

Measuring the Formulation of Electric Vehicle Regional Regulations in Supporting the Transportation Electrification Policy in Jakarta

Dhien Favian Aryanda^{1*} Prayogi Ramadhani Putra²

¹Department of Politics and Government, Universitas Gadjah Mada
Jl. Sosio-Yustisia No.1, Yogyakarta, 55281, Indonesia

²Department of Political Science, Universitas Airlangga,
Jalan Dharmawangsa Dalam, Surabaya, 60285, Indonesia

*Corresponding author: dhienfavianryanda559901@mail.ugm.ac.id

Article Info

Article History

Article History

Accepted: 03-10-2025

Approved: 08-10-2025

Published: 09-10-2025

Keywords:

Mass Transportation
Vehicle Electrification
Regional Regulation
Public Policy

Abstract

Abstract: This research aims to review the effectiveness of the electrification policy by The Government of Jakarta. The research method used qualitative methods with a descriptive approach to provide a comprehensive explanation regarding the implementation dynamic of local regulations regarding vehicle electrification within Jakarta. Data collection was carried out by in-depth toward The Jakarta Local Council (DPRD Jakarta) along with comparative literature reviews regarding electrification policy in Los Angeles. The results of this study indicate that the electrification policy has been implemented through various policy, such as procurement of electric buses for TransJakarta. However, the electrification policy is still carried out on a small scale due to various problems, such as budget realization, vehicle specifications, to the absence of a legal basis. For this reason, a proposal and support for a Regional Regulation on vehicle electrification is being prepared by the Jakarta Regional People's Representative Council to support the electrification policy on a massive scale.

Abstrak: Penelitian ini bertujuan untuk meninjau efektivitas dari kebijakan elektrifikasi transportasi massal oleh Pemerintah Provinsi DKI Jakarta untuk mempercepat penerapan transportasi berbasis tenaga listrik. Metode penelitian yang digunakan tertuju pada metode kualitatif dengan pendekatan deskriptif untuk memberikan penjelasan secara komprehensif mengenai dinamika pembentukan peraturan daerah mengenai dinamika implementasi elektrifikasi kendaraan pada lingkup DKI Jakarta. Pengumpulan data dilakukan dengan wawancara mendalam dengan DPRD Jakarta dan didukung oleh telaah pustaka komparatif mengenai kebijakan elektrifikasi di Los Angeles. Hasil penelitian ini menunjukkan bahwa kebijakan elektrifikasi transportasi massal sudah diterapkan oleh Pemerintah Provinsi DKI Jakarta melalui pengadaan bus listrik untuk TransJakarta. Namun demikian kebijakan elektrifikasi transportasi massal masih dilakukan dalam skala kecil oleh karena berbagai permasalahan, seperti realisasi anggaran, spesifikasi kendaraan, hingga ketiadaan landasan hukum dalam mendukung kebijakan elektrifikasi ini. Atas dasar itulah, pengusulan Perda (Peraturan Daerah) elektrifikasi kendaraan sedang disiapkan oleh DPRD Provinsi DKI Jakarta untuk mendukung kebijakan elektrifikasi tersebut secara masif.

Introduction

Motorized vehicle dilemma in Indonesia

The automotive world has experienced rapid progress in recent decades. Through various modes of transportation developed by the global automotive industry today, it can be predicted that the world of transportation will be more effective and efficient in community transportation. One mode of transportation that has developed rapidly is land transportation, where since the invention of motorized vehicles (cars, buses, and others) by Henry Ford, the use of motorized vehicles reached its peak in the 21st century. Now, motorized vehicles are transformed into primary goods for humans to become a means of transportation. The rapid progress of motor vehicles cannot be separated from the existence of petroleum, where the industrialization of petroleum in turn encourages the commercialization of oil for widespread human needs. This then led to an increase in global petroleum consumption, including in the aspect of transportation as the main human need today, and this also applies to Indonesia ([EIA, 2023](#)).

Fuel consumption in Indonesia is still relatively high, which as a country with the 4th largest population in the world, the use of fuel is certainly important to drive the community's economy to become a source of state revenue. In 2022, the Ministry of Energy and Mineral Resources noted that oil consumption in the current year reached 264 million barrels with an average consumption of 347,625 barrels per day. This trend is also found in the consumption of fuel oil (BBM), where the Ministry of Energy and Mineral Resources noted that the consumption of pertalite gasoline (RON 90) has reached 29.68 million kiloliters, an increase of 27% compared to the total consumption in 2021 ([Kementerian ESDM, 2023](#)). This massive increase in fuel consumption is also accompanied by the quantity of motorized vehicles in Indonesia, where the Police Traffic Corps recorded the number of motorized vehicles registered in Indonesia reaching 152.1 million units and the majority of them still use gasoline as the main fuel. ([Sadya, 2023](#)).

With such a large amount of data, it is possible to find the correlation between fuel consumption and motor vehicle use in 2022. This shows that Indonesians are still dependent on fossil fuels for transportation needs. Even when compared to neighboring countries such as Malaysia which only reaches 700 thousand barrels a day, the dependency in Indonesia is clearly higher due to the size of Indonesia's population compared to the two countries. ([Purwantono, 2022](#)). Not only that, this increase in consumption is also supported by the increasing production of motor vehicles, where data from OICA (International Organization of Motor Vehicle Manufacturers) shows that vehicle production in 2022 will reach 1.47 million units, an increase of 31% compared to 2021. ([OICA, 2023](#)). The combination of these three data points makes petroleum dependency commonplace in Indonesia's transportation context.

However, the high dependence on petroleum has in turn led to an increase in air pollution in Indonesia. By 2022 alone, carbon emissions in Indonesia have increased dramatically with various variants of data presented. Climate Transparency notes that the quantity of carbon emissions in Indonesia has reached 910 metric tons of CO₂ per year, much higher than in 2015 which reached 800 metric tons of CO₂, which involves various factors such as vehicle pollution, forest fires, and so on. ([Climate Transparency, 2022](#)). Not only from Climate Transparency, the Ministry of Environment and Forestry also recorded a decline in air quality at various points throughout Indonesia with the average Air Quality Index (AQI) score reaching 155 and PM (Particular Matter) 2.5 concentration reaching 30.4 µg/m³ (micrograms per cubic meter), much higher than Laos

which only reached 27.6. This makes Indonesia the 26th worst air quality country in the world (BBC, 2023; IQAir, 2022).

