



# Jakarta LEZ Roadmap: An Executive Summary

April 2024





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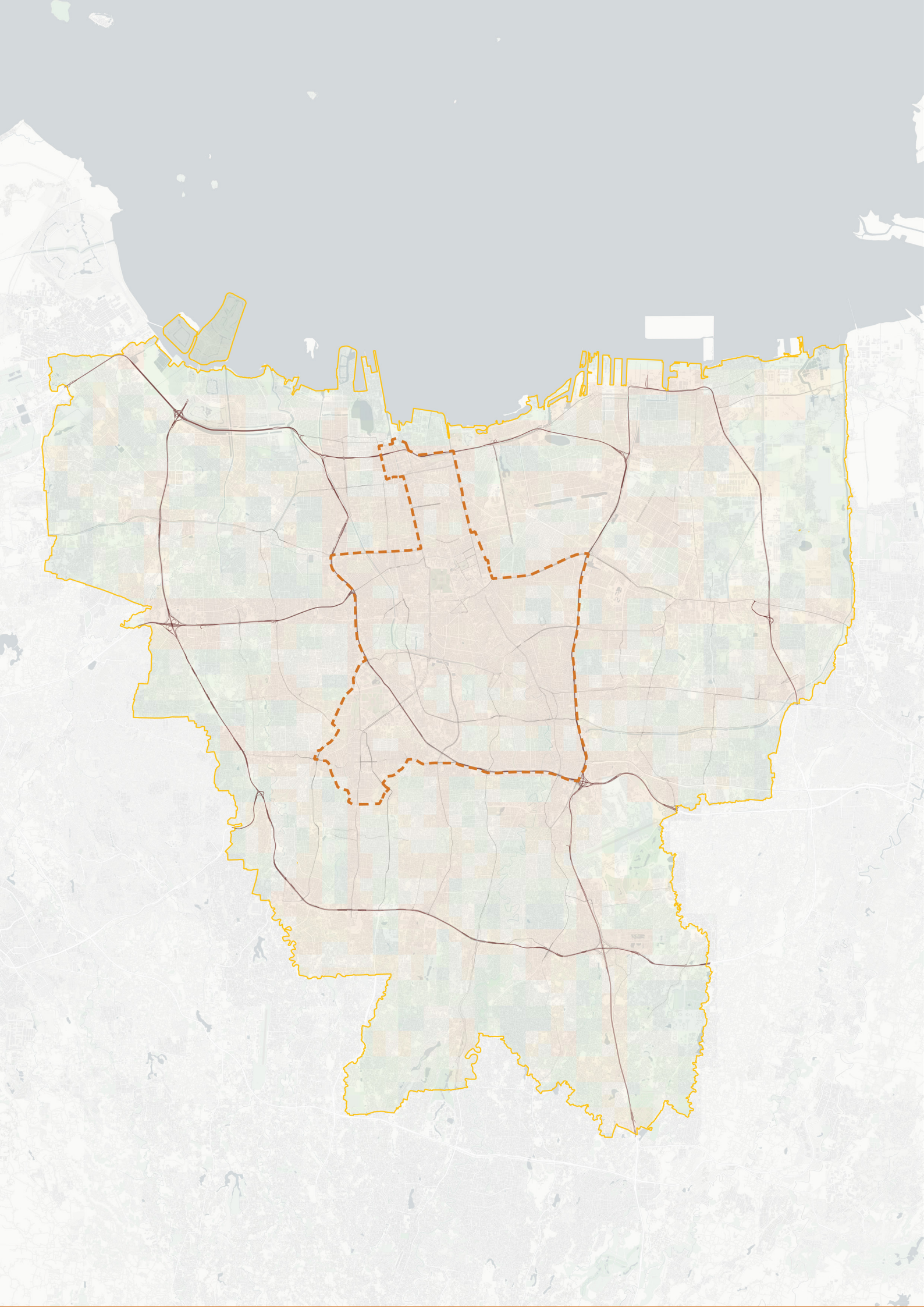
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# CONTENT



<b>Findings</b>	<b>7</b>
A. Current Conditions of LEZ in Jakarta	7
B. Supporting Regulations for LEZ	8
C. Stakeholders responsibility	9
<b>Recommendations</b>	<b>10</b>
<b>2.1. Planning LEZ location in Jakarta</b>	<b>10</b>
<b>2.2. Roadmap of Jakarta LEZ implementation</b>	<b>12</b>
<b>2.3. Air pollution impact estimation</b>	<b>14</b>
<b>2.4. Type of implementation (restriction mechanism and enforcement type)</b>	<b>16</b>
<b>2.5. Supporting Measures</b>	<b>16</b>
Enabling policy	16
Anticipation of LEZ negative impact	17
Additional measures	17







