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Perspectives

How to cite:

Schur Petri, Emilie. "Promoting Health, Combining Climate Change: How the *Promontores de Salud* Netowrk in the US-Mexico Borderlands is Building Climate Resilience," edited by Katrin Kleemann and Jeroen Oomen, *RCC Perspectives: Transformations in Environment and Society* 2019, no. 4, 69–77. doi.org/10.5282/rcc/8854.

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Leopoldstrasse 11a, 80802 Munich, GERMANY

ISSN (print) 2190-5088
ISSN (online) 2190-8087

SPONSORED BY THE

Federal Ministry of Education and Research

Deutsches Museum

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

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Promoting Health, Combating Climate Change: How the *Promotores de Salud* Network in the US-Mexico Borderlands is Building Climate Resilience

The impacts of climate change, as scientists outline them, sound insurmountable. The National Climate Assessment of the United States classifies the impacts of climate change in the southwest region into five categories: declining snowpack and streamflow, threats to agriculture, increased wildfire, sea level rise and coastal damage, and heat threats to health.[1] Furthermore, these climate-related risks are unevenly distributed across the region and population, and those living within the US-Mexico borderlands are particularly vulnerable to the impacts of climate change. In this region, stretching 3,219 kilometers east to west and one hundred kilometers north to south, a hotter and drier climate is already resulting in a cascade of social vulnerabilities. These include increasing costs for energy and food, and greater demand for adequate healthcare, but it is water scarcity and increasing competition for water resources that are arguably the most salient concerns in this desert region, where a lack of surface water has created a historic dependence on groundwater.[2] Underground aquifers are now being depleted, as groundwater is extracted at unsustainable levels for agricultural, industrial, and residential use, and are not being replenished due to decreasing annual snowfall. In addition, climate change, together with human activities such as groundwater pumping and urbanization, aggravates levels of contaminants that naturally occur in groundwater basins along the US-Mexico border.[3] The threat of water contamination thus compounds the threat of water scarcity already experienced by people living in this region.

Climate scientists and social scientists alike argue that climate-change risks need to be addressed to protect both the environment and society. Yet overcoming these seemingly insurmountable challenges raises questions about how we can communicate complex

1 Gregg Garfin, Guido Franco, Hilda Blanco, Andrew Comrie, Patrick Gonzalez, Thomas Piechota, Rebecca Smyth, and Reagan Waskom, "Southwest," chap. 20 in *Climate Change Impacts in the United States: The Third National Climate Assessment,* ed. Jerry M. Melillo, Terese (T. C.) Richmond, and Gary W. Yohe, (Washington, DC: US Global Change Research Program, 2014), 462–86, https://doi.org/10.7930/J08G8HMN.

2 Margaret Wilder, Diana Liverman, Laurel Bellante, and Tracey Osborne, "Southwest Climate Gap: Poverty and Environmental Justice in the US Southwest," *Local Environments* 20 (2016): 1332–53, https://doi.org/10.1080/13549839.2015.1116063.

3 María Teresa Alarcón-Herrera, Jochen Bundschuh, Bibhash Nath, Hugo B. Nicolli, Melida Gutierrez, Victor M. Reyes-Gomez, Daniel Nuñez, Ignacio R. Martín-Dominguez, and Ondra Sracek, "Co-Occurrence of Arsenic and Fluoride in Groundwater of Semi-Arid Regions in Latin America: Genesis, Mobility and Remediation," *Journal of Hazardous Materials* 262 (2013): 960–69.

scientific knowledge to the communities most at risk and how to transform knowledge into action, as well as questions about climate justice. In this article, I will present a case study of two border communities suffering from groundwater contamination. Groundwater contamination in the US-Mexico borderlands is an example of a grounded climate-change risk where questions of environmental and climate justice are especially relevant, namely how to ensure that rights to access clean water are equitably distributed within and between communities, and that community members are recognized and included in decision-making on water management.[4] In addition, the process of tackling the problems caused by groundwater contamination involves negotiating between expert knowledge, technological solutions, and local action in communities. By themselves, neither scientific knowledge about climate change and groundwater contamination, nor decentralized water filtration stations funded by federal and binational development programs, had been successful in adequately communicating the risks or building resiliency. However, by partnering with a local network of community health workers, or *promotores de salud*, scientific knowledge was converted into community resilience through a process of identifying risks, communicating through community networks, and implementing appropriate solutions. This example may offer insights for how the inclusion of nonexpert voices in climate-change communication need not decenter science, but can connect it to sustainable local efforts that may be able to transform the hopeless list of climate-change impacts into grounded community action.

