

Climate Change and Water in the Andes

Conference held at the Hemispheric Institute of the Americas at the University of California, Davis, USA on 15 April 2009

From Newsletter of the Mountain Research Initiative, MRI News, No. 3, October 2009.

The Conference “Climate Change and Water in the Andes” brought together engineers, geographers, historians and anthropologists to discuss the dramatic disappearance of tropical glaciers. The talks emphasized the advance in scientific understanding of glacier retreat and its impacts, especially on water resources. They described the adaptation programs that are beginning to address this significant problem.

Ben Orlove (UCDavis) discussed glacier retreat in the Peruvian Andes. Worldwide, this process impacts physical and social systems in multiple ways. These impacts include the reduction in water resources, increases in geohazards, and the loss or deterioration of culturally significant landscapes. It is a great challenge for societies to adapt to this retreat, because the impacts are very different in nature and in scale, and because they are distributed unevenly in space and time.

A study in Cusco, Peru demonstrates the difficulties of adaptation efforts. Interviews with indigenous livestock herders shows that they live at fairly small social and spatial scales, concentrating on their own village and nearby villages. At the same time the herders dispose of a variety of temporal scales, looking at both the near and distant future, and are concerned about both economic impacts (principally water availability) and cultural impacts, since they hold mountains in great reverence. Interviews with NGOs, by contrast, indicate that they address broad social and spatial scales of entire regions, but focus on the near future of project cycles, and address only economic impacts. This mismatch of scale is a severe impediment to the cooperation that is necessary to both if they are to adapt to climate change.

<http://www.des.ucdavis.edu/faculty/orlove/orlove.htm>

Geoff Schladow (UCDavis) discussed the water resources of Chilean Patagonia under a changing climate. This region is unique because the principal anthropogenic stress on inland waters is the result of atmospheric deposition of global contaminants, and climate change. This makes the region important on a global scale for studying these impacts, free of the confounding local effects that dominate water resources in most countries. The impacts of climate change can be explored through analysis of stream flow records, sediment records, and archived satellite data and through the establishment of new monitoring programs. The impacts of climate change may already be evident, with GLOF (Glacial Lake Outflow Flood) events increasing in frequency in recent years. There is particular urgency to addressing these issues, as new anthropogenic stresses such as hydroelectric development may soon start having an impact on lakes in Patagonia. Water resources in Chile are distributed very heterogeneously, with the bulk of

the water present in Patagonia, and the demand for both water and hydroelectricity largely in the central and northern parts of the country.

<http://www.terc.ucdavis.edu>

Mark Carey (Washington and Lee University) noted that future climate change and glacier retreat will likely produce dramatic impacts on water supplies for people worldwide, especially in the Peruvian Andes. Although most research on this topic in the Andes focuses primarily on the science of environmental processes influencing water supplies, over the last half century the most influential factors affecting water use have been social, cultural, political, and economic. Water use on Peru's glacier-fed Río Santa has increased substantially since 1950 due to construction of a large hydroelectric facility and major irrigation projects. National and international government policies, such as neoliberal reforms and



Research at Glacial Lake Palcacocha, Cordillera Blanca, Peru (2003) (photo by Mark Carey)



Ritual pilgrimage to the snow-capped Andes in Cusco (photo by anthropologist Zoila Mendoza)

authoritarian politics, drove the development of these projects. Cultural beliefs and social relations, on the other hand, have compelled some communities to successfully challenge new reservoir construction. Human variables including government policies, technology, social relations, and cultural beliefs must be acknowledged to avoid simplistic or deterministic projections about future climate-glacier-water dynamics.

<http://home.wlu.edu/~careym/>

Walter Vergara (World Bank) noted that since 1970, glaciers in the Andes (Colombia, Ecuador, Peru, Bolivia, Chile, and Argentina) have lost 20% of their volume with serious immediate implications for water, power supply and ecosystem integrity in the region. The World Bank and many partner organizations are coordinating their strategies to address this problem. Key components include institutional strengthening, particularly in the area of supporting access to information and linking science to development; promoting carbon finance to maximize the value and synergies of carbon revenues by tightening the linkage between these resources and local environmental and social priorities; and supporting adaptation.

