

# A River Ran Through It

Climate change is melting glaciers high in the Himalayas, threatening crucial water resources for much of Asia—and giving us a convincing reason to fight it

BY BRYAN WALSH/LEH

Photographs for TIME by Bharat Sikka

**T**HE ROAD TO KHARDUNG LA begins in the Indian town of Leh on the northwestern fringe of the Himalayas. Exhaust-spewing army trucks rattle up the side of dry rock, past Buddhist monasteries clinging to the craggy mountainside and alongside small farms barely scraping fertility from the earth. Khardung La, the highest motorable mountain pass in the world, is nearly 5,500 m above sea level, the air so thin that just standing there a few minutes leaves you feeling as if your head might lift off like a balloon. But if 65-year-old Syed Iqbal Hasnain is bothered by the altitude, he isn't showing it. The Indian glaciologist hops lightly from a car and walks to the edge of the pass, beneath fluttering Buddhist prayer flags. The rock is dusted with early winter snow, and there might not be much more this season or next, he says.

Reports from Leh indicate that precipitation has dropped during the past quarter-century as temperatures have risen, a possible consequence of climate change. But the real threat is to the heart of the greater Himalayas and the vast Tibetan Plateau, where more than 100,000 sq km of glaciers hold water in the largest collection of land ice outside the polar regions. "These glaciers are central to the region," says Hasnain, looking over Khardung La. "If we don't have snow and ice here, people will die."

Scientists call it the third pole—but when it comes to clear and present threats from climate change, it may rank first. The high-altitude glaciers of the Himalayas and the Tibetan Plateau—which cover parts of India, Pakistan, Nepal, Bhu-

tan and China—are the water tower of Asia. When the ice thaws and the snow melts every spring, the glaciers birth the great rivers of the region, the mightiest river system in the world: the Ganges, the Indus, the Brahmaputra, the Mekong, the Yellow, the Yangtze. Together, these rivers give material and spiritual sustenance to 3 billion people, nearly half of the world's population—and all are nursed by Himalayan ice. Monsoons come and go, filling the rivers at times and then leaving them lethargic, but the ice melt has always been regular and dependable in a region where water—or the lack of it—defines civilization. "This isn't like the polar ice caps," says Shubash Lohani, an officer with the Nepal program of the World Wildlife Fund (WWF). "You have a huge population downstream from the Himalayas who are dependent on it."

It's a population that is stressed for water, even if the ice doesn't disappear. According to the International Water Management Institute (IWMI), most of South Asia is already in a state of water scarcity, as is much of China. At the same time, the population in this part of the world is set to expand, even as economic growth increases competition for water used in agriculture and industry.

Regardless of the impact of climate change, there is a widening gap between water supplies and needs. In fact, a new report from the international consulting group McKinsey & Co. estimates that by 2030, India alone will have only 50% of the water that it needs under a business-as-usual scenario. Nor is Asia the only region that will grapple with water scarcity in a warmer world: the McKinsey report estimates that the globe will have 40% less water than it needs by 2030 if nothing is done to change current consumption patterns. "The countries where water is already scarce are going to be the ones really vulnerable to climate change," says Colin Chartres, director general of the IWMI.

