

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

Ying Yao¹, Francisco Artigas², Songyun Fan¹, and Yuan Gao¹

¹Rutgers University

²New Jersey Sports and Exposition Authority

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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 (CO₂) decreased 17%, carbon monoxide (CO) decreased 7%, and nitrogen oxides (NO_x) decreased 51% during the Stay-at-home Stage in 2020. However, the ground-level ozone (O₃) increased in 2020 because of the reduced NO_x emission and the possibly increased levels of volatile organic compounds (VOCs) due to the warmer weather. With the step-by-step reopening process, the difference in local CO₂ levels between 2019 and 2020 was reduced and the NO_x concentration returned to its 2019 level. The CO₂ concentrations were positively correlated with CO, and the NO_x concentrations were negatively correlated with O₃ in 2020. However, these correlations are different from those in 2019. The impact of COVID-19 was found to influence the concentration levels of CO₂, CO, NO_x, and O₃ 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.

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

Ying Yao^{a,b}, Francisco J. Artigas^{a,b*}, Songyun Fan^b, Yuan Gao^b

^aMeadowlands Environmental Research Institute, New Jersey Sports and Exposition Authority, 1

Dekorte Park Plaza, NJ 07071 United States

^bDepartment of Earth and Environmental Science, Rutgers University, Newark, NJ 07102 United

States

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 (CO₂) decreased 17%, carbon monoxide (CO) decreased 7%, and nitrogen oxides (NO_x) decreased 51% during the Stay-at-home Stage in 2020. However, the ground-level ozone (O₃) increased in 2020 because of the reduced NO_x 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 CO₂ levels between 2019 and 2020 was reduced and the NO_x concentration returned to its 2019 level. The CO₂ concentrations were positively correlated with CO, and the NO_x concentrations were negatively correlated with O₃ in 2020. However, these correlations are different from those in 2019. The impact of COVID-19 was found to influence the concentration levels of CO₂, CO, NO_x, and O₃ beyond the effects of meteorology parameters on air quality in metropolitan New Jersey. Moreover, our findings

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