

# Trends in Air Quality and Sources of Air Pollution in Jakarta

**Annisa Zahara**

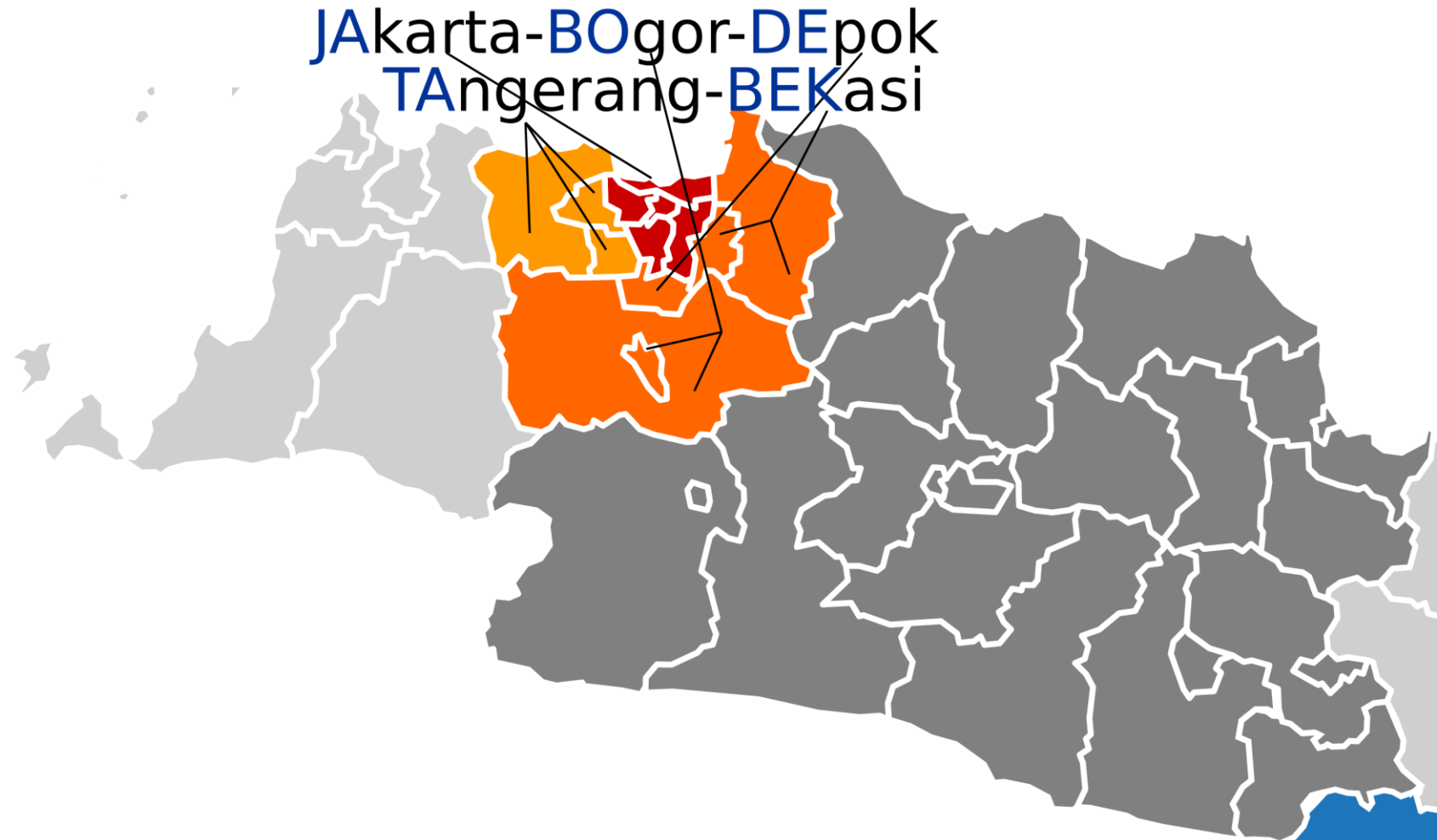
Environmental Impact Controller  
Directorate of Air Pollution Management and Protection  
Ministry of Environment, Indonesia

13 March 2026 | Bangkok, Thailand



# Background, Issues and Problems

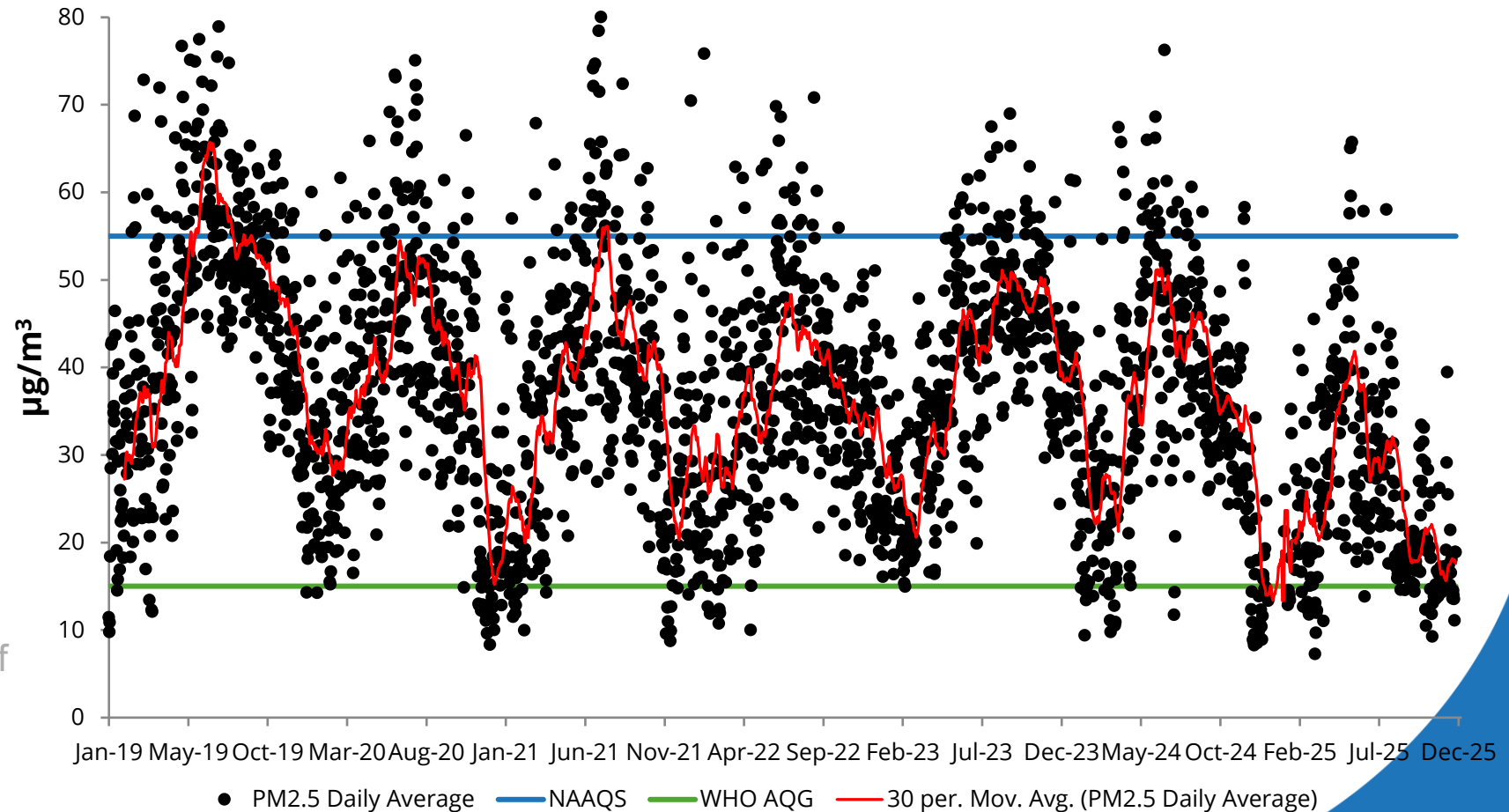
- ❑ Greater Jakarta Area (Jabodetabek) is Indonesia's largest metropolitan area, with a population of over 40 million people, characterized by high transportation activities and surrounded by industrial zones
- ❑ PM<sub>2.5</sub> levels frequently exceed national standards and WHO guidelines.
- ❑ Air pollution concentrations typically peak during the dry season (June), driven by reduced rainfall → the lack of wet deposition processes.