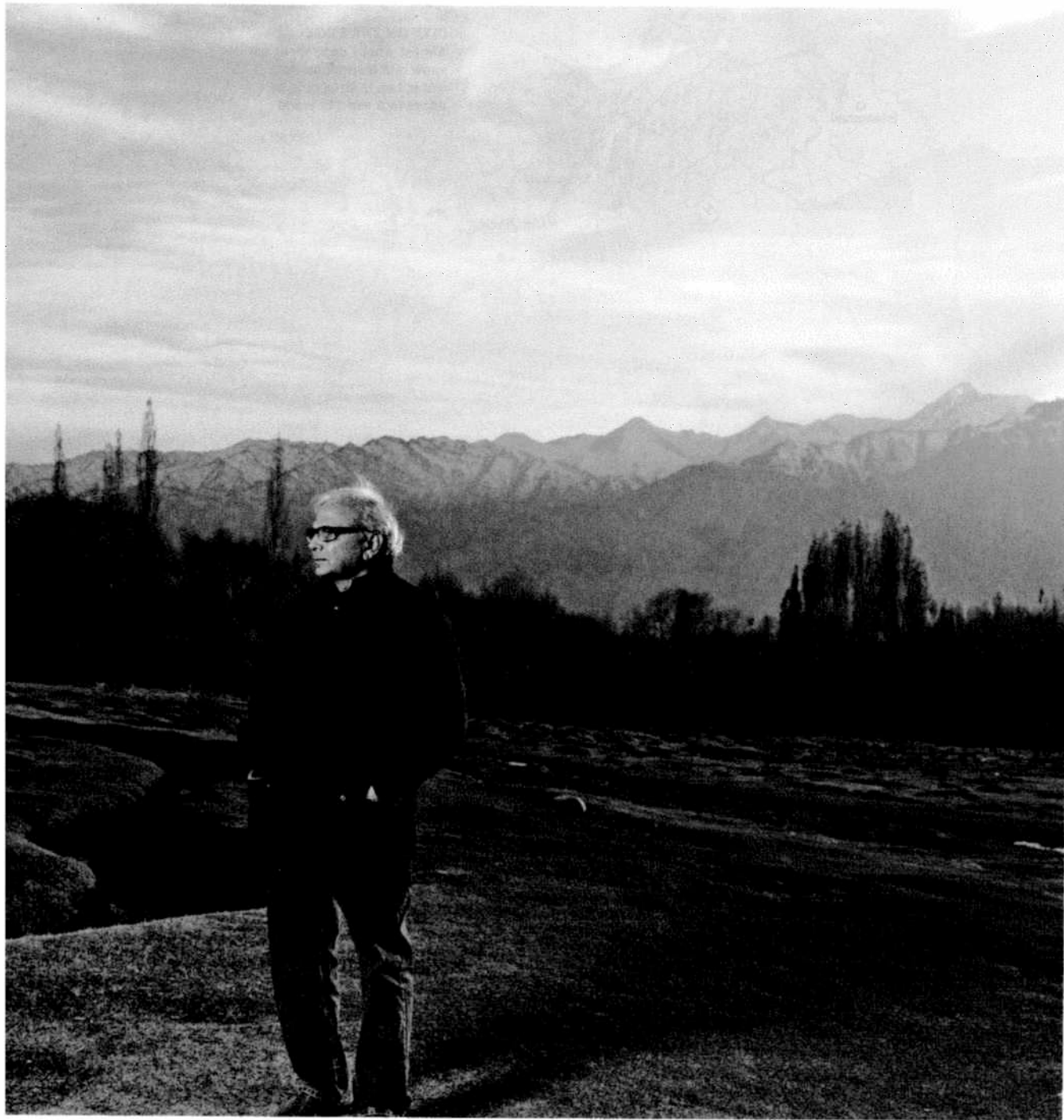
That makes the security of the Himalayan glaciers all the more important for the region and their potential loss all the more threatening. While it's difficult to get a comprehensive assessment of the tens of thousands of glaciers in the Himalayas—all above 3,000 m—independent scientific

studies indicate that the third pole is melting fast, probably because of warming temperatures brought on by climate change. Since 1960, almost a fifth of the Indian Himalayas' ice coverage has disappeared, and the 2007 global-warming assessment by the Intergovernmental Panel on Climate Change judged that glaciers in the Himalayas were "receding faster than at any other place in the world." If global warming goes unchecked, the Himalayan melt will certainly get worse. This year Chinese



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AT THE ENERGY AND RESOURCES  
INSTITUTE



**Iceman Hasnain, above, climbs glaciers to gauge the impact climate change is having on the ice of the Himalayas**

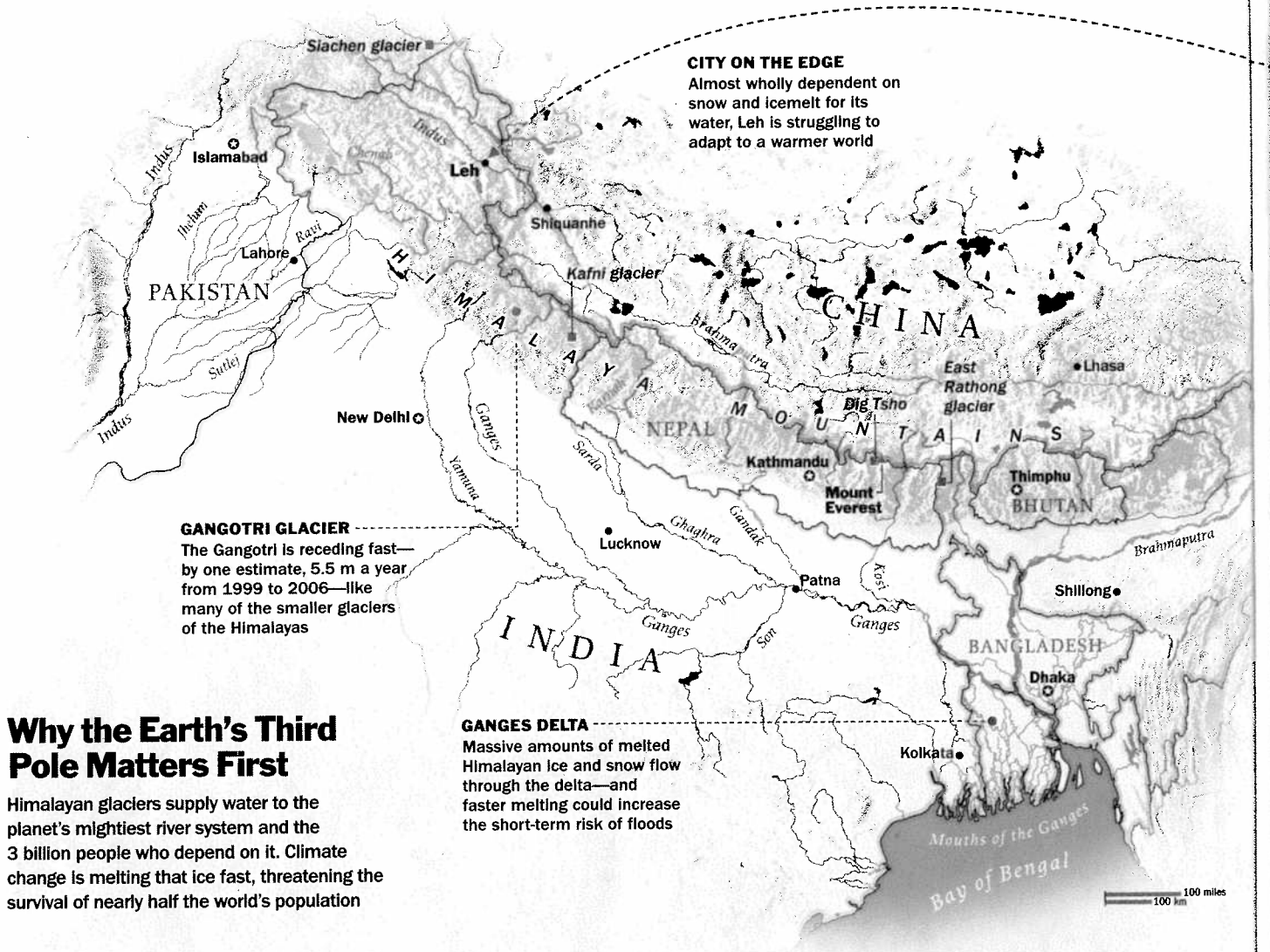
Researchers projected a 43% decrease in precipitation in the region by 2070. If that happens, the impact could be catastrophic. Losing Himalayan meltwater would only stress the remaining resources further. High-mountain states like Nepal and Bhutan could suffer flash floods as glacial lakes gave way under a rush of accelerated melting. And since the rivers of the Himalayas are shared by several powers that have engaged in violent conflict over the past half-century—India, Pakistan and China—the threat of a

war over water can't be denied. "The warming of the past 20 years is getting more and more intense," says Yao Tandong, head of China's Institute of Tibetan Plateau Research. "If warming continues, [the impact] will be even more serious."

Whether the warming will continue is largely up to us. Next week, representa-

tives from more than 190 nations will meet in Copenhagen, where they will work to hammer out a new, more equitable—and more effective—global climate deal. Expectations for the summit have been tamped down in recent weeks, in part because of sluggishness on the part of the U.S. Senate, which has yet to act on a bill that would cap and reduce the country's carbon emissions. There is some good news: President Obama will be in Copenhagen, and the U.S. is pledging to cut carbon emissions 17%





## Why the Earth's Third Pole Matters First

Himalayan glaciers supply water to the planet's mightiest river system and the 3 billion people who depend on it. Climate change is melting that ice fast, threatening the survival of nearly half the world's population

below 2005 levels by 2020, while China is promising to improve its energy efficiency. But now is the time to make the hard decisions that will set the world on a cleaner path, one that gives us a chance to avoid truly dangerous climate change. The potential loss of Himalayan ice is by no means the only threat from global warming, but it's one that can be seen in real time, with our own eyes. It can be hard to imagine the amount of energy it takes to melt a mountain glacier; it will take even more imagination to stop the melting. "We must have a global policy to reverse this trend," says Madhav Kumar Nepal, the Prime Minister of Nepal, whose impoverished country will be an early victim of warming. "This question is one of survival."

### Scenes from a Warmer World

THERE'S A SAYING ABOUT LEH THAT "THE passes are so high and the land is so barren, only a dear friend or a serious enemy

will reach here." That truth overlooks the stark beauty of this town of 27,000 in India's mountainous Ladakh region, but it accurately captures the harsh climate. At 3,000 m and surrounded by even higher mountains, Leh is in a cold desert, receiving less than 13 cm of precipitation a year. Young Buddhist monks in training carry tanks of water to the towering monasteries poised in cut-rock valleys. The region

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is permanently water-stressed, and the growth of tourism there has only stretched resources thinner. Without snowmelt from the mountains above and the Indus River, which flows south of the town, it's difficult to imagine anything living there at all. "Leh has always been dependent on the glacier for our livelihood," says Nisa Khatoon, who runs the WWF office in Leh. "When there is less snowfall, less ice, there is a water problem for Leh."

That's exactly what seems to be happening in Leh, whose people, along with those in other high-altitude regions of the Himalayas, are the first in the world to feel the impacts of ice loss. According to a study by the French environmental group GERES, average winter temperatures in the region have risen 1°C, and snowfall has generally declined over the past 25 years. Although relatively little scientific study has been done on the cumulative effect of that warming on the ice and snowpack



the region—a problem that crops up repeatedly in research on the Himalayas, where sheer inaccessibility makes science expensive and dangerous—elders in the region say the ice they remember from childhood is long gone, having receded from the mountains, and water isn't as plentiful as it once was.

The community has been forced to adapt in unexpected ways. Chewang Norphel, a 74-year-old engineer who has lived in the region his entire life, has been building what he terms artificial glaciers, stone cisterns that can collect and store what meltwater exists. Because he keeps his “glaciers” in the shade—and because they're small, less than 2,800 sq m—the water stays frozen longer in the winter and can be tapped in the spring to irrigate the farming villages that surround Leh. His invention is a way to compensate for the area's fluctuating water levels, but it's no replacement for gla-

cial ice, which locals say is vanishing. “I have seen glaciers disappear in my own life,” says Norphel. “I don't need the scientific data. I am the scientific data.”

The ice loss is visible elsewhere too, including on the world's tallest mountain, in neighboring Nepal. The famous Khumbu glacier, near the end of the trail to the base camp for Mount Everest, has receded 5 km since Tenzing Norgay and Edmund Hillary first ascended the peak in 1953. Sherpas who guide climbers up the mountain today say the trekking has gotten more treacherous and the trail harder to predict as warming has stolen the ice. More dangerous are the risks of bursting glacial lakes and flash flooding because of glaciers weakened by warming. The early stages of Himalayan melt will result in an increase of water flow and pressure within glaciers; when glaciers finally give way, releasing huge amounts of water, entire villages could be instantly wiped

out, as happened at the glacial lake of Dig Tsho in 1985. “This threat is not theoretical for us,” says Dawa Sherpa, a veteran Everest trekking guide. “This is real, and it will happen more and more. We don't see a very bright future.”

In Nepal it's easy to gauge the threat of warming, where the vanishing glaciers can be seen with one's own eyes. But downstream, in the farmland and cities of India, Bangladesh, Pakistan and China, the consequences are both more dire and less evident. According to the estimate of an Indian researcher, melt from the glaciers of the Himalayas supplies the rivers of Asia with more than 8.5 million cubic meters of water every year—as much as 50% of the water flow of some major rivers (like the Indus, which irrigates India and Pakistan), according to the International Center for Integrated Mountain Development, an advocacy group based in Kathmandu, Nepal. Although more-rapid melting

from warming would increase that water flow in the short term, potentially aiding agriculture, it would be like making ever larger withdrawals out of a limited bank account: eventually it will run dry. Given how fickle the monsoon can be—and the additional risk of climate change weakening those vital rains—the water tower of the Himalayas becomes all the more important. “It is the ice melt from these glaciers that sustains irrigation,” says Lester Brown, president of the Earth Policy Institute. “The melting of these glaciers is the most massive threat to food security that we have ever projected.”

It is also a threat to global security. In developing nations such as China and India, growing prosperity means ever greater demand for—and potential battles over—water. For countries that have long grappled with famine, that’s a frightening possibility and one that could trigger international conflict. The rivers of the Himalayas crisscross international borders, while the mountains are shared by several nations. Already China has come under fire from its neighbors for damming rivers that eventually flow into other nations. And while security experts point out that cross-border conflict over water has been relatively rare—even India and Pakistan have so far managed to share the Indus—water scarcity has frequently led to internal civil conflict. In a water-stressed region with nuclear capabilities, it could be disastrous to let the most valuable commodity become rarer still. “Climate change is a real specter that we don’t fully understand yet,” says the IWMI’s Chartres. “The impacts already seem to be stronger than we expected, and we could have real difficulties in the developing world.”

### The Search for Science

THE TROUBLE IS THAT WHILE MELTING glaciers remain a leading indicator of climate change, determining exactly how quickly they’re melting has been difficult, especially in the remote Himalayas. Data on the ground remain thin, and records may go back only a few decades or are all but nonexistent in the case of many glaciers. Nor does it help that the nations that share the Himalayas do so jealously.

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—V. RAMANATHAN,  
CLIMATOLOGIST, SCRIPPS INSTITUTE  
OF OCEANOGRAPHY



### Himalayan Glaciers Under Threat

To see photos of the water crisis at the top of the world, go to [time.com/himalayas](http://time.com/himalayas)

India does not allow Chinese researchers to visit its glaciers, China is sensitive because of concerns over Tibet, and India and Pakistan cooperate little on science or almost anything else.