What Does Climate Change Look Like in the US-Mexico Borderlands?

Along the US-Mexico border, as many as 36 transboundary aquifers supply groundwater to meet agricultural, industrial, and residential demands.[5] However, the rate of groundwater extraction from numerous transboundary aquifers, particularly within the eight city pairs that straddle the border, is unsustainable. Unlike transboundary surface water, groundwater shared between the US and Mexico is not governed under any international treaty.[6]

4 Emilie Schur, "Potable or Affordable? A Comparative Study of Household Water Security within a Transboundary Aquifer along the US-Mexico Border," *Journal of Latin American Geography* 16, no. 3 (2017): 29–38.
5 Rosario Sanchez, Victoria Lopez, and Gabriel Eckstein, "Identifying and Characterizing Transboundary Aquifers along the Mexico-US Border: An Initial Assessment," *Journal of Hydrology* 535 (2016): 101–19, https://doi.org/10.1016/j.jhydrol.2016.01.070.
6 Stephen P. Mumme, "Minute 242 and Beyond: Challenges and Opportunities for Managing Transboundary Groundwater on the Mexico-US Border," *Natural Resources Journal* 40, no. 242 (2000): 341–78.

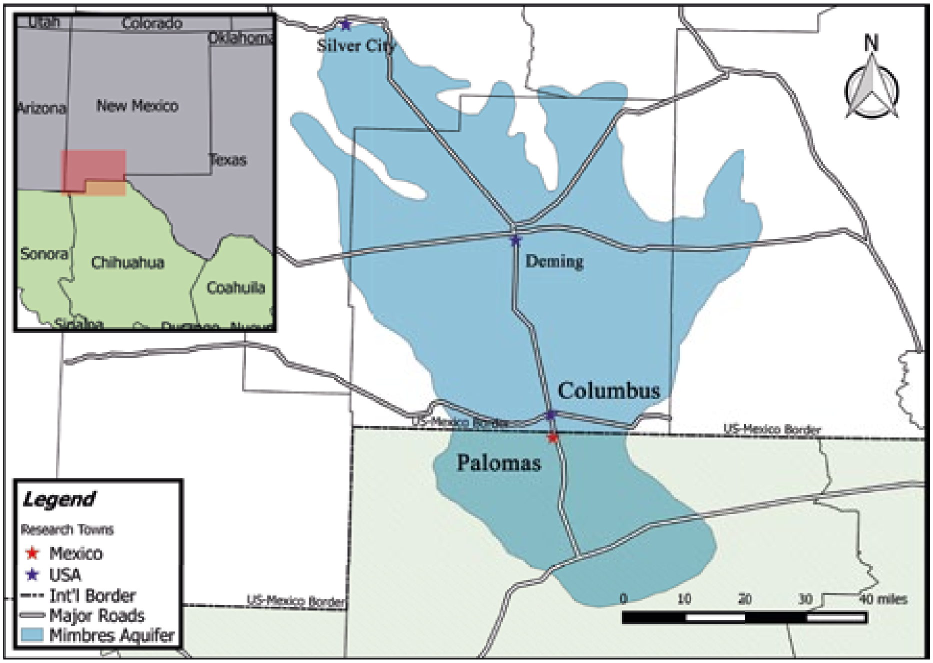

Figure 1: Map of Study Area: US-Mexico border towns Palomas, Mexico, and Columbus, USA, and their underlying transboundary Mimbres Basin Aquifer. Created by Carl-Philipp Petri.

Without a contractual route to co-manage transboundary groundwater, water scarcity and water contamination present ongoing threats to the population. The villages of Columbus, New Mexico, in the USA (population 1,625) and Palomas, Chihuahua, in Mexico (population 5,748) are particularly vulnerable to water contamination from their shared aquifer basin. Although the two towns are separated by the US-Mexico border they are intimately linked, particularly in their dependency on the Mimbres Basin Aquifer (MBA). The lifeblood of the MBA is the snow-fed Mimbres River, whose headwaters are in the Black Range on the Continental Divide. As the river flows south to the US-Mexico border, it disappears underground near Deming, New Mexico, to replenish and recharge the 13,313 square kilometer aquifer basin.[7]

Beginning roughly 50 years ago, as annual snowfall in the Black Range decreased and the groundwater pumping rates in the MBA began to fluctuate, the water quality at the terminus of the basin began to deteriorate rapidly. Water testing, dating back to the

7 John W. Hawley, Barry J. Hibbs, John F. Kennedy, and Bobby J. Creel, *Trans-International Boundary Aquifers in Southwestern New Mexico* (Las Cruces, NM: New Mexico Water Resources Research Institute, 2000).

