

## As Himalayan Glaciers Melt, Two Towns Face the Fallout

*For two towns in northern India, melting glaciers have had very different impacts – one town has benefited from flowing streams and bountiful harvests; but the other has seen its water supplies dry up and now is being forced to relocate.*

BY DANIEL GROSSMAN · MARCH 24, 2015

Recently, Buddhists at a nunnery in Zaskar Valley, a 30-mile-long alley of gray stone high in the Himalayas of northwest India, took the unprecedented step of planting an apricot tree. The valley is known as a “cold desert,” because just half an inch of rain falls a year. Temperatures in Zaskar’s highest villages drop to 40 degrees F below zero during long winters, and heavy snowfall shuts down the road linking the valley to the rest of India. Yet, to the surprise of nearly everyone in this valley of 14,000 people, the tree blossomed and then bore fruit, finally convincing local residents, who are mostly farmers, that the valley is gradually warming.



Without the water once supplied by a glacier, the Himalayan town of Kumik is now planning to relocate. DANIEL GROSSMAN

It’s not just the unusual fruit tree that has signaled a change in the climate, however. Milder weather has reduced snowfalls, stretched out the growing season, and pushed up the sowing date of fast-growing wheat, barley and lentils. Now seeds are planted in May, a full month earlier than before. Harvests are becoming a bit more reliable, too. But warmer weather has also eroded glaciers that loom thousands of feet above the valley and which provide a crucial source of water to the farmers’ irrigated fields. Accelerated melting has swelled some streams beneficially, meaning more water for some. Elsewhere, streams have dried up with dire consequences for others living in this isolated valley.

Global warming is often presented as a two-edged sword, with winners and losers. For those on the leading edge of climate change, like those in Zaskar Valley, that has proven to be the case. What is happening in this high-altitude farming region

mirrors other extreme spots, where climate change is quickly altering the environment and the lives of those who live there.

About 400 million people around the globe rely on mountain glaciers for a portion of the water they drink and use in agriculture. But, with few exceptions, rising temperatures are shrinking ice on every glaciated range on earth. In its most recent “State of the Climate” report, the American Society of Meteorology stated that in 2012, the glaciers of the world lost more mass through melting than they gained from snowfall for the 23rd consecutive year. The rate of loss is accelerating decade by decade.



A map showing Kumik and Stongde, and the glaciers on which they have depended for water.  
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This future poses a direct challenge to Zaskar’s 25 villages, most clinging to mountain slopes rising above the Zaskar River and its two primary tributaries. Residents take water from streams tumbling directly off glaciated summits. In Stongde, a village of about 700 people, the warming climate has led these mountain streams to flow more heavily, improving access to irrigation and swelling harvests. But in Kumik, a slightly smaller village two miles away, farmers have watched in despair as their water supplies slowed to a trickle and then dried up altogether. As a result, they’re being forced to relocate.

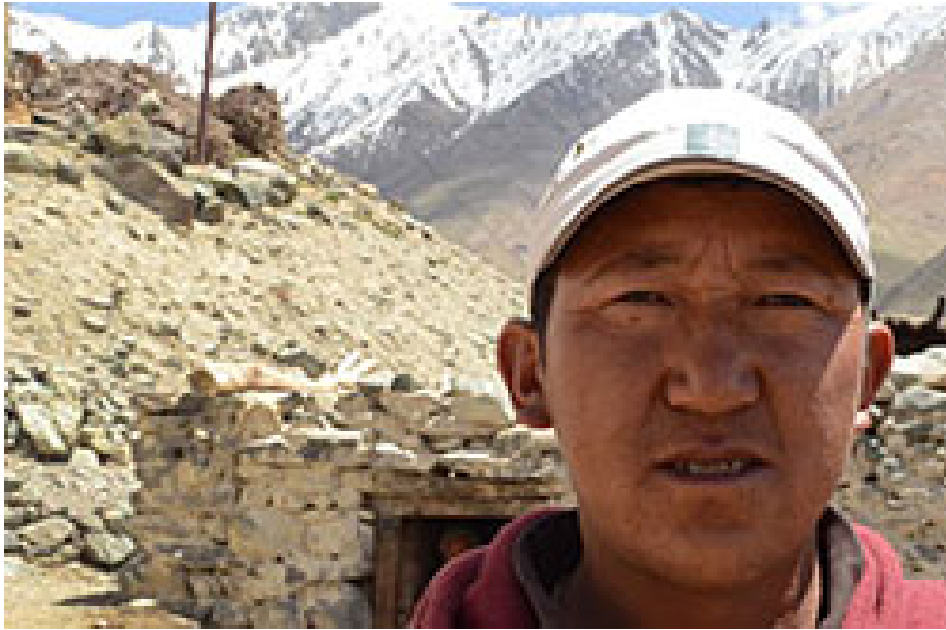
Carey Clouse, a professor of landscape architecture at the University of Massachusetts, has visited the Zaskar Valley twice, to help lay out the new town. Kumik, she said, has “much to teach the rest of the world about adapting to a changing climate.”