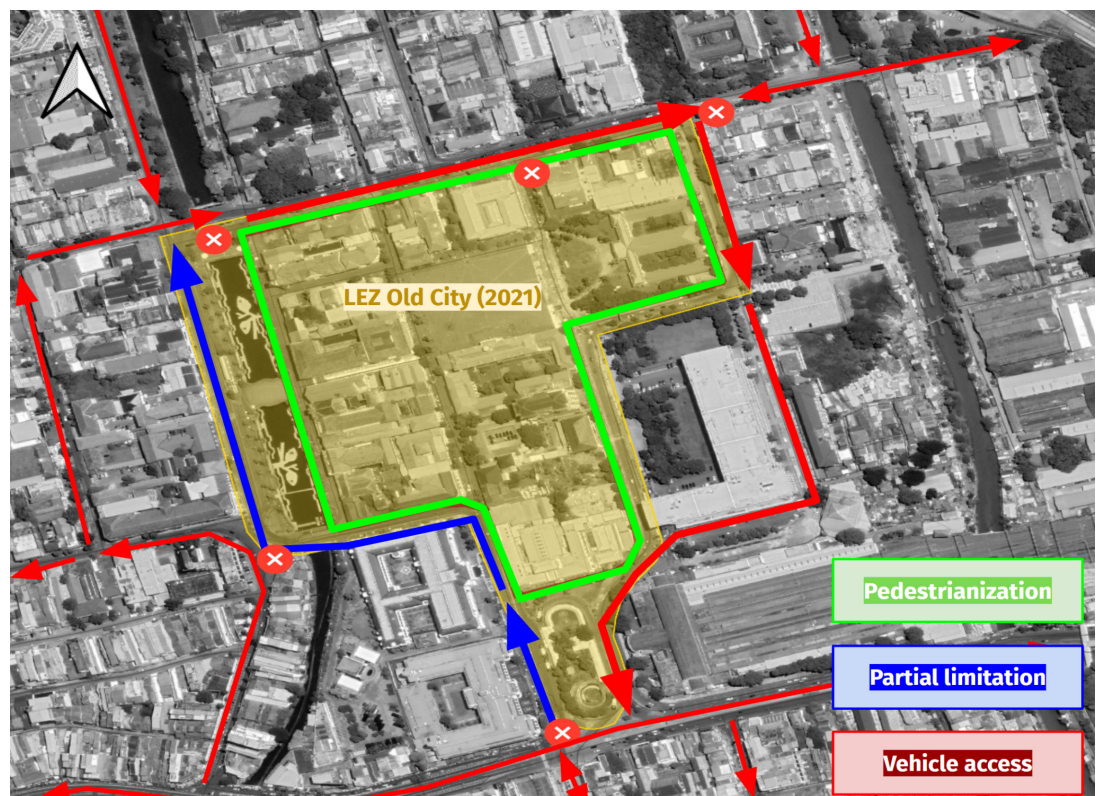
# Findings

## CURRENT CONDITIONS OF LEZ IN JAKARTA

Low Emission Zone (LEZ) is an important strategy to address the issue of air pollution from transportation sectors in Jakarta. LEZ restricts access to the most polluting motorised vehicles based on the emission level (e.g., vehicle standard by Euro) or type of vehicle (e.g., heavy-duty vehicle) into a certain area with the main objective to reduce the air pollutant emission from motorised traffic. Implementation of LEZ in Jakarta is important because the transportation sector is responsible for the majority of air pollution in the city. Using NO<sub>x</sub> and PM<sub>2.5</sub> as indicators, the land transportation sector is accountable for 64% and 58.9% of production, respectively<sup>1</sup>. The PM<sub>2.5</sub> level in Jakarta was three times higher than the national standard in 2019. It is responsible for more than 10,000 deaths, 5,000 hospitalisations and more than 7,000 adverse outcomes in children, resulting in an economic cost of approximately USD 2934.42 million, equal to 2.2% of Jakarta Province GRDP<sup>2</sup>.

