

## Impact of the COVID-19 Pandemic on Air Quality in Metropolitan New Jersey

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### Abstract

Improved air quality has been the silver lining of the pandemic since early 2020. The air quality in northern New Jersey was continuously measured during the COVID-19 pandemic and through the three stages of recovery, i.e. the Stay-at-home Stage, Reopening Stage 1 and Reopening Stage 2. A significant change in air quality was observed during the Stay-at-home Stage (March 16 to May 16, 2020) as most people stayed home and industrial activity decreased 60%. Compared to 2019, carbon dioxide (CO<sub>2</sub>) decreased 17%, carbon monoxide (CO) decreased 7%, and nitrogen oxides (NO<sub>x</sub>) decreased 51% during the Stay-at-home Stage in 2020. However, the ground-level ozone (O<sub>3</sub>) increased in 2020 because of the reduced NO<sub>x</sub> emission and the possibly increased levels of volatile organic compounds (VOCs) due to warmer weather. With the step-by-step reopening process, the difference in local CO<sub>2</sub> levels between 2019 and 2020 was reduced and the NO<sub>x</sub> concentration returned to its 2019 level. The CO<sub>2</sub> concentrations were positively correlated with CO, and the NO<sub>x</sub> concentrations were negatively correlated with O<sub>3</sub> in 2020. However, these correlations are different from those in 2019. The impact of COVID-19 was found to influence the concentration levels of CO<sub>2</sub>, CO, NO<sub>x</sub>, and O<sub>3</sub> beyond the effects of meteorology parameters on air quality in metropolitan New Jersey. Moreover, our findings

provide a reference of air pollution reduction through replacing fossil fuels with electric or renewable energy in the transportation system and industry.

**Keywords:** COVID-19; Air quality; Carbon dioxide; Carbon monoxide; Nitrogen oxides;  
Ground-level ozone