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PHOTOGRAPHS BY BRYAN DENTON FOR THE NEW YORK TIMES

Clockwise from top: A flooded street in Mumbai; a dry well in Uttar Pradesh, in India's northeast; and Fakir Mohammed in his ruined cotton field in Marathwada, in the west.

India's lifeline turns erratic

Monsoons are shifting amid climate change, with unpredictable outcomes

BY SOMINI SENGUPTA

No season is as central to Indian life and lore as the monsoon. It turns up in Sanskrit poetry and in Bollywood films. It shapes the fortunes of millions of farmers who rely on the rains to nourish their fields. It even has its own music.

Climate change is now messing with the monsoon, making the seasonal rains more intense and less predictable. Worse, decades of shortsighted government policies have left millions of Indians defenseless in the age of climate disruptions — especially the poor.

After years of drought, a struggling farmer named Fakir Mohammed stares at a field of corn ruined by pests and the late-arriving rains. Rajeshree Chavan, a seamstress in Mumbai, has to sweep the sludge out of her flooded ground-floor apartment not once but twice during

this year's exceptionally fierce monsoon. The lakes that once held the rains in the city of Bangalore are clogged with plastic and sewage. Groundwater is drawn faster than nature can replenish it.

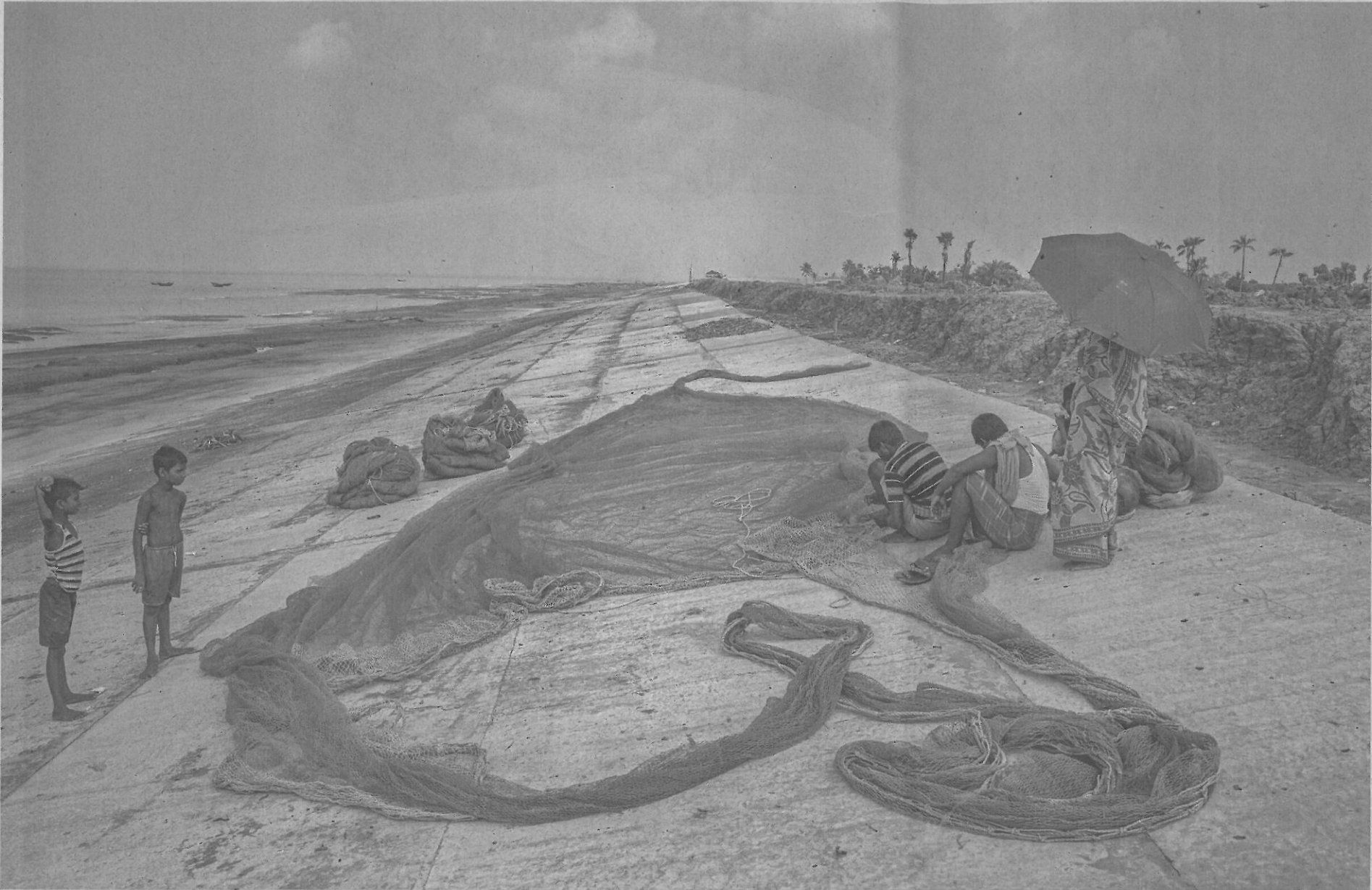
Water being water, people settle for what they can find. In a parched village on the eastern plains, they gather around a shallow, fetid stream because that's all there is. In Delhi, they worship in a river they hold sacred, even when it's covered in toxic foam from industrial runoff. In Chennai, where kitchen taps

