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Air-conditioners are proliferating in India, but even now few people have them. For those without, “the social cost is high,” said an economist, Joyashree Roy.

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Debilitating heat on rise in India

NEW DELHI

Temperatures in cities reaching ‘unlivable’ levels, affecting health and jobs

BY SOMINI SENGUPTA

On a sweltering Wednesday in June, a rail-thin woman named Rehmati gripped the doctor’s table with both hands. She could hardly hold herself upright, the pain in her stomach was so intense.

She had traveled for 26 hours in a hot oven of a bus to visit her husband, a migrant worker here in the Indian capital of New Delhi. By the time she got here, the city was an oven, too: 111 degrees Fahrenheit by lunchtime, and Rehmati was in an emergency room.

The doctor, Reena Yadav, didn’t know exactly what had made Rehmati sick, but it was clearly linked to the heat. Dr. Yadav suspected dehydration, possibly aggravated by fasting during the Muslim holy month of Ramadan. Or it could have been food poisoning, common in summer because food spoils quickly.

Dr. Yadav put Rehmati, who is 31 and goes by one name, on a drip. She held her hand and told her she would be fine. Rehmati leaned over and retched.

Extreme heat can kill, as it did by the



Rehmati, sitting in a hospital, had traveled 26 hours in a hot bus only to arrive in New Delhi, where it was 111 degrees Fahrenheit. Her doctor blamed the heat for her illness.

dozens in Pakistan in May. But as many of South Asia’s already-scorching cities get even hotter, scientists and economists are warning of a quieter, more far-reaching danger: Extreme heat is devastating the health and livelihoods of tens of millions more.

If global greenhouse-gas emissions continue at their current pace, they say, heat and humidity levels could become unbearable, especially for the poor.

It is already making them poorer and sicker. Like the Kolkata street vendor who squats on his haunches from fatigue and nausea. Like the woman who sells water to tourists in Delhi and passes out from heatstroke at least once each summer. Like the women and men with fever and headaches who fill emergency rooms. Like the outdoor workers who become so weak that they miss days of work, and their daily wages.

“These cities are going to become unlivable unless urban governments put in systems of dealing with this phenomenon and make people aware,” said Sujata Saunik, who served as a senior official in the Indian Ministry of Home Affairs and is now a fellow at the Harvard University School of Public Health. “It’s a major public health challenge.”

A recent analysis of climate trends in several of South Asia’s biggest cities found that if current warming trends continued, by the end of the century, wet bulb temperatures — a measure of heat and humidity that can indicate the point when the body can no longer cool itself — would be so high that people directly exposed for six hours or more would not survive.

In many places, heat only magnifies the more thorny urban problems, including a shortage of basic services, like electricity and water.

For India’s National Disaster Management Agency, alarm bells rang after a heat wave struck the normally hot city of Ahmedabad, in the western part of the country, in May 2010, and temperatures soared to 118 degrees Fahrenheit, or 48 Celsius: It resulted in a 43 percent increase in mortality, compared to the same period in previous years, a study by public health researchers found.

Since then, in some places, local governments, aided by the Natural Resources Defense Council, an advocacy

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Working at a construction site on a hot summer evening in New Delhi. Outdoor workers become so weak from the heat that they miss days of work, and their daily wages.

Debilitating heat on rise in India

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group, have put in place simple measures. In Ahmedabad, for instance, city-funded vans distribute free water during the hottest months. In the eastern coastal city of Bhubaneswar, parks are kept open in afternoons so outdoor workers can sit in the shade.

The science is unequivocally worrying. Across the region, a recent World Bank report concluded, rising temperatures could diminish the living standards of 800 million people.

Worldwide, among the 100 most populous cities where summer highs are expected to reach at least 95 degrees Fahrenheit by 2050, according to estimates by the Urban Climate Change Research Network, 24 are in India.

Rohit Magotra, deputy director of Integrated Research for Action and Development, a research organization in New Delhi, is trying to help the city develop a plan to respond to the new danger. The first step is to quantify its human toll.

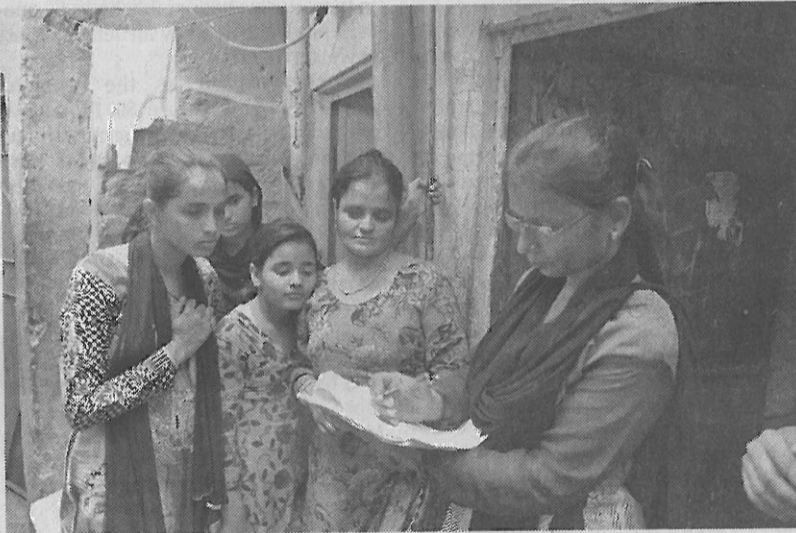
"Heat goes unreported and under-reported. They take it for granted," Mr. Magotra said. "It's a silent killer."

