

Projected pollutant and greenhouse gas emission benefits of a low-emission zone in Warsaw

BACKGROUND

The residents of Warsaw frequently experience poor air quality, with air pollutant levels consistently surpassing World Health Organization guidelines. Motor vehicles contribute significantly to this air pollution, and a small share of older vehicles contribute disproportionately to pollutant emissions in the city. Warsaw intends to implement a low-emission zone (LEZ), restricting access to polluting cars with the aim of improving air quality. Implementing an LEZ could also produce climate benefits by reducing greenhouse gas (GHG) emissions from cars. Discussions are currently underway regarding the final design and implementation schedule of the LEZ.

A new TRUE report investigates the impacts of an LEZ on air pollutant and GHG emissions from passenger cars in Warsaw. Using real-world data collected from emissions testing conducted in 2020,¹ the study designs an LEZ and evaluates the emissions impact of two varying schedules: Option 1, which gradually tightens restrictions every two years from 2024 to 2034, and Option 2, which tightens restrictions each year at a more accelerated pace from 2024 to 2028. Both LEZ implementation schedules were evaluated to assess the reductions in air pollutant emissions that could be achieved, including reductions in nitrogen oxide (NO_x) and particulate matter (PM), and GHG emissions.² The impact of the LEZ on emissions was also examined through scenarios which simulate how drivers may comply with the requirements of the LEZ.

Table 1. Low-emission zone design and implementation schedules for passenger cars in Warsaw.

Passenger car	Minimum standard		Implementation year	
	Diesel	Petrol	Option 1	Option 2
1	Euro 4	Euro 2	2024	2024
2	Euro 5	Euro 3	2026	2025
3	Euro 6	Euro 4	2028	2026
4	Euro 6d-TEMP	Euro 5	2030	2027
5	Euro 6d	Euro 6	2032	2028
6	Euro 7	Euro 6d	2034	2030
7	Euro 7	Euro 7	2035	2035
8	Zero-emission vehicle ^a	Zero-emission vehicle	2038	2038

^a Zero-emission vehicle considers all vehicles that generate zero tailpipe emissions.

1 Kaylin Lee, Yoann Bernard, Tim Dallmann, Uwe Tietge, Izabela Pniewska, and Isabel Rintanen "Evaluation of Real-World Vehicle Emissions in Warsaw" (Washington DC: TRUE Initiative, 2022), <https://www.trueinitiative.org/data/publications/evaluation-of-real-world-vehicle-emissions-in-warsaw>.

2 GHG emissions consider emissions produced during energy production, transport, and vehicle use.

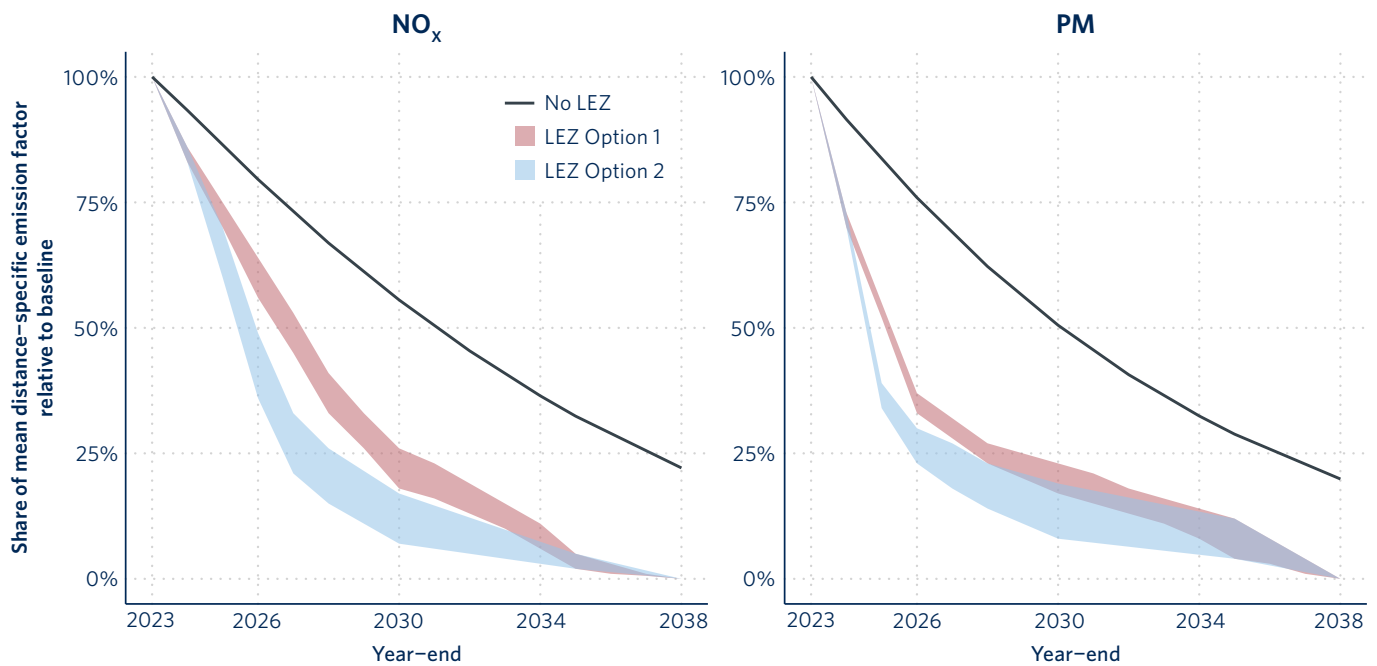


Figure 1. NO_x and PM emissions reduction potential relative to 2023 levels as a result of LEZ Option 1: two-year interval implementation and LEZ Option 2: accelerated implementation schedules. Shaded areas of the figures show the ranges of possible emission reductions that depend on the responses of vehicle owners affected by LEZ restrictions. The responses of vehicle owners range from vehicle owners replacing their non-compliant vehicles with 100% used vehicles (upper boundary of each shaded area) to vehicle owners who switch entirely to zero-emission mobility (lower boundary of each shaded area).

