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The changing water cycle: climatic and socioeconomic drivers of water-related changes in the Andes of Peru

Focus Article

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Water resources in high mountains play a fundamental role for societies and ecosystems both locally and downstream. Impacts of global change, including climate change, glacier shrinkage, and socioeconomic forces related to demographics, agroindustrial development, and hydroelectricity generation; pose new hydrological risks for human livelihoods. However, these hydroclimatic and socioeconomic drivers of water resource change are often poorly quantified and interconnected, while data scarcity poses challenges in these regions. Here we review the state of knowledge for two major catchments in the Peruvian Andes, which hold the largest tropical glacier mass worldwide: the Santa River (Cordillera Blanca) and Vilcanota River (Cordillera Vilcanota). Our integrative review of water resource change and comparative discharge analysis of two gauging stations in the Santa and Vilcanota River catchments show that the future provision of water resources is a concern to regional societies and must be factored more carefully into water management policies. In this context, observed hydroclimatic and socioeconomic changes represent important drivers of water availability, allocation, and conflicts over water resources. The legal framework and decentralized institutional architecture in Peru could potentially provide a basis for participatory integrative water management; however, unequal power relations, institutional fragility and increasing competition over water resources hamper these efforts. We identify several research gaps, including the need for more *in situ* data, cultural analyses, and a risk-based framework that combines climate-related hazards with human and natural vulnerabilities. Finally, this review suggests that future adaptation plans for water management should better link science, society, and policy. *WIREs Water* 2015, 2:715–733. doi: 10.1002/wat2.1105

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