A regional project on Adaptation to Rapid Glacier Retreat in the Tropical Andes (Bolivia, Ecuador and Peru) addresses water supply (through the development of alternative sources, demand management and engineered storage), energy supply (through diversification of supply from hydropower sources), and agriculture (through promotion of

alternative crops and advanced irrigation systems). Also, under the Colombia Integrated National Adaptation Project, the World Bank supports the monitoring of glaciers and associated moorlands in Colombia, in order to characterize water and carbon cycle in moorlands (páramos), to estimate loss of water regulation function and carbon release caused by warming.

In cooperation with NOAA and the Japanese Space Agency, the World Bank also supports a regional effort for remote and field monitoring of the hydrology and climate in glaciated areas.

<http://beta.worldbank.org/people/vergara>

Jeffrey Bury (UC Santa Cruz) discussed some of the findings from his new interdisciplinary research focusing on glacier recession, hydrological change and human vulnerability in the Cordillera Blanca, Peru. Preliminary findings from the project, which includes glaciologists from Ohio State University and hydrogeochemists from McGill University, illustrate that rapid glacier recession in the Cordillera Blanca of Peru is significantly affecting hydrological processes in the region and generating new vectors of human vulnerability for inhabitants of the region. His presentation illustrated the ways in which glacier recession has begun to limit local household access to water, a crucial access for agricultural, livestock and tourism related livelihoods.

He argued that these recent changes and the risks that rapidly receding glaciers pose for new natural hazards events highlight the need for new planning and preparedness efforts in the region.

Finally, he suggested that the complex nature of shifts in vulnerability taking place along multiple vectors and across several scales of natural resource governance point to the need for new forms of adaptive governance that are flexible, responsive, transparent, and that enhance human capacity and resilience.

<http://people.ucsc.edu/~jbury/Current-ResearchProjects.htm>

Marisa Escobar and David Purkey (Stockholm Environment Institute) discussed a project that seeks to develop, test and demonstrate the utility of a glacier module in hydrological models that can investigate climate change impacts on water management regimes in Peru. Flows in glacierized basins are critical for Peru's hydropower production, the source of 71.6% of the country's total electricity supply. They presented a newly developed glacier module coupled to the WEAP (Water Evaluation and Planning System) hydrologic model to assess the relationship between climate and hydrologic change in the Río Santa basin in Peru. Their current effort seeks to understand the threat climate change poses to water managers in the Andes considering potential climate futures, the implications of these climate scenarios on the hydrology of the high Andes, and finally the ramifications of these changes on the productivity of current and future water management regimes. This chain of analysis permits the formation and evaluation of potential adaptations.

<http://sei-international.org/?p=staff&staffid=163>
<http://sei-international.org/?p=staff&staffid=118>

Authors

Ben Orlove, Environmental Science and Policy, University of California at Davis, bsorlove@ucdavis.edu

Jeffrey Bury, Environmental Studies, University of California at Santa Cruz, jbury@ucsc.edu

Charles Walker, Hemispheric Institute on the Americas, University of California at Davis, cfwalker@ucdavis.edu

References

Bury, J., and French, A., 2008. Adapting to Uncertain Futures: A Report on New Glacier recession and Livelihood Vulnerability Research in the Peruvian Andes. *Mountain Research and Development* 28 (3/4): 332-333.

Carey, M., 2010 (forthcoming). In the Shadow of Melting Glaciers: Climate Change and Andean Society. Oxford: Oxford University Press.

Orlove, B. 2009. Glacier retreat: Reviewing the limits of adaptation to climate change. *Environment* 51(3):22-34

Orlove, B., Wiegandt, E., Luckman, B. H. (Eds.), 2008. Darkening Peaks: Glacier Retreat, Science and Society. Berkeley: University of California Press.

Weblinks

<http://hia.ucdavis.edu/>

<http://glaciers.wlu.edu/> (Glacier Hazards and Society: Online Bibliography and Resources)

<http://Darkeningpeaks.blogspot.com>

<http://glaciers.wlu.edu/>

<http://home.wlu.edu/~careym/>