have been dry for months, women sprint downstairs with neon-colored plastic pots under their arms when they hear a water truck screech to a halt on their block.

The rains are more erratic today. There is no telling when they might start, nor how late they might stay. This year, India experienced its wettest September in a century. More than 1,600 people were killed by floods, and even as the traditional harvest festivals rolled around in October, parts of the country

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WORLD



Fishermen mending a net on a sea wall that was built to protect the coastline in a village on Mousuni Island. Sea levels are rising there at a rate that's more than twice as fast as the global average.

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INDIA, FROM PAGE 1
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Even more troubling, extreme rainfall is more common and more extreme. Over the last century, the number of days with very heavy rains has increased, with longer dry spells stretching out in between. Less common are the sure and steady rains that can reliably penetrate the soil. This is ruinous for a country that gets the vast share of its water from the clouds.

The problem is especially acute across the largely poor central Indian belt that stretches from western Maharashtra State to the Bay of Bengal in the east: Over the last 70 years, extreme rainfall events have increased threefold in the region, according to a recent scientific paper, while total annual rainfall has measurably declined.



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"Global warming has destroyed the concept of the monsoon," said Raghu Murtugudde, an atmospheric scientist at the University of Maryland and an author of the paper. "We have to throw away the prose and poetry written over millennia and start writing new ones!"

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India's insurance policy against droughts, the Himalayas, is at risk, too. The majestic mountains are projected to lose a third of their ice by the end of the century if greenhouse gas emissions continue to rise at their current pace.

But, as scientists are quick to point out, climate change isn't the only culprit to blame for India's water woes. Decades of greed and mismanagement are far more culpable. The lush forests that help to hold the rains continue to be cleared. Developers are given the green light to pave over creeks and lakes. Government subsidies encourage the over-extraction of groundwater.

The future is ominous for India's 1.3 billion people. By 2050, the World Bank estimates, erratic rainfall, combined with rising temperatures, stand to "depress the living standards of nearly half the country's population."