# Background, Issues and Problems

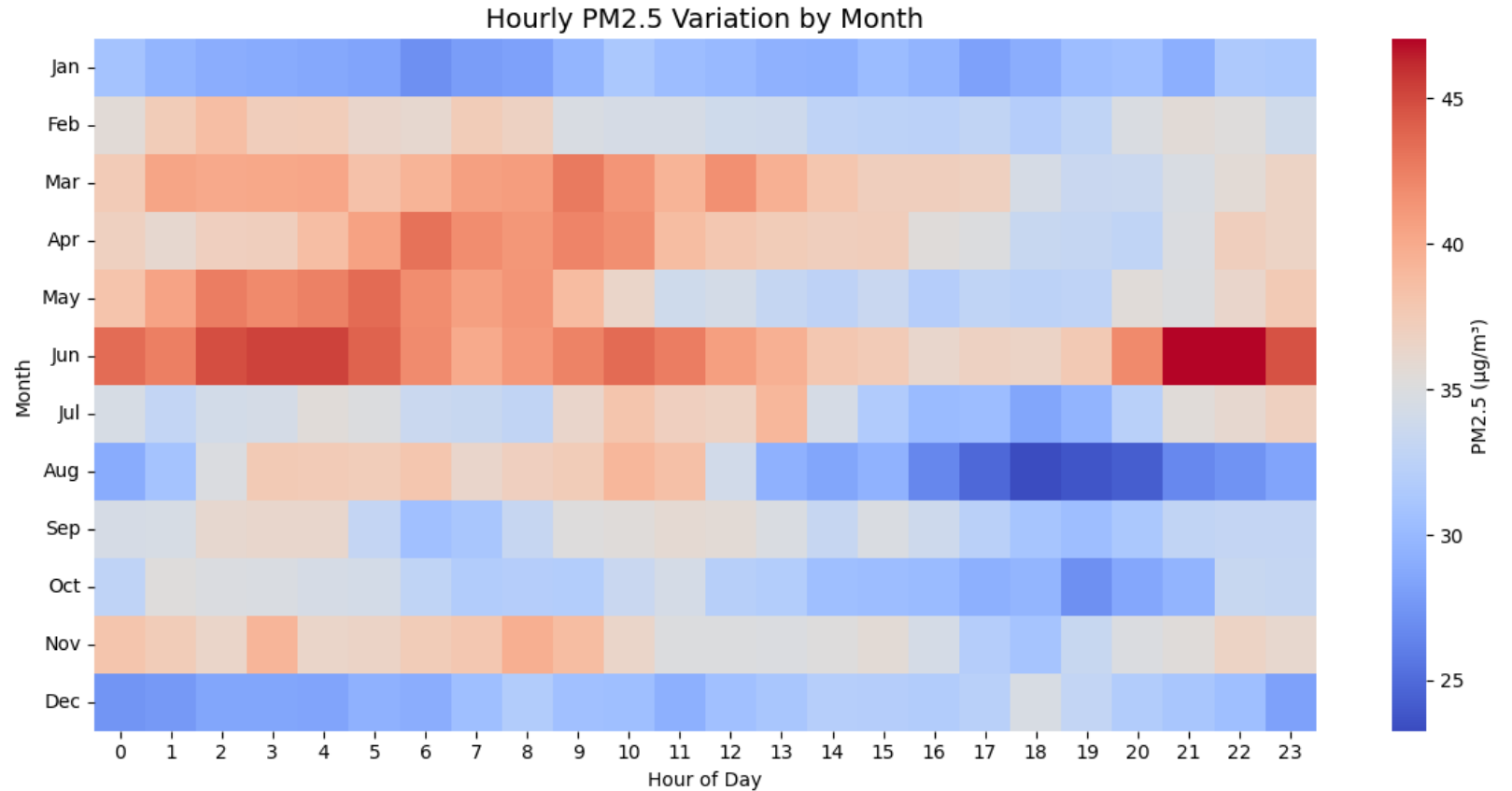
- Greater Jakarta Area (Jabodetabek) is Indonesia's largest metropolitan area, with a population of over 40 million people, characterized by high transportation activities and surrounded by industrial zones
- PM<sub>2.5</sub> levels frequently exceed national standards and WHO guidelines.
- Air pollution concentrations typically peak during the dry season (June), driven by reduced rainfall → the lack of wet deposition processes.

Daily Average of PM<sub>2.5</sub> in Jakarta  
2019 - 2025



# Background, Issues and Problems

- Greater Jakarta Area (Jabodetabek) is Indonesia's largest metropolitan area, with a population of over 40 million people, characterized by high transportation activities and surrounded by industrial zones
- PM<sub>2.5</sub> levels frequently exceed national standards and WHO guidelines.
- Air pollution concentrations typically peak during the dry season (June), driven by reduced rainfall → the lack of wet deposition processes.

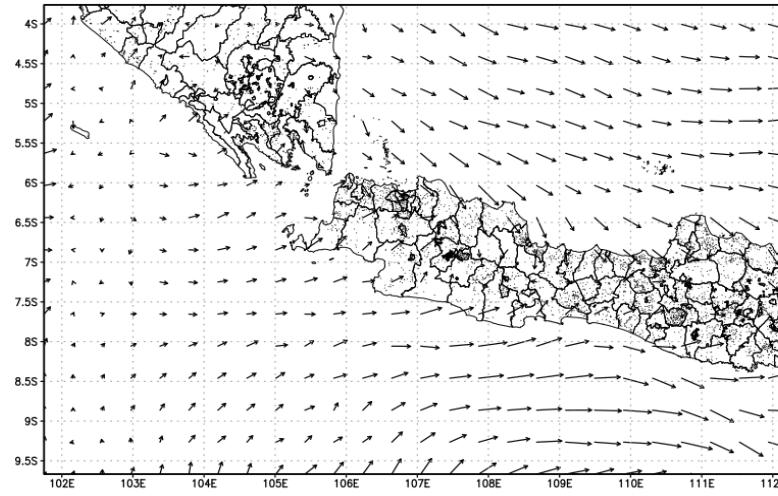


# Air Pollution in Jakarta Is Not Only Local

Air pollution in Jakarta is influenced by surrounding regions; based on backward trajectory analysis, emissions during the rainy season predominantly originate from the western part of Jakarta (Banten), while in the dry season they mainly come from the eastern direction (Bekasi).

