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# Watch the Footprint of Coronavirus Spread Across Countries

By Nadja Popovich   March 17, 2020

As the new coronavirus shuts down countries around the world, the impact can be seen from space.

A satellite that detects traces of human activity — tailpipe emissions from cars and trucks, fossil fuel burned in power plants and other industrial activities — shows striking reductions in pollution across China and Italy since the outbreak first started.

Both countries have taken unprecedented measures to limit the movement of people in the hope of slowing or even containing the spread of the disease. Even in South Korea, which has put more modest restrictions on the movement of its citizens, pollution appeared to fall.

"It's the first time in history we've seen something like this," said Marco Percoco, an associate professor of transportation economics at Bocconi University in Milan, referring to the speed and the size of the pollution declines in Italy and China.
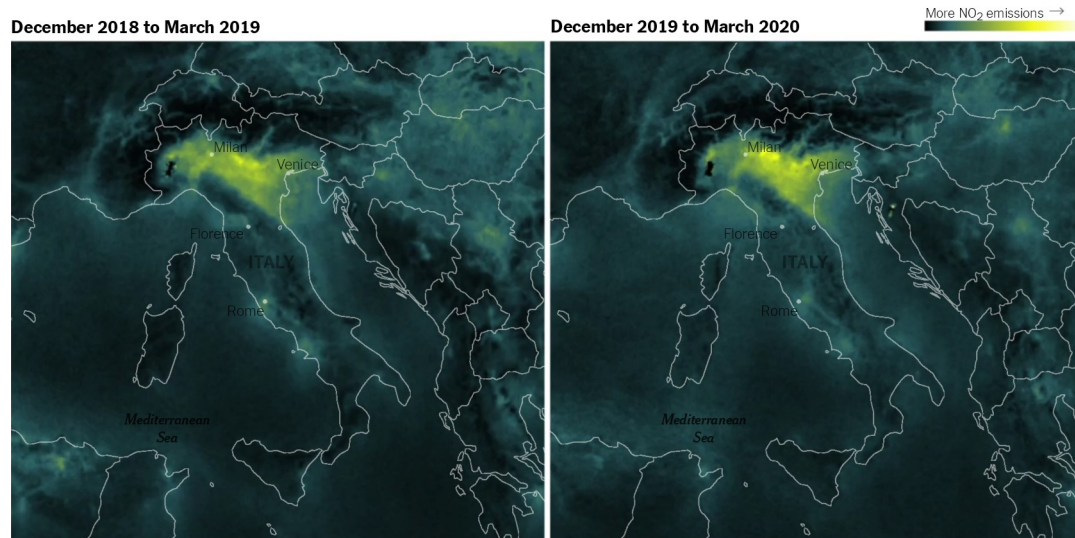
Each frame in this video represents a 20-day composite of nitrogen dioxide concentrations from mid-December through mid-March. Source: Sentinel-5P satellite data processed by Descartes Labs

Northern Italy

Italy is facing the largest coronavirus outbreak outside of China, with nearly 30,000 illnesses and 2,100 deaths reported so far.

Early cases were clustered in the north, where the outbreak has been especially severe, but the disease has continued to spread throughout the country.

In early March, the government imposed emergency measures restricting the movement of roughly 16 million people throughout northern Italy, including major cities like Venice and Milan. Bars, restaurants and other gathering places were closed, and citizens were asked to avoid all unnecessary movement. Soon after, similar restrictions were extended countrywide.

The impact of those restrictions can be seen in pollution readings gathered by the European Space Agency's Sentinel-5P satellite. The images show that emissions of nitrogen dioxide, a gas closely linked to vehicle exhaust, are considerably lower across northern Italy compared to the same time period last year. The region regularly struggles with wintertime smog.

The satellite data was analyzed for The New York Times by Descartes Labs, a geospatial analysis group.

In a separate analysis made public this weekend, researchers from Bocconi University reported a "sizeable" decline in several types of air pollution in Milan during the lockdown, including nitrogen dioxide levels

and particulate matter pollution, a byproduct of burning fossil fuels that is highly damaging to human health.

"It is clear people are not moving by cars," said Dr. Percoco, an author on the study, noting that vehicle emissions are a major source of particulate matter and other pollution in Italian cities. Few people are on the streets, he said, with many Italians staying home to avoid the virus.