RURAL INDIA: BRUTAL DROUGHT

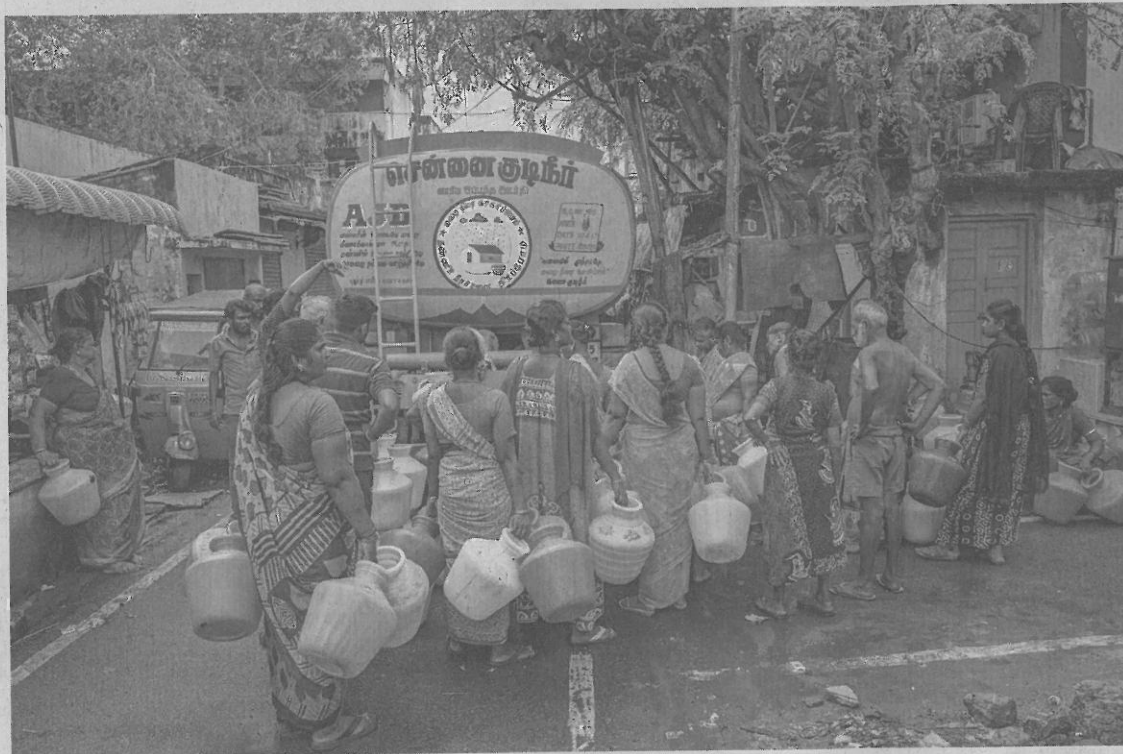
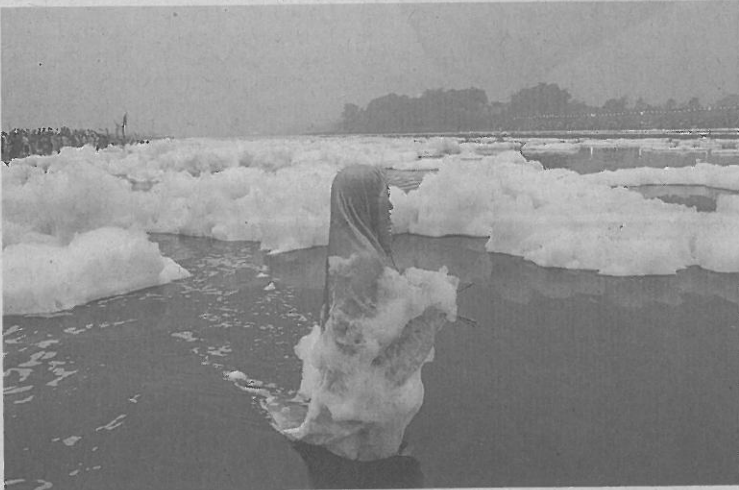
The Marathwada region, stretching out across western India, is known for its cruel, hot summers. Hardly any rivers cut through it, which means that Marathwada's people rely almost entirely on the monsoon to fill the wells and seep into the black cotton soil.

Marathwada is also an object lesson in how government decisions that have nothing to do with climate change can have profoundly painful consequences in the era of climate change.

In October, just weeks before the traditional harvest season, Fakir Mohammed led me through his family's one-and-a-half-acre plot of land. A neem tree stood in the middle of the fields. Lie under it, Mr. Mohammed said with pride, and you'll never get sick.

The same could not be said of his land. The rains had been deficient for most of the last nine years. This year, they came late, and when they came, the thirsty ground drank everything.

Then, an infestation of fall armyworm attacked Mr. Mohammed's corn. The



millet was ravaged by a fly. The cotton had flowered, but Mr. Mohammed could tell it would be a paltry harvest. "We worked very hard," he said. "But we'll get nothing out of this."

Worse, the rains this year did nothing to solve the community's drinking water shortage. Even at the end of the monsoon, Mr. Mohammed's well was dry. A dam nearby, built to supply drinking water to his village and nearly 20 others, had turned to scrubland, fit only for a few skinny cows to graze.

