

# Team to analyze the risk to Sherpa communities of glacial lake bursting

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Imja Lake in the Himalaya region is a glacier lake that is on the verge of bursting, posing a severe threat to settlements below. Arizona State University anthropologist Milan Shrestha will be part of a team studying the lake — both the risk it poses and how those who live near it want to handle the situation.

Credit: Daniel Byers/Skyship Films

At the head of a river valley in the high Himalaya lurks a liquid demon.

A melting glacier has engorged a lake at its foot to the point where the waters are barely contained by a loose natural dam of rock and earth.

An avalanche, a rockslide or a truck-size block of ice could explode the lake, burst the natural dam and rocket a wall of water down the valley, devastating settlements downstream.

Five villages lie immediately below the lake. The villages are about 300

years old, nestled alongside the Dudh Khosi riverbed, where there's prime agricultural land for growing potatoes and barley as well as herding goats and yaks.

Proximity to Everest, Annapurna and other prized climbing peaks means Sherpa are close to where they work as guides and porters. There's more to their ties to the land than that, though. They identify themselves as climbers, as mountain people. There's no more likelihood of them leaving the high mountain valleys than surfers leaving Southern California.

"They will not move," said Milan Shrestha.

Shrestha is an Arizona State University anthropologist joining a team of scientists who will analyze the risk of the glacial lake bursting during a study funded by a recent \$1.4 million grant from the National Science Foundation.

"Our job is to study what (the Sherpa) want," he said. "That's why they asked an anthropologist to be a part of this."

During the study Shrestha will act as a liaison between the earth scientists and the Sherpa. It is a three-year study and has an interdisciplinary team of water-resource engineers, a glaciologist, an anthropologist and a mountain geographer.

Similar hazards occur around the world. In many places the danger is removed by draining or damming the lakes. That's not possible in the Khumbu region. It's too remote to haul in heavy equipment and material. And the Sherpa don't want the lake drained, even though it could destroy their villages. After all, it's pretty and tourists pay them to go there.

This isn't a story about solving a problem, it's about understanding why

people live in dangerous places.

## **The lake**

Sometimes called the "third pole," the Himalaya mountains hold the most frozen water outside the polar regions. Warming trends for the Himalaya range are higher than the global average, leading to serious danger downstream.

Of 9,000 lakes in the Hindu Kush Himalaya, about 200 have the potential to burst, according to the International Centre for Integrated Mountain Development (ICIMOD), a regional intergovernmental organization.

One glacial lake burst above the town of Pokhara in May 2012. Twenty-six people were killed. Forty-four others were never found. Houses, temples and public buildings were swept away, along with livestock. Roads were washed out. Crops were destroyed.

"Locals said (the) god was very angry that day," Shrestha said.

Imja Lake, the focus of Shrestha and the team's research, hangs above a valley of villages and cities like the sword of Damocles. Imja Glacier is retreating at a rate of about 70 yards per year.

The lake began to form in the 1960s. "This is one of the very few lakes expanding rapidly," Shrestha said.

## **The Sherpa**

There are more than 20 settlements downstream from Imja Lake. It is estimated that the number of people likely to be directly affected by a

potential flood ranges from about 5,000 to 7,000. More than 96,000 people will be affected indirectly, according to regional group ICIMOD.

Other local [climate-change](#) threats are landslides.

"The lake is a reminder (climate change) is happening, and that there is risk," said Shrestha, a lecturer in the Julie Ann Wrigley Global Institute of Sustainability at ASU. "The (Sherpa) don't want to see the lake completely go away. They want to manage it in such a way risk is mitigated."

In 1985, a big flood hit the same area. "People still have the memory of that," he said.

The local Sherpa aren't aware of climate change in the same sense that Westerners are, Shrestha said. Nor do they have an ingrained cultural fear of flooding. However, they believe gods inhabit every mountain.

"We do not have a good idea of how the Sherpa perceive these lakes in their cultural memories," Shrestha said. But, "When they see glaciers melting, it's a sign."

Other threats they're facing are declining tourism, landslides and young people leaving to go to the big cities.

"The lake is only one threat they're facing, but the lake embodies the threat they're seeing," Shrestha said.

## **The danger**

Glacial-lake outburst floods are fairly rare, said Kelin Whipple, a geologist in the School of Earth and Space Exploration at ASU who studies how the Earth's surface is sculpted.

