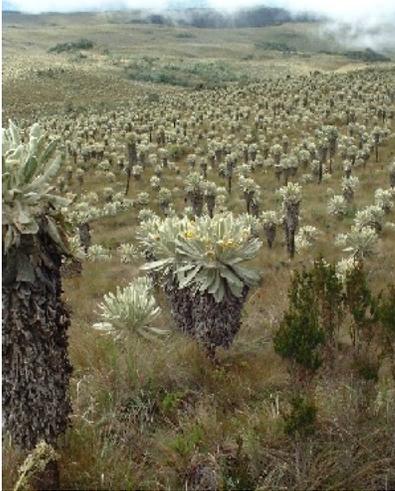


Water Management in Ecuador's Andes Mountains



El Angel paramo in Ecuador's Carchi province. (Photo courtesy of UBC)

In the countries of the Northern Andes, there is a unique ecosystem that starts at 5,000, at the edge of the glaciers that cap the mountains, and runs down to about 3,600 m. The landscape of these high, treeless, plateaus — known as the paramo — is dotted with plants and shrubs uniquely adapted to the cold night temperatures and high levels of ultraviolet light . But most unusual about the paramo is its soil. Black, peaty, volcanic in origin, the soil of the paramo functions like a sponge — it absorbs and holds water moisture from rain, mists, and glacial thaws, slowly releasing it.

Irrigation canals bring water from the paramo down to the populations living below — and have done for centuries. Virtually all of the water systems in the Northern Andes rely on the paramo as a source, and regulator, of water. Yet, perhaps because of its remote location, the paramo is one of the least understood ecosystems in the region. It is only as the Andean countries become increasingly dry that attention is converging on this high altitude water supply.

In Ecuador's Carchi province, home to a paramo of about 45,000 hectares, conflicts over water are common — and so is water theft. Farmers are illegally pumping water from canals in the dark of night in order to irrigate parched fields of crops. One municipal government was diverting water into its reservoirs to service its growing population. By the time the water reaches those farmers living at the lowest elevations — the ones who are most poor — it has been reduced to a mere trickle. Many farmers are simply forced to leave the area, becoming "thirsty migrants". Elsewhere in the watershed, disagreements over water have come to violence.

In the face of such shortage and conflict, has come the call: tap more water from the paramo.

The drive for alternative solutions

But the paramo is a delicate ecosystem. Once the soil dries, it becomes hydrophobic: instead of absorbing water, it repels it, inducing an uncontrolled downward flow of water. In addition, paramo soils store more carbon than the rainforest. Should the soil structure be

seriously damaged, this carbon starts to decompose and is released in large quantities into the atmosphere.

And so, in the El Angel watershed in Carchi province, there has been a concerted effort to find alternative ways to solve the problems of water shortages, driven largely by a research team working on a project known as Manrecur. Their work is supported by Canada's International Development Research Centre (IDRC) among other donors.

"Rather than destroying the paramo trying to build dams," says Susan Poats, Manrecur's lead researcher, "what we're saying is: let's work on the social and organizational aspects of water. Let's use water more efficiently. And let's deal with the fact that people who live in the upper part of the watershed are stealing the water from those who live at the bottom of the watershed."

And in fact, information the research team has generated has helped create a chain reaction that has seen a conflict over water between two municipalities resolved; a new approach to the allocation of water being taken in the area; a growing popular movement among local people in favour of protecting the paramo; renewed interest in improving irrigation infrastructure; and a slight, but significant, budge in the region's entrenched power dynamics.

In essence, Manrecur is aiming to define a cluster of solutions that could cumulatively resolve the problems in the watershed, without risking irrevocable damage to the paramo.

The El Angel watershed

The watershed of the El Angel River, located in the North of Ecuador, affects an area of about 100,000 hectares, and is home to some 25,000 people. The river is fed by a paramo contained in the ecological reserve that borders on Colombia. The watershed is comprised of three distinct ecological zones: the upper zone (3,100 m to 4,100 m), the mid zone (2,400 m to 3,100 m), and the lower zone (1,500 m to 2,400 m).

