

Drought management on catchment scale: indicators, tools and challenges. The Limarí catchment case study, Chile

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A natural drought is occurring when water availability is below normal conditions. Droughts sporadically affect any climatic zone worldwide. Another definition for drought is that water demand is exceeding water supply which can be attributed additionally to unsustainable water management and overuses.

As a drought risk can only be appropriately assessed by a good understanding of the natural hazard on the one hand and the vulnerability of the human and physical system on the other. Its complexity can only be understood by applying a number of tools investigating a set of indicators which need to be identified on each individual catchment scale.

At present Northern Central Chile is facing the longest and most severe drought period since 150 years. This has increased the awareness that there is still a strong demand for consistent long-term and short-term drought management measures and alert products to the stakeholders. These need to be based on reliable information about climate, hydro(geo)logical processes and water extractions.

Export oriented irrigated agriculture is the main economic sector in the Limarí river basin which entirely relies on the mountainous hydrology and cryosphere originating in the high Andes Cordillera. However, no hydro-meteorological information is available for the Cordillera above 1250 m of elevation. To improve the understanding of high elevation hydrology, climate, hydrogeology and snow processes, a distributed and a conceptual hydrological model were applied to two mountainous subcatchments at an elevation ranging from 1250-5500m. The modelling performance and calibration results were validated with high elevation climate monitoring, flow measurements, geochemical and stable isotope tracer and other in situ data collected during 2012 and 2013 in two Andean headwater catchments.

Despite decreasing water availability, there is an increasing agricultural water demand of perennial crops in the region which by far exceeds water availability especially in dry periods. The Recoleta irrigation system was analysed regarding its operational rules, irrigation efficiency and water losses. In the scope of two BMBF funded applied research projects “Web based River Basin Information system to support drought management in Northern-Central Chile” and “Increasing water use efficiency in the Limarí basin” (www.hidro-limarí.info; <http://leutra.geogr.uni-jena.de/limariRBIS/metadata/start.php>) both the basin scale water availability indicators and also the water extractions from agriculture were assessed with the aim to provide a web-based information system offering standardized and user-friendly information on climate, water availability and irrigation efficiency to the stakeholders.