However, "they're not new," Whipple said. "Ever since we've had glaciation, we've had glacial lakes."

An avalanche, an earthquake, more snowmelt, "anything could destabilize this lake and burst it," he said. "It's a dramatic hazard. Everything downstream from there, you'd see flood lines of debris high on the walls."

Whipple described the sound of the burst: There would be a loud roar from waves and turbulence, with the muffled tocks and clacks of boulders banging against each other on the riverbed.

Glacial-lake outburst floods have been a fact of life in Peru since the 1930s, where the number of lakes has dramatically increased. There were 13 major floods in the 20th century.

Lake Palcacocha in the Peruvian Andes burst in 1941, killing 5,000 people. Last year it was declared to be in a state of emergency. It's full again. If it bursts, it is estimated the 120,000 people in the town of Huaraz would have a little more than an hour to flee.

After a power plant was destroyed in the 1950s, the Peruvians created a government agency to deal with glacial lakes. The agency created a systematic [glacial-lake](#) classification index to identify and rank hazards. After they inventoried hundreds of lakes, they drained and dammed 19 of them.

They also designated hazard zones and told people they'd have to move.

In one area where almost 15,000 died after a glacial avalanche, declaring hazard zones was a disaster in itself. No one left. Some wanted to be near where family members had died. "We want to die here, where we were born," one said. Leaders feared moving the town would cripple its

economy. Tourism was an issue because the proposed new town wasn't located near the mountains. There were social and political issues as well, but what finally killed the move was how the government handled the whole issue, according to a 2008 paper. Officials never discussed relocation plans with local people.

## **Why people live with danger**

Shauna BurnSilver is an environmental [anthropologist](#) who studies how climate change affects native peoples who have depended on the environment for centuries. She has studied the Iñupiaq on the north coast of Alaska and the Maasai and Tuareg herdsman in Africa. She is an assistant professor in the School of Human Evolution and Social Change at ASU.

"Perception of risk is not just perceived risk," BurnSilver said. To engineers and scientists, the solution is clear: Fix it or move.

"To (specialists) the risk was very clear," she said "What needed to happen was zoning of hazards. ... The problem was people wanted to be there."

Sense of place is a powerful human emotion. After Superstorm Sandy drowned, burned and flattened the Rockaways in Queens, New York, in 2012, a retired fire chief was quoted as saying, "This is a Rockaway story. Now we're really never going to leave."

The Rockaways are still being rebuilt. If Southern California were somehow devastated, surfers would probably move to other beaches somewhere. They would still be surfers; they just wouldn't be Californians. For the Sherpa and the Iñupiaq, leaving just isn't an option. It's not an economic calculation.

"Sense of place has to do with being a people from that place," BurnSilver said. "If you moved them from that place, they wouldn't be able to say, 'I am Sherpa.'"

Some Iñupiaq in the Alaskan Arctic identify themselves as "People of the River." Even if one of them has a job in town driving a grader and only fishes on weekends, he is still a River Person in his mind. His sense of place will never change. He will always be one of the "People of the River."

For someone with that sense of place, leaving "is a narrative of loss," BurnSilver said.

To Athapaskans, native peoples of Alaska of which the Iñupiaq are part, glaciers are sentient. They are also unpredictable. The fact that glaciers occasionally kill people is something they live with. Because they have lived with risk so long and accept it as part of living where they do, they stay where they are, just like the Sherpa.

"It's a question of different world views," BurnSilver said. "The Iñupiaq are not going to leave the northern coast of Alaska. ... The Sherpa might decide to stay with what we perceive as an unacceptable level of risk."

What anthropologists do is bring in those non-risk, non-structural factors, BurnSilver said. They are trained to take in other perspectives. Oftentimes it's a series of trade-offs.

"Solving this is not about solutions, but a process," she said, "beginning to understand what is an acceptable level of risk."

Shrestha will visit Nepal in December to meet with local contacts, then return in May to begin work. Assisted by a graduate student, he will do 350 household surveys during the summer.

"[The study] is going to have an immediate effect," he said. "We have done a remarkable job identifying these lakes. What we have not done is assess the local people's needs. ... If it poses an immediate danger, what can we do? What are the things they can do? What are the things they can put off?"

An early warning system, like a flood gauge coupled with a broadcast or telecommunication system, is one possibility.

Work on the study began in August and will continue until July 2018.

Provided by Arizona State University

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