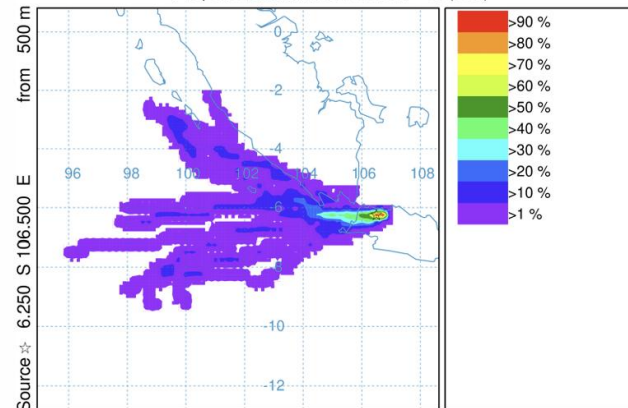
Therefore, **air quality management plan should be developed at the greater metropolitan (agglomeration) level.**

Rainy Season

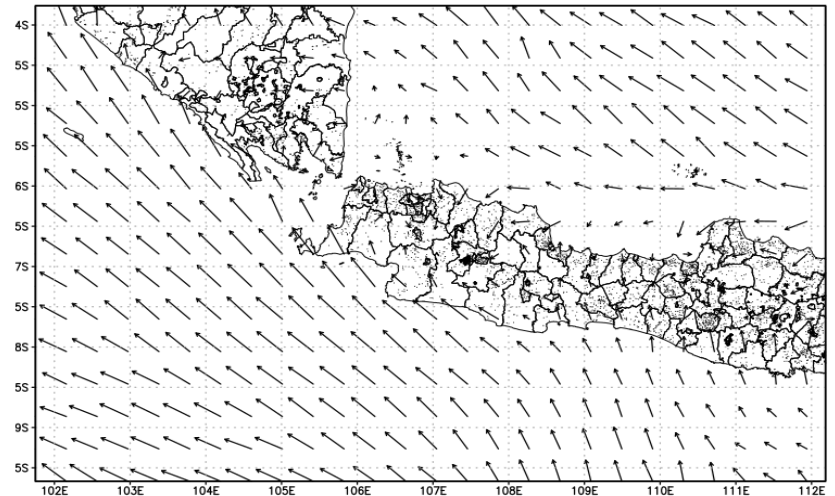


GRADS/COLA

NOAA HYSPLIT MODEL - TRAJECTORY FREQUENCIES  
# trajs passing through grid sq./# trajectories (%) 0 m and 99999 m  
Integrated from 1100 07 Feb to 1400 03 Feb 24 (UTC) [backward]  
Freq Calculation started at 0000 00 00 (UTC)

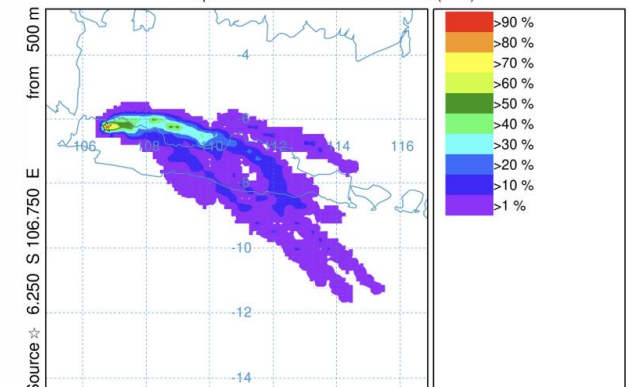


Dry Season



GRADS/COLA

NOAA HYSPLIT MODEL - TRAJECTORY FREQUENCIES  
# trajs passing through grid sq./# trajectories (%) 0 m and 99999 m  
Integrated from 1100 07 Aug to 1400 03 Aug 24 (UTC) [backward]  
Freq Calculation started at 0000 00 00 (UTC)



Source: CAA & KLH, 2025

# Source of Air Pollution in Jakarta Greater Area ++

The main root causes of PM<sub>2.5</sub> pollution in the Greater Jakarta area include the rapid increase in the number of vehicles, the use of gasoline and gasoil with high sulfur content, and the use of coal without effective air pollution control devices.