The Provincial Government of Jakarta has established an LEZ initiative in the Old Town (Kota Tua) area of Jakarta in 2021. The implementation is in the form of the pedestrianisation of six road segments surrounding the inner Old Town area with a total area of intervention of 0.14 km<sup>2</sup>. Only Transjakarta fleets and vehicles with stickers (people living in the area and business owners) are allowed to pass through LEZ.

**Figure 1.** Accessibility in the Old Town Jakarta (ITDP, 2022)



<sup>1</sup> Vital Strategies. (2020). *Laporan Inventarisasi Emisi Pencemar Udara DKI Jakarta*. Unpublished report.

<sup>2</sup> Syuhada et al. (2023). Impacts of Air Pollution on Health and Cost of Illness in Jakarta, Indonesia. *J Environ Res Public Health*, 20(4), 1-14. doi: [10.3390/ijerph20042916](https://doi.org/10.3390/ijerph20042916)

The main evaluation of LEZ implementation in the Old Town area is the lack of law enforcement to limit motorised vehicle access in the area and the insignificant air pollution reduction efforts. Although the pedestrianisation intervention has created a dedicated road only for pedestrians and cyclists, motorised vehicles can still pass through, as illustrated in Figure 1 with the red line. As for the air pollution reduction conditions in Old Town, there has been a reduction of air pollution concentration in the area, but it is still above the standard set by WHO and the national government<sup>3</sup>. The impact of the micro-scale LEZ implementation also does not contribute to meaningful pollution reduction at the city level<sup>4</sup>.

## SUPPORTING REGULATIONS FOR LEZ

The Low Emission Zone (LEZ) program has been well integrated into regulation at the provincial level but only briefly mentioned at the national level. The provincial government of Jakarta has shown a great interest in the effort to reduce greenhouse gas emissions and air pollution. A specific regulation has set a 2030 goal to reduce air pollution from transportation sectors. At the national level, the regulation can only manage vehicle traffic based on volume, not emission standards.

LEZ has been mentioned explicitly in the several provincial regulations in Jakarta. Governor Regulation 90 of 2021 about the Low Carbon and Climate Resilient Development Plan has set out a plan to replicate the existing LEZ implementation. However, the conception of LEZ program is still being in the context of the pedestrianisation project. The Governor Decree 576 of 2023 about the Strategy of Air Pollution Management has set a target to conduct and publish regulations related to LEZ in the near future.

At the national level, no regulation specifically mentions LEZ as a program, but several regulations can be related to the LEZ. The National Government 22 of 2021 provides a framework for area-based intervention for air pollution mitigation where the provincial government can create their plan according to the local context. MoEF 8 of 2023 set the provincial government authority to impose incentive or disincentive mechanisms to manage air pollution. Another related policy is the National Government 32 of 2021, where the provincial government has the flexibility to create its own policy to manage traffic. This flexibility must be made not only for traffic situations but also for environmental reasons.

<sup>3</sup> University of Trisakti. (2022, 20 June). *Presentation of: Evaluasi Kualitas Udara LEZ Kota Tua*. Dissemination event from Environment Agency on the evaluation of LEZ Old Town.

<sup>4</sup> C40. (2023, 7 November). *Presentation of Introduction of C40's AQUA Tools*. Dissemination event from C40 and RDI on the AQUA Transport Tools



## STAKEHOLDERS RESPONSIBILITY

The collaboration between government institutions is essential to ensure the success of LEZ implementation, and it has been well settled at the provincial level of Jakarta. There are two main government Institutions responsible for the LEZ, the Environment Agency and the Transportation Agency. The Governor Decree 576 of 2023 about Air Pollution Management mandates the Environment Agency to lead Jakarta's air pollution reduction strategy. The Environment Agency will lead the formulation of the academic report to determine the potential location of LEZ in Jakarta. Transportation Agency is mandated to become the head of the climate mitigation team from the Governor Regulation 90 of 2021 about the Low Carbon and Climate Resilient Development Plan.