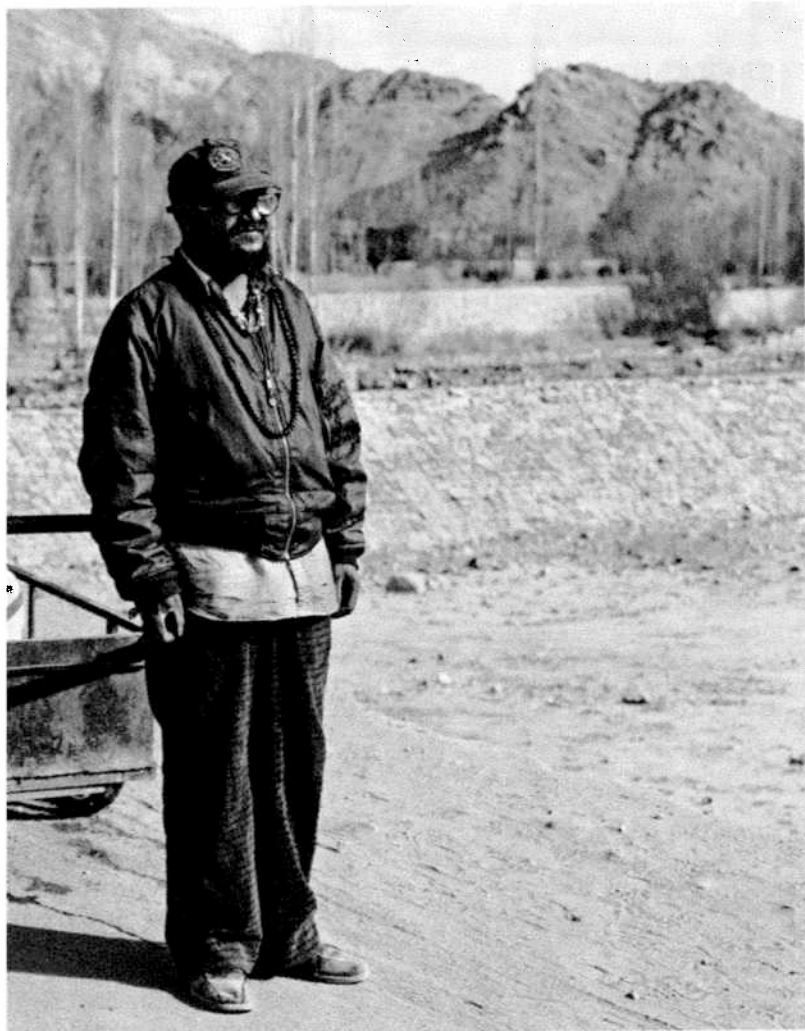
There is, unsurprisingly, active scientific disagreement about the impact of climate change on the glaciers. An Indian-government-backed report published in October claimed that many Indian glaciers are stable or that the rate of retreat has slowed in recent years, despite clear warming. Critics pointed out that the report was not peer-reviewed in a scientific journal and had major data gaps. But the lack of clarity makes it that much more difficult for policymakers to craft the right response. “The Himalayan data just isn’t there,” says Richard Armstrong, a senior research scientist at the National Snow and Ice Data Center in Boulder, Colo., who is skeptical that the glaciers are receding rapidly. “These glaciers are at a very high altitude, and what precipitation they get tends to fall as snow, which can add to their mass. There’s a tendency to oversimplify.”

What’s needed is cold, hard data in a cold, hard place. That’s what Syed Iqbal Hasnain is after. A senior fellow at the Energy and Resources Institute in New Delhi, he began his career as a hydrologist before switching to the more demanding



