

Real-world emissions of passenger cars impacted by the London Ultra Low Emission Zone expansion

Vehicle emissions are a major contributor to urban air pollution and thus to the public health problems it causes. Based on the most recent data (2015), in metropolitan London air pollution from transportation sources is linked to 1,500 annual premature deaths, with the greatest share of this health burden attributable to on-road diesel vehicles.¹ Increasingly stringent emission standards have led to a reduction in nitrogen oxides (NO_x) and particulate matter (PM) exhaust emissions from new vehicles. However, older high-emitting vehicles remain on the roads, and certain specific vehicle groups produce exhaust emissions above regulatory limits.

London's Low Emission Zone (LEZ), implemented in 2008, covers the greater London area and regulates access of medium- and heavy-duty vehicles, encouraging shifts away from older, high-emitting vehicles by charging an access fee to vehicles based on the emission standard they were built to (older standards set more lenient pollutant limits). The Ultra Low Emission Zone (ULEZ), launched in 2019, added similar regulations for diesel and petrol passenger vehicles operating in central London. The ULEZ has been effective in reducing tailpipe emissions and improving air quality, driving a particularly large reduction in ambient nitrogen dioxide concentrations within its boundaries.² On 25 October 2021 the area of the ULEZ will be expanded to cover a much larger portion of the inner London area. Regulated vehicle types and standards will remain the same, with daily charges for drivers of petrol vehicles not meeting Euro 4 standards and diesel vehicles not meeting Euro 6 standards.

The TRUE Initiative's extensive collection of real-world emissions data provides a unique opportunity for independent insight into the emissions impacts of the upcoming expansion of the London ULEZ. The database contains emission measurements of vehicles during on-road

operation from remote-sensing campaigns across Europe. More than 2 million emission records are compiled in the database, including approximately 100,000 records from a 2018 TRUE study in London that measured vehicle emissions at 9 locations throughout the city.³ Here, we use the TRUE database to estimate the average NO_x and PM emissions of individual passenger car groups, differentiating by fuel type and emission standard to align with ULEZ requirements.

Our results, summarized in the figure below, show that in almost all cases the London ULEZ requirements impact those vehicle groups with the highest real-world NO_x and PM emission levels. Importantly, the ULEZ charge applies to all diesel passenger vehicles that are not equipped with particulate filters. The TRUE data show that PM emissions from these older diesel vehicles are particularly high, with Euro 2 to Euro 4 vehicles emitting 17–41 times more PM than diesel vehicles compliant with Euro 6–6d standards, which are exempt from ULEZ access charges.

TRUE studies have also added to the evidence base documenting the excess NO_x emissions from diesel passenger cars in real-world operations relative to type-approval limits. The ULEZ requirements apply to the vehicle groups with the highest demonstrated real-world NO_x emission levels, including Euro 4 and Euro 5 diesel cars, which emit up to 18 times more NO_x than the cleanest vehicles compliant with ULEZ standards.

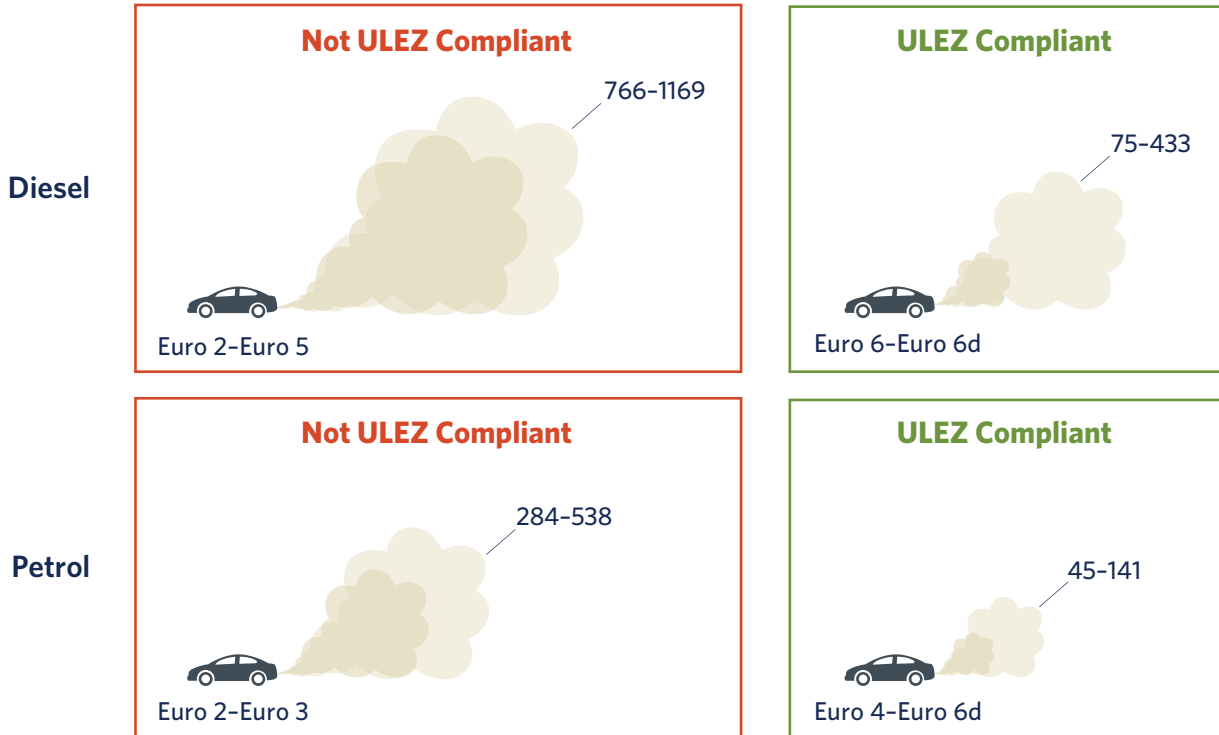
The TRUE data indicate that replacing a diesel car that does not meet ULEZ standards with a new Euro 6d diesel car would result in a 90%–94% reduction in NO_x emissions and a 61%–98% reduction in PM emissions. For petrol vehicles, a switch from a Euro 2 or Euro 3 vehicle to a new Euro 6d vehicle would result in an 84%–92% reduction in NO_x emissions and 76%–83% reduction in PM emissions. Even greater emissions benefits would result if drivers impacted by the ULEZ expansion shift activity to zero-emission, non-motorized, or public transit options.

