used as CBERS-2B or ALOS satellite images. A new aerial photogrammetric field campaign was performed in August 2009 over the Cordillera Real in Bolivia in order to quantify the water resource availability applying Digital Elevations Models and Hydrologic Models. The analysis of the water demands and supplies for “El Alto” shows a break in 2009, where the demand will surpass the water supply. This significant loss of water resources availability can jeopardize the hydrological, agricultural and energetical sustainability of the region in the next decades.