**Waterless world** Glacier loss will stress countries like India that are already going dry—leaving families to scramble for drinking water

field of glaciology. For years he and a small band of students have climbed Himalayan glaciers, like the East Rathong, measuring them and tracking their changes. It’s hard and expensive work—“not something Indian youth prefer as a profession,” he says with a chuckle—but he’s managed to add to the small body of scientific literature on Himalayan ice. Now he’s embarking on a joint project with the eminent climatologist V. Ramanathan of the Scripps Institute of Oceanography and Eric Wilcox, an atmospheric scientist at NASA, to determine exactly how quickly some benchmark glaciers in the Indian Himalayas are melting. Hasnain’s team will do the fieldwork, driving stakes with global-positioning-system capability into glaciers to let the researchers know year by year how the ice is changing. NASA will be able to augment that



earch with satellite data. The team will o test Ramanathan's hypothesis that ack carbon—the heavy black soot from :esel combustion and wood-burning at pollutes local air—could play a large rt in the melting of the Himalayas in dition to more traditional greenhouse ses. "Putting all this together, we can gin to get a reasonable estimate of the gional melt," says Wilcox.

#### Agenda for Copenhagen

R HASNAIN, WHO HAS DEVOTED HIS eer to studying the dynamics of Hima-an ice, establishing a firm benchmark ll help clear up the uncertainty that ll clouds the subject. But he has little ubt that the glaciers are melting fast, d he knows saving them will be vital India, as well as the rest of Asia and the rld. That will mean reducing carbon issions: "The debate is over," he says. /e know the science. We see the threat. e time for action is now."

The place for action will be Copen-

hagen, the Danish capital, where diplo-mats from will meet from Dec. 7 to Dec. 18 to discuss a new global climate treaty. With the Kyoto Protocol—a flawed deal that the U.S. repudiated and places few demands on major developing nations—set to expire in 2012, time is running out to approve a more effective and equitable agreement, one that could put the world on the path to a safer future in which water will be more plentiful and damag-ing storms and other natural disasters less frequent. Global CO<sub>2</sub> emissions rose 31% from 1997 to 2008, and emissions from China alone, now the world's big-gest emitter, have more than doubled. Instead of leveling off, as many skeptics have argued, the observed effects of cli-mate change, including glacial melt and species loss, have largely accelerated since 1997. "Global warming hasn't paused or declined or reversed," says Eric Steig, a climatologist at the University of Wash-ington and a co-author of a just-released climate science update. "There is the pos-

sibility that the climate system could con-tinue to warm to the highest end of the envelope of climate projections."

But turning back the momentum of climate change will be a momentous undertaking. A 2008 study by Ramanathan concluded that even if we halt the growth of greenhouse gas emissions im-mediately, we're committed to 2.4°C of warming over the next several decades. While the global community, including the G-8 in a statement last year, has agreed not to allow the global temperature to rise more than 2°C above preindustrial levels, we're already at 0.76°C.

The longer we wait to change, the more carbon we add to the atmosphere and the greater the chance that we'll be locking ourselves into truly catastrophic warm-ing. At Copenhagen and beyond, the mis-sion to halt climate change must be led by the U.S.—though the major developing nations that will be responsible for most of the world's carbon emissions must fol-low closely. "This isn't an environmental problem. It's a humanitarian problem global in scope," says Frances Beinecke, president of the environmental-advocacy group Natural Resources Defense Coun-cil. "The longer we wait to act, the more expensive those changes will be."

If that's not enough, there are any number of other reasons to cut carbon: to create clean-energy jobs, to ease politi-cal tensions tied to oil, to cut pollution, to save money through energy efficiency. But ultimately we need to act because if we fail to do so, the science tells us that we are committing ourselves to an unstable and dangerous world in which geographic and economic security—not to mention the health of all earth's species—may be at stake. There are glimpses of that differ-ent world in the Himalayas, where warm-ing has happened faster than elsewhere on the planet, where a mountain as im-mutable as Everest is changing before our eyes. "To me, continuing down our path is akin to committing suicide," says Ra-manathan. "But for my granddaughter, I'm optimistic that we're going to solve these problems." If we don't act today, we will fail to safeguard tomorrow for every-one's children. —WITH REPORTING BY AUSTIN RAMZY/BEIJING ■