This ranking certainly stems from the air quality in DKI Jakarta as the nation's capital, where Jakarta has experienced various problems in terms of air quality, especially regarding air pollution. The IQAir report shows Jakarta's air quality as of July 5 reached a score of 155 and that score is 13x higher than the WHO standard for health. (Andre, 2023). The causes of this problem are twofold: carbon emissions from industrial activities and motor vehicle pollution, both of which remain unresolved issues to this day (Eko et al., 2022). Specifically for vehicle pollution, it is undeniable that fossil fuel vehicles are still used by 10 million DKI Jakarta residents and the trend is predicted to continue to increase in the future. The problem is that all vehicles that use gasoline clearly produce CO₂ emissions due to the combustion system itself which produces carbon residue and the increase in CO₂ content in the atmosphere will have a negative impact on the environment and health (Solomon et al., 2009).

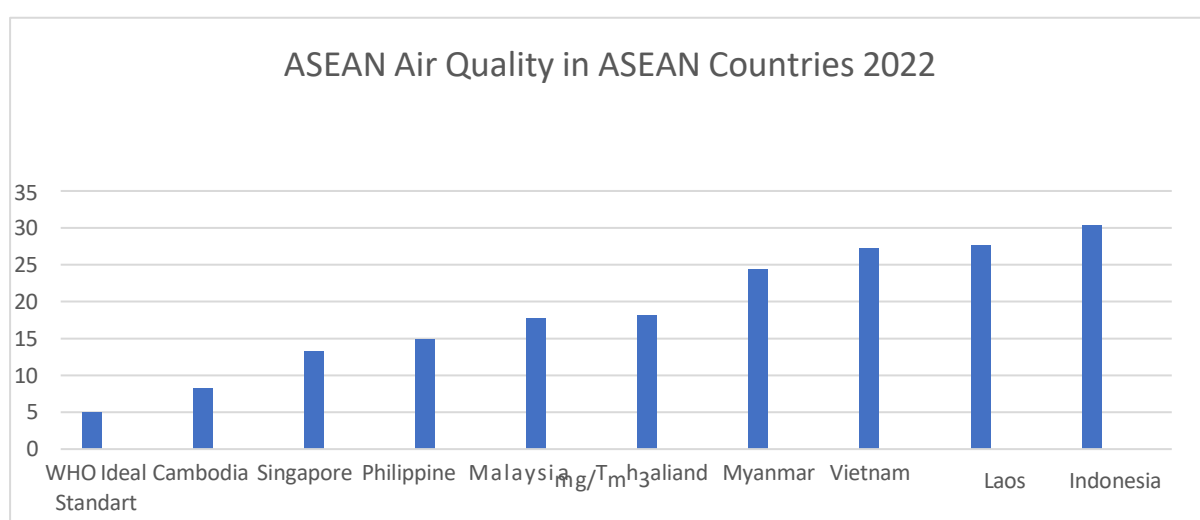


Figure 1. Air quality in ASEAN countries 2022 (IQAir, 2022)

On the one hand, the impact of emissions on the environment is fatal, be it the reduction of the ozone layer to extensive global warming, which then makes the climate on earth more erratic and risks damaging other forms of life. On the other hand, unchecked carbon emissions in Jakarta have triggered respiratory illnesses among its residents. In the past semester, many Jakarta residents have experienced suffocation and acute asthma due to air pollution. In addition, with some people's conditions getting worse, continuous exposure to pollution will disrupt their body's performance in the long term (Zulfikri, 2023).

The absence of regional regulations for vehicle electrification policy

Through the problems that occur in DKI Jakarta as follows, it makes sense if the central government begins to echo the policy of gradual electrification of vehicles to reduce carbon emissions to 0% by 2060, as stated by Indonesia at COP 26 in 2021. This has been outlined in the Electric Vehicle Development Plan by Bappenas (National Planning and Development Agency) in 2017, where the government projects that 2.02 million electric vehicles (cars and motorcycles) and 700,000 hybrid-powered cars will be on the road by 2025 (Climate Transparency, 2022). To support this projection, the government has issued policies that provide various incentives to the public and automotive companies to support massive vehicle electrification in the future as a follow-up to Presidential Decree Number 55 of 2019 concerning the Acceleration of the Electric Vehicle Program (Nur & Kurniawan, 2021).

One of the incentive policies passed by the government is aimed at providing VAT (Value Added Tax) incentives to automotive companies, where this policy has been passed in the form of Minister of Finance Regulation Number 38 of 2023. This regulation stipulates a reduction in the value of the tax burden for the purchase of electric cars by 11% of the selling price, provided that the car has a 40% portion of locally produced components, and the reduction will be given to consumers at the end of the transaction (Krisdarmajati, 2023). In addition to the VAT cut, the government is also preparing a national electric vehicle ecosystem scheme. This scheme focuses on three aspects, namely the integration of supporting infrastructure for electric vehicles, local-scale production of electric vehicle components, and procurement of electric power-oriented public transportation. (Mahalana & Yang, 2021). In the DKI Jakarta case study, the implementation of the scheme has been reflected through three policies carried out by The Government of Jakarta. In the infrastructure aspect, the government stipulated Governor Regulation Number 3 of 2020 which provides freedom for electric car owners from Motor Vehicle Title Transfer Fees (BBN-KB). This freedom at least relieves electric car users in terms of costs and at the same time accelerates the commercialization of electric cars because they are no longer charged with transfer tax (Ibad et al., 2022).

In addition to tax breaks, the Government of Jakarta also opens cooperation in the provision of SPKLU (Public Electric Vehicle Charging Stations) to Pertamina, PLN, and other investors. with a total of 83 units of SPLKU available in Jakarta. These two policies on the one hand provide results when viewed from the increasing quantity of electric vehicles in Jakarta (Ibad et al., 2022). At the same time, vehicle electrification in the public transportation sector has also increased significantly. For example, TransJakarta's policy to increase the bus fleet by 100 units for 2023, which will increase the quantity of electric buses and reduce air pollution from conventional buses (Zahira, 2023). However, although the Government of Jakarta has taken concrete steps to accelerate vehicle electrification, these steps have not fully resulted in a comprehensive electric vehicle ecosystem. This is because the existing policies still dwell on the entry-level, which is interpreted as sporadic vehicle electrification.

