Climate Change versus Demographic Change: Impacts on Future Water Resources

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Water resources are under increasing stress worldwide. Climate change is often portrayed as a major driver of future water scarcity, but particularly in developing countries demographic changes may also have an important impact. In this study, we analysed the impact of both drivers on the evolution of water resources, and the consequences for water resources management in the tropical Andes. The entire set of models of the CMIP3 climate ensemble is downscaled and fed into a tailor-made regional hydrological model to assess future changes in runoff. The results of this model are routed through a regional water resources model in order to quantify water scarcity per capita for current and future population densities.

Taking the average of the CMIP3 climate projection ensemble, the impact of climate change on water resources is limited over most of tropical South America, as a result of a trade-off between increased precipitation and an increased evapotranspiration because of higher air temperatures. However, due to the dynamic and complex climate pattern over the Andes, global climate models have problems to represent local climate processes, resulting in large uncertainties in future projections. Spatial patterns are complex and in most places, uncertainty in model projections obfuscates trends.

On the other hand, demographic changes and their impact on water resources are much more straightforward and unequivocally negative. In highly populated areas such as the Ecuadorian and Colombian Interandean valleys, parts of the Peruvian coast and the highlands of Bolivia, they tend to surpass the impact of climate change, depending on the demographic growth scenario. In these areas, the impacts of demographic change should be the main focus of policy making.