At the national level, the ministries are involved in providing the relevant regulations related to the development of low emission transportation. The Ministry of Environment and Forestry (MoEF) is responsible for managing air pollution with the Directorate of Management of Air Pollution by creating relevant policies, standards of conduct, coordination, and evaluation related to air quality management. The Ministry of Transportation (MoT) supports limiting access to motorised vehicles and improving more sustainable modes of transportation. As for the Coordination Ministry for Maritime Affairs and Investment (Kemenkomarves), they lead the effort to enhance the air quality in Greater Jakarta under the Deputy 3 of Infrastructure and

# Recommendations

## 2.1 PLANNING LEZ LOCATION IN JAKARTA

The main purpose of LEZ is to reduce air pollution emitted by vehicles in the most polluted area of the city. ITDP chose six main parameters as follows:

Table 1. Indicators to determine the possible area of intervention for LEZ

Parameters	Consideration	Weight ITDP (%)
Pollutant in the area	Area with a high concentration of air pollution using vehicle emission factor criteria, data derived from vehicle volume source from JUTPI II	40
Push policy	Area/road assigned as odd-even policy, limitation for HDV, and parking management (in TOD area)	10
Access to public transportation	Existing area served by mass public transportation (rail and road-based)	30
Availability of NMT Infrastructure	Existing walking and cycling infrastructure	5
Land use	Area with land use that attracts movement (commercial, office, mixed-use, hotel, tourism, services, health services, education, administrative, public park)	5
Residential	Area with lower residential density to determine priority low resistance area	10

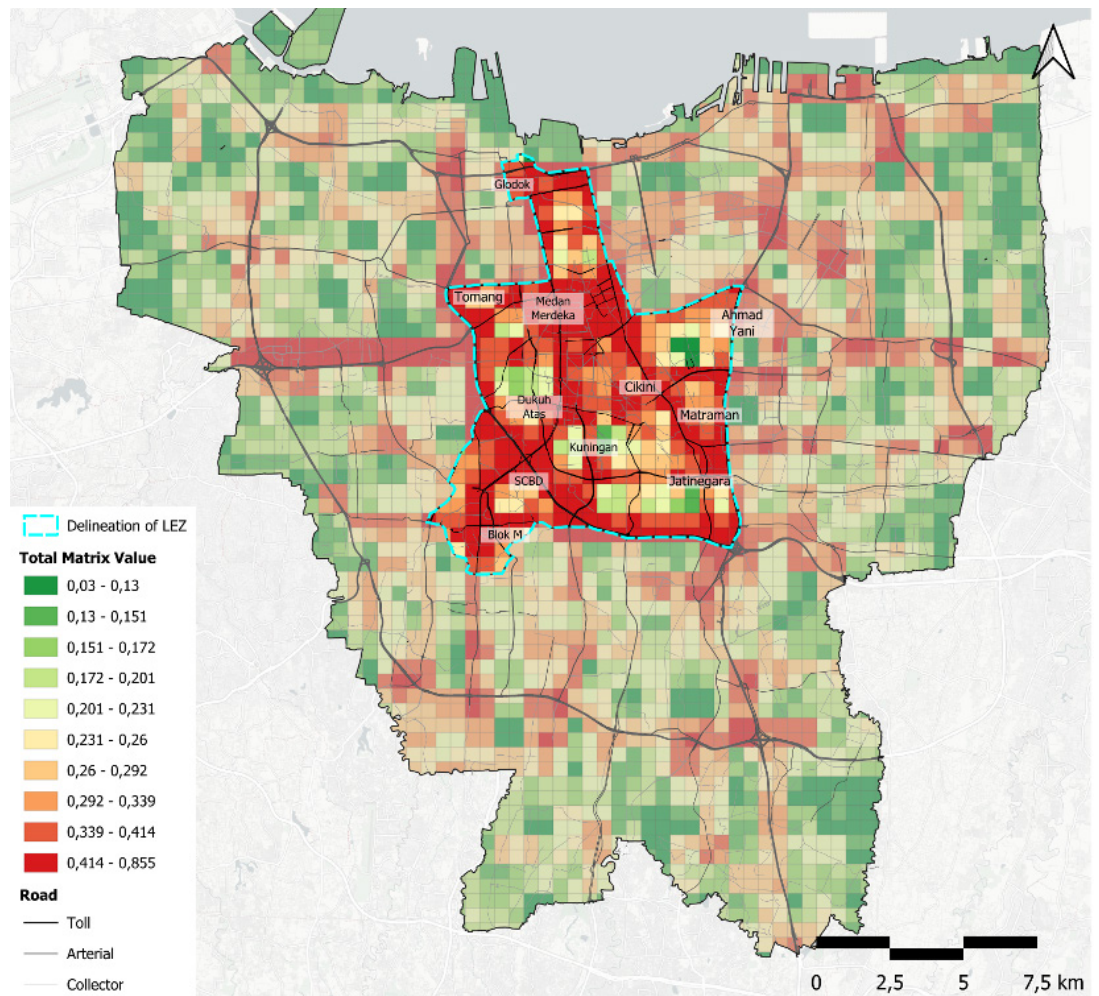
Pollutants in the area have the highest weighted parameters because the main objective of LEZ is to reduce air pollution. The indicators used the emission factor from the vehicle volume approach to generate air pollution distribution. The second highest parameter is access to public transportation since the expected outcome of LEZ is to shift travel behaviour from using private vehicles to public transportation. In supporting public transportation services, the availability of NMT infrastructure with sidewalks and bicycle lanes is important. LEZ delineation should also be integrated with the parameter of the existing push policy to limit the use of private vehicles to ensure its continuity with the previous policy (odd-even, cargo limitation, parking management). Another parameter with the same weight proportion is the residential density, LEZ is expected to be located in a high concentration of air pollution but at a lower density area to anticipate the resistance from the people living in the area. The last indicator is the distribution of active land use categorised as economic and basic services which attract movement.