The central government has indeed issued regulations since 2019 to support holistic vehicle electrification efforts. However, the existing regulations are only focused on incentivizing the purchase of vehicles that only focus on the consumption sector and this makes the existing regulations not provide a more sustainable vehicle electrification scheme (IESR, 2019). Unlike the United States and China, which have successfully built electric vehicle ecosystems since the 2010s, Indonesia is still focusing on the quantity of vehicle aspect and this will also hamper the implementation of electric vehicle policies at the regional to local level (Subekti, 2022).

Research Method

The writing of this journal uses a qualitative method with a descriptive approach. The qualitative method is used to analyze a social phenomenon thoroughly regarding the topic presented in this journal, especially a description of the dynamics that cannot be quantified by quantitative methods (Gerring, 2017). In addition, a descriptive approach is also used to provide a more detailed explanation of the efforts made by the Jakarta Regional People's Representative Council (DPRD Jakarta) as a provincial-level legislative body in the formation of regional regulations regarding electric vehicles (Mohajan, 2018). Data collection was carried out using a combination of primary data and secondary data. Primary data collection was carried out through in-depth interview into several lawmakers at the Jakarta Regional People's Representative Council DKI Jakarta who proactively proposed an electric vehicle regional regulation. Secondary data collection was conducted through internet-based research, with a focus on comparative policy studies from Jakarta's sister city, such as Los Angeles. Data was obtained from online scientific journals, electronic books, electronic media, and official websites – either from Google Scholar or another credible sources – to find journal articles related to the

topic with the keywords vehicle electrification policy worldwide (Cruceanu, 2019). This comparative study can provide an overview of experiences regarding electric vehicle regulations in other countries, so that this comparison will become a foundation stone for the establishment of these regulations in Indonesia as a whole. After the research data is collected, the next stage is that it will be analyzed with several stages of data analysis, where Hammarberg et. al. (2016) reveal that there are four stages that need to be done to analyze data in qualitative research (Hammarberg et al., 2016).

The process or the phase of data analysis can be described in Table 1.

Table 1. Stages of qualitative analysis methods

Qualitative Data Analysis	
Data Collection	Data collection from this journal would be based on two data, which is primary data and secondary data. Primary data will be gathered from in-depth interview to several expert staff regarding the design of regional regulation on electric vehicle in DKI Jakarta. Meanwhile, secondary data will be gathered from credible journal, report, and even regulation by searching for keywords such as vehicle electrification policy.
Data Reduction	Data reduction means summarizing by selecting the main things or playing a central role in answering the formulation of research problems and the summary is also focused on important things during the research, so that the data that has been reduced will provide a vivid picture and can make it easier for researchers to present data in accordance with the formulation of the problem in question.
Data Analysis	All data collected is then reduced to such an extent as to give substantive explanation regarding the effort to create regional regulation on electric vehicles in Jakarta. In addition, this data analysis will also be supported by empirical data from previous data collection along with the existing theoretical framework to produce a formulation of data discussion that correlates with an analytical framework that can answer the research questions posed.
Conclusion	Following the analysis stage, author will have to draw conclusion based on data analysis before, which this conclusion can be utilized as a milestone for reader on studying the influence of the formulation on this regulation to the implementation of vehicle electrification policy in the near future. This conclusion will be added with recommendation for key stakeholder—especially for local government—to initiate regional regulation on electrification policy and couple with meaningful policy to accelerate energy transition on transportation aspect.