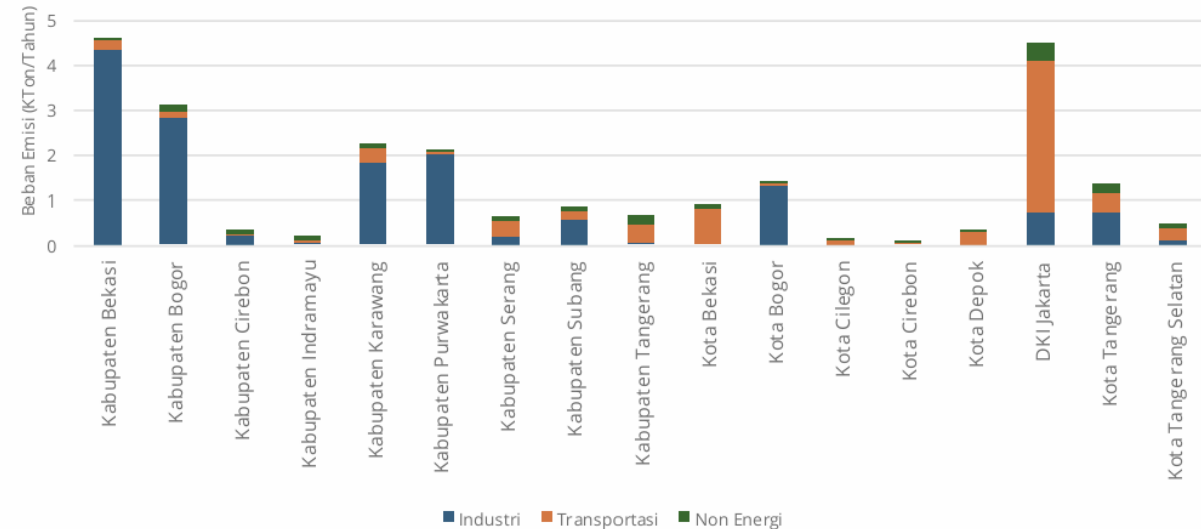
3.8 million car



18 million motorcycles



Emission Load for PM<sub>2.5</sub>

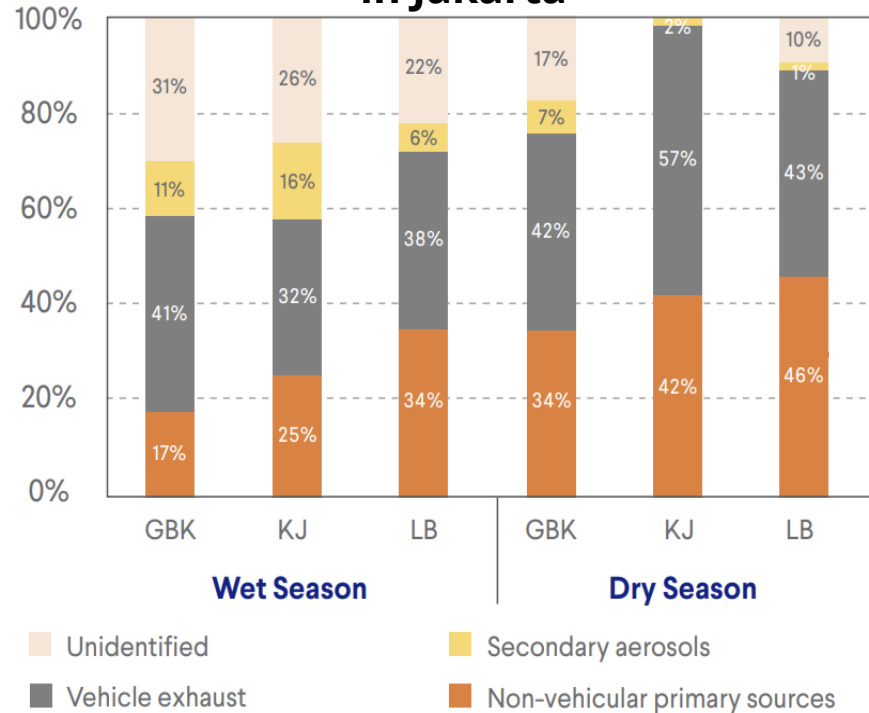


- DKI Jakarta ranks second in PM<sub>2.5</sub> emissions after Bekasi Regency, where transport is the dominant source due to the relatively limited number of industries.
- Bogor Regency and Serang Regency remain significant contributors to PM<sub>2.5</sub> emissions, largely driven by industrial activities.
- Other urban areas such as Bekasi City, Depok City, Tangerang City, and South Tangerang City are also dominated by transport emissions.

Source: CAA & KLH, 2025

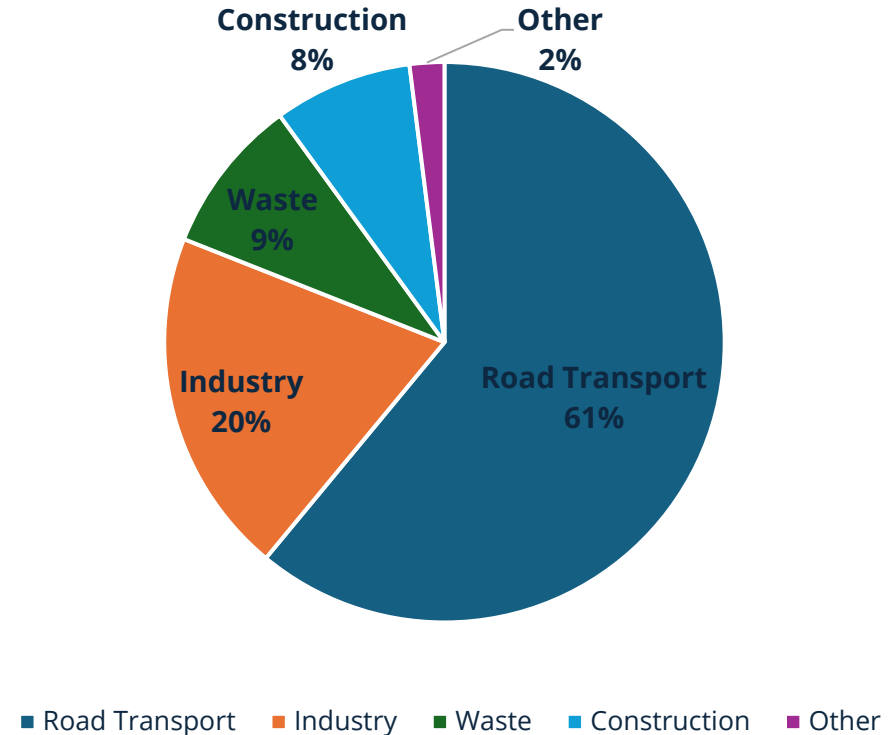
# Source of Air Pollution in Jakarta

Source contribution (%) to PM<sub>2.5</sub> concentration in Jakarta



Source: Vital Strategies & ITB, 2019

Source of Air Pollution in Jakarta, 2023 Based on sectoral energy consumption



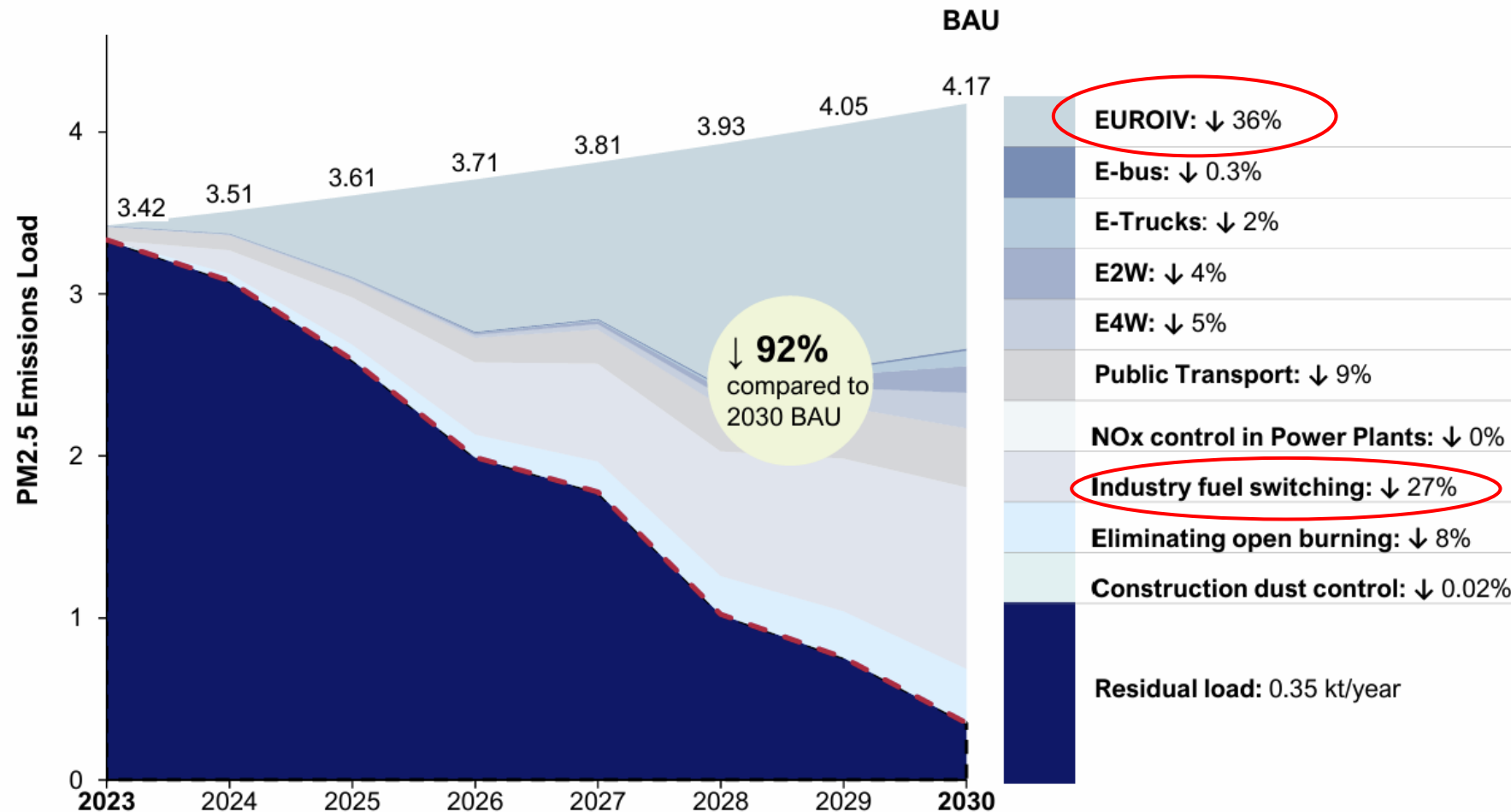
Source: Systemiq, 2024

Based on emission inventory and particulate chemical composition analysis, the transport sector has been identified as the main contributor to PM<sub>2.5</sub> emissions in Jakarta.