1970s, revealed arsenic and fluoride in the groundwater at high enough concentrations to exceed the maximum contamination standards established by the US Environmental Protection Agency. The most contaminated groundwater in the MBA is consumed by the residents in Columbus and Palomas, presenting an ongoing public health challenge.[8]

Life in a Contaminated Aquifer

"My teeth are stained like the people who grew up in Palomas," a village council member in Columbus explained to me. "You can still tell," he admitted, pointing to his teeth. "It was very evident, all my life I grew up with the water problems." Arsenic and fluoride are the two most serious inorganic contaminants found in drinking water worldwide, causing health impacts like mottled teeth, brittle bones, skin discoloration, and cancer.[9] Boiling the water does not remove these inorganic contaminants; instead, the contaminated water requires a specialized treatment process like reverse osmosis (RO) filtration. In the RO process, contaminated water is pressurized and sent through a membrane filter, which discharges clean water and a concentrated brine. Although the government was aware of the water contamination as early as the 1970s, it wasn't until the early 2000s that both Columbus and Palomas received new RO technology and water/wastewater infrastructure to address water contamination.[10]

Despite these infrastructural improvements, both communities continue to suffer from water contamination. In Columbus, the local water utility adopted a centralized RO water filtration plant financed through federal and binational grants and loans, which improved access to clean water and reliability. But centralized water-filtration technology increased costs and reduced affordability in Columbus, which in turn affected that same access. In Palomas, the local water utility financed decentralized water, filtration stations through a binational grant, which inadequately resolved household water-supply contamination—with 61 of the one hundred households surveyed continuing to consume contaminated water.[11]

8 Janet Tanski, Adrian T. Hanson, Alfredo Granados-Olivas, and Zohrab Samani, *Water Quality Assessment Plan for Columbus, New Mexico, and Puerto Palomas, Chihuahua* (San Diego, CA: Southwest Consortium for Environmental Research and Policy, 1998).

9 "Arsenic Fact Sheet," World Health Organization, accessed 15 May 2017, http://www.who.int/en/news-room/fact-sheets/detail/arsenic.

10 Elaine M. Hebard, "A Focus on a Binational Watershed with a View toward Fostering a Cross-Border Dialogue,"*Natural Resources Journal* 40, no. 281 (2000): 281–340.

11 Schur, "Potable or Affordable?"

Thus, despite the technological improvements, households in both communities remain unevenly exposed to water contamination and costs. This example raises concern more broadly about how climate change impacts are communicated and moderated, which should be more finely attuned to climate justice. This will be discussed below.

Greater Recognition and Community Participation

Figure 2: Promotores de Salud Palomas Focus Group. Photo by the author.

One local initiative in Palomas could be the keystone to communicating the climate-change-related risk of groundwater contamination—the Promotores de Salud de Palomas. These community health workers are a group of eight women who promote health and wellness within Palomas using a wide variety of methods including nutrition and gardening workshops, home visits, health fairs, health surveys, and organized exercise events and classes. Since 2014, they have also provided basic healthcare services and counseling at their small clinic, which is financed through a mix of private and public funding.

The promotores are not unique to Palomas, but can be found throughout Mexico and the borderland areas of the United States. The broader promotores de salud network is an approach to cultivating culturally competent healthcare delivery, as the promotores serve as cultural brokers between their community and the formal healthcare system.[12] Within Palomas, the promotores play a crucial role in connecting the most vulnerable people in the community to care. As one Palomas promotora explained to me, "We have the pulse of the community, when something is wrong we know about it."

12 Emma K. WestRasmus, Fernando Pineda-Reyes, Montelle Tamez, and John M. Westfall, "Promotores de Salud and Community Health Workers: An Annotated Bibliography," *Family & Community Health* 35, no. 2 (2012): 172–82, https://doi.org/10.1097/FCH.0b013e31824991d2.

