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Modeling street level NDVI and traffic simulation to assess spikes in CO, CO2, NOx, HC and fuel use affecting vulnerable populations

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This study presents a novel approach to assess air pollution exposure at street level, considering traffic simulation and vegetation cover. We utilize the Comprehensive Modal Emissions Model (CMEM) to simulate traffic flow and estimate emissions of CO, CO2, NOx, and HC. Traffic data is derived from origin-destination matrices based on US census commute patterns. To account for the mitigating effect of vegetation, we incorporate the normalized difference vegetation index (NDVI) –a measure of street-level green cover. This combined approach allows us to pinpoint pollution hotspots, particularly near areas sensitive to respiratory health like schools and hospitals.

The simulations were conducted in Bloomington, Monroe County, analyzing over 5,000 street segments. The results indicate that arterial roads exhibit higher concentrations of pollutants. Conversely, NDVI values demonstrate greater variation across the study area. Based on these findings, we propose the implementation of green zones around arterial roads and strategic placement of future schools and hospitals behind natural buffers. This study offers valuable insights for urban planners and policymakers seeking to develop localized solutions to mitigate air pollution/heat and protect vulnerable populations.

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