# PM<sub>2.5</sub> Emission Reduction Options

## PM2.5 Projections 2023-2030: BAU vs. Levers

Kilotons/year

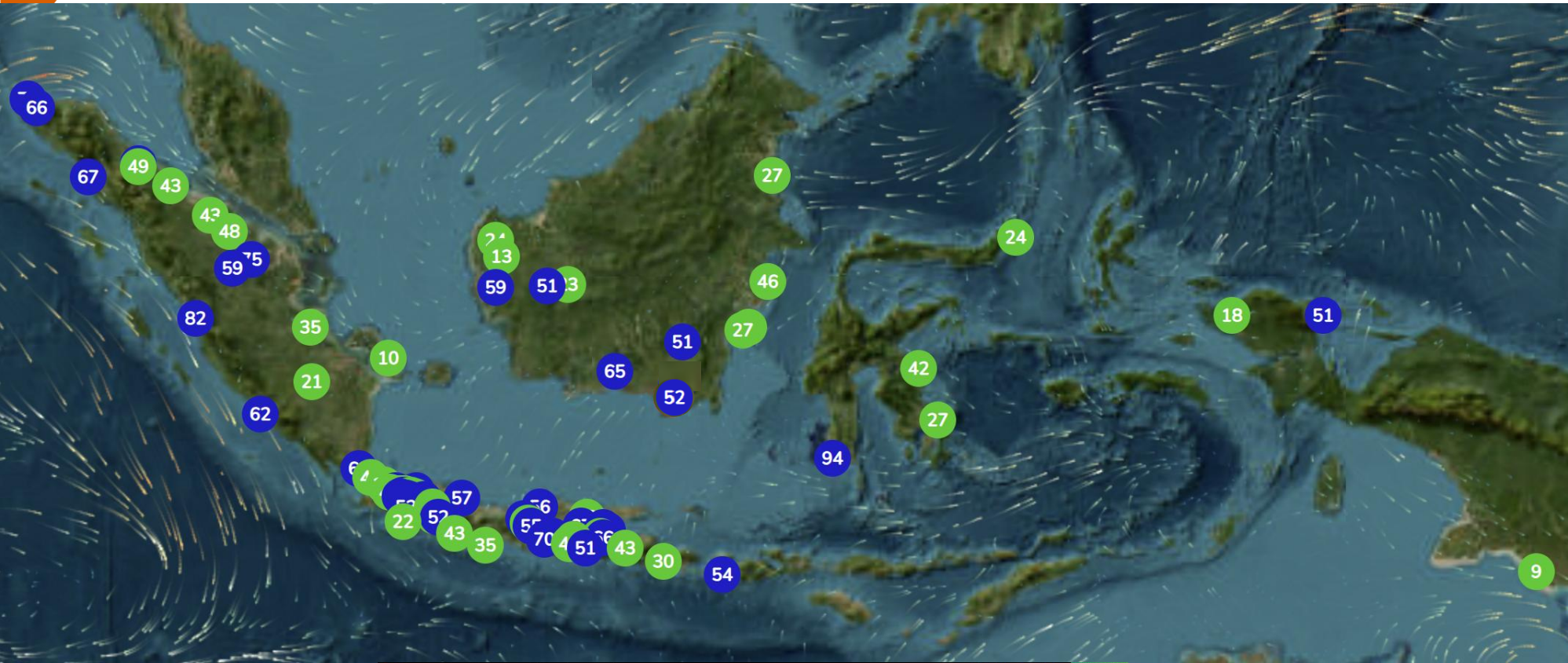


## 2030 Targets

- **100% Euro IV fuel adoption** (supported by Low Emission Zone & truck retrofits) in Jakarta
- **100% electrification (~10k E-Buses)** of TransJakarta e-bus<sup>1</sup>
- **15% electrification (~115k E-Trucks)** of commercial trucks in Jakarta, assumed target<sup>1</sup>
- **45% electrification (~5.5M E2W)** of 2W in Jakarta share, based on GOI nat'l target 13m
- **23% electrification (~800k E4W)** of 4W in Jakarta share, based on GOI national target 2m
- **60% Public Transport ridership**
- **100% coal-to-gas fuel switching** in industrial boilers
- **NOx control installations** at combined-cycle power plants (CCGT)
- **100% waste handling** (zero waste open burning)
- **100% construction dust control**

Source: Systemiq, 2024

# Expansion of Air Quality Monitoring Network



The screenshot shows the ISPU Net mobile application interface. At the top, the time is 11:55 and the battery level is 32%. The app logo is ISPU Net. The main heading is "Indeks Standar Pencemaran Udara (ISPU)". Below this, the location is "DKI Lubang Buaya" with ID "DKI4" and the timestamp "29-Mei-2024 20:00:00". The air quality is reported as "SEDANG" (Moderate) with an ISPU value of 96 and a critical parameter of PM<sub>2.5</sub>. A blue banner states: "Tingkat kualitas udara masih dapat diterima pada Kesehatan manusia, hewan dan tumbuhan." (Air quality level is still acceptable for human, animal, and plant health). Below this are three weather-related icons: Kelembaban (Humidity) with a water drop icon, Tek. Udara (Air Pressure) with a pressure gauge icon, and Suhu (Temperature) with a thermometer icon. At the bottom, there is a "Grafik Indeks Standar Pencemaran Udara (ISPU)" section with a bar chart showing AQI values for various pollutants: PM<sub>10</sub> (76), PM<sub>2.5</sub> (96), SO<sub>2</sub> (31), CO (12), O<sub>3</sub> (20), NO<sub>2</sub> (7), and HC (0). The chart uses a color scale from green (BAIK) to black (BERBAHAYA). The bottom navigation bar includes Home, Map, Stasiun, and Info icons.

The screenshot shows a web-based air quality monitoring dashboard for "Stasiun Kabupaten Gresik Kebomas". The dashboard is titled "Kualitas Udara" and "Cuaca". It displays the current AQI as 59 (SEDANG) for PM<sub>2.5</sub> on 25 November 2024 at 15:00. The dashboard includes a "Trend Cuaca" section with three line graphs: "Salah Cikabasi", "Tekanan (hPa)", and "Kelembaban (%)". Below the graphs are "Data Konsentrasi (µg/m<sup>3</sup>): 25-Nov-2024 15:00" for various pollutants (PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, CO, O<sub>3</sub>, NO<sub>2</sub>, HC) and a "Kategori" section showing the AQI range from BERBAHAYA to BAIK. The dashboard is provided by the "Kementerian Lingkungan Hidup dan Kehutanan" (Ministry of Environment, Forestry and Fisheries) for Gresik, Provinsi Jawa Timur.

- As of 2025, 133 Air Quality Monitoring Stations (AQMS) have been established
- 17 AQMS from various local government agencies and other institutions have been integrated

# Continuous Emission Monitoring System (CEMS)

Continuous emission monitoring is intended to obtain real-time emission monitoring data. This system is integrated with the Ministry of Environment's system. The company will receive notification via email if the monitoring results exceed the emission quality standards.

