



A fish farmer tended his stocks in the Kolkata wetlands. Today, many of the city's lakes and canals are filled with muck or built over altogether.



Skyscrapers in the wetlands of Kolkata. The rapid extraction of groundwater for such developments is causing the landscape to sink.



A rainy day in Kolkata. The city is projected to have more people exposed to coastal flooding than any city in the world.

Kolkata didn't have to be a climate casualty

KOLKATA, INDIA

As global warming poses threat to Indian city, it lets natural defenses languish

BY SOMINI SENGUPTA

I wanted to glimpse the future in the city where I was born. So, this summer I returned to India for a firsthand look at the way climate change is affecting Kolkata.

I spent the first seven years of my life in this delta city, close to where the Ganges pours into the sea. In my memory, it was a city of steam and sweat, rice and fish, of languid, muggy afternoons. A city of water. Lots and lots of water.

On this trip, in the era of global warming, I found a city at profound risk.

Kolkata, formerly known as Calcutta, now faces more intense and more frequent storms, cyclones, river tides and floods.

Plus, its hot, muggy days are getting hotter and muggier: In mid-June, when I was there, the heat index, a measure of temperature and humidity, peaked at 45 degrees Celsius, or 113 degrees Fahrenheit. In Gariahat market, where I once watched my mother unfurl sari after sari, one street vendor leaned wearily against a wall, dabbing his head with a handkerchief in vain.

Most worrying, this sprawling metropolis of 14 million is utterly unprepared.

"On one side your threat is increasing and you are basically in a prehistoric level of preparedness," Jayanta Basu, an environmental journalist and a Kolkata native, said of his city. "All in all, you're in for a disaster."

More upsetting to Mr. Basu, it didn't have to be this way.

Kolkata had natural defenses: the mighty Ganges to the west, wetlands to the east, all emptying into the mangrove-rich delta region known as the Sundarbans and out to the Bay of Bengal. The city's lakes and creeks could swallow the rains. The soft clay soil, used by the city's sculptors to create figures of revered Hindu gods, could hold groundwater.

Today, many lakes and canals are filled with muck or built over altogether. An area of low-lying fields that once absorbed the runoff is now a suburb of high-rises known as New Kolkata. The rapid extraction of groundwater is causing the landscape to sink.

"We're actually kind of destroying all these natural subsidies," Mr. Basu said. And the Sundarbans? The people of



Between 1955 and 2015, Kolkata recorded three times as many cloudburst days, when it rained more than four inches a day, compared with the first half of the 20th century.

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the Sundarbans are pouring into Kolkata.

The water of the Bay of Bengal is rising faster than the global average. Their paddy fields turned salty, they told me, and their houses fell down. So they packed up and moved to Kolkata, the closest big city, joining the ranks of the most vulnerable: the city's poor.

Now, they live in houses made of bamboo and tin, in neighborhoods where the drains back up in the monsoon and you have to hitch up your sari to wade through the filthy, stinking floodwaters.

Kolkata — once a city of empire, then a city of jazz, then a city synonymous with destitution — sits in a saucer, sloping down from the Ganges to the wetlands and eventually out to the Bay of Bengal, roughly 90 miles away. The Adi Ganga, a tributary of the Ganges, meanders through the city. Clogged with silt, today, it is no more than a shallow,

fetid wastewater canal.

I went to a neighborhood perched on the edge of the Adi Ganga. Inside the brick and tin houses it was blazing hot, and so the neighborhood women sat in the narrow lanes, combing their children's hair or washing lunch pots at the public tap.

I asked them about the rainy season. Every year, they said, especially during high tide on the river, the lanes flood. Water sloshes into their homes. The drains back up and overflow. The community tap is often contaminated. Dengue fever, once unheard-of in Kolkata, is now a common hazard.

The city is no stranger to flooding. Sugata Hazra, an oceanographer at Jadavpur University, said that even after a moderate downpour, a movie theater he favored as a young man would fill up with water. He remembers having to lift his feet in the middle of a movie. These

days, even though many drains have been cleaned, low-lying parts of the city still get inundated. Traffic grinds to a halt.

The risk of flooding has increased, as extreme rainfall events have become more common. One study found that Kolkata is receiving many more heavy rainfall days than before.

One of Dr. Hazra's doctoral students, Amit Ghosh, drilled down further. He found that between 1955 and 2015, the city recorded three times as many cloudburst days, when it rained more than 100 millimeters, or four inches, a day, compared to the first half of the 20th century. These heavy rainfall events are disastrous for an already flood-prone city, where nearly a third of the population lives in slums, or worse, on the sidewalks under the open sky.

According to the Organization for Economic Cooperation and Develop-

ment, if the current trajectory of greenhouse gas emissions continues, by 2070 Kolkata is projected to have more people exposed to coastal flooding than any city in the world.

Among cities facing growing flood-damage losses between now and 2050, Kolkata is projected to be among the top three.

"This is what we say to God: 'If a storm comes, kill us and our children all at once, so no one will be left to suffer,'" said Malati Mandal, a 30-year-old homeless mother of four. She lived on a sidewalk along Rashbehari Avenue, a 10-minute walk from my childhood apartment.

Joyashree Roy, a Jadavpur University economist who studies the impact of climate change, said the extreme weather that she has been reading about in academic journals for years was already a fact of life in Kolkata. "Climate models

are showing temperature related extremes and rainfall extremes, which we are seeing is already happening," she said.

These days, the city seems to live in a simultaneous state of growth and decay. A new Metro line is under construction, stretching into the eastern suburbs. The roots of old trees wrap their fingers around the old unkempt houses. One afternoon, walking to a tea shop on Russell Street, in the city center, I peered through a window to find that an abandoned courtyard had grown into a jungle.

Early on a Sunday morning in June, before the midday sun could fry us, Mr. Basu took me to the eastern wetlands, an internationally protected site stretching across 12,500 hectares, or 30,888 acres, that he described as the city's "ecological subsidy."

The wetlands, a patchwork of ponds woven together by slender berms, cleans the city's wastewater. It also defends the city from catastrophic floods, carrying floodwaters to the sea. "The runoff has to go somewhere," Mr. Basu said. "This is that somewhere."

We drove around the perimeter of the wetlands. On one side there was a forest of office buildings. On another, a luxury condominium complex was under construction, aspirationally called Fifth Avenue. Nearby, boys rifled through an illegal hill of garbage, looking for recyclables. Through the haze, you could see the suburb known as Rajarhat. Mr. Basu noticed something he hadn't noticed before.

"Everywhere you have an image of huge monstrous buildings looking at you from all sides of the wetland," he said. "It's basically waiting to be sucked."

We drove on to a canal that empties into the wetlands. Along its banks in a makeshift factory, three migrants from neighboring Bihar State were grinding old rubber flip-flops into rubber particles for reuse.

Further along the canal, I met Rini Giri, who said she left her village in the Sundarbans after Cyclone Aila swept through in 2009, flattening her house and turning the rice fields salty. With her husband, Bapi, and their two children, Ms. Giri came to the city a few months later, only to have a thunderstorm send a tree crashing down on the asbestos-and-tin roof of their new home.

This is what Mr. Basu worries about most: Cyclones are becoming more intense in the Bay of Bengal. With the exception of Aila, which downed power lines and trees, the city has been largely spared. But, he says, "Kolkata is not going to be lucky forever."