This report uses multi-criteria weighted overlay analysis to determine the delineation of LEZ in Jakarta. The different layers from the previously mentioned indicators are overlaid in the same matrix to compare different indicators together. The analysis resulted in a high-value matrix indicated with red matrix as an indication of possible LEZ location. The possible area delineation of LEZ used the existing road network as illustrated in Figure 2.



The concentration of high-value matrix is located on the main economic corridor of Jakarta from the central Jakarta of Medan Merdeka to the south of Jakarta, reaching SCBD and Blok M as the southern delineation. This area has the highest matrix score since the highest concentration of air pollution is situated there, and it has the highest availability of public transportation, NMT infrastructure, and various push policy measures. The southern delineation also covers Gatot Subroto, which extends to Tomang, as the corridor with the highest pollution from different types of vehicles. LEZ delineation covers other parts of central Jakarta, including Kuningan as the main office district with the newly opened mass public transportation of LRT Metropolitan Jakarta. Delineation also covers east Jakarta, including Ahmad Yani, Matraman, and Jatinegara. The delineation of LEZ is integrated with the current LEZ initiative in the northern part of Jakarta in Kota Tua and Taman Tebet in the south of Jakarta.

Figure 2. Possible delineation of LEZ in Jakarta



## 2.2 ROADMAP OF JAKARTA LEZ IMPLEMENTATION

Table 2. Roadmap of implementation for LEZ in Jakarta with vehicle emission standard consideration

Type of Vehicle		Fuel	Share of fuel in each vehicle category	LEZ Scenario Planning					
				2024	2025	2026	2027	2028	2029
Area of Intervention				LEZ Phase 1 (Pilot)			LEZ Phase 2 (Innercity)		
Motorcycle (MC)		Petrol	100%	Euro II		Euro III		Euro III	
Passenger cars (C)		Petrol	88%	Euro II		Euro IV		Euro IV	
		Diesel	12%	Euro II		Euro IV		Euro IV	
Light Commercial Vehicle (LCV)		Petrol	45%	Euro II		Euro IV		Euro IV	
		Diesel	55%	Euro II		Euro IV		Euro IV	
TJ Car (microbus)		Petrol	100%	Euro II + Electric Vehicle			Fully electric fleet	Fully electric fleet LEZ Phase 1 + Euro IV	
TJ Bus		Diesel	100%	Euro II + Electric Vehicle			Fully electric fleet	Fully electric fleet LEZ Phase 1 + Euro IV	
MDV + HDV	Medium Duty Vehicle (MDV)	Diesel	100%	Euro II MDV & HDV		Euro IV MDV + HDV		Euro IV MDV	
	(access restriction based on time for HDV)			(access restriction for HDV based on time)		No access			
				Outer LEZ		Euro IV MDV & HDV			

The phasing implementation of LEZ in Jakarta is divided into two phases, with the first phase as the pilot implementation and the second phase as the expansion. The first phase will focus on disseminating information about the LEZ policy, which will be implemented in a smaller area. The enforcement for vehicles to comply with the current national standard emission will be started in 2026, 2 years after the grace period in 2024. The emission standard will follow the MoEF regulation, where motorcycles must comply with Euro III and four-wheeled vehicles with Euro IV emission standards.