Early on in my research, I met with the promotores de salud to discuss the issue of groundwater contamination in Palomas. I learned from our focus groups that although community members realized something was wrong with their household tap water, they were unaware it was contaminated with arsenic and fluoride. I explained that a specialized filtration process is required to remove arsenic and fluoride, and that simply boiling tap water only concentrates these harmful contaminants. Based on their healthcare work in the community, several of the promotores voiced concern. They had observed that people typically consumed filtered water for drinking, but used unfiltered tap water for cooking. We decided to do a survey of one hundred households to better understand the risk of contamination.

After a month of survey work, we concluded that 61 percent of households continued to use tap water for cooking. Furthermore, 47 percent of households reported having a negative opinion about their overall water situation, which included complaints about water-related illnesses, the price of water, or the inaccessibility of the decentralized water filter stations.[13] When these results were reported to the local water utility, they seemed unable to mitigate the situation. Without an outreach program or the routine publication and distribution of consumer reports, they couldn't reach the community. "Our responsibility is to maintain the water filter stations. We can't make people use them."

Luckily, the promotores had other ideas on how to communicate to the community the importance of using the decentralized water purifying stations, particularly for cooking. They organized meetings with key stakeholders in the community—including representatives of the local government, the school board, and NGOs—where we discussed how to share the results with the broader community and incorporate educational activities into the different sectors of society. These include environmental education campaigns to raise awareness about proper water-treatment options led by the promotores and teachers, water-conservation workshops led by local NGOS, and rainwater-harvesting initiatives organized by community members. One US-based NGO, Border Partners, has also collaborated with New Mexico State University to develop an inexpensive and effective household water filter, which uses activated carbon.[14] Taken together, these initiatives successfully translate scientific findings into local community action and thus mitigate the effects of climate change.

13 Schur, "Potable or Affordable?"
14 For more on the work of Border Partners, see their website, http://borderpartners.org.

Conclusions

This article asks the question: How should we (scientists, researchers, academics) responsibly communicate climate change knowledge to communities most at risk and transform knowledge into action, and what is the role of science in the way we communicate climate-change-related phenomena? In the case study example, the lack of decision-making power given to the communities to choose their preferred water-filtration technology in Palomas and Columbus resulted in a technological mismatch. Although these types of top-down infrastructure projects are vital to building resiliency to climate change worldwide, without robust community networks to champion the initiative they fail to reach their full potential. Throughout the borderlands, more funding should be awarded to local initiatives and NGOs, in addition to infrastructure, to successfully integrate the projects and combat climate change risks.[15] Following the *Promotores de Salud* example, I propose a three-step model to enhance climate change communication:

1) Identify grounded climate-change risks: Climate-change projections are often too abstracted or too general for communities to respond and adapt to, such as projected increasing temperatures and decreasing precipitation in the borderlands. But, by surveying and interviewing community members in the field, the most salient impacts of these projections are more easily identifiable (such as water contamination in the case study).

2) Communicate through community networks: Instead of creating entirely new programs with external funding or limited contracts, researchers and scientists should support already existing community networks whenever possible (such as the unlikely partnership with the promotores de salud to communicate the risks of climate change).

3) Turn risk into resilience: If the risks of climate change are communicated through robust networks, this can lead to often simple, but powerful actions that build community resiliency (such incorporating the health impacts of climate change into broader community health initiatives).

15 Allyson Siwik, Elaine Hebard, and Celso Jaquez, "A Critical Review of Public Participation in Environmental Decision Making along the U.S.-Mexican Border: Lessons from Border 2012 and Suggestions for Future Programs," in *Southwest Consortium for Environmental Research and Policy* SCERP Monography Series No. 16, ed. Erik Lee and Paul Ganster, 105–44 (San Diego, CA: San Diego State University Press, 2012).

Alongside expert knowledge and technological solutions, this article argues that nonexpert voices are particularly powerful in communicating climate change risks and building resiliency within their communities. The approach of the promotores includes several initiatives, among them a broad wellness campaign—which now includes an education piece about cooking with filtered water—and a partnership with the NGO Border Partners to incorporate cost-effective rainwater harvesting systems or to install filters on water faucets so that large water users (like schools) can be connected to clean water without having to travel to the decentralized water stations.

The inclusion of nonexperts in climate change communication is not decentering science, but connecting it to sustainable local efforts. If we (scientists, scholars, practitioners, and researchers) prioritize fieldwork, we become better attuned to community priorities. By forging this connection to local networks, climate change risks can be communicated in a sustainable and trustworthy manner and solutions can become reflective of the values and preferences of the community. If we work toward these goals, there is reason to hope for climate resilience.

Suggested Further Reading

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