December 2018 to March 2019

December 2019 to March 2020

More NO$_2$ emissions →
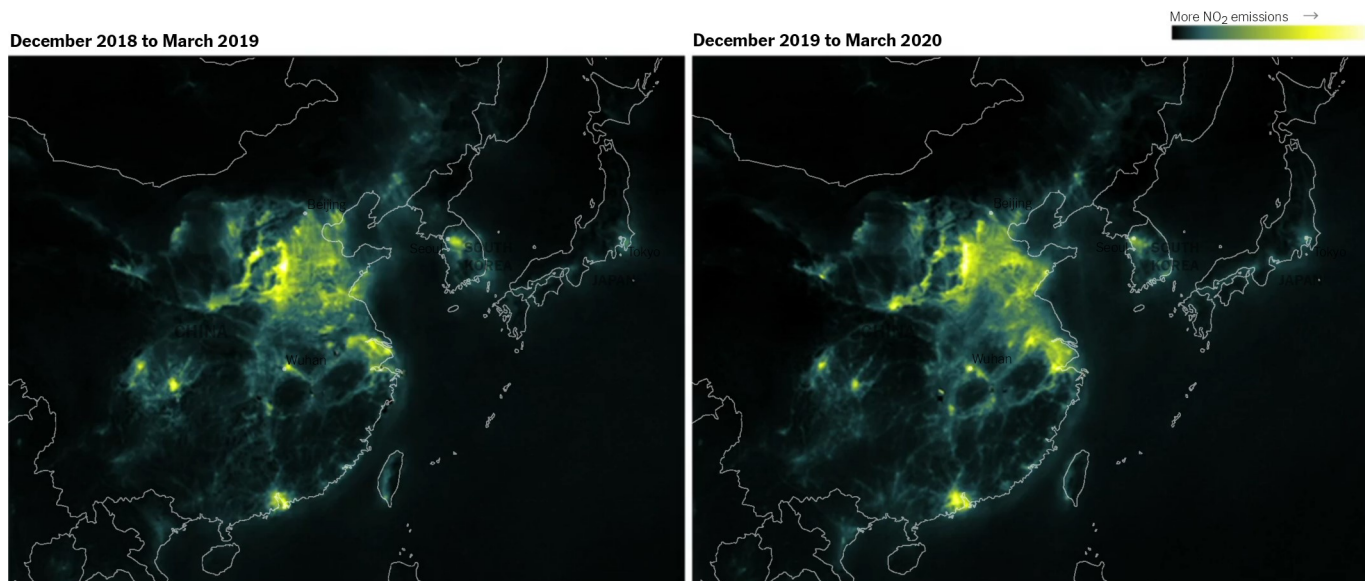
China and South Korea

The drop in pollution was even starker in China, where the new coronavirus was first detected. The largest emissions reductions were seen surrounding the city of Wuhan, in Hubei Province.

Chinese officials put the region on lockdown in late January, following the Chinese New Year holiday, and have only recently begun relaxing restrictions to allow workers in key industries to return to their jobs. That includes public transportation workers and those involved in making medical supplies and other necessities.

The unprecedented lockdown, which barred the movement of nearly 35 million people, caused widespread economic disruptions, including a slowdown in manufacturing and electricity generation.

Pollution across the region plunged accordingly.

"What we saw in China was a very rapid effect," said Joanna Joiner, an atmospheric physicist at NASA. The agency's own analysis found that nitrogen dioxide emissions over eastern and central China were significantly lower during January and February this year compared to what is normal for the period.

Every year, pollution dips across the country during the weeklong Lunar New Year celebration, as factories shut down and people stay home from work. (The holiday falls in late January or early February each year). But usually, emissions rebound as the country reopens for business. This year, they stayed at lower levels for weeks.

A smaller decrease in nitrogen dioxide pollution can also be seen in South Korea, around the capital, Seoul. The South Korean government did not bar the movement of its citizens but encouraged strict social distancing by closing down schools and universities, asking people to work from home and canceling large gatherings.

The social distancing measures, as well as an increasing number of people in self-quarantine, appear to have had an impact on air pollution, said Minwoo Son, a coordinator at the Global Air Pollution Unit of Greenpeace East Asia. But further analysis is needed to fully understand the depth of coronavirus' impact on South Korea's air, he added.

As more countries shut down life as usual to slow the spread of coronavirus, we may see further drops in pollution around the world, Dr. Joiner said.

"We're seeing changes in human behavior, in how people are moving

around and how they're using fuels," she said. "Pollution won't hide from the satellite data. It's going to tell us what's going on."

Correction: March 18, 2020

An earlier version of this article misspelled the last name of the Greenpeace East Asia coordinator. He is Minwoo Son, not Minwoo Sun.