In the upper zone, where the soil is richest and the weather humid and cold, are found the large farms and rambling country homes of the hacienda owners — along with smaller-scale farms. This is where potatoes are grown and cattle raised. In the mid-zone, which is semi-humid with moderate temperatures, less wealthy farmers grow corn and other grains. There are also several flower farms in this zone. In the semi-arid, hot, lower zone the farmers are poorest. They grow tropical crops that require the bare minimum of irrigation.

There are three municipalities in the El Angel watershed, none of which has all its territory inside the watershed. Espejo in the upper zone, Bolivar at the left border and Mira at the right border. An irrigation network comprised of hundreds of kilometers of canals brings water to the three municipalities. These canals, many of which are more than 100 years old, are primarily managed by water users' associations. Water is allocated to users in terms of water concessions established by the State. Applications for new concessions or changes are made to a local water judge, who works for the national government.

Uncovering hidden problems

The research team's starting premise was that they needed a clear and detailed picture of how life in the watershed functions. Without this baseline data, they did not believe they could bring into focus ways of addressing the problems that were ultimately hindering development. They took the watershed as their unit of analysis and gathered data on the geographic, environmental, social, and productive characteristics of the area. They didn't just focus on the poor: they took into account the rich, the urban, and the powerful. Small- and medium-scale farmers were interviewed, but so were hacienda owners, shop-owners, and members of the government involved in working in the area.

The research team then took a close look at water flow to discern the reasons why water wasn't coming down to the lower zone at the rate it should. "In the community of Yascon, for example, they should have 55 litres per second, but the average is 15 litres per second. And they spend weeks at a time with no water at all," says Poats.

Manrecur's researchers analyzed water concessions, for example, finding that of the 233 concessions granted in the watershed, a privileged minority (close to 4%) had concessions for quite large volumes of water: more than 100 litres per second. Moreover, there were nine people who had very large concessions for 1,200 litres per second — or more. By way of contrast, the vast majority of concessions (60%), allocated significantly lower volumes: 0.02 to 10 litres per second.

"Conventional wisdom [among upper zone farmers] was that people in the upper zone did not have access to as much water as those in the lower zone — and so stealing was justifiable." However, eight of the nine people with very large water concessions live in the upper zone, and Poats says conventional wisdom among farmers is starting to change.

Researchers also examined the water flow through the canals, finding very significant losses in the conduction and transport of water. But one of their more far-reaching findings was that the official data on the volume of water flowing through the watershed no longer reflected reality.

Action based on new data

According to official data, the total supply of water was more than enough to meet the total demand. But Manrecur's research revealed there was a water deficit. It was illuminating information for the water judge, Pedro Loyo.

"There is this amount given in the official data: 230 litres. So 230 litres have been adjudicated, but in reality, according to Manrecur, the irrigation area is only receiving about 50% of this amount of water." Based on this information, Loyo decided to put a freeze on granting any new concessions. "Otherwise, it is like giving a cheque with no money," he explains. "I don't want to cheat people."

The decision had a ripple effect.

Municipal conflict

There was a municipal government, Espejo, that had been illegally diverting more water than it was entitled to into its reservoirs to meet the needs of its growing population. It was stealing, but the government didn't see it as serious. As Poats says: "Everyone who steals water out of the canal says: 'Oh: I'm just taking a little bit. There's still plenty of water.'"

However, without legal title to an increased volume of water the government could not move forward with planned development projects for potable water. So government officials entered into a dialogue with the municipality downstream. They reached an agreement whereby the municipality in question would have access to an increase in water. In return, the two municipal governments agreed to join forces to address the problems of stealing elsewhere in the watershed — and to work together to solve problems related to water supply.

They began working together to develop plans for rehabilitating an old reservoir that was built in the municipality of Bolivar during the 1960s. They worked together to develop the proposal and secured funds from an international donor to hire a local contractor (secured through public tender) to undertake the work. Their aim is to bank water in the reservoir during the wet season so it is available for use during the period of greatest shortage, in the

summer. They will also bank some water at night for use during the day. Espejo is making an in-kind contribution to the project equivalent to approximately CAN\$15,000.

