

# *Indigenous Communities Model*

## *How to Adapt to Climate Change*

Jorge Recharte

Translated from Spanish by Jesse Chapman-Bruschini

When the poisoned river ran red with heavy metals, people from Canrey Chico and nearby mountain communities didn't believe at first that climate change was to blame. These small villages in Peru are nestled in the Cordillera Blanca, a majestic mountain range that contains several of the highest peaks in South America. As the glaciers melted, metal-rich rocks were exposed to the air for the first time in thousands of years.



*Fructuosa Cruz by the Rio Negro near her village in Canrey District, Peru. (Photo: Simeon Tegel)*



The glacial meltwater washing over the exposed rocks carried metals such as lead, arsenic, cadmium and iron into area waterways, turning rivers like the Quillcay and Rio Negro a rust red. This contaminated both soil and water and posed a significant health risk. Over time, people, wildlife and livestock who drank the water became sick, and crop productivity plummeted.

As headlines of global climate change become more alarming, it's easy to forget that climate change is also an intensely local problem. Startling statistics announcing that the snowcaps of the Andes or Alps will disappear before the end of this century conceal the fact that hundreds of smaller glaciers in these mountain ranges have already melted

away, leaving a trail of devastation and threatening thousands of families' way of life.

In Peru, the government conducted a national inventory in 2013 and found that between 1970 and 2003, the nineteen Peruvian

**Climate change is an intensely local problem.**

mountain ranges with glaciers lost around 40 percent of their total ice surface. Some very large glacier ranges have already lost a third of their perennial ice, and some smaller glaciers no longer exist at all.

Silently, climate change has started to leave a trail of disasters in these mountains, and that has consequences for major lowland cities that rely, knowingly or not, on mountain ecosystems for food and water, agriculture and livelihoods. In a place like Peru, climate change adaptation begins in the mountains. And alpine communities are scrambling to find ways of adjusting to a new reality.

*This page: Guadalupe Beraun (middle) stands with other high-mountain villagers beside one of the ponds restored by a revitalized canal in 2013. (Photo: The Mountain Institute)*

*Opposite: Stones dyed red by iron and other minerals washed into the river from melting glaciers. (Photo: Simeon Tegel)*

In the remote mountain villages around the Rio Negro, that adaptation effort took a curious and innovative form. To restore the poisoned river water and contaminated landscape around it, villagers collaborated with scientists from The Mountain Institute and with academic specialists. With training, they built a water purification system that collects the acidic river water in small ponds. Then, using local traditional knowledge, they planted native plant species that could absorb metals from the water.

Involving the communities on the front lines of climate change in this way is vital to finding concrete solutions to local problems; the open dialogue and collegial relationship with the scientists empowered the