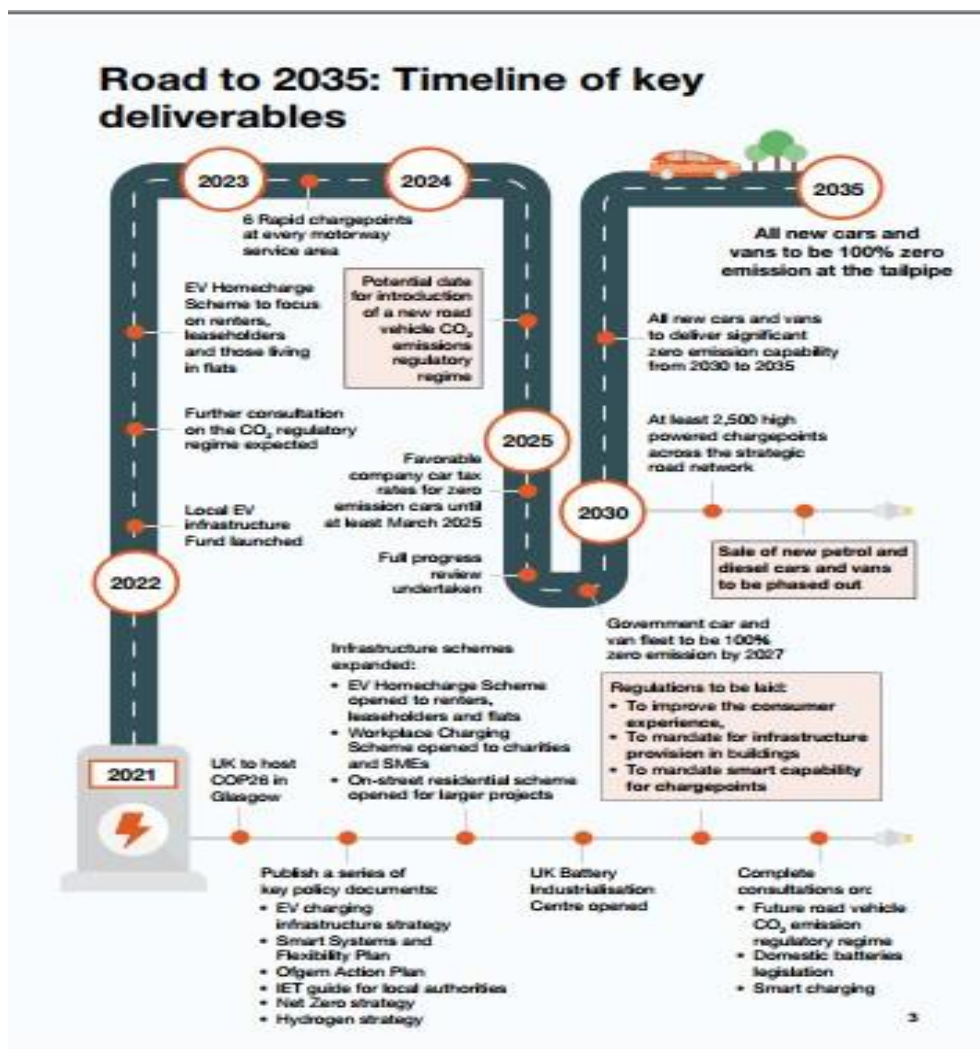
Results and Discussion

Electric vehicle regulation in comparative perspective: Los Angeles case study

In the midst of the world's increasingly uncertain climatic conditions, the response to global warming needs to be implemented sustainably by various countries to prevent catastrophic environmental damage. One of the policies being promoted by several countries today is vehicle electrification, especially on car and bike. Conversion of fossil-fuel vehicles into electric vehicles has started since the 1990s, where General Electric had developed EV1 as a prototype for electric cars in the United States and this development would be followed by various automotive industry such as Ford, Honda, and Toyota. However, this attempt had been discontinued in 2006 worldwide due to various obstacles, such as massive campaign from fossil fuel sponsor and the overturn of zero-emission mandate, and this development has been restarted in 2010s as the environmental impact of fossil fuel and greenhouse gas emission led to climate change today. Responding the impact of climate change, COP26 has been held in 2021 and over 140 countries pledged to achieve 100% zero-net emissions by 2040 (United Nations, 2021).

This commitment is also accompanied by a pledge to full-conversion of transportation, where the Glasgow Climate Pact lists commitments from the world's automotive manufacturers to accelerate the transition to electric vehicles by 2035 at the latest. This commitment is aimed at reducing greenhouse gas emission worldwide – which global transportation sector has contributed on seven billion metric ton of carbon dioxide in 2021 – and the mass production of

electric vehicle is expected to support commitment on reducing CO₂ emission by 90% as stated in Glasgow Climate Pact (Tiseo, 2023). Salah satu studi kasusnya merujuk pada pengesahan on national document of EV transition from United Kingdom, whereas the host of COP26, UK had released the national scheme of vehicle transition which have been conducted in 2021 and beberapa skema ini akan dilakukan melalui formulasi kebijakan from UK government, such as publication of key policy document, expansion of EV infrastructure, until phase out policy of fossil fuel cars (HM Government, 2021). This scheme will be explained as follow:



Picture 1. 2035 delivering plan of EV transition in United Kingdom (HM Government, 2021)

The scheme issued by The Government of United Kingdom is one of the benchmarks for conducting EV transition gradually and this transition policy cannot be successful without the role of regulatory regime. In the case of the policy implementation, every government must have an EV policy blueprint to make vehicle transition successful in the long run. Thus, regional regulations are needed to provide legal certainty for the transition policy at the local level. In this section, the author will present an explanation regarding the regulatory regime of EV transition in one city, namely Los Angeles, where this city has been placed as Jakarta's sister city. The experience gained from this city can provide a comparative picture of efforts to establish local regulation on EV transition to be applied in a metropolitan city like Jakarta for years to come.

Urban Mobility Report in 2021 showed that annual person-hours of delay in Los Angeles has reached 119 hours per year in 2019, the most congested traffic lanes in the United States, where this delay mostly happened in main highway (The Texas A&M Transportation Institute, 2021).

Even though Covid-19 has dropped this record for Los Angeles, however, Los Angeles is still categorized as 6th most congested cities in the United States in 2022. According to INRIX report in 2023, it is stated that traffic congestion in Los Angeles has reached 95 hours annually in 2022, minus 24 hours compared to 119 hours delay in 2019. This record has also combined with congestion cost per driver, where average of Los Angeles citizen had lost USD 1,601 to compensate traffic congestion in 2022. From this report, it can be seen that Los Angeles, as the second largest city in the US, also has problems with traffic congestion similar to Jakarta. The massive mode of land transportation in the city in turn creates other problems, namely air pollution (Cilligan, 2023).

IQAir noted that Los Angeles has been declared as the second most pollutive city in the United States in 2022. This is based on IQAir's findings in southern California, where the air quality in this dumping industry region has contributed to this record, with the air pollution itself having exceeded EPA 12µg/m³ beyond the WHO (World Health Organization) standard. Despite this record of poor air quality in Los Angeles, one of the dominant factors of poor air quality is mass transportation that still consumes fossil fuels. By reflecting on the density of traffic on various highways in Los Angeles, it can be assumed that the massive number of fossil fuel vehicles on the road on the one hand has an impact on greenhouse gas emissions that increase everyday (Briscoe, 2023; McCormick, 2023). This record has represented how traffic congestion and air pollution is still a daily problem in Los Angeles and it will get worse if not addressed as soon as possible. Reflecting on the above problems, the Government of Los Angeles then formulated several policies to suppress the spread of greenhouse gas emissions, especially on forming the electrification vehicle regulatory regime.

Until this journal was written, there are at least two efforts made by the Los Angeles which is a derivative of the California government regulation to develop the electric vehicle ecosystem, which in 2021 the cumulative registration of plug-in electric vehicles in California has reached 1.072 million units and 588 thousand units in Los Angeles alone (California New Car Dealers Association, 2022). *First*, the implementation and extension of the Clean Vehicle Rebate Project (CVRP). The Government of Los Angeles has been implementing this policy since 2014, with the details being rebates from selling prices for private and business vehicles commonly used by individuals. The amount offered by the Los Angeles government was originally pegged at USD 5,000 for a single purchase, but the deduction gradually changed due to economic conditions in California, so the deduction value set was also uncertain. Currently, Los Angeles government officials follow the scheme set by the California government in 2016, where the rebate for electric vehicle procurement is calculated based on annual income. (Edelstein, 2015). For example, plug-in electric car buyers whose income is less than 300% below the federal poverty standard - USD 14,580 - will get a rebate of USD 3,000 and this rebate will no longer be available for car buyers with incomes over USD 250,000. In 2023, the amount of electric vehicle rebate will be even higher for the subsidized target group. The California Air Resource Board has allocated up to USD 4,500 rebate fund for plug-in electric vehicles (Macht, 2023).