Thirty or forty years ago, when he was a child, local school headmaster Tashi Stobdan recalls the stream called Kumikthu flowing right through the center of Kumik. The torrent ran down from a glacier, 19,000 feet above sea level, cascading through a v-shaped ravine. It emerged from folds of the valley wall at a broad alluvial fan, where Kumik lies. Swelled with snow melt, Kumikthu could hardly be forded all summer. To get to school, Stobdan says, he balanced himself on large flat stones covered over by gushing water.

Stobdan says his mother recalls that when she married about 45 years ago, the glacier hung above the town, like a wide, glistening-white mantle. But in the intervening years, the ice disappeared, revealing a vertical face of eroded dusky stone. The town’s water supply of melted snowpack continued to renew each spring, but, with the retreat of the glacier, the flow ebbed.

Then in the summer of 1998, for the first time in memory, Stobdan says, Kumikthu dried up completely. So a team of men, including Stobdan, trudged up the gully above town to investigate what had happened to their stream. Straining to reach the summit, they saw that the glacier had retreated completely off the sheer headwall overlooking Kumik. They crossed to the backside of the mountain, where water dribbled off the tattered remains of the glacier. The precious ice-coated mountaintop patch was only slightly larger than the built-up area of tiny Kumik

itself, and the runoff was flowing in the wrong direction – away from town. They saw no way to channel the water back around the mountain.



School headmaster Tashi Stobdan says the loss of water has made Kumik even poorer. DANIEL GROSSMAN

“From that time, we have many, many problems,” Stobdan says. Pastures turned brown. Shepherds could no longer feed their cows, sheep, and yaks. Without water, crops failed to grow. “Our village is the poorest one in the Zaskar Valley,” says Nawang Phunchok, the previous headmaster of Kumik’s school. Now, he adds, it’s even poorer.

Mauri Pelto, a glaciologist and professor of environmental science at Nichols College in Massachusetts, has studied recent and archival satellite photos of the glacier, which sits on the mountain above Kumik. The glacier shrank by about 30 percent between the mid-1990s and 2000. Pelto, who represents the United States at the World Glacier Monitoring Service, says the side of the glacier draining toward Kumik no longer exists. But Shila, a town far downstream of the glaciated backside of the ridge, receives a plentiful glacial flow. Zanskaris have a refrain that explains Kumik’s misfortunes: “The glacier is on Kumik, and water is going to Shila.”

While no scientist has published temperature measurements for Zaskar Valley and long-term regional meteorological records are not available, the evidence of gradual warming is unmistakable. Shakil Romshoo, an Indian glaciologist who heads the Earth Sciences Department at the University of Kashmir, said glaciers are receding all over Jammu and Kashmir, where Zaskar is located. A 2014 report found that about two-thirds of 212 glaciers in Zaskar had receded between 1962 and 2003. They had lost 8 percent of their area. Professor Romshoo said in an email that “global warming/climate-change is the dominant factor responsible for their recession.”

Concerned residents approached government agencies more than a decade ago, and the authorities eventually granted Kumik land for a new town, Lower Kumik, about a mile away and several hundred feet below the old town. The government

then paid residents to dig a five-mile canal that channels water from the Laknak river, a tributary of the Zanskar, to the new site.