1 Susan C. Anenberg et al., *A global snapshot of the air pollution-related health impacts of transportation sector emissions in 2010 and 2015* (ICCT: Washington DC, 2019), <https://theicct.org/publications/health-impacts-transport-emissions-2010-2015>.

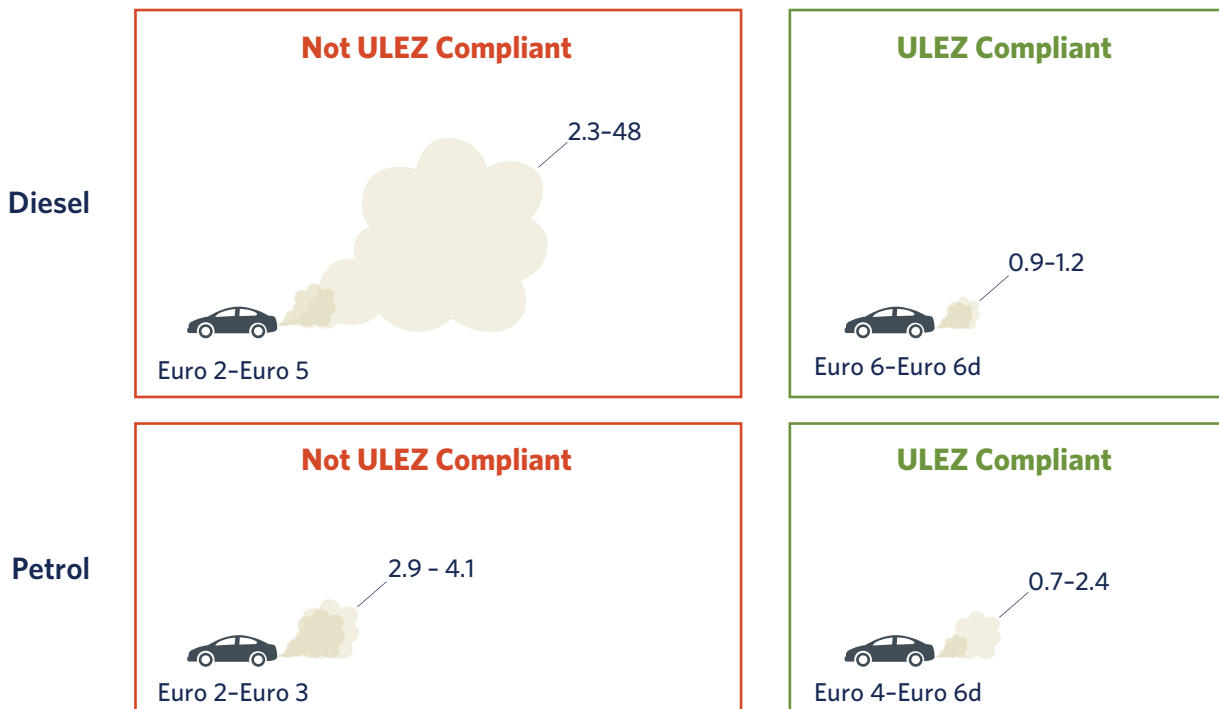
2 Greater London Authority (2020), *Air Quality in London 2016-2020*. Retrieved from https://www.london.gov.uk/sites/default/files/air_quality_in_london_2016-2020_october2020final.pdf.

3 Tim Dallmann et al., *Remote sensing of motor vehicle emissions in London*, (ICCT: Washington, DC, 2018), <https://theicct.org/publications/true-london-dec2018>.

Real-world NO_x emissions (mg/km)



Real-world PM emissions (mg/km)



Summary of the average real-world NO_x and PM emissions of passenger cars by fuel type and emission standard. Pre-Euro 2 vehicles, which are not shown here because they make up a small fraction of the on-road fleet, are also subject to ULEZ requirements.

With the expansion of its ULEZ, London continues to position itself as a leader among cities taking strong actions to address the harmful emissions of their vehicle fleets and protect the health of their citizens. TRUE emissions data show that ULEZ requirements effectively target passenger vehicle groups with the highest real-world NO_x and PM emission levels. As London moves forward with the ULEZ expansion and other actions to promote cleaner transportation options, continued monitoring will be important to not only ensure these actions are achieving their desired effects, but also to provide the information

needed to effectively target future policy actions to have the greatest impact.

FURTHER READING:

Transport for London, "ULEZ expansion," <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/ulez-expansion>

Tim Dallmann et al., *Remote sensing of motor vehicle emissions in London*, <https://theicct.org/publications/true-london-dec2018>



TO FIND OUT MORE

For details on the TRUE remote sensing database, contact **Tim Dallmann**, t.dallmann@theicct.org.

For more information on TRUE, visit www.trueinitiative.org.