New Retail Light Vehicle Registrations (excluding fleets) 2021			
North and South California	2020	2021	% chg.
Statewide Total	1,366,382	1,566,396	14.6%
Cars	503,152	534,475	6.2%
Light Trucks	863,230	1,031,921	19.5%
Northern California	460,915	528,383	14.6%
Cars	158,524	167,383	5.6%
Light Trucks	302,391	361,000	19.4%
Southern California	905,467	1,038,013	14.6%
Cars	344,628	367,092	6.5%
Light Trucks	560,839	670,921	19.6%
Selected Regional Markets			
San Francisco Bay	243,075	275,321	13.3%
Cars	89,554	91,347	2.0%
Light Trucks	153,521	183,974	19.8%
LA and Orange Counties	521,972	588,042	12.7%
Cars	207,954	216,933	4.3%
Light Trucks	314,018	371,109	18.2%
San Diego County	119,841	139,335	16.3%
Cars	39,426	42,313	7.3%
Light Trucks	80,415	97,022	20.7%

Picture 2. Northern and Southern California Markets for Electric Cars in 2021 ([California New Car Dealers Association, 2022](#))

This policy in turn benefits the citizens of Los Angeles because the rebates offered only apply to lower and middle classes citizen whose income is below the federal standard. This well-targeted subsidy has led to a massive increase in the number of plug-in electric vehicles in Los Angeles, so that the prospect of electric vehicles in Los Angeles will increase and the target of zero emission vehicles can be partially met by 2035 ([Searle et al., 2016](#)). *Second*, the establishment of an electric vehicle supporting infrastructure policy. As a prelude, the United States Government has enacted The Infrastructure Investment and Jobs Act in 2021, where this act has been positioned as the legal basis for strengthening the development of infrastructure supporting electric vehicles all across the United States, including California and Los Angeles as its largest city of this state. From this act, Biden administration open up application for all U.S state government to receive grant from federal government regarding infrastructure development, especially on fostering public accessibility of electric-charging infrastructure ([Infrastructure Investment and Jobs Act, 2021](#)). Responding from the act, California government requested worth USD 384 million grant from federal government to funding charging stations construction in all of California cities, including Los Angeles.

This policy resulted in the authorization of the federal government to allocate grants submitted by the California government and these grants were then allocated for the construction of nearly 80,027 public charging stations by The California Public Utilities Commission. These developments were successfully realized across California and specifically for Los Angeles, public charging stations in the city have reached 4,769 by 2023 ([PlugShare, 2023](#); [Wynkoop, 2022](#)). Not stopping there, the Los Angeles government also passed the Los Angeles EV Master Plan as a reference framework for electric vehicle policies, where this master plan is an integral part of the LA100 Energy Transition Initiatives to realize the 100% zero

carbon target by 2035, one of which is the integration of electric vehicles in Los Angeles transportation (Cochran et al., 2021; Searle et al., 2016). In this Master Plan, the Los Angeles government is committed to organizing a comprehensive vehicle electrification scheme to support the full transition of electric vehicles while further implementing the two regulations that have been regulated from the federal government and California state government. Not only the implementation of the electric vehicle rebate initiative and expansion on EV charging stations across the city, this master plan further contains three priority policies in the electric vehicle transition. (Jackson, 2021; UCLA, 2017).

Table 2. These three policies will be further explained in Table 2 as follows:

EV Master Plan Policy	Explanation
Los Angeles County Metropolitan Transportation Authority's (Metro) Innovative Clean Transit Rollout Plan	The program initiated by the California Air Resources Board regulates all public transit agencies to transition conventional buses into zero-emissions buses (ZEB), either battery-electric or fuel cell, to 100% by 2040. The Government of Los Angeles envisions the ZEB transition to be phased in from 2020-2040. The required transition timeframe is described below: January 1, 2023 = 25 percent of all new bus purchases must be ZE January 1, 2026 – 50 percent of all new bus purchases must be ZE January 1, 2029 – 100 percent of all new bus purchases must be ZE January 1, 2040 – 100 percent of fleet must be ZE In addition to transition timeframe which must be comply ICT regulation, Government of Los Angeles has also prepared four strategies to fulfill 100% of metro buses transition, which then has been awarded to “ZEBGO” – a joint venture of multiple industry experts – to produce a Master Plan and action-ready RFPs to transition to all ZEBs by 2030. These strategies will be explained as follows: Future Bus Fleet Composition. The ZEB fleet composition in Los Angeles alone reach 160 in 2019. To expand ZEB fleet, In September 2019, the Metro Board granted approval to execute 369 bus options (40 battery-electric buses or BEB and 329 compressed natural gas or CNG) to cover Metro’s fleet needs (pre-pandemic) until 2022. Then, after 2022, Metro is expected to initiate ZEB procurement gradually until 2040, with the expected procurement in 2023 will be 4 buses for FY 2023 into 259 buses for FY 2030 (ZEBGO Partners, 2021). Facilities and Infrastructure Modifications. In order to support the expansion of ZEB, several modifications and replacements to existing infrastructure and operations must be conducted to meet the requirement. For Los Angeles, it is expected that 10 bus infrastructure will be converted to include charging station for buses. All divisions will support DC inverted pantograph charging. In an effort to maximize space and cost savings via reduced demand charges, Metro is currently planning for a “one to many” 150-kW charger to dispenser ratio (one charger to more than one buses) for overnight charging (ZEBGO Partners, 2021). Providing Service in Disadvantaged Communities (DAC). Recently, 73 percent of Metro’s divisions are located in communities that are classified as “disadvantaged” according to CalEnviroScreen. Responding the need of public transportation for disadvantage communities, conversion of existing CNG operations to BEB operation must be taken to meet the requirement of ICT regulation. So far, there are seven metro bus division in Los Angeles which offer accessibilities for DAC and all of this metro will be operated by BEB in 2025 according to construction of local and shuttle routes (ZEBGO Partners, 2021).