KEY FINDINGS AND RECOMMENDATIONS

An LEZ targeting old, high-emitting diesel passenger cars certified to Euro 4 or below could reduce air pollutant emissions in Warsaw significantly, even if the affected drivers replace their old cars with newer, used cars. An LEZ targeting these old diesel cars registered before 2011 could result in a 50% reduction in NO_x and PM emissions compared to 2023 levels by 2027 and 2025, respectively. These vehicle groups have a disproportionate impact on air quality in the city, as they represent only around 8% of expected passenger car activity in 2026 but would contribute about 27% of NO_x and 55% of PM emissions.

The faster the LEZ phases are implemented, the greater and more immediate the impact is on air pollutant emissions. If Warsaw adopts the accelerated implementation schedule presented in Option 2, the

city could achieve a 75% reduction in fleet-average NO_x emissions two to three years earlier than it could with LEZ Option 1. A 75% reduction in PM emissions could also be achieved one or two years earlier.

The introduction of an LEZ in Warsaw could generate significant climate benefits. The potential GHG emissions avoided by an LEZ depend on the actions taken by the affected drivers in response to an LEZ. This could range from 10% to 31% in case of LEZ Option 1 and from 13% to 45% in case of LEZ Option 2, as shown in Figure 2. If Warsaw adopts LEZ Option 2 and affected drivers switch to zero-emission mobility options like cycling, walking, and using public transport, 45% of the cumulative GHG emissions that would otherwise be emitted until 2038 without a LEZ could be avoided. This percentage reduction in cumulative GHG emissions is in line with reductions required in the transport sector to meet the Paris Agreement target.³

³ Arijit Sen and Joshua Miller, "Emissions Reduction Benefits of a Faster, Global Transition to Zero-Emission Vehicles" (Washington, DC: ICCT, 2022), <https://theicct.org/publication/zevs-global-transition-benefits-mar22/>.

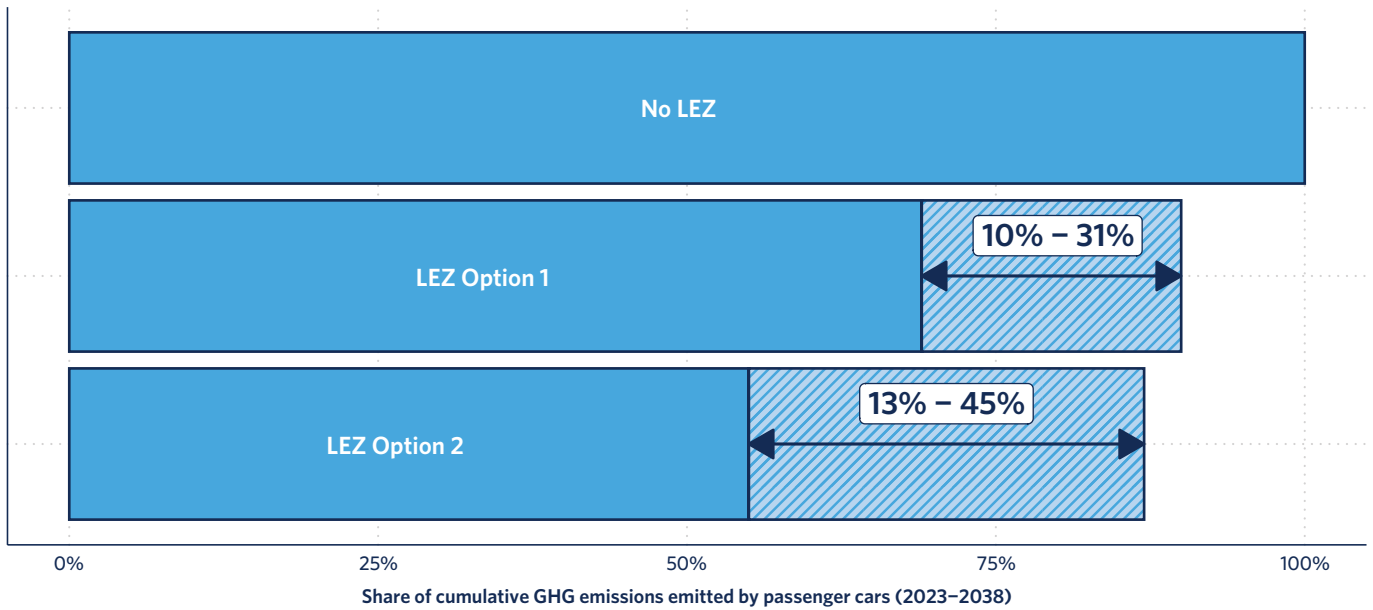


Figure 2. Potential share of cumulative GHG emissions avoided from passenger cars (2023-2038) through implementation of two varying LEZ schedules: LEZ Option 1: two-year interval implementation and LEZ Option 2: accelerated implementation schedules. Shaded areas of the figure shows the ranges of possible GHG emissions avoided compared to no LEZ.



TO FIND OUT MORE

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