## Some older Kumik residents are refusing to relocate because of their ‘spiritual relation with this place.’

Today, a pair of unadorned concrete pillars, each sprouting a bloom of rusted steel rebar, flank the entrance to the town’s new site. Dust swirls around several dozen stone and concrete homes in various states of construction. About one-third of Kumik’s inhabitants now work the land here. Seven families just completed their first winter in the new town. Phunchok, the former schoolteacher, says some of Kumik’s older residents are refusing to relocate from their ancestral home, because of their “spiritual relation with this place.” He doubts that the new canal will carry enough water for everyone.

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Just down the valley from Kumik, the Stongde Monastery, a cluster of multi-story, whitewashed, cobble and adobe buildings strung with colored prayer flags, perches on a promontory overlooking the Zanskar River. Several dozen Buddhist monks dressed in burgundy robes and orange-wool caps pray in the 11th-century complex. From their windows they can see the stone walls partitioning the now-abandoned pastures of Kumik a short distance up the valley. But if they gaze down, just below their compound, they can see the emerald grain and vegetable plots of Stongde, one of Zanskar’s wealthiest farm towns. Fine, silver lines—irrigation canals sparkling with water—spread like tendrils and weave circuitously about the village.

About 10 years ago, Palden Tsering—the sarpanch, or headman, of Stongde—realized that by harnessing the water emerging from the town’s creek more efficiently, Stongde could improve harvests.

He and other villagers had noticed spring was coming several weeks earlier than in the past. This observation is born out by research, which shows that the northwest Himalayas, a region that includes Zanskar, warmed 3 degrees F during the last century and the rate of warming accelerated in the 1990s.

That earlier, warmer weather also meant they could sow crops in May rather than June, extending the growing season by a month and avoiding the late-summer cold snaps that sometimes destroyed their harvests. Tsering’s family had suffered these late summer crop losses during his childhood. “We had nothing to eat. No seed,” he recalls.

But to plant that early, they needed water. Like Kumik, Stongde’s water originated from a glacier above town, known as Sultennong. Though also shrinking because of warmer weather, Sultennong still filled the town’s irrigation channels each summer.

But its melting snowpack didn't begin flowing until June. So Tsering came up with a plan for storing water over the winter months by freezing it, then tapping it for irrigation in May. He had heard that an engineer in the city of Leh, two days by bus across several mountain passes, had improved harvests this way.

## Global warming is a lottery, with benefits for some compensating in part for harm to others.

In 2012, Stongde's families hired a crew of Nepali masons. In two months the workers built a stone dam across the streambed in a gulch behind the town. Water now passes freely through the gaps between the rocks but once the temperature drops, ice seals the porous barrier. Water then backs up behind it, and freezes into a pond. In the spring, weeks before snow melts on the mountain, the pond thaws and fills Stongde's irrigation channels.

Now, "our crops mature and we harvest them on time," Tsering says. "We no longer worry that it will get cold, or snow, and our crops will be destroyed."

The contrast between Kumik and Stongde fits in with a widespread sense that global warming is a lottery, with benefits accruing to some that will compensate at least in part for harm done to others. Under this scenario, it is believed, prospering in the era of climate change will require ingenuity and adaptation, as well as some luck.

Still, the story of Zanskar's farmers most likely foreshadows a darker future. In Stongde, Tsering worries that he and his neighbors will run out of water as their glacier source keeps melting, meaning the artificial glacier is only a temporary measure. Within a decade, he fears, his town might also need to relocate.

Pelto, the U.S. glaciologist, says Tsering is probably right. Stongde's glacier, which, like Kumik's, has shrunk since the mid 1990s, will likely disappear, according to Pelto, as greenhouse gases warm the planet at an increasing rate. Given current projections for warming, he said, the village "will survive the next two decades, but likely not to 2060."

"It's very hard for us to start from scratch," says Tsering, imagining a time when Stongde's glacier will no longer provide water. "Those who have money will be able to cope; but those who are poor or infirm, for them it will be very hard." They may soon be counted among the casualties of global warming.

*This article was produced in collaboration with the [Food & Environment Reporting Network](#), a non-profit investigative journalism organization.*

**Correction, March 26, 2015:** *Previous versions of this article stated that no residents of Kumik have relocated to a new town. Seven families have just completed their first winter there.*