EV Infrastructure Deployment Plan	The program is implemented under the legal framework of the California National Electric Vehicle Infrastructure (NEVI) Plan, where the basic framework of the NEVI Plan has been initiated by California to expand and integrate electric vehicle infrastructure throughout the state, including Los Angeles. As of February 2022, California will divide the AFCs into segments based on an analysis of gaps in the current network, future charger needs, and geography. The gap analysis will begin with a review of existing infrastructure (Fauble et al., 2022). During this analysis, California will also establish a criterion for determining if more than 4 charging ports are needed to fill the gap in infrastructure and if the gap location would benefit from chargers with power beyond 150kW per port. In addition, California's Governor Newsom signed SB 671 to establish the Clean Freight Corridor Efficiency Assessment. The bill requires the CTC to identify freight corridors, or segments of corridors, as priority candidates for the deployment of zeroemission medium- and heavy-duty vehicles by December 2023. The assessment's findings and recommendations will be incorporated into the California Transportation Plan (Fauble et al., 2022). Instructions from California then has been interpreted by Los Angeles Government. Overall, there are three policy actions that will be implemented by Los Angeles government on strengthening electric vehicle infrastructure policy (Bui et al., 2021), which is as follows: 1) Short-term Policy Actions (2021-2022): - Expansion of Charge Up LA! Residential and Commercial Rebate Program - Expansion of streetlight, curbside, and multi-dwelling charger program - Develop city policy actions, including stakeholders, key partners, and charging infrastructure strategy 2) Medium-term Policy Actions (2023-2025): - Modification of Charge up LA! Program and restriction of eligibility based on key criteria including vehicle price, consumer income, or vehicle technology - Curbing parking location reconfiguration into DC Fast Charges-enabled charging station - Development of electric charging infrastructure from private sector - Upgrade EV-ready building code to ensure home charging for EV consumers 3) Long-term Policy Action (2026-2030) - LADWP rate-based MuD (Multi-Unit Dwellings) and public infrastructure deployment - Infrastructure installation at designated EV-only parking space - Work places requirement to provide EV charging infrastructure
Commercial EV Charging Station Rebate Programs	The program initiated by the Los Angeles Department of Water and Power (LADWP) is carried out by providing financial rebates for the deployment of EV charging stations, either from state-owned enterprises or from private companies, with the USD 17 million funding has been released by the city council to support this program in 2019. In general, the distribution of EV charging station rebate has been classified into three parts of rebate application, which is as follows: Commercial L2 EV Chargers will be able to receive USD 12 million rebate for each application Commercial DC Fast Chargers will be able to receive USD 3 million rebate for each application Commercial MDHD EV Chargers will be able to receive USD 2 million rebate for each application As of 2022, 203 rebate application which has been accepted to receive funding from LA government, 189 L2 EV application worth USD 12 million each and 14 DC Fast Chargers worth USD 3 million each. There are 23,000 EV charging station for all types in Los Angeles and approximately 16,310 charging station which has been installed in Disadvantaged Communities (Los Angeles City Council, 2022).

Both strategies implemented by the Los Angeles Government, from following federal regulations to local initiatives, show that the development of the EV ecosystem in Los Angeles is already advanced for a country like the United States. Compared to Jakarta today, the development of the EV ecosystem in Los Angeles is only waiting for "take-off" for a sustainable energy transition that is targeted to be fully operational by 2030.

Discussion

Electric vehicle regulation in Jakarta: long way to ev integration

Urban problems in Jakarta, the largest capital city in Southeast Asia, are still unsolved. Both air pollution and traffic congestion are still homework that needs to be resolved by the government and the community in the next few years. Especially for transportation issues, the DKI Jakarta Government has actually taken the initiative to develop an electric vehicle ecosystem in 2020 along with the increasing trend of electric vehicles in Indonesia ([CNN Indonesia, 2022](#)). One of them refers to the elimination of the Motor Vehicle Title Transfer Tax (BBN-KB), where Anies Baswedan as Governor of DKI Jakarta at that time issued Governor Regulation Number 3 of 2020 as the legal basis for removing the tax for electric vehicle owners. This elimination is claimed to reduce the costs involved in managing the vehicle registration certificate (STNK) ([PERGUB, 2020](#)).

In addition to tax write-offs, The Government of Jakarta also allows electric vehicles to cross the odd-even lanes that are enforced on several roads in Jakarta. This is stated in Governor Regulation No. 88/2019, where Article 4 states that electric vehicles are not subject to even-odd traffic restrictions. ([PERGUB, 2019](#)). This exemption is claimed to be an effort to support the central government's initiative to boost the spread of electric cars, especially in DKI Jakarta as a pilot area. However, the initiative to boost the spread of electric vehicles was spurred by the G20 conference held in Bali last November. Indonesia as the host has committed to accelerate the vehicle transition and therefore, the electric vehicle policy began to be massively promoted after the summit ([Suprobawati et al., 2021](#)). The same thing is happening in Jakarta, where in 2022 to 2023, the Government of Jakarta seems to be boosting the electric vehicle policy after the G20 Summit. Heru Budi as Anies' successor has instructed several new policy packages to complement existing policies.

Some of them are quite new policies compared to the Anies era. The first one is expansion of Electric Vehicle Charging Station (Stasiun Pengisian Kendaraan Listrik Umum, SPKLU). The development of SPKLU is carried out through Jakarta Transportation Office (Dinas Perhubungan DKI Jakarta) coordination together with State-Owned Electric Corporation (Perusahaan Listrik Negara, PLN), where PLN through the Electric Vehicle Infrastructure Road Map 2020-2024 launched the addition of SPKLU from 695 stations in 2020 to 16,410 stations in 2025 in Jakarta alone ([Asaad, 2020](#)). This projection will be supported by the Transportation Office through the construction of SPKLUs in four strategic location, namely Grogol Bus Station, Pulo Gebang Bus Station, Manggarai Station, and Tanah Abang station, and six additional station and this construction will be executed in 2023 ([detik.com, 2022](#)). Not only development, Heru also instructed the One-Stop Investment and Integrated Services Office (Dinas Penanaman Modal dan Pelayanan Terpadu Satu Pintu, DPMPSTP) to set up every new building with home charging installation. This setup in addition to

facilitating public access to electric charging for their EVs will also minimize government expenses for building EV charging stations alone (Suryowati, 2022).



Picture 4. SPKLU provided by PLN (Asaad, 2020)

Second, the development of electric-powered public transportation. The Government of Jakarta has long [boosted](#) the development of public transportation as an alternative to reducing traffic congestion, be it in the form of TransJakarta, KRL Commuterline, to Mass Rapid Transit. The latest two transportation mode ini powered by electric source since the start, where KRL dan MRT receive its power source from pantograph above the train dan PLN has a full responsibility distribute electricity for these mode directly ([Jumardi et al., 2020](#); [Tasroh, 2018](#)). The expansion of electric trains is still not satisfying for The Government of Jakarta to develop public transportation capable of reaching every transit point. TransJakarta is the embodiment of this statement, where TransJakarta is designed to replace the buses that have been operating before. However, because the majority of TransJakarta buses are still fossil-fueled, the idea to convert TransJakarta buses from fossil-fuel buses into electric buses has emerged since 2020. TransJakarta as the state-owned bus operator has planned transform its fleets into 100 battery electric bus (BEB) fleets by 2030, with the amount of electric bus today reached 52 unit as of 2023 ([IESR, 2019](#); [Nababan, 2023](#)). Besides its current fleet, TransJakarta is looking to add another 100 plus approximately 300 units by 2023 and has signed a MoU to retrofit hundreds of ICEV buses into E-buses, which today will be overseen by Project Implementation Unit (PIU) to monitor and evaluate the progress of electric bus projects ([ITDP, 2020](#); [Zahira, 2023](#)).

