

National Geographic Daily News

# "Mining" Groundwater in India Reaches New Lows

Small-scale rainwater harvesting and new crops could fill the gap



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Water-intensive onions are grown as a cash crop.

*Photograph by Lynsey Addario, National Geographic*

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for National Geographic News

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Nearly a third of India is suffering from chronic water shortages, and making up for it with "the world's largest groundwater mining operation," according to experts.

A band of land stretching across northern India, at the foot of the Himalayan Mountains, is one of the most heavily populated and intensely irrigated regions in the world. The area is chronically short of water. But the region still has a limited supply of it in underground aquifers, according to water resources expert Shama Perveen of Columbia University.

According to a new study by Perveen and her colleagues, Upmanu Lall and Naresh Devineni, some parts of India are using groundwater three times faster than it's being replenished.

The team's new analysis draws on a 100-year record of daily rainfall in India, reflecting how much water has been available in various parts of the country as its residents endured both droughts and floods.

By estimating water needs over dry spells and across decades, and comparing the estimate with actual rainfall, they found that many areas have been falling chronically short for many years.

The findings, presented this month at an American Geophysical Union meeting in San Francisco, fit with the results from gravity-sensing satellites that have detected the loss of groundwater across the heavily irrigated areas of northern India—with the extraction of water at about 11 billion cubic yards (9 billion cubic meters) of water per year over the past decade. (Read: "NASA Satellites Track Vanishing Groundwater.")

### **Local Water Management**

Local planners told the researchers they were aware there was a problem with water shortages and stress on the groundwater supply, she said, but they weren't aware of the depth of the problem, Perveen added.

When presented with the results of the study, she said, the officials were "amazed."

The researchers found that some regions receive enough rainfall to supply their needs, as long as they build more reservoirs, ponds, and tanks to store water when supplies are plentiful.

Much of the yearly rain comes during intense monsoon downpours, so storage is needed to help get through the long dry periods of the year.

By analyzing the historical data, day by day, the researchers showed that water stress exists even where the average annual rainfall is apparently enough to cover the average water use.

But the majority of the country's key food-growing areas would need far more water storage to be able to stop depleting the groundwater, Perveen said.

### **Water Storing Solutions**

A more sustainable solution is to use small ponds, dams, and other ways of storing water locally, a new study suggests.

For about half of the country, their analysis suggests, if people used small-scale "rainwater harvesting"—capturing rain and storing it in tanks and ponds—they would have much of the water they needed, assuming they continued

to grow the same types of crops.

(Related: "Lessons From the Field—Rainwater Harvesting in India.")

By providing detailed information on small areas of the country, the analysis could help policy makers decide how much additional water storage they need to avoid depleting groundwater further, Perveen said.

"India's [water] storage infrastructure is very dismal compared to other countries," she said, because reservoirs there store only about 325 cubic yards (250 cubic meters) per person, compared with 6,500 cubic yards (5,000 cubic meters) per person in China, or 7,800 cubic yards (6,000 cubic meters) in the United States.

"This study points out that India needs to invest in more water storage infrastructure—whether large or small," Perveen said.

(Related: "How to Stem a Global Food Crisis? Store More Water.")

## Crop Insurance

In other parts of India, though, rainwater harvesting alone won't be enough to avoid depleting groundwater further, the study suggests.

So the team is studying how farmers could shift the crops they grow to ones that require less water.

To make a living from agriculture, farmers will have to shift away from water-intensive crops such as rice, sugarcane, and cotton. Or they will have to drastically change their ways of growing these crops to make farming more water-efficient, Perveen said.

"This [kind of] work needs to happen more," said Edward Moran, a water resources expert with the U.S. Geological Survey in Columbia, Missouri.

"The general public needs to be better informed" about looming water shortages, he said, because in many places around the world "we're really not addressing the problem."

(Related: "Groundwater Depletion Raises Likelihood of Global Food Crises.")

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