Emission monitoring with CEMS is mandatory for 10 industries with high emission loads, including:

Power Plant	Rayon
Oil & Gas	Iron & Steel
Fertilizer	Mining
Cement	Carbon Black
Pulp & Paper	Lithium Battery Recycling



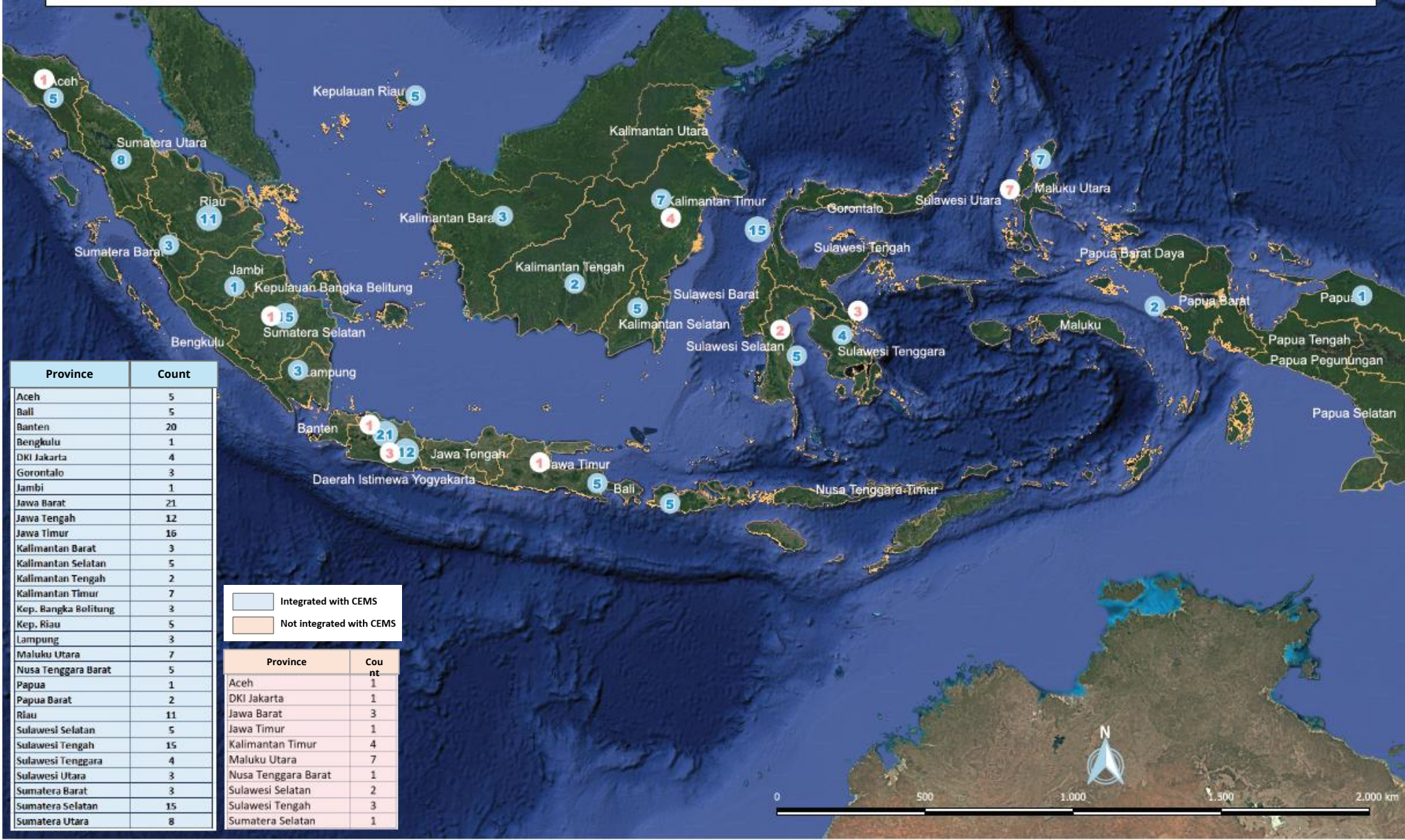
# Sistem Informasi Pemantauan Emisi Industri Kontinu (SISPEK)

## Integration Scheme



Before being integrated with SISPEK, CEMS must obtain QAL 1 certification and pass RATA, RA, RCA, CGA audits.

# THE DISTRIBUTION OF COMPANIES REQUIRED TO IMPLEMENT CEMS ACROSS VARIOUS PROVINCES IN INDONESIA FROM 2021 TO 2025



Province	Count
Aceh	5
Bali	5
Banten	20
Bengkulu	1
DKI Jakarta	4
Gorontalo	3
Jambi	1
Jawa Barat	21
Jawa Tengah	12
Jawa Timur	16
Kalimantan Barat	3
Kalimantan Selatan	5
Kalimantan Tengah	2
Kalimantan Timur	7
Kep. Bangka Belitung	3
Kep. Riau	5
Lampung	3
Maluku Utara	7
Nusa Tenggara Barat	5
Papua	1
Papua Barat	2
Riau	11
Sulawesi Selatan	5
Sulawesi Tengah	15
Sulawesi Tenggara	4
Sulawesi Utara	3
Sumatera Barat	3
Sumatera Selatan	15
Sumatera Utara	8

Province	Count
Aceh	1
DKI Jakarta	1
Jawa Barat	3
Jawa Timur	1
Kalimantan Timur	4
Maluku Utara	7
Nusa Tenggara Barat	1
Sulawesi Selatan	2
Sulawesi Tengah	3
Sulawesi Tenggara	3
Sulawesi Utara	1

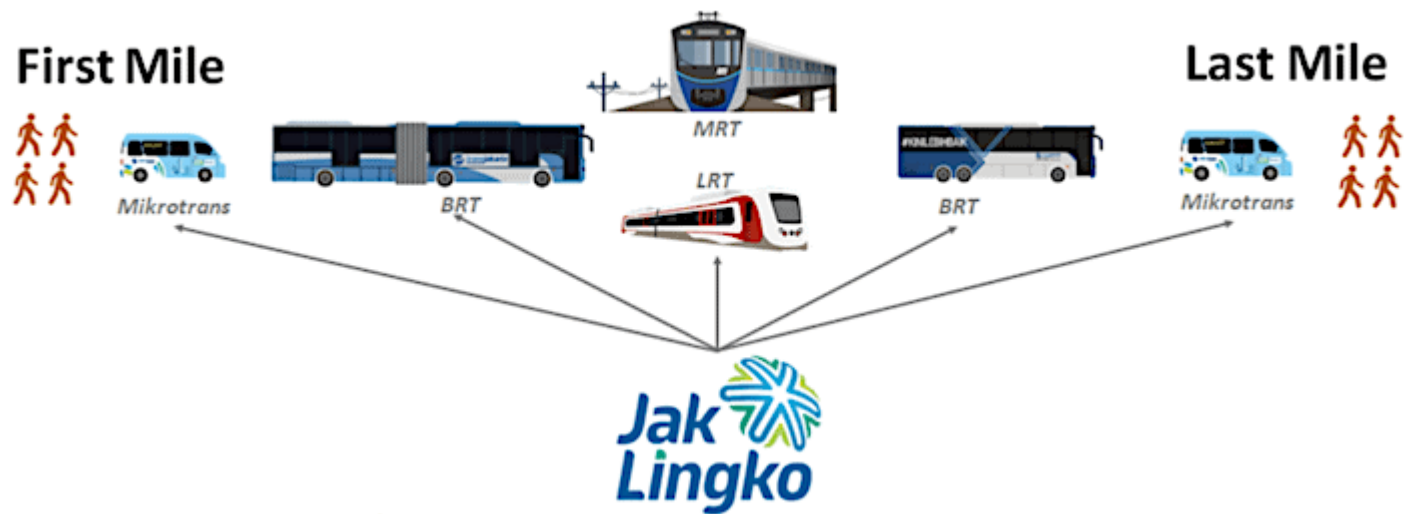


# Vehicle Emission Testing



Vehicle emission testing has been conducted to assess compliance with emission standards, and the majority of vehicles that fail the emission test are diesel-fueled vehicles

# Expanding Integrated Public Transportation



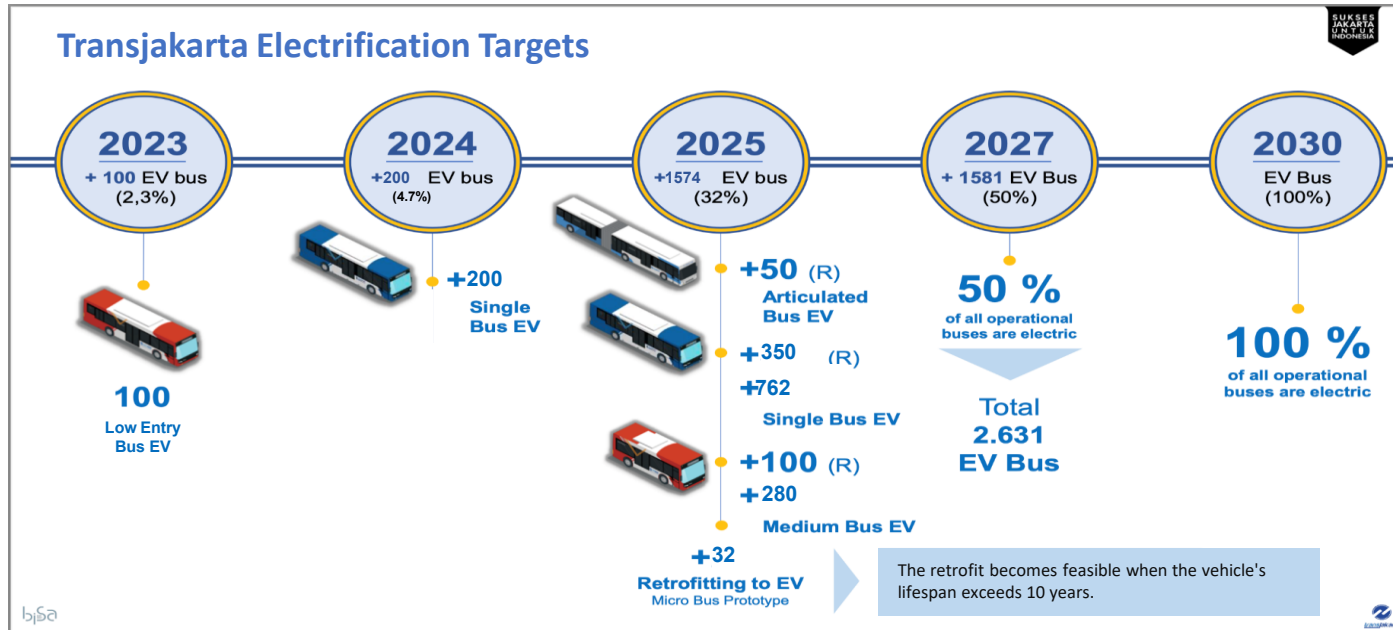
# Shifting from Conventional to Electric Buses

## Jakarta Provincial Government's Commitment to Zero-Emission Public Transport 50% of Transjakarta Fleet to Be Zero-Emission by 2027, 100% by 2030

This initiative is aligned with Presidential Regulation No. 79/2023, which supports sustainable urban transportation.

Key policies supporting this program include:

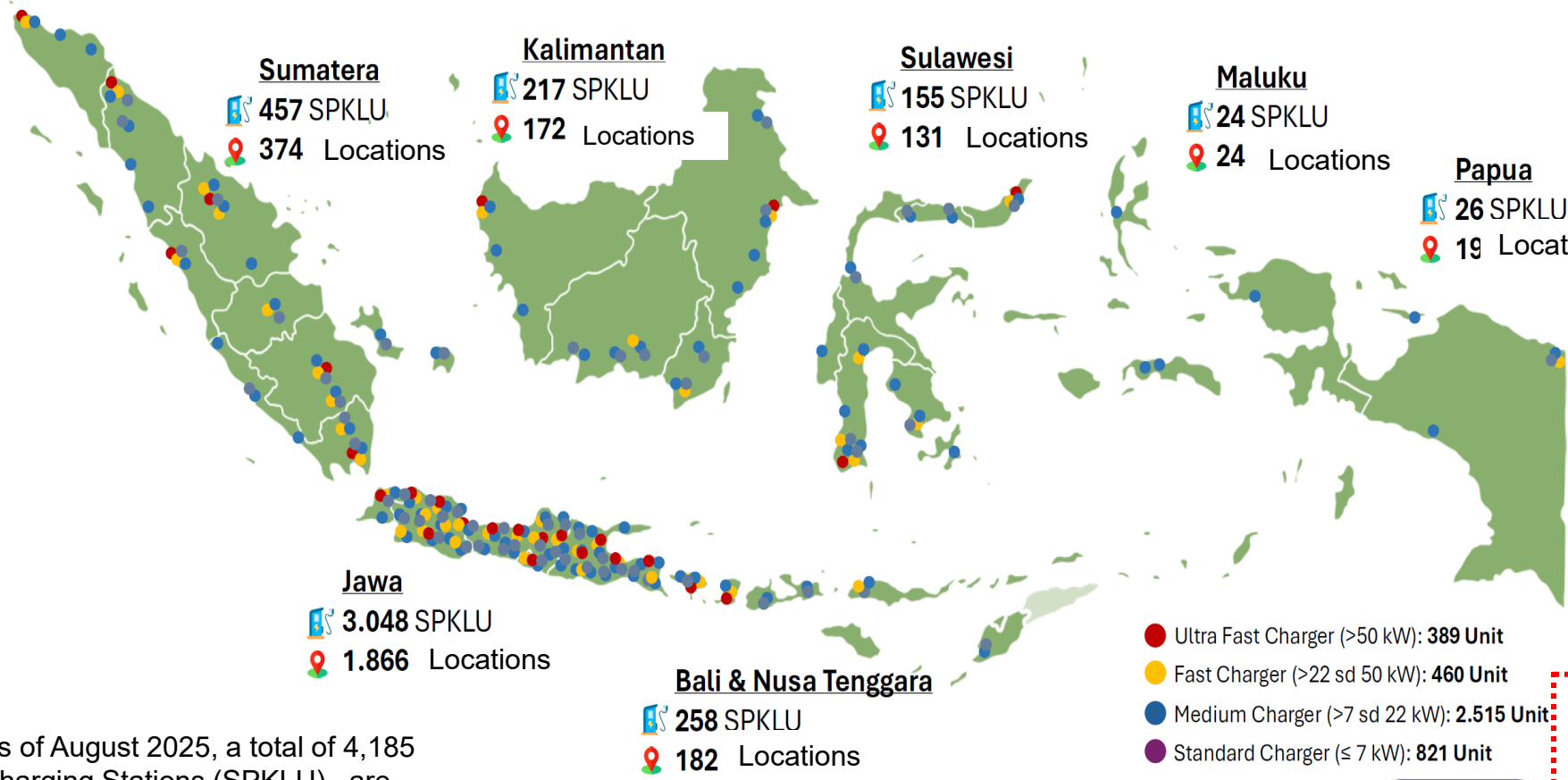
- Governor Instruction No. 66/2019 on Air Quality Control
- Governor Decree No. 1053/2022 on Guidelines for Accelerating the Use of Battery Electric Vehicles (KBLBB) for Transjakarta
- Governor Decree No. 576/2024 on Air Pollution Control Strategy, including plans for electric bus procurement and fleet retrofitting