Water is so precious that the women of his family said they drank half a cup if they wanted a whole one. They went without a daily shower so their children could go to school clean and fresh. When their nerves were frayed, they smacked a child who spilled a cup by accident.

Every day, four government trucks came down the muddy lane to fill the village water tank, which met a fraction of what the village needs. Most people bought drinking water from far away.

Mr. Mohammed, who says he is around 60, is not wrong to worry. Since 1950, annual rainfall has declined by 15 percent across Marathwada, according

to an analysis by Roxy Mathew Koll, a monsoon specialist at the Indian Institute of Tropical Meteorology. In that same period, cloudbursts have shot up threefold. But here's what's shocking. Also during that same period, Marathwada, along with the rest of India, has seen a boom in the production of one of the thirstiest crops on earth: sugar cane.

Down the road from Mr. Mohammed's village, on land that gets water from an upstream dam, farmers had planted acres and acres with sugar cane. Why? Because sugar mills had sprung up across the state, some owned by politicians and their friends. They were ready to pay handsomely for cane.

Bizarrely, the taxpayers of India, one of the most water-stressed countries in the world, have aided sugar producers handsomely. The government subsidizes electricity, encouraging farmers to pump groundwater for their sugar cane fields, as well as fertilizers, which are used in vast quantities for sugar. State-owned banks offer cheap loans, which are sometimes written off, especially when politicians are courting farmers' votes. This year, the government has ap-

proved nearly \$880 million in export subsidies for sugar mills.

With all those perks, sugar cane production has grown faster than any other crop since independence from British rule in 1947, making India the world's biggest sugar producer, according to an analysis by Ramanan Laxminarayan, a researcher at the Princeton Environmental Institute. Three-fourths of irrigated sugar cane production takes place in areas under "extremely high water stress," the World Resources Institute found.

URBAN INDIA: FLOODS IN MUMBAI

The image of the potbellied Hindu god, Ganesha, that hangs above Savita Vilas Kasurde's narrow doorway is intended to keep obstacles away from her family's path.

The same can't be said for the Mithi River, which flows a few steps from Ms. Kasurde's door. Its path has been blocked every which way as it winds through this city of 13 million people.

Mumbai's international airport straddles the Mithi; you can see the planes taking off from Ms. Kasurde's street.

Clockwise from top right: Sakto Pal, 69, preparing to inject one of his sick sheep as they grazed on dry fields near Chak Ela, Uttar Pradesh. He said many of the lambs in his herd die when the dry season comes; residents lining up to collect drinking water in north Chennai; and a woman praying in a polluted river.

Sewage and rubbish pour into the Mithi. A vast spread of high-rises have been built on land reclaimed from the Mithi, along with higgledy-piggledy working class enclaves like this one, perched precariously on its edge. They are the ones that flood first and flood worst after a heavy rain. The city's other natural defense against floods, mangrove trees, have been pulled out for concrete.

Ms. Kasurde is a seasoned veteran. When the water rises, she hauls her fridge on top of the highest table, unplugs the television, wraps her children's school books in plastic. When the water is up to her knees, she takes it all upstairs to the second-floor bedroom.

Mumbai got more rain this year than it had in 65 years, and several times this season, it came in exceptionally heavy downpours. The drains overflowed. The lanes filled with muck. Commuter trains were disrupted. Flights were diverted. Several times in Ms. Kasurde's neighborhood, schools turned to storm shelters. Those without an upstairs room sloshed through the water to get there.

After each flood, as the waters began to recede, they returned to cover their noses and sweep the water and sludge out of their homes. Mosquitoes can breed in the puddles of dirty water. A dengue outbreak was the last thing they needed.

This is what worried Rajeshree Chavan when I saw her in the middle of the monsoon. She had managed to save her sewing machine, the source of her livelihood, twice this year when her ground floor room flooded. She had to throw away a sack of rice and her children's clothes.

It infuriated her that politicians came through only when they were trolling for votes. Even the state's top politician was here earlier in the year, she said. He wanted the neighborhood's support for the governing Bharatiya Janata Party, she recalled. He promised new houses for people on higher ground, in the northern suburbs of the city. He left after giving symbolic plastic keys to five families.