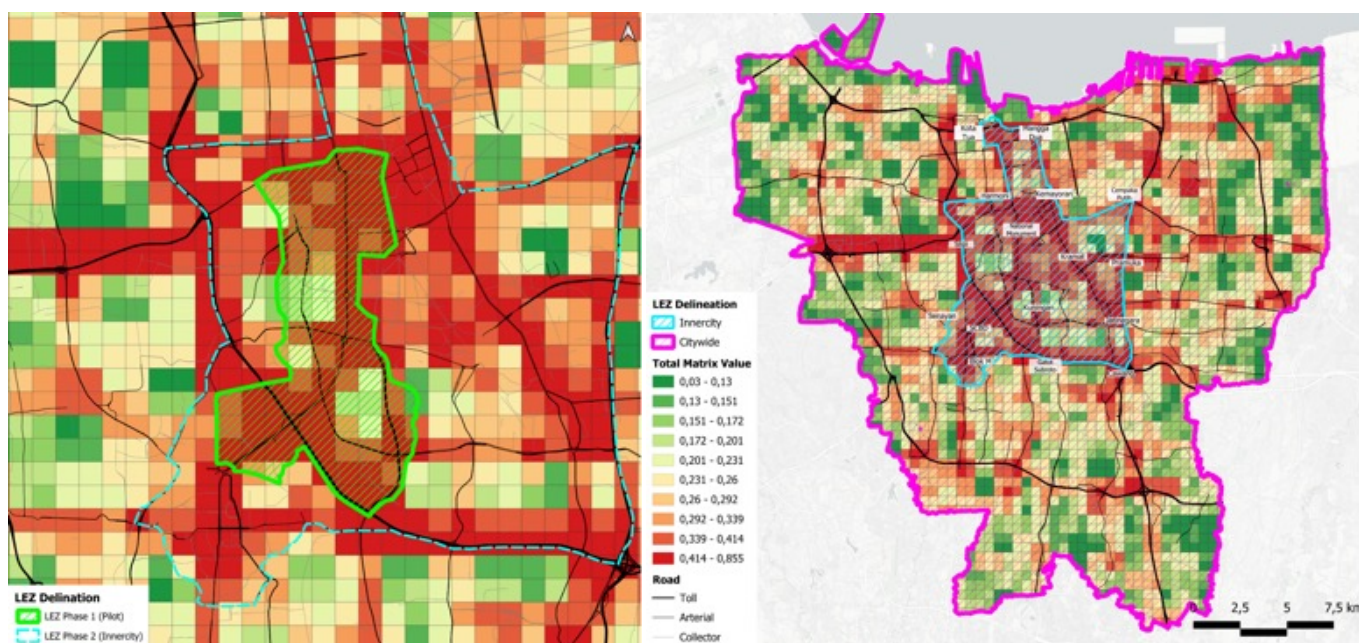


Figure 3. Phase 1 (left) and Phase 2 (right) LEZ implementation

The first phase of LEZ implementation will mainly focus on the smaller scale of the Innercity LEZ, as visualised in Figure 3 (left) with the green area. The coverage area of the pilot area is five times smaller than the Innercity LEZ, with a total area of 18.77 km<sup>2</sup> which only covers 2.9% of the total area of Jakarta. The Pilot delineation is located on the main economic corridor of Jakarta, where the total matrix value is at its highest. This area has also been served by multiple types of mass public transportation, namely MRT with 6 stations, 4 commuter rail stations, 4 LRT Metropolitan Jakarta stations, 36 BRT stations, and multiple feeder routes. Another consideration of this area is the low residential density since most of the land use is dominated by offices, which will reduce the resistance from the people residing there. The pilot area also has been integrated with the plan for the ERP area.

The second phase starts from 2028 until 2030 with two types of intervention: Innercity LEZ with more types of vehicle limitation and a larger area of implementation, together with Outer LEZ that specifically focus on targeting the logistic fleet. The Innercity LEZ will have the same emission standard vehicle as the previous Pilot Phase but with larger area coverage. The total area for Innercity LEZ is 87.8 km<sup>2</sup>, or 13% of the total area. The Innercity LEZ is served by multiple types of mass public transportation: MRT with 9 stations, 24 commuter rail stations, 8 LRT Metropolitan Jakarta stations, 141 BRT stations, and multiple feeder routes.

## 2.3 AIR POLLUTION IMPACT ESTIMATION

The estimation of the impact of air pollution reduction is generated from the consideration of pollutant emission factors for each vehicle model year and fuel type, as well as the age distribution of vehicles operating in Jakarta by fuel type and emission standard. The impact on average vehicle emission factors was calculated under four response scenarios with different assumptions depending on how the vehicle owner will respond to the LEZ implementation: one baseline scenario (natural assumption), adopting the minimum emission standard (two options for conventional vehicle responses: buy\_worst, buy\_best) and electric vehicle adoptions. The assumption used in the modelling reflects the owner's decision to replace the LEZ banned vehicle with a newer vehicle according to the minimum emission standards. This approach also omitted the assumption of shifting from private vehicles to sustainable transportation modes. Hence, this evaluation presents a more conservative effect on emission reduction.

### Emission reduction from LEZ Phase 1 Pilot

Figure 4. LEZ design emission standards based - Phase 1 pilot emission reduction for all response scenarios and vehicle types

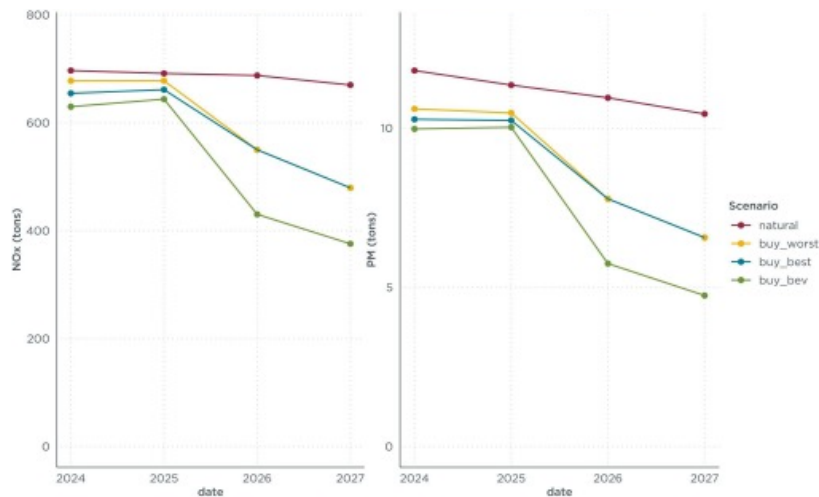
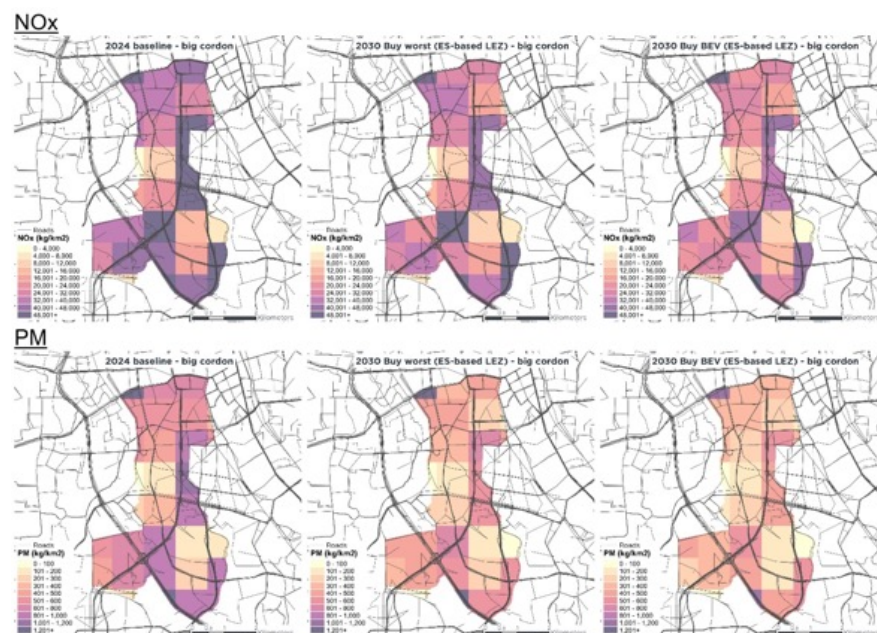


Figure 5. LEZ Phase 1 Pilot NOx and PM spatial distribution in 2024 (left figures) and the two LEZ responses in 2030 (centre and right figures) using LEZ restrictions based on emission standards





At the end of phase 1 in 2027, the adoption of minimum emission standards vehicles (buy\_worst or buy\_best) will have a reduction of 190.7 tons NOx (28.5%) and 3.9 tons PM (38.2%). Higher reduction is expected under the buy EV scenario, with a reduction of NOx and PM reaching 294.3 tons (43.9%) and 5.7 tons (54.6%). A high portion of the reduction comes from motorcycles, passenger cars, and TJ buses because of its huge share of activity in the middle area of the city.

The projected emission reduction distribution from LEZ implementation in terms of emissions concentration (kg/km<sup>2</sup>) is shown in Figure 5. The regions along the eastern and southern edges of the pilot area show the largest reductions in NOx and PM in 2030. A more significant result is shown by adopting electric vehicles compared to the 2024 baseline. Again, more modest but noticeable reductions are observed in the map from the adoption according to the vehicle emission standard scenario 2030.

### Emission Reductions Phase 2: Inner LEZ

Figure 6 provides the emission reduction for each scenario in Phase 2 implementation. A reduction of 331.6 tons NOx (12.4%) and 7.1 tons PM (18.4%) is expected adoption according to the minimum vehicle emission standard in 2030. Higher reduction is identified in buy EV scenarios, 580.0 ton NOx (21.6%) and 12.0 ton PM (31%).

Figure 6. LEZ design emission standards based - Phase 2 Inner city - emission reduction for all response scenarios and vehicle types



Figure 7. LEZ Phase 2 Pilot NOx and PM spatial distribution in 2024 (left figures) and the two LEZ responses in 2030 (centre and right figures) using emission standard assumption



## 2.4 TYPE OF IMPLEMENTATION (RESTRICTION MECHANISM AND ENFORCEMENT TYPE)

The implementation of LEZ requires a consideration of the restriction mechanism and the enforcement type. The restriction mechanism decides whether the LEZ uses a fee-based approach for non-compliant vehicles or opts for a penalty-based system where non-compliant vehicles are banned and fined for rule violations. As for the enforcement type, it varies between automatic enforcement using technology (ANPR/RFID) and manual enforcement using on-ground enforcers.

The ideal scenario to implement is the non-priced scheme with the automatic system. The non-priced scheme is aligned with the regulation of Law 22 of 2009, where vehicles that do not meet emission standards will be subject to penalty. The automatic system also aligns with the reformation in the Police department, where the automatic system is prioritised. Jakarta already implemented the ETLE (Electronic Traffic Law Enforcement) using cameras that can identify the number plates of vehicles. Integrating the existing system with vehicle emission standards can be the priority strategy implemented in the future.

## 2.5 SUPPORTING MEASURES

LEZ is not a stand-alone policy and requires additional measures to ensure the impact of reducing air pollution in the city is significant. Three categories of supporting measures for LEZ must be prepared: enabling policy, policy to anticipate LEZ negative impact and other additional measures.

### A.

#### Enabling policy



- 1 Improve vehicle emission standard:** improvement of vehicle emission standard to Euro V or Euro VI to achieve more significant air pollution reduction.
- 2 Improve fuel technology:** provide suitable fuel technology according to the vehicle emission standard specification and reduce the availability of the old fuel technology.
- 3 Electrification:** electrification program for Transjakarta fleet with prioritised routes in LEZ area. It can be supported by the electrification of ride-hailing services.
- 4 Improve emission testing activity and standard:** improve emission testing activity for two- and four-wheeler vehicles since the current participation is still low. Future emission testing activities should also incorporate the PM and NOx indicators to integrate the activity with LEZ program.

## B. Anticipation of LEZ negative impact



- 1 **Congestion charging:** congestion charging aims to reduce traffic congestion issues by imposing a charge for all of the vehicles entering an area or corridor. Congestion charging will be aligned with the LEZ delineation.
- 2 **Parking management:** imposing higher parking rates and setting the maximum capacity of parking capacity with the main focus in the LEZ area.

## C. Additional measures



- 1 **Public transportation:** multiple mass public transport system network improvement that aligned with the LEZ area (MRT Phase 2A, 2B, 3, 4; LRT Jakarta Phase 2A, 2B, 2C, 3A, 3B, 4; BRT corridor 14, 15, 16, 17, 18, 19)
- 2 **Walking and cycling:** improvement of walking and cycling infrastructure in the LEZ area with the support of bikesharing system.
- 3 **Improvement of the logistic system:** improving the logistic system by implementing a micro-consolidation scheme to reduce the use of HDV.
- 4 **Land use management with Transit Oriented Development (TOD):** integration with the TOD concept, which will reduce the VKT and increase the use of sustainable modes of transportation.