### Electric Bus and Retrofit Plan:

	2024	2025	2027	2030
<b>Total</b>	4,661	5,256	5,262	5,262
<b>ICE Bus (unit)</b>	4,461	3,574	2,631	0
<b>EVs (unit)</b>	300	1,874	2,631	5,262
<b>% EV (unit)</b>	4.7%	32%	50%	100%

# Development of Charging Station to Support Electric Vehicle Mobility In Indonesia

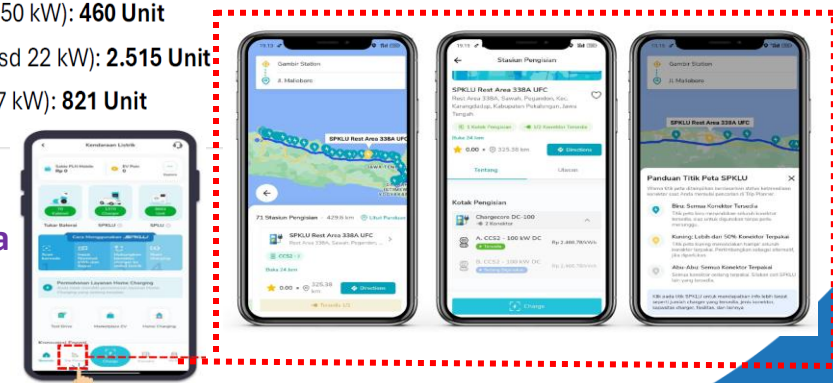


As of August 2025, a total of 4,185 Charging Stations (SPKLU) are available at 2,768 locations

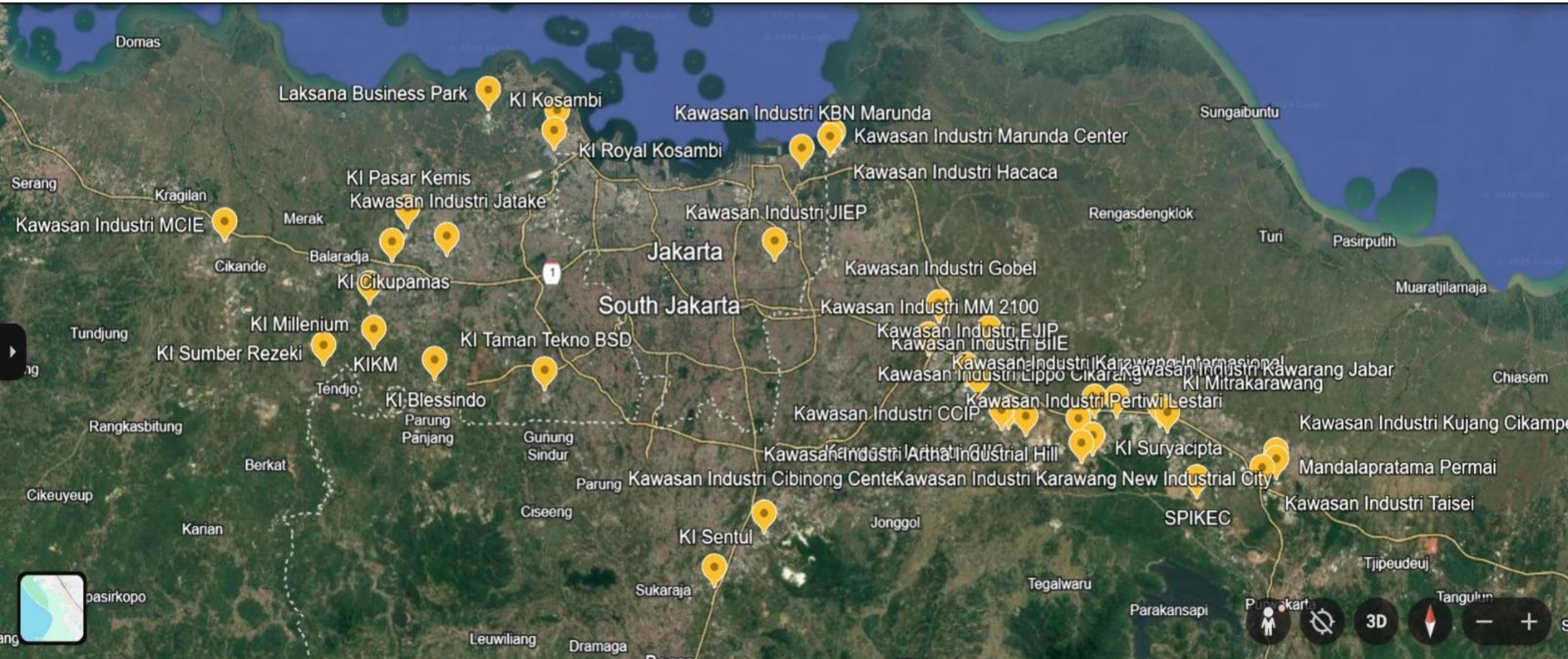
Source: PLN, 2025

- Ultra Fast Charger (>50 kW): 389 Unit
- Fast Charger (>22 sd 50 kW): 460 Unit
- Medium Charger (>7 sd 22 kW): 2.515 Unit
- Standard Charger (≤ 7 kW): 821 Unit

## Charging Station (SPKLU) locations via Road Trip Planner



# Industrial Zones Monitored Through Emission Patrols



# Recap of Emission Patrol Results

## Monitoring Results (January–February 2026):

- Number of industrial areas monitored: 40 industrial areas/zone
- Total industries monitored: 1,719
- Number of stacks monitored: 590
- Number of emission sources temporarily suspended: 11 emission sources



# Law Enforcement on Waste Burning Activities



Law enforcement through regular patrols to prevent open waste burning in Jakarta and the Greater Jakarta area, as well as emission patrols to monitor industrial stacks. Facilities with high-opacity emissions are required to immediately stop the emission source and take corrective actions

# Conclusion

- PM<sub>2.5</sub> levels in Jakarta show a declining trend, but exceedances still occur during the dry season.
- Air quality is influenced by local emissions, meteorology, and regional transport of pollutants.
- Transportation and industry are the main contributors in Jakarta and Jabodetabek.
- Effective PM<sub>2.5</sub> reduction requires a combination of fuel quality improvement, public transport promotion, EV adoption, fuel switching (coal to gas), and high-efficiency control technologies.



# BAQ 2026

BETTER AIR QUALITY  
CONFERENCE 11-13 MAR • BANGKOK



# Thank You for Listening!

[annisazhraa@gmail.com](mailto:annisazhraa@gmail.com)