At first glance, these two instructions are claimed to be an update of the previous policy. With these two initiatives, The Government of Jakarta projects that the electric vehicle transition will be fully realized by 2030 in accordance with the plan outlined by the central government and the increased intensity of the vehicle electrification policy has begun to appear since 2023. In addition, with the massive spread of electric vehicles today, it is hoped that the success that has been achieved in Jakarta will be applied to other metropolitan areas including Medan, Surabaya, and other major cities in Indonesia ([IESR, 2020b](#)). However, there are still unresolved gaps in the transition project even though several policy packages have been issued. In general, there are two main gaps that remain unresolved and have the potential to leave major risks related to vehicle electrification in DKI Jakarta.

The first is a patchwork pattern in vehicle electrification, where the Government of Jakarta's electric vehicle policy is still struggling with shifting the supply-demand logic of electric vehicles. This can be seen from the main policies that are currently being rolled out, namely the provision of electric car subsidies and the addition of an electric bus fleet (Mahalana & Yang, 2021). The provision of incentives on the one hand can reduce the purchase price of electric cars, which is still very high. In addition, subsidies provided by the government can economically stimulate people to convert to electric cars (IESR, 2020b). However, this incentive will make the spread of electric cars uncontrollable in the future. Coupled with the absence of a strict measure from the government to phase-out fossil fuel vehicles, these incentives will only increase the amount of electric cars instead of replacing fossil fuel cars, making congestion even worse (IESR, 2019). The same also applies to the addition of electric buses, where the addition of the electric bus fleet from TransJakarta is also still struggling on the increasing demand side. Although it needs to be recognized that the existence of electric buses can reduce CO₂ emissions from conventional buses, TransJakarta still has not established a preventive measure in phasing-out the distribution of conventional buses. With the expectation of 100 bus fleets in 2023 running together with conventional buses, this will disrupt TransJakarta bus operations as well as the transition of electric buses in the long term (ITDP, 2020).

The second is the absence of multisectoral integration for sustainable electric vehicle transition, where all policies issued are still dominated by a centralized one-way policy pattern from The Government of Jakarta's decision. It should be recognized that the centralization of the Jakarta Provincial Government cannot be separated from regional autonomy - when the vehicle electrification policy is directly executed by the local government - and as an embodiment of local jurisdiction in dealing with city problems, the role taken by The Government of Jakarta on the one hand is also seen as good because the community can directly benefit from it (Doaly, 2022). However, one-way policies have the potential to waste budget because they are only carried out unilaterally and the absence of inter-agency integration schemes will eliminate the common blueprint from the government to achieve sustainable EV transition. Multisectoral integration in the case of DKI Jakarta still involves PLN to support infrastructure, while for other cases, the Government of Jakarta has not considered several aspects that should be considered to create a comprehensive ecosystem in EV transition (IESR, 2023). Let's say vehicle conversion and battery standardization policy, where these two policies are still not initiated by various parties. In fact, it is in this aspect that institutions such as PLN and automotive producers like Hyundai and KIA must be involved to succeed the EV ecosystem. In the absence of these two policies, the EV transition still focuses on the consumption aspect and this will also cause new problems along the way, such as the lack of clarity on the regulation of electric cars and the short-lived transition (Fuad, 2023; ITDP, 2020).

Third is the unaffordable availability of electricity supply and vehicles. The DKI Jakarta government may be promoting the transition to electric vehicles from fossil fuel vehicles. However, this cannot go smoothly if there is not enough electricity supply. This problem becomes serious when the number of Public Electric Charging Stations in Jakarta is currently insufficient for the number of electric vehicles available. So that with the number of charging stations that are not many will make the integration program towards electric vehicles even

more difficult to realize. In addition to the infrastructure that has not been grounded in Jakarta, the price of EV vehicles is also still so high. One of the things that causes most DKI people to be reluctant to replace with electric vehicles is the price that is so expensive. Therefore, in the future, it is hoped that the price of EV vehicles can be affordable even though for now it cannot be realized easily considering the constraints of (dis)economies of scale still remain (Regina & Ulmi, 2022).

Fourth is the potential inequality of the electric vehicle transition. TransJakarta buses can actually be a solution to maximize equitable access to public transportation for disadvantaged communities, provided that the buses can reach various transit points located in sub-urban spaces or even slum areas in Jakarta. But until now, transit lanes for electric buses still reach strategic transit points that are still dominated by established people and this can also eliminate the opportunity for disadvantaged communities to access eco-friendly public transportation (Fisher et al., 2020; National League of Cities, 2022). As a result, those who can use public transportation still belong to the economically well-off and the disparity between communities in accessing public transportation is obvious. In addition to accessibility, TransJakarta electric bus fares are still relatively high, although on several occasions they have been affordable. The discourse on increasing bus tariffs is one of the reasons, where the high operational costs of electric buses have an impact on the increase in tariffs to access the buses at this time. If policies to reduce operational costs are not enacted, then what happens is that there are fewer opportunities for disadvantaged communities to use the bus (Yuliani, 2023).

Of the four problems that arise above, the obstacles that occur in realizing the implementation of the application of electric vehicles in DKI Jakarta must be overcome immediately. With urban problems that are still unresolved, several parties are urging the Government of Jakarta to accelerate the process of switching to electric vehicles to reduce the environmental impact that occurs in DKI Jakarta. In the DKI Jakarta Regional House of Representatives itself, several factions have encouraged all parties from the government, NGOs, and the general public so that the process of accelerating the implementation of electric vehicles can be carried out optimally through various regional regulations that encourage the immediate realization of the implementation of electric vehicles. Several regulations such as Governor Regulation No. 3 of 2020 concerning tax incentives for electric vehicles have been issued to reduce tax incentives from electric cars. After that, Governor Decree No. 1263 of 2020 concerning Air Pollution Control in DKI Jakarta and Governor Instruction No. 17 of 2021 concerning Controlling the Impact of Climate Change in DKI Jakarta also regulate efforts to reduce carbon emissions in Jakarta, one of which is through vehicle electrification that can produce zero carbon emissions.