**The Mountain Institute**

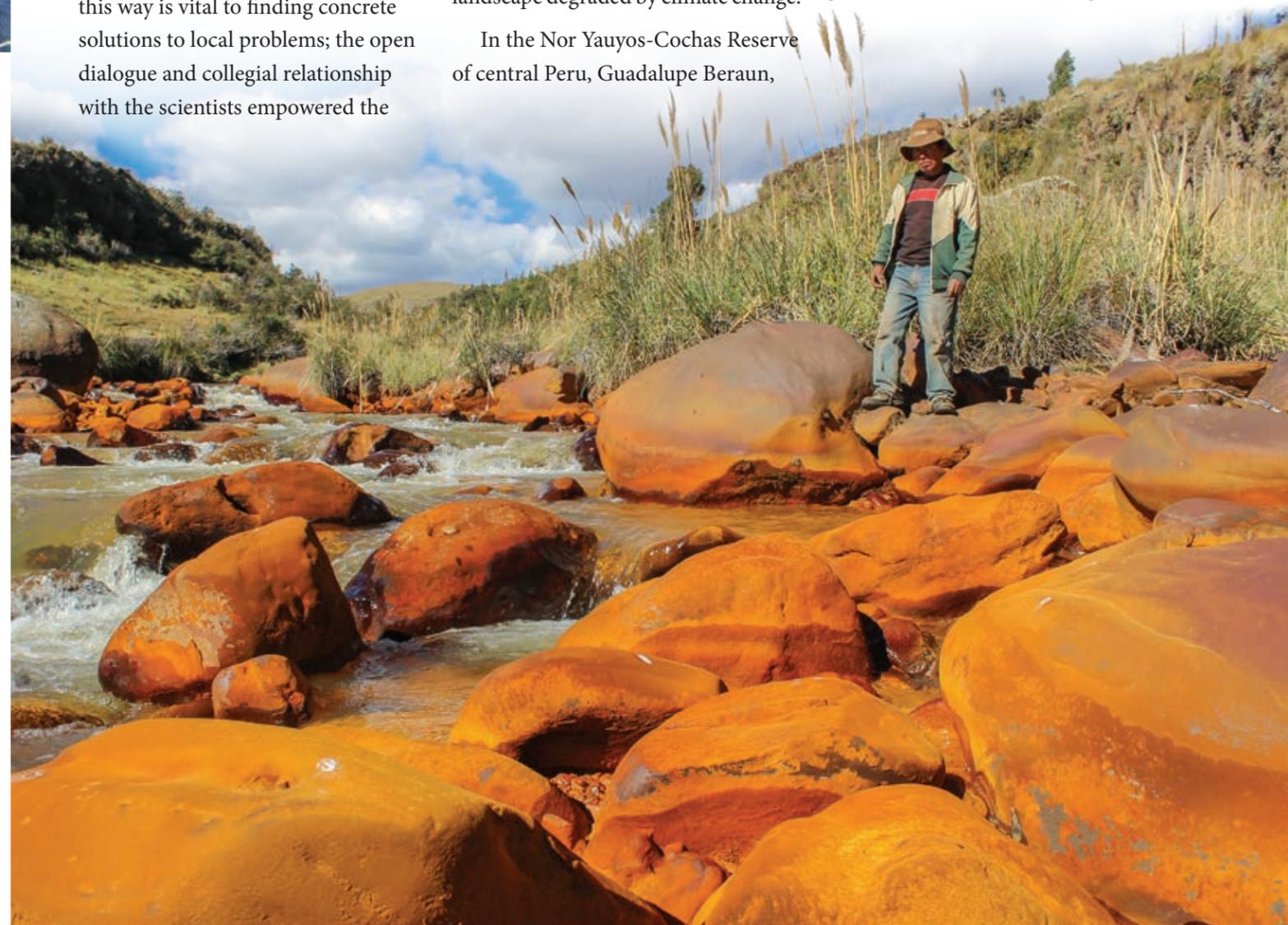
The Mountain Institute is an international nonprofit organization dedicated to sustaining mountain communities, their unique cultures and environments. Collaborative projects in the Andes and Himalayas, and the western US bring together local, traditional knowledge with the latest science to help communities adapt and become more resilient to the impacts of climate change. This signature approach to partnering with communities, which is participatory in all steps of the project, is key to creating sustainable solutions. Jorge Recharte is an anthropologist who directs the Institute's Andes Program and serves as Director for Global Strategy. [mountain.org](http://mountain.org)

local community, sparking a palpable sense of pride in both local traditions and scientific solutions to complex climate problems.

And it wasn't the only time traditional knowledge helped restore a landscape degraded by climate change.

In the Nor Yauyos-Cochas Reserve of central Peru, Guadalupe Beraun,

a wise and respected grandmother from the small village of Canchayllo, showed me around the parched pastures where her sheep and cattle used to graze. The mountain peaks towered darkly above us. A small glacier called Wacra used to glisten





llamas, also had to migrate elsewhere. I asked Guadalupe what these drastic, local changes have meant to her. She paused and said, “It’s changed my whole way of life. When I walk here now, I long to see vicuña in the grasslands, like before. I used to sing to them to show my happiness and gratitude to this place.”

**Glacial meltwater washing over the exposed rocks carried metals—lead, arsenic, cadmium and iron—into area waterways.**

there, a blinding white against the dark mountain and blue sky beyond. But year after year, it receded, finally disappearing completely around 1990.

Once the glacier was lost, the wetlands started drying up, and sheep and cattle had to be moved down the mountain to pastures that still had a few ponds. Wild vicuña, a relative of

Where Guadalupe lives, people have relied on glacial meltwater to supply their alpine wetlands and grasslands, known as the puna, for as long as anyone can remember. The puna ecosystem extends from around 13,000 feet to 16,000 feet, a belt of pastures above the tree line and below the glaciers. Traditional

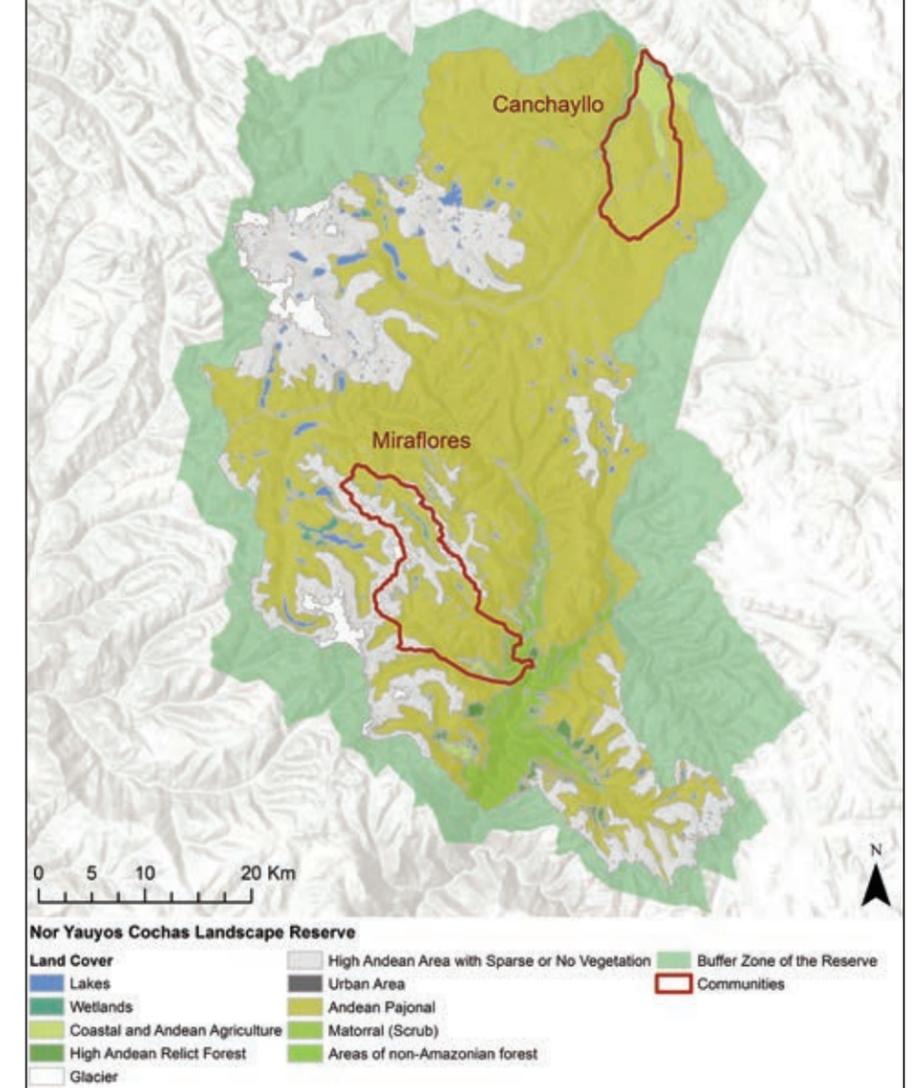
ways of making a living at this high altitude rely on a healthy ecosystem. Villagers raise sheep, cattle and alpaca and also shear wild vicuña for their valuable wool. Local farmers grow native potatoes and lesser-known tubers such as oca, olluco and mashua as well as corn, quinoa, broad beans, squash, fodder crops and much more.

Their food and water security has always depended on glacial meltwater.

As glaciers receded, dozens of villagers like Guadalupe left their highland pastures years ago and began to over-exploit grasslands at lower elevations. But those pastures, too, were only going to last a few years. Locals were well aware that the puna would continue to degrade, livestock would suffer, and the ecosystem itself would eventually collapse. A more permanent solution—a sustainable adaptation to climate change—had to be found.

Together with scientists from The Mountain Institute and the National Agrarian University in Lima, villagers from Canchayllo and nearby Miraflores planned a “back-to-the-future” solution. Instead of re-inventing the wheel, they chose to honor their ancestors’ impressive engineering by restoring ancient, local infrastructure that was used to regulate water in the puna.

The water management systems developed in ancient Peru involved a set of technologies designed to slow or retain water in high alpine territories. The purpose was to keep water available for use as long as possible in the dry season. These ancient systems included dams and reservoirs of different sizes, irrigation canals and large silt traps that kept soil from being eroded in years of intense rain. They also encouraged wetlands to develop. The excess soil in these silt traps could be “harvested”



and used in terraces in warm valleys below the puna.

Pre-Inca civilizations in the Andes maintained highland pastures with water technologies that slowed the movement of water through grasses and soils and provided a buffer against flooding and drought. Local wildlife flourished. A steady supply of water supported lush pastures and livestock, which in turn provided manure, used as fertilizer for corn, tubers, hard grains and the hundreds of potato varieties that are native to mountain valleys in the Andes.

Over the centuries, most of this infrastructure was abandoned. Today,

*Opposite, top: Wild vicuña, a relative of llamas. (Photo: The Mountain Institute); bottom: Wetlands in the Cordillera Blanca. (Photo: Elmer Segura) Above: The Nor Yauyos Cochis Landscape Reserve in Peru. (Map: Anaïs Zimmer)*





older villagers remember only some of the locations and uses. The social and demographic collapse of indigenous cultures after the Spanish conquest of Peru in 1532 helps explain why these ancient socio-technological systems decayed. In more recent times, glacier retreat, changes in precipitation, loss of local labor and shifts away from traditional herding and farming practices have all contributed to the abandonment of this infrastructure and the degradation of the puna ecosystem.

But that's starting to change. Villagers and scientists worked together to restore some of the ancient canals, and the wetlands

began coming back to life. Cattle and sheep graze once again in revitalized highland pastures. The approach once again produced a strong sense of pride that traditional knowledge was being used to enable the community to become more resilient to the impacts of climate change.

The disappearing glaciers of the tropical Andes are our preview of what climate change has in store for mountain communities as well as the millions of people in lowland areas whose livelihoods depend on high-elevation ecosystems. We must prepare in our own regions by following the lead of these mountain people and learning from them as agents of change. We should pay close attention; mountains near the equator are our canary in the coal mine. They are the Earth's "thermometer"—an early indicator of a planetary fever.

I am hopeful and inspired by the mountain communities that live at the foot of receding glaciers. Their creativity, tenacity and resilience come from their deep trust in nature and their kinship with the mountains that surround them. They can teach all of us how to start adapting to a future without glaciers.

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Previous page, top: Guadalupe Beraun in community workshop. (Photo: Elmer Segura); bottom: Inauguration of canals in the community of Canchayllo. (Photo: Aneli Gómez)

Above: Guadalupe Beraun with alpine flowers. (Photo: Elmer Segura)



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