

Management of Water in Snowmelt Dominated River Basins in a Changing Climate: What can science offer?

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Over one-sixth of the world's population, and one-quarter of the global gross domestic product, originates in river basins that are fed primarily by snowmelt runoff. The dynamics of these river basins are changing –as a result of a warming climate which reduces the natural storage in the snowpack, and as a result of population change (especially evident, for instance, in much of the western and southwestern U.S.), as well as changing land cover and land use. Methods of managing water that have been used in these river basins in the past – for instance, prediction of spring and summer runoff based on long-term measurements (and statistical models derived from them) of spring snow accumulation, are not likely to work as well in the future. On the other hand, new types of data are becoming available, including continuously recorded and transmitted observations of snow water storage, and satellite observations of snow cover extent and water equivalent. Furthermore, spatially distributed hydrologic models, which are able to ingest these new data through data assimilation methods, have the potential to change the manner in which water is managed in snowmelt dominated river basins. We review these new sources of data and modeling methods against the backdrop of evidence of climate and other large scale environmental change, and identify areas where future scientific and management advances seem most plausible.