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Title: How Formal and Informal Institutions Interact to Shape Watershed Management in the Colca Watershed of Peru

The Arequipa region of Peru faces significant challenges regarding sustainable agricultural, mineral and urban development in the context of climate change. Previous research identified a range of concerns such as water quality and food safety, glacial decline and future water supply, and conflict associated with mining. Formal and informal institutions in Arequipa have been evolving over time to address these challenges and concerns. Our study assesses the institutional landscape of water resource governance, particularly the synergies and conflicts between the formal and informal institutions around water at multiple scales. We focus on the Colca watershed of Arequipa, where a large-scale water development project named Majes 1 was implemented by the provincial and national government in the 1970's, diverting water from the highlands to irrigate downstream agriculture in the newly established city of Majes. Despite ongoing water shortages and increasing conflict in communities along the Colca river, a similar project, Majes 2, is planned to divert more water for additional agricultural development. We conduct semi-structured interviews with community leaders and national, provincial and regional water resource professionals, conduct participant observation of water practices among community members and of water management meetings among water resource professionals, and analyze documents from provincial and regional water-related agencies and organizations. Our preliminary findings suggest that regional water resource councils are the formal institutions that regulate water access, usage and quality, while local practices and oral traditions around water make up informal institutions within communities. We also find that while both formal and informal actors are aware of each other and some of the associated institutional arrangements, little collaboration and communication between the two occur. Furthermore, both formal and informal institutions are undergoing changes, but it is unclear how these changing institutions are (mal-)adapting to addressing complex water rights, development and equity challenges in the watershed. Our study contributes to a better understanding of how formal and informal institutions interact to shape water challenges on the ground, and identifies opportunities for formal actors to increase their knowledge of local practices to reduce local and regional conflict while addressing agricultural, mineral and urban development needs across landscapes.