

Study of European historical data suggests proportion of NO₂ in NO_x emissions smaller than thought

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(Phys.org)—A team of researchers at the University of York in the U.K. has found that the proportion of nitrogen dioxide (NO₂) in nitrogen

oxides in European traffic emissions is smaller than has been thought. In their paper published in the journal *Nature Geoscience*, the group describes analyzing data from roadside monitors over the course of many years and what they found by doing so. Drew Gentner and Fulizi Xiong with Yale University offer a News and Views [perspective](#) on the work done by the team in the same journal issue and suggest that the team's findings could have implications for air pollution standards organizations in many more places than just Europe.

One of the types of pollutants emitted by cars and trucks is [nitrogen oxides](#) (NO_x), in particular NO₂ and nitric oxide (NO). These pollutants have been in the news in Europe over the past couple of decades because many truck and car owners have chosen to switch to vehicles powered by diesel fuel, which costs less than gasoline—but such vehicles also emit more NO_x. To combat [air pollution](#), officials in Europe and the U.K. have enacted [emissions standards](#) that have resulted in less NO_x emitted into the atmosphere. But most such emissions have applied only to NO₂, which has muddied the standards. Making things ever murkier—such standards have been based on the percentage of NO₂ in total NO_x emissions. This is because not only do vehicles emit NO₂ directly, but NO turns into NO₂ over time once released into the air. Now, it appears that the percentages that officials have been using to set their standards has been wrong.

To get an accurate measurement of the true percentage of NO₂ in the NO_x being emitted by vehicles, the researchers analyzed data from roadside monitors across Europe. In looking at the data, they found that NO₂ percentages had risen, as expected, during the period 1995 to 2010 (as people converted to diesel) but then as emissions regulations came into effect, the percentage of NO₂ leveled off and has remained at those levels ever since. These levels, the researchers note, are roughly half of what is described by air quality policy, which suggests Europe may reach mandated levels sooner than thought. Gentner and Fulizi Xiong suggest

the group's finding could have also implications for developing nations as well because consumers there tend to buy used diesel vehicles from Europe.

More information: Stuart K. Grange et al. Lower vehicular primary emissions of NO₂ in Europe than assumed in policy projections, *Nature Geoscience* (2017). [DOI: 10.1038/s41561-017-0009-0](https://doi.org/10.1038/s41561-017-0009-0)

Abstract

Many European countries do not meet legal air quality standards for ambient nitrogen dioxide (NO₂) near roads; a problem that has been forecasted to persist to 2030. Although European air quality standards regulate NO₂ concentrations, emissions standards for new vehicles instead set limits for NO_x—the combination of nitric oxide (NO) and NO₂. From around 1990 onwards, the total emissions of NO_x declined significantly in Europe, but roadside concentrations of NO₂—a regulated species—declined much less than expected. This discrepancy has been attributed largely to the increasing usage of diesel vehicles in Europe and more directly emitted tailpipe NO₂. Here we apply a data-filtering technique to 130 million hourly measurements of NO_x, NO₂ and ozone (O₃) from roadside monitoring stations across 61 urban areas in Europe over the period 1990–2015 to estimate the continent-wide trends of directly emitted NO₂. We find that the ratio of NO₂ to NO_x emissions increased from 1995 to around 2010 but has since stabilized at a level that is substantially lower than is assumed in some key emissions inventories. The proportion of NO_x now being emitted directly from road transport as NO₂ is up to a factor of two smaller than the estimates used in policy projections. We therefore conclude that there may be a faster attainment of roadside NO₂ air quality standards across Europe than is currently expected.

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