The Carchi Consortium

The opportunity for dialogue between municipal governments arose at a monthly environmental forum known as the Carchi Consortium. "We used the Consortium as a space," explains Poats. "It wasn't like bringing the conflict into the Consortium: [as in] Now we are going to talk about the conflict! No, it was more around the edges." In fact, conversations between municipal representatives started during the coffee breaks of the Consortium meeting.

The Consortium is actually one of the few spaces where people from all parts of the watershed come together. In its beginnings in 1994, the Consortium was attended mainly by researchers, government representatives, and development workers who came together to discuss and coordinate their work. But it has since developed to attract a lively following within the community, and has a locally staffed office in the town of El Angel. At least 50 people attend each meeting — although the mix of people varies from month to month. Farmers, students, teachers, shop-owners, members of water associations, and women's groups are among the people who attend. The topics discussed at the meeting run the gamut but have a focus on natural resources.

"A lot of people come — I don't know if its that they're addicted to it — but it's a forum," says Poats. "There aren't many places or events in Carchi that deal with natural resources. There's no learning space. And so there are people who come because they want to learn. There are people who have just gotten used to it; its become part of their life." And, likewise, the local office for the Consortium has become a part of the community, often involved in community happenings: from celebrations to funerals.

People and the paramo

As a result of the Consortium meetings, people have begun thinking in terms of the watershed as a interconnected system on which they all depend. "Before, years ago, most people didn't know what a watershed was," says Paul Arellano, a researcher working with Manrecur.

In particular, there is an increased awareness of the paramo. "We continually harp on it," says Poats, "practically ad nauseam. And we've had many different meetings that have focused on different aspects of the paramo." Moreover, she adds, a management plan has been developed for the paramo involving local stakeholders, who in turn have become powerful spokespeople.

"In the past, people didn't talk about the paramo. Now, wherever you go, when you talk to people who are involved in the water associations, they are much more aware. This awareness is moving to: okay what are we going to do?"

Poats adds that this awareness has extended to hacienda owners: and one or two of them have become allies of the project.

A way forward

As the mayor Espejo municipality, Renan Flores expressed it: "The research of Manrecur has allowed us to think in a more community based way and to focus on making an investment in the 'sponge of water' [the paramo]."

"Now we are living in a world crisis [with respect to water]. If we don't invest in protecting and taking care of our water resources, in five years it will probably be finished," he adds.

There has been movement in the watershed toward improving the water infrastructure. As the water judge, Loyo says, "I have used the information from Manrecur and my own understanding as a civil engineer. Together, working with the project, we can see what we can do to rehabilitate the area — to improve the canals and the reservoirs."

Moreover, the municipality of Mira has secured funding to undertake a feasibility study for building another reservoir just below the paramo. The long-term idea, says Poats, would be to build a canal that would connect the two reservoirs.

In collaboration with a non-governmental organization and with support from various donors, the Manrecur research team is setting up a paramo research station in the upper zone. It will become the first climate monitoring station in Ecuador. A pilot project is also being launched to develop a community based approach that could be used to manage the entire paramo.

Ultimately, Manrecur is hoping that solving problems in the watershed will help to fundamentally improve people's lives. "We are looking at water," says Poats, "But we are looking at it in terms of the entire watershed to see: why does this watershed not develop? Why are people poor here? Do we want to simply alleviate poverty — or do you find a way to eliminate it by creating new platforms for people to operate on. That is what we are dealing with here."

Lisa Waldick is the editor of Reports magazine.

For more information:

Simon Carter, Team Leader, MINGA, IDRC, 250 Albert Street, PO Box 8500, Ottawa, Ontario, Canada K1G 3H9; Phone: (613) 236-6163 ext 2562; Fax: (613) 567-7749; Email: scarter@idrc.ca

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