On a blistering Wednesday morning, with the heat index at 111 degrees Fahrenheit, he and a team of survey takers snaked through the lanes of a working-class neighborhood in central Delhi. They measured temperature and humidity inside the brick-and-tin apartments. They spoke to residents about how the heat affects them.

"Only by 4 a.m., when it cools down, can we sleep," a woman named Kamal told him. Her husband, a day laborer, suffered heatstroke this year, missed a week's work and with it a week's pay.

A shopkeeper named Mohammed Naeem said that while he managed to stay cool in his ground-floor space, his father's blood pressure rose every summer, as he sweltered in their top-floor apartment all day.

Through the narrow lanes all morning, young men hauled stacks of paper to a printing plant that operated on the ground floor of one house. A tailor sat cross-legged on the floor, stitching lining onto a man's suit. A curtain of flies hung in the air.



A research organization surveyed New Delhi residents on how they were coping with the heat. The group hopes to help the city plan a response to increasing temperatures.

A woman named Abeeda told Mr. Magotra that she helped her husband cope during the summer by stocking glucose tablets in the home at all times. Her husband works as a house painter. Even when he is nauseated and dizzy in the heat, he goes to work, she said. He can't afford not to.

Across town, workers covered their faces with bandannas as they built a freeway extension for Delhi's rapidly growing number of cars. The sky was hazy with dust. Skin rash, dry mouth, nausea, headaches: These were their everyday ailments, the construction workers said. So debilitating did it get that every 10 to 15 days, they had to skip a day of work and lose a day's pay.

Ratnesh Tihari, a 42-year-old electrician, said he felt it getting hotter year by year. And why would that be surprising? He pointed his chin at the freeway extension he was helping to build. "It's a fact. You build a road, you cut down trees," he said. "That makes it hotter."

Worldwide, by 2030, extreme heat could lead to a \$2 trillion loss in labor productivity, the International Labor Organization estimated.

Delhi's heat index, a measure that takes average temperatures and relative humidity into account, has risen sharply — by 0.6 degrees Celsius in summer and 0.55 degrees during monsoons per decade between 1951 and 2010, according to one analysis based on data from 283 weather stations across the country.

Some cities are getting hotter at different times of year. The average March-to-May heat index for Hyderabad had risen by 0.69 degrees per decade between 1951 and 2010. In Kolkata, a delta city in the east, where summers are sticky and hot anyway, the monsoon is becoming particularly harsh: The city's June-September heat index climbed by 0.26 degrees Celsius per decade.

Joyashree Roy, an economist at Jadavpur University in Kolkata, found that already most days in the summer are too hot and humid to be doing heavy physical labor without protection, with wet-bulb temperatures far exceeding the thresholds of most international occupational health standards.

And yet, walk through the city on a sti-

fling hot day in June and you'll find people pedaling bicycle rickshaws, hauling goods on their heads, constructing towers of glass and steel. Only a few people, Dr. Roy pointed out, are protected in air-conditioned homes and offices. "Those who can are doing this. Those who can't are becoming worse," she said. "The social cost is high in that sense."

Researchers are tinkering with solutions.

In Ahmedabad, city funds have been used to slather white reflective paint over tin-roofed shanties, bringing down indoor temperatures.

In Hyderabad, a similar effort is being tested. A pilot project by a team of engineers and urban planners covered a handful of tin-roofed shacks with white tarpaulins. It brought down indoor temperatures by at least two degrees, which was enough to make the intolerable tolerable. Now they want to expand their cool-roof experiment to a 1-square-kilometer patch of the city, installing cool roofs, cool walls and cool sidewalks, and planting trees. Their main obstacle now: funding.

Rajkiran Bilolikar, who led the cool-roof experiment, has a personal stake in the project. As a child, he would visit his grandfather in Hyderabad. There were trees all over the city. It was known for its gardens. He could walk around outside, even in summer.

Now a professor at the Administrative Staff College of India in Hyderabad, Mr. Bilolikar can't walk much. His city is hotter. There are fewer trees. Air-conditioners have proliferated, but they spew hot air outside.

Mr. Bilolikar said it's hard to persuade policymakers, and even the public, to take heat risk seriously. It's always been hot in Hyderabad. It's getting hotter slowly, almost indiscernibly. Heat, he said, is "a hidden problem."

At home, he had resolved not to use his air-conditioner. Through his open windows, though, his neighbor's machine blew hot air into his apartment. His three-year-old daughter became so overheated that her skin was hot to touch. Reluctantly, he shut his windows and turned his machines on.