dvrpc | July 2021

Alert

Alert is a monthly update on transportation and air quality planning activities in the Delaware Valley.

Air Quality Regulations

Study Shows that Weather Played an Important Role in Pandemic Air Quality

Recent research conducted at Washington University in St. Louis showed that the natural variability in meteorology played a larger role in the reduction of fine particulate pollution ($PM_{2.5}$) than the pandemic lockdowns across the globe.

Headlines that declared COVID-19 lockdowns drastically reduced pollution were mostly referring to nitrogen dioxide (NO_2). NO_2 is a reactive gas that is emitted from burning fuel. There had been less understanding of how lockdowns affected $PM_{2.5}$. $PM_{2.5}$ is a harmful pollutant that can penetrate a person's lungs, leading to a host of health problems, including increased risk for heart attack and cancer.

The research, published in the June 23, 2021 issue of *Science Advances,* mapped $PM_{2.5}$ levels across China, Europe, and North America. Using satellite data, ground-based monitoring, and a computer modeling system, researchers found mostly slight changes in $PM_{2.5}$ levels during the lockdown period. The majority of changes they found were not driven by lockdown, but by the natural variability of meteorology.

During the pandemic, news outlets published articles with before and after pictures claiming air quality improved because people were staying home. The visuals were striking with data from NASA satellites showing a clear atmospheric reduction in NO_2, largely because satellite imaging of NO_2 concentrations were readily available. Whereas data for other pollutants that impact public health was not avaliable in real time.

“People automatically started wondering, ‘What’s the picture for $PM_{2.5}$?’” said Melanie Hammer, lead author of the study. That was the obvious question not just because particulate matter often comes from the same sources as NO_2, but because NO_2 can form $PM_{2.5}$.

Since most of the world’s population lives in areas without $PM_{2.5}$ monitors, researchers focused on three regions that do have extensive ground monitoring systems in place: North America, Europe, and China. The team then compared monthly estimates of $PM_{2.5}$ from January to April in 2018, 2019, and 2020.

When they compared $PM_{2.5}$ levels over the three years during the months that coincided with each region's lockdown phases, there weren't many clear signals over North America or Europe, however significant reductions were seen over the North China Plain, where the most strict lockdowns

Save the Date

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July 30, 2021

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For more information, please visit:
www.nj.gov
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Now Accepting Applications

Pennsylvania DEP Level 2 Electric Vehicle Charging Rebate Program

Accepting applications for Level 2 EV Charging Station Rebates

For more information, please visit:
https://gis.dep.pa.gov/drivingpaforward/

were concentrated. Hammer suspects that the change in $PM_{2.5}$ levels over the North China Plain was so striking because of how polluted it tends to be in "normal" times. "You're probably more likely to see a larger reduction in a region that has higher concentrations to begin with," she said.

The researchers concluded that since $PM_{2.5}$ levels have been significantly dropping over the past few decades in North America and Europe, it is unlikely to see drastic changes in $PM_{2.5}$ levels because existing concentrations of the pollutan are already low. In China, where $PM_{2.5}$ concentrations are high, drastic changes in economic activity resulted in significant reductions in $PM_{2.5}$ concentrations.

While the results of the research may be counterintuitive, they do underscore the complex relationship between pollutants and metereorolgy and show that in the short term, weather has an outsized role in local pollution events. These results highlight the importance of addressing climate change for its potential impacts on air pollution episodes that have great impacts on public health.

To read more about weather's impact on $PM_{2.5}$ levels during the pandemic please visit: https://wustl.edu/ and search "pandemic air quality".

Air Quality News

New Forecasting Model Allows Meteorologists to Predict Ozone Levels Weeks Ahead of Time.

According to a recent article in the publication *Scientific Reports,* ozone levels in the earth's troposphere (the lowest level of our atmosphere) can now be forecasted with accuracy up to two weeks in advance. This is a considerable improvement over current models that can only accurately predict ozone levels three days ahead. Conventional forecasting uses a numerical model, which means the research is based on equations for the movement of gasses and fluids in the atmosphere. The new artificial intelligence (AI) system developed in the University of Houston's Air Quality Forecasting and Modeling Lab could lead to improved ways to control high ozone problems and even contribute to solutions for climate change issues.

"This was very challenging. Nobody had done this previously. I believe we are the first to try to forecast surface ozone levels two weeks in advance," said Yunsoo Choi, professor of atmospheric chemistry and AI deep learning at the University of Houston.

Ozone levels have become a frequent part of daily weather reports. But unlike weather forecasts, which can be reasonably accurate up to 14 days ahead, ozone levels have been predicted only two or three days in advance. There is still work to be done to make this a commercially viable model that is available to meteorologists but the larger public health and environmental benefits are worth the investment.

Ozone is a secondary pollutant. It is not directly emitted but forms when volatile organic compounds and nitrogen oxides combine in the presence of sunlight. The resulting ozone is damaging to human lung tissue and even plants. By predicting elevated ozone levels further in the future, steps can be taken to reduce the emissions that form ground level ozone and public health officials can advise populations that are susceptible to ozone pollution- like people with asthma, children, and older people - to take precautions to protect their health.

"If you know the future - air quality in this case - you can do a lot of things for the community", said Choi. Using the current ozone forecasting models, the public only recieves a day or two notice to prepare for elevated ozone episodes or may miss the alerts entirely. More advanced noticed will allow people to plan to take actions to reduce emissions and protect their health, like taking transit, reducing strenuous outdoor activities, or rescheduling using gas powered lawncare equipment.

For more informationon on the University of Houston air quality model, please visit: https://www.nature.com/articles/s41598-021-90446-6f.

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