

A 'New Era of Air Pollution' in the Tropics Could Have a Huge Toll

Increasingly bad air in big cities is expected to kill hundreds of thousands in coming years if stronger controls are not put in place.



By Maggie Astor

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Urban air pollution in the tropics is rapidly increasing and will lead to hundreds of thousands of preventable deaths if stronger regulations are not put in place, according to a new study.

Some 180,000 premature deaths in large tropical cities in 2018 alone were attributable to increased exposure to pollutants since 2005, according to researchers at University College London. That number, they noted, is made all the more alarming by the fact that nearly three-quarters of megacities, those with 10 million or more residents, are expected to be in the tropics by the end of the 21st century.

In many megacities, pollutants increased between 8 and 14 percent year to year, which is up to three times as high as national or regional rates of increase. And the vast majority appeared to come from industrial and residential sources, not from agricultural practices like biomass burning that have historically driven air pollution in tropical regions.

“What really surprised us was the size of the trends that we were seeing,” said Eloise Marais, an associate professor of geography at University College London and a co-author of the study, published Friday in the journal *Science Advances*. “Because air quality is degrading so rapidly and population is increasing so rapidly, we estimated really, really steep trends in urban population exposure to air pollution, with implications for urban public health.”

The researchers used data collected by instruments on satellites from NASA and the European Space Agency to estimate concentrations of several pollutants known to be harmful to humans: fine particulate matter, known as PM2.5; nitrogen dioxide; ammonia; and volatile organic compounds, or V.O.C.s, a group of chemicals that includes formaldehyde and

benzene. The data covered 46 tropical cities in Africa, the Middle East and Asia that are projected to have populations of 10 million or more by 2100.

They found yearly increases of up to 14 percent for nitrogen dioxide, up to 12 percent for ammonia, up to 11 percent for V.O.C.s and up to 8 percent for fine particulate matter. Those numbers, combined with public health risk assessment models, allowed them to estimate how many premature deaths would be associated with such increases.

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From 2005 to 2018, nitrogen dioxide, which has been linked to lung cancer and heart disease, increased significantly in 34 of the 46 cities. Among the hardest hit were Chittagong, Bangladesh, where concentrations tripled, and four cities — Luanda, Angola; Dhaka, Bangladesh; Antananarivo, Madagascar; and Hanoi, Vietnam — where concentrations more than doubled.



A smoggy Hanoi skyline in 2019. Manan Vatsyayana/Agence France-Presse — Getty Images

In many cities, concentrations of some pollutants declined while others increased. But Jakarta, Indonesia, was the only one that saw a statistically significant improvement in overall air quality as a result of governmental policies.

Improvement is relative as Jakarta still has a severe air pollution problem, but the trends there pointed to how effective targeted policies could be at reducing pollution. The city has emission standards for vehicles, the researchers noted, and saw a decrease in nitrogen dioxide, which is associated with vehicle exhaust. But it does not have limits on biomass burning, such as burning land to clear it after a harvest, and it saw increased concentrations of ammonia, which is associated with such agricultural activities.

Overall, however, the researchers found that most of the increased pollution was driven not by biomass burning but by sources like traffic and fuel burning — a distinction the researchers were able to make because biomass burning shows up in satellite observations in intense but relatively short bursts, usually with a seasonal pattern. Other human activities produce less intense but more sustained pollution.

“Open burning of biomass for land clearance and agricultural waste disposal has in the past overwhelmingly dominated air pollution in the tropics,” Karn Vohra, a research fellow at University College London and the lead author of the study, said in a statement. “Our analysis suggests we’re entering a new era of air pollution in these cities, with some experiencing rates of degradation in a year that other cities experience in a decade.”

The study does not answer the question of what activities, specifically, are most responsible.

“The driver of these trends is anthropogenic activity, but that’s very broad — there’s so much anthropogenic activity that takes place within a city,” Dr. Marais said, adding that further scientific research was needed to identify the largest contributors.

Then, she said, it would be up to policymakers to do cost-benefit analyses and determine the most effective and economically viable ways to reduce pollution.

Of course, the ever-present political challenges will remain and, even when laws are enacted, their effects are not immediate.

In their report, the researchers emphasized the disproportionate harm that air pollution could do in tropical cities, many of which are in countries with weak or overburdened health care systems.

The coronavirus pandemic has only underscored “that health care systems in tropical countries are vulnerable to the looming health crisis supported by our exposure trends,” they wrote. “Immediate and strict policy measures are needed to improve air quality and curtail increased exposure to hazardous pollutants due to abrupt population growth and urbanization in a part of the world that accounts for an increasingly large portion of the global population.”