Although various regulations have been made to support EV transition from an environmental aspect, the DKI Jakarta Regional House of Representatives still finds various gaps in the problems that have not been explained in the regulations in question. A problem that has not been considered until now is the management of electric battery waste. Lithium-ion batteries that are the power source of electric vehicles statistically have an advantage in the power output provided. However, the lithium-ion batteries used also contain various elements that can contaminate the soil (IESR, 2020a). Although the national regulation on

battery waste management still uses the Minister of Environment and Forestry Regulation No. 6 of 2021, it is deemed insufficient to anticipate EV battery waste that will increase year after year. If the central and local governments do not issue new regulations to comprehensively manage the waste, the ongoing EV transition will produce new waste that cannot be handled ([KlikLegal.com, 2023](#)).

Reflecting on the gaps found by the Regional Council, the enactment of a unified regulatory framework is clearly needed to link the electric vehicle transition scheme to an integrated energy transition ecosystem. To support this, a Draft Regional Regulation on the Regional Energy General Plan (RUED) was initiated by the DKI Jakarta Regional Council in 2022, where the RUED serves as a regional legal basis to support the energy transition in a sustainable manner, including creating a sustainable EV ecosystem in Jakarta ([DEN, 2022](#)). In the academic paper that has been published by the Regional Council, it is explained that the formation of the EV ecosystem will involve all cross-sectoral parties in every policy formulation later and this regulation will also become the main legal umbrella of The Government of Jakarta to form an EV transition scheme that is as comprehensive as in Los Angeles. This EV transition will not just take place, but will also be supported by the massive use of New Renewable Energy (EBT) to provide clean energy to electric vehicles, be it Solar Power Plants or the Integration of Waste Battery Processing specifically for DKI Jakarta ([DPRD DKI Jakarta, 2023](#); [IESR, 2019](#)).

Although the content of the academic paper is still general, at least there is a commitment from the Regional House of Representatives to support the EV transition in a sustainable manner. This draft regulation will serve as the basic legal basis for the government to continue a more comprehensive transition - including regulating electric car production quotas to the automotive industry and establishing consequential waste treatment centers through the intermediary of the Environmental Department - and this draft regulation will certainly be reduced to more technical regulations to regulate several parts of the EV ecosystem in detail, so that the existence of this draft regulation will strengthen the EV transition efforts that have been launched by the Government of Jakarta towards a more comprehensive scheme ([DTKTE DKI Jakarta, 2022](#)). Currently, the draft regulation is still being developed by the Regional Regulation Formation Agency of the DKI Jakarta DPRD, where Gembong Warsono said the ratification process is still being discussed by several lawmakers, especially from Commission D for Development ([Heppy, 2023](#)). It is anticipated that this Raperda will be passed by the end of 2023 by the Regional House of Representatives (DPRD) and once this regulation is finalized, by next year any integration of the EV ecosystem should be implemented by The Government of Jakarta to achieve a sustainable transition like Los Angeles.

Conclusion

The Government of Jakarta's vehicle electrification policy on the one hand reflects the government's commitment to accelerate the transition of vehicles from conventional vehicles to electric vehicles. As air pollution and traffic congestion are still unresolved in Jakarta, vehicle electrification is a manifestation of the central government's efforts to initiate the transition to environmentally friendly vehicles. Not only to follow up the commitment of the central government, vehicle electrification from The Government of

Jakarta is also carried out to reduce the quantity of conventional vehicles, which will also contribute to reducing carbon emissions in the future. Currently, vehicle electrification in Jakarta still focuses on three aspects, namely tax cuts for electric cars; the addition of the TransJakarta electric bus fleet; and the expansion of Public Electric Vehicle Charging Stations, which these three policies still draw criticism because they are still struggling to fulfill the aspects of public consumption alone. In addition, with policies that still lean towards short-term policies without a sustainable scheme, it is feared that the policies issued will stop within a certain period of time and actually cause new problems.

Thus, EV integration efforts have been voiced by the Regional Representative Council of DKI Jakarta to create a comprehensive EV transition scheme. In addition to supporting policies and regulations issued by The Government of Jakarta, the Regional Representative Council is also working on the Regional Energy General Plan draft as a general legal framework for realizing long-term EV transition. The Raperda, which is due to be passed by the end of 2023, will serve as a legal umbrella to continue a broader and longer-term EV transition policy. Through its general nature, there is a potential that downgrading to more specific regulations will pave the way for the integration of electric vehicles in all aspects, from production to waste management, in the coming years. Therefore, the road to integration will take time and require more cohesive cross-sectoral coordination so that vehicle electrification in Jakarta can match Los Angeles and even truly bring benefits to society and the environment.

References

- Andre, J. (2023). *Capai Angka 155, Kualitas Udara Jakarta Siang Ini Tak Sehat Bagi Kelompok Rentan*. Kompas. <https://megapolitan.kompas.com/read/2023/07/05/14121151/capai-angka-155-kualitas-udara-jakarta-siang-ini-tak-sehat-bagi-kelompok>
- Asaad, M. I. (2020). *Road Map Pengembangan Infrastruktur Kendaraan Listrik 2020-2024* (Issue September 2020).
- BBC. (2023). *Polusi udara di Jakarta tertinggi se-Asia Tenggara, dua tahun setelah Pemprov DKI kalah gugatan*. British Broadcasting Corporation. [bbc.com/indonesia/articlecjmy2nez84vo.amp](https://www.bbc.com/indonesia/articlecjmy2nez84vo.amp)
- Briscoe, T. (2023). *Los Angeles gets "F" grade for air quality once again in national report*. Los Angeles Times. <https://www.latimes.com/environment/story/2023-04-19/l-a-gets-failing-grade-for-air-quality-once-again>
- Bui, A., Slowik, P., & Lutsey, N. (2021). *Los Angeles Electric Vehicle Charging Infrastructure Zero-Emission Area Planning* (Issue January).
- California New Car Dealers Association. (2022). California Auto Outlook: California New Vehicle Registrations Should Approach 2 Million Units in 2022. *California Auto Outlook*, 18(1), 1–8.
- Cilligan, C. (2023). *The 10 U.S. Cities With the Worst Traffic*. U.S. News. <https://www.usnews.com/news/cities/articles/10-cities-with-the-worst-traffic-in-the-us>
- Climate Transparency. (2022). *Indonesia Climate Transparency Report: Comparing G20 Climate Action*.
- CNN Indonesia. (2022). *Kebijakan DKI Soