

Climate Change Could Destroy His Home in Peru. So He Sued an Energy Company in Germany

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Local communities are taking the world's largest polluters to court. And they're using the legal strategy that got tobacco companies to pay up.

In the mountains far above the red-brick city, behind a locked gate, there is a great, green valley. Its high stone walls are streaked by waterfalls; its floor dotted with flowers and grazed by horses and cows. Six boulder-strewn miles beyond the gate, the valley ends abruptly at an enormous wall of rock and ice. Beneath it lies a stretch of calm, bright water in milky turquoise — Lake Palcacocha. Though few of its residents have ever seen this lake, the city below lives in fear of it.

On Dec. 13, 1941, a piece broke off a hanging glacier and fell into Palcacocha, creating a great wave that overwhelmed a natural dam and sent a flood surging toward Huaraz, a provincial capital in the Peruvian Andes, about 14 miles below. A third of the city was destroyed and at least 1,800 people were killed. In response, the government reinforced the natural dam and installed drainage tubes to lower the level of the lake. Huaraz boomed to 130,000 inhabitants from 20,000. Occasionally there was a scare — a rock slide into the lake in 2003 sloshed a smaller amount of water over the edge, causing panic — but to many people in Huaraz the danger began to seem remote. Until it became clear that the lake was getting bigger.

In 2009, glaciologists found that amid the widespread melting of Andean ice, the amount of water held in Palcacocha had increased by 3,400 percent over just a couple of decades. Even more worrying, this melt associated with climate change was destabilizing the glaciers hanging above it, making major avalanches more likely. The regional government declared a state of emergency and began posting guardians to watch the lake around the clock.

The guardians of the lake live above Palcacocha, in a little stone house with a tin roof. It was built by hand from nearby rocks and has no insulation, though at 15,000 feet the air is thin and the cold brutal, even in summer. There is no heat apart from a cook fire, and few supplies: raincoats, warm blankets, flashlights for working at night, snowshoes for working in winter.

On a cold summer day in February, I looked up from the lake to see a man descending a zigzagging trail. He walked lightly across loose boulders to the water's edge, where a large ruler pierced the surface. He read it, and then turned to climb the switchbacks back to the hut, where a radio was wired to what looked like a car battery. It was his job, shared with two other men, to report on the status of the water levels every two hours, day and night.



Lake Palcacocha in the Peruvian Andes. Felipe Fittipaldi for The New York Times

The man introduced himself as Víctor Morales, one of the guardians. I followed him up to the hut, where we listened to the rumble of falling ice echoing repeatedly off the high walls around the lake. Seeing me jump as yet another distant waterfall of white tumbled down, Morales laughed and said in Spanish: “Little! Just a little avalanche.” He would mark the activity on his next report, he said, as “minimal,” far less than the fall two weeks before, which raised 12-foot waves in the placid lake. That one he described, with a shrug, as “regularcito.” Should a more substantial avalanche happen, something that researchers consider a significant risk, the resulting flood would careen down the valley, overwhelming houses and farms until it arrived in Huaraz. According to the best available estimates, even without a collapse of the glacial moraine, a wall of rock that serves as the lake’s natural dam, which is considered unlikely, a large avalanche could lead to the inundation of 154 city blocks and more than 6,000 deaths. The regional government has considered various solutions: lowering the lake level by another 60 to 100 feet; creating a more technologically advanced early-warning system with sensors and sirens; plastering the city with evacuation maps. “We want a map in every schoolchild’s notebook,” César Portocarrero Rodríguez, an engineer and glaciologist in Huaraz, says.

One of the first neighborhoods to be flooded would be Nueva Florida, blocks of brick-and-adobe homes that edge the stream from the canyon. Saúl Luciano Lliuya, a soft-spoken, 39-year-old farmer and father of two who also works as a mountain guide during the tourist season, lives there in a bright yellow house, across the street from Morales's parents; the families have known each other for decades. Many people in Huaraz, Luciano Lliuya told me, don't fully appreciate the sacrifices that the guardians make to do their jobs — in part because they don't fully realize the dangers of deglaciation. Over the years, Luciano Lliuya has seen lakes expanding and avalanches increasing and ice retreating with every climb; he has seen farmers begin to argue over diminishing clean water. The loss of ice, it is clear to him, means a future that's more uncertain in all kinds of ways. "I depend, in every sense, on the mountain," he told me. "It is everything."

One day, five years ago, Luciano Lliuya sat talking with a friend about the many changes and costs that climate change is bringing to the Andes, whose residents have, by global standards, done very little to contribute to the problem. "We wondered," he said, "whether we could find los responsables" — the responsible ones — and somehow persuade them to change their behavior. He wanted, fervently, to find a way to stop the ice from melting even more.

Luciano Lliuya's friend introduced him to a contact at a nongovernment organization called Germanwatch, based in Bonn, that works to promote equity between developed and less-developed countries. In 2015, with the group's support, Luciano Lliuya, who had never left his country, traveled 6,500 miles to file a lawsuit against RWE, Germany's largest energy utility. The lawsuit claimed that the company, though it does not operate in Peru, had contributed about half of 1 percent of the emissions that are causing the global climate to change and that it should therefore be responsible for half of 1 percent of the cost of containing the lake that might destroy Luciano Lliuya's house. His claim entered the courts in the form of a demand for \$19,000.

"There weren't high hopes," Luciano Lliuya said — either that a lawsuit would have any real effect on how quickly the glaciers were melting or that he would actually be able to make the case, in court, that Huaraz's woes were the fault of a company an ocean away. But he didn't know what else to do, and he felt he had to do something: "It was like ... a shout."



Luciano Lliuya at home with his daughter Gleysi. Felipe Fittipaldi for The New York Times

Legal systems have long struggled with the best way to respond when individuals have been harmed by others. Who qualifies as a victim, and what counts as a misdeed? How can harm be traced and measured? If it can't be undone, what might make things right? Nearly 4,000 years ago, the Code of Hammurabi decreed harsh restitution for dozens of situations. If, for example, someone failed to maintain his dam and it failed, flooding a neighbor's fields, the negligent dam owner should "be sold for money, and the money shall replace the corn which he has caused to be ruined." Anglo-Saxon law offered wergild, set amounts to be paid by offenders to the families of their victims, in atonement for murder or adultery. In seventh-century Kent, the lives of freemen were valued at 100 shillings, noblemen at 300.

In the modern era, common-law countries such as the United States have turned to the courts to sift through the complexities of injury, causation and remedy. Common law, as distinct from statutory law, applies in situations where no legislative guidelines have been set and courts instead respond to cases as they happen — leaning on, and adding to, centuries of accumulated decisions interpreting the basic legal idea that individuals have unfringible rights. Modern cases that take on environmental damage rest on a heritage that includes, for example, William Aldred's complaint, in the early 1600s, that the stench from a pigsty built by his neighbor Thomas Benton made his home unbearable.

Today, Benton's action would be considered a tort, a harm or an infringement of a legal right that requires redress. To sue, plaintiffs in tort cases must show they have sufficient connection to a specific harm (what's called standing); that the defendant owed them some duty of care and breached it; that the harm was particular to the plaintiff and that the defendant's action was a direct cause of that harm; and that they, the plaintiff, suffered an actual injury or damage — including, perhaps, a future one. First-year law students are initiated into how fraught these seemingly simple questions can become when they study an infamous 1928 lawsuit involving a package that exploded on a train platform in Brooklyn and a woman, Helen Palsgraf, who was injured in the ensuing confusion. That's the short version; the single injury claim involves, as the Wake Forest law professor Jonathan Cardi has noted, "a series of bizarre twists so curious and mesmerizing that one has trouble averting one's gaze." The case, whose details and lessons are still being argued, was repeatedly appealed. Some of the great jurists of the day weighed in, eloquently debating the responsibilities that humans have toward one another, especially when they harm one another indirectly, in ways that are difficult to foresee. If an act "has a tendency to harm someone, it harms him a mile away as surely as it does those on the scene," wrote one of the judges. "We draw an uncertain and wavering line, but draw it we must as best we can."

Tort law has, of course, weighed injuries far trickier than Helen Palsgraf's. State courts in particular have a history of offering remedies to complex and evolving claims. Mesothelioma patients and their families routinely win monetary relief despite not being able to trace precisely which product was the source of decades-old asbestos exposure (and despite the fact that more than 100 companies tied to the asbestos industry have declared bankruptcy, leaving trusts behind to deal with the continuing suits). Oil companies have paid hundreds of millions of dollars since the mid-2000s in recompense to states and local governments for using a gasoline additive that, while employed to help meet clean-air standards, turned out to pollute groundwater (a fact the companies kept to themselves). Beginning in the 1990s, courts began to find tobacco companies liable for the health effects

of cigarette smoking, even though smokers used their products willingly and even though the first 800 or so lawsuits against the companies failed. In recent years, more than a thousand lawsuits have sought to make pharmaceutical companies pay for the sprawling costs of the opioid-addiction crisis, including the costs of hospital visits, overwhelmed foster-care systems and overburdened coroner's offices. (In March, Purdue Pharma and its owners, the Sackler family, agreed to a \$270 million settlement in just one of those cases, avoiding going to trial in state court in Oklahoma.)

Now a new wave of lawsuits is testing whether fossil-fuel companies can be made to pay for the costs of climate change. Since 2017, eight United States cities, including New York and San Francisco, six counties, one state and the West Coast's largest association of fishermen have brought suit against a host of corporations — Exxon Mobil, Royal Dutch Shell, BP, Chevron, Peabody Energy, among others — for selling products that caused the world to warm while misleading the public about the damage they knew would result. The suits demand compensation for a variety of expenses: in California, sea walls and infrastructure to cope with rising waters; [in Colorado](#), the costs of combating wildfires, floods, pine beetle infestations, agricultural losses and heat waves.



In the event of a flood from Lake Palcacocha above Huaraz, Peru, the waters would inundate the Nueva Florida neighborhood (center). Felipe Fittipaldi for The New York Times

A separate legal argument underpins a parallel set of new cases, the most famous of which was [brought in 2015 by a group of American children](#), which target governments for failing to adequately tackle climate change and uphold what one judge called “the right to a climate system capable of sustaining human life.” Another track is to sue companies for misleading their shareholders, in violation of securities law. In November, Ralph Regenvanu, the foreign minister of the Pacific nation of Vanuatu, offered a glimpse of what may become a new reality: “My government is now exploring all avenues to utilize the judicial system in various jurisdictions, including under international law, to shift the costs of climate protection back onto the fossil-fuel companies, the financial institutions and the governments that actively and knowingly created this existential threat to my country.”

Ann Carlson, faculty co-director of the Emmett Institute on Climate Change and the Environment at U.C.L.A. School of Law, says that lawsuits linking fossil-fuel companies to the

climate impacts of their products could set significant legal precedents. “If one of these cases succeeds,” she says, “even if all the others are dismissed, that’s a really big deal. That’s why companies will fight tooth and nail.” But while Luciano Lliuya’s suit was accepted by a regional appeals court in Germany in late 2017 and is now moving into the evidentiary phase, none of the recent United States lawsuits has moved beyond preliminary consideration and into discovery, never mind an actual trial. The question remains whether the American tort system is prepared to litigate a problem of the enormous scale and complexity of global climate change. “Diffuse and disparate in origin, lagged and latticed in effect, anthropogenic greenhouse-gas emissions represent the paradigmatic anti-tort,” Douglas A. Kysar, a professor at Yale Law School, [wrote in a 2011 paper](#), “a collective-action problem so pervasive and so complicated as to render at once both all of us and none of us responsible.”

We are still learning what dangers will arise from our altered atmosphere. Some changes, such as warmer ocean water taking up more space and pushing into cities, have a direct, calculable cause. Others, like powerful tropical cyclones or abnormally heavy flood-producing rains, are more indirect products of the ways in which humans are affecting the climate. The largest challenge to adjudicating responsibility for these damages is proving attribution: of specific damages or disasters to climate change; of climate change to specific emissions; of emissions to those responsible for them. In an early test case filed in 2008, an [Alaska Native village sought](#) to make energy companies pay for its relocation, which the disappearance of its protective barrier of sea ice necessitated. A United States District Court judge, dismissing the case, wrote, “There is no realistic possibility of tracing any particular alleged effect of global warming to any particular emissions by any specific person, entity, group at any particular point in time.”

But eight years after calling climate change “the paradigmatic anti-tort,” Kysar recently told me that “a fair number of things have changed.” Scientists have gotten better at quantifying the links between emissions and impacts. When the links are indirect, they calculate what’s known in epidemiology as “fraction of attributable risk”: how much more likely it was that an extreme event would occur because of an altered climate. Plaintiffs also argue that they don’t need to prove that specific disasters were directly caused by climate change, because climate change makes future disasters more likely and governments must take expensive steps to adapt now. We also know more about the ways fossil-fuel companies misdirected the public about the risks associated with their products and about how much companies actually emitted. “What I see right now are well-pled complaints that should get beyond a dismissal motion and proceed to discovery,” Kysar says. “For better or for worse, that’s been our process in determining wrongdoing.”

To implicate specific companies, the new lawsuits have turned to [data collected by Richard Heede](#), director of the Climate Accountability Institute in Snowmass, Colo., who has spent much of the past 16 years searching through archives to find reports about how much fossil-fuel companies extracted during their sometimes long histories. He then estimates how much fossil fuel was used for a company’s own operations, how much diverted for things like asphalt or petrochemical production, how much volatilized into the atmosphere. The work is tedious, involving hundreds of thousands of data points and a basement full of dusty reports. Still, Heede told me, “we needed that kind of leverage in order to talk turkey with oil and gas companies.”



Glacial Lake Palcacocha poses significant flood hazard downstream to communities in Huaraz. Siphons installed in 2011 lowered the level of the lake by 7 to 16 feet in an attempt to reduce the flood hazard. Felipe Fittipaldi for The New York Times

Heede's work reveals that, if you include all the carbon extracted and supplied, just 90 companies are responsible for two-thirds of all the greenhouse gases emitted between 1751 and 2016. Even more startling, more than half those emissions have occurred since 1988, the year that the climate scientist James Hansen, then at NASA, appeared before Congress to urge that "it is time to stop waffling" and recognize the clear link between the emission of greenhouse gases and the warming of the planet.

Heede's data underpins many of the new United States lawsuits, as well as Luciano Lliuya's claim about RWE's share of climate emissions. Plaintiffs believe that they can establish fault that meets the required standard of substantially contributing to a harm by combining these estimates with recent revelations that oil companies had knowledge of the climate dangers of fossil fuels as early as the 1960s but actively worked to undermine the public's trust in climate science. (Even as they privately prepared for climate impacts on their operations, companies followed a public strategy of emphasizing doubts about the growing scientific consensus that their products would lead to climate change.) According to Carlson, in the first test cases of climate liability (the Alaska village lawsuit and a case brought by eight states, New York City and three environmental groups in 2005 against five power companies, including the Tennessee Valley Authority), "the courts seemed to be worried, like: 'Oh, did these people really cause the problem? Some power plants, maybe 2 percent?'" Now, she says, "it feels like you have the big contributors right in front of you." Roda Verheyen, the lawyer representing Luciano Lliuya, concurs. "I long to present Heede in court," she said. "Just because it's a complex issue doesn't mean that you can't prove liability."

The year before Luciano Lliuya was born, his father decided to move his six children — Saúl was the seventh and last — from the countryside above Huaraz to the Nueva Florida house, where they could be close to school and he to his job as a watchman. (The family also kept a house and land in the hills for raising crops and animals, which Luciano Lliuya and his wife, Lidia, still maintain. They have seven cows and raise corn, potatoes, quinoa and mint.) Land in Nueva Florida was relatively cheap; when people dig into the soil,

Luciano Lliuya told me when I visited, they regularly find huge boulders, reminders of the 1941 flood.

It wasn't guiding season, but Luciano Lliuya was dressed in hiking gear; Lidia wore the tall bowler hat and wide woolen skirt that is common to the mountains. She spoke mostly in Quechua, which is also Luciano Lliuya's first language, while he translated to Spanish. Luciano Lliuya is currently renovating the house, replacing adobe walls with concrete, so everyone sat on the floor or on overturned buckets. "If I said, 'It's a flood zone, I won't fix the house,' that would look crazy," Luciano Lliuya mused. "But it's also crazy to do it knowing the danger, no? From both sides, it's crazy."

The technical term for the disaster that threatens Huaraz is glacial lake outburst flood, or GLOF, a fairly obscure offender in a lineup of climate impacts that includes famine-inducing droughts, the acidification and deoxygenation of the oceans and the inundation of cities like New York and Jakarta. But GLOFs are a growing concern not just in Peru's Cordillera Blanca, the mountain region where Huaraz is — hundreds of square kilometers of ice have melted in recent decades, creating at least 100 new lakes and more risk of flooding from existing ones — but also in the Himalayas and the Alps.



Víctor Morales, guard at Lake Palcachoca Glacier, Cordillera Blanca. He and other guards report on the status of the water levels every two hours, day and night. Felipe Fittipaldi for The New York Times

As Luciano Lliuya's case makes its way through the German court system, court-appointed experts have been assigned to investigate his claims against RWE. First, hydrologists and other scientists will study how much danger the house in Nueva Florida faces. If they confirm the danger exists, the court will consider how much, if any, of the responsibility lies with RWE. The company, for its part, has objected to the entire premise of the case. "It is simply not allowed to pick one out of a million and say, 'You are guilty, I put the blame on you,'" Guido Steffen, a spokesman for RWE, told me. Should such lawsuits be allowed, he

continued, a person might be sued for flying in planes or driving a car. “It would mean the war of everybody against everybody,” he said.

German courts do not use common law, but the statute under which Luciano Lliuya sued is similar to the nuisance principle invoked in many of the United States lawsuits: the legal category of “nuisance,” one of the oldest torts. It has played a role in innumerable public health, pollution and injury cases since the dispute over Thomas Benton’s stinky pigsty. Companies targeted by lawsuits in the United States also put forward arguments similar to the one made by RWE: Climate change is simply too vast an issue for courts to be able to respond adequately to the injuries it causes. There are too many contributors, too many tangled chains linking emitters to harms, too many benefits to be weighed against costs and too many consequences for national and international policy if demands for redress are actually met. They argue that responding to greenhouse-gas emissions should fall to the legislative and executive branches (though those branches have in fact failed to regulate emissions) and that cases should be moved to federal court, where judges, including the justices of the Supreme Court, have found that common-law climate claims are superseded by federal law (including the Clean Air Act, under which a 2007 Supreme Court decision determined that the E.P.A. must treat greenhouse gases as a pollutant).

These arguments have helped persuade judges to dismiss climate lawsuits before they can move on to document discovery or the testimony of experts. “The dangers raised in the complaints are very real,” wrote Judge William Alsup, when dismissing suits brought against five oil companies by Oakland, Calif., and San Francisco last year. “But those dangers are worldwide. Their causes are worldwide. The benefits of fossil fuels are worldwide. The problem deserves a solution on a more vast scale than can be supplied by a district judge or jury in a public-nuisance case.” Indeed, the sheer vastness of the climate problem has been a boon to defendants. “If I were the fossil-fuel company,” says William Ruskin, who has spent his career defending large companies in environmental litigation, “I’d open this up as broadly as possible. I’d talk about the industrial revolution. I would basically create a historical tableau and put civilization on trial.”

For plaintiffs in the new wave of cases, however, such defenses represent a fundamental misunderstanding not only of what the lawsuits are claiming but also of what the law is capable of handling. Kate Sears is a supervisor of Marin County, which is suing to recoup the costs of combating more extreme and more persistent flooding; she is also a lawyer and was part of California’s suit against banks for deceptive mortgage practice that contributed to the 2008 financial crisis, which resulted in the state’s receiving a multibillion-dollar settlement in 2012. “These are accepted and established and sort of tried-and-true claims in state courts,” Sears says. “We’re not trying to create new law here,” adding, “We’re just trying to get damages for injuries caused.” Last year a federal judge agreed, sending the case, now joined with others filed by California cities and counties, back to the court. Vic Sher, [whose firm is handling that case](#) as well as suits brought by Baltimore and Rhode Island, says that the lawsuits pose a simple question: “Should those costs be paid for by the taxpayers or by the companies who knew what they were doing and caused the impacts?”

San Francisco, New York and Oakland are all appealing the federal dismissals of their cases, and the two sides continue to wrangle over where the suits belong. In an amicus brief in the New York case, eight states and the District of Columbia argued that the refusal to hear the lawsuit in state court “would lead to the extraordinary conclusion that no law at all applies

to the environmental harms caused by defendants' allegedly tortious activities." In another brief in the San Francisco and Oakland case, a group of Democratic United States senators noted that fossil-fuel companies' insistence that curbing climate change is the responsibility of the legislative and executive branches seemed to be in conflict with the same companies' past efforts to prevent those branches from actually curbing emissions. "It becomes apparent," the senators wrote, "that Defendants' real position is that no one should address climate change, the cataclysmic effects it is already having and particularly the real injuries that Defendants have proximately caused."



The city of Huaraz in the Peruvian Andes. Felipe Fittipaldi for The New York Times

If courts are persuaded to allow any of the United States cases to follow Luciano Lliuya's to the evidentiary phase and onward to a full hearing, they will still have to find satisfactory answers to a long list of difficult questions. Where on the chain of causality — from coal extraction to power generation, for example — does responsibility lie? How do we put a dollar amount on the degree of liability? How do we account for nonclimate variables, such as whether a city magnified its exposure to damages from wildfire or rising seas by permitting development in risky places? How should other contributors to climate change, from deforestation to population growth, be considered?

Defendants know they benefit from complicating the question of fault. They could theoretically seek to name co-defendants — the auto industry, perhaps, or chemical refineries or cement manufacturers — that they argue should shoulder or share in the blame. Chevron filed a third-party complaint to include Equinor, the Norwegian state oil company, as a fellow defendant in the cases brought by California cities and counties. And when New York City filed suit against BP and others, the companies responded that the city, because of its use of the oil industry's products in its own police cars and garbage trucks and so on, shouldn't be able to sue because it had what's known as "unclean hands." If everyone is at fault, the argument goes, no one can be held responsible — or, if courts decide they can be, it will create a legal free-for-all, "the war of everybody against everybody" that RWE's spokesman described.

It might be good political theater to “name John and Jane Does One through Eight Billion,” says Michael Burger, the executive director of the Sabin Center for Climate Change Law at Columbia Law School, who has written amicus briefs in support of the new suits. But if “companies are arguing that they, individually, are too small to be held legally responsible, it would be absurd to think that an individual human being would be responsible enough to haul into court.” Complicity is not the same as liability.

Proponents of lawsuits against fossil-fuel companies have studied the cases against tobacco companies carefully. For decades, the suits failed by the hundreds as tobacco companies argued that ultimate responsibility fell not on them but on the people who chose to use their products — an argument akin to oil companies contending that they can’t be held responsible for what comes out of consumers’ tail pipes. The tide began to turn against the tobacco industry once subpoenaed documents showed a longstanding conspiracy to cover up the harms of smoking. But the parallels aren’t perfect. Unlike tobacco, energy companies have argued, the existence of the fossil-fuel economy has provided considerable advantages to society. If we had understood the perils of climate change sooner, would we have stopped driving cars or using electricity from polluting sources? Most likely not, at least not on an individual level. So plaintiffs offer a different narrative: That companies actively prevented the development of alternative energy sources and the regulation of carbon-intensive ones, thus politically and economically propping up a polluting system. “It’s incorrect to say that there’s a strong public demand for fossil fuels,” Sher, the plaintiffs’ lawyer, told me. “What we have is a desire for energy.” In February, at a hearing in Rhode Island’s lawsuit against 21 oil and gas companies, Sher argued that “emissions magnify the harm, but the tort is the deception.”

Lawsuits themselves have sometimes led to novel attempts at untangling the Gordian knot of responsibility. Settling the tobacco lawsuits eventually involved attorneys general from 46 states, the District of Columbia and five U.S. territories, more than \$125 billion and dozens of companies — all but four of which asked to sign on after a settlement was reached. The Superfund law of 1980 imposes strict, retroactive liability on companies that create hazardous pollution and holds that any companies with even potential responsibility may be held liable for the entire cleanup of a site. Some observers imagine a future in which fossil-fuel companies support carbon regulation because it includes a provision shielding them from a morass of liability. Others point to disgorgement, a legal remedy most associated with securities fraud that compels surrendering profits gained through wrongful acts. Still other scenarios include companies’ offloading liability onto shell corporations or lawsuits continuing to lead nowhere, with climate change remaining a problem that is too large to litigate. Or the law may one day come to see things as straightforwardly as Luciano Lliuya does. “They have polluted,” he said, “and now there are consequences. They have to be responsible.”

One morning in Huaraz I woke up to the sound of tubas, part of an early celebration of carnival. People from the countryside streamed into the city, carrying enormous crosses decorated with leaves and flowers, and the streets filled with people dancing, food stalls selling fried guinea pigs and the cacophony of more brass bands than might reasonably be expected from the region’s population. As people swayed to the music, passing bottles of beer, the guardians of Lake Palcacocha were by the radio up at their cold hut, filing their latest report about the safety of the dancers below.

Luciano Lliuya also missed the day's festivities. He was at a meeting in Llupa, the small village above Huaraz where he and Lidia raise their crops. The community was debating whether to share its water source with a neighboring village, whose drinking water, Luciano Lliuya explained, came from a stream that was becoming polluted. "The children have been getting sick," he said. The water had become contaminated by another of climate change's lesser-known impacts: what's called acid rock drainage, which occurs when melting glaciers expose sulfur-bearing minerals to air and water, creating sulfuric acid. Like GLOFs, it's only the beginning of the problems that the people of Peru will face as glaciers melt. The country has depended on consistent runoff from its rapidly disappearing ice to irrigate its fields, to run its power plants and to support the growth of Lima, a city of almost 10 million, in a desert. After a long debate, the people of Llupa agreed to share their water. It was impossible to say no to their neighbors, though they knew it would make the coming dry season even harder.

In Huaraz, above the street party, the sky darkened. Lightning flashed, but the thunder was inaudible over the noise of the crowd. The brass bands kept playing as the rain began to fall.

Brooke Jarvis is a contributing writer for the magazine. [She last wrote a remembrance for a deceased baby orca](#) in the 2018 "Lives They Lived" Issue.

Also see: Nathaniel Rich (2019) *The Next reckoning: Capitalism and Climate Change*, *New York Times Magazine*, 10 April.

David Leonhardt (2019) *The Problem With Putting a Price on the End of the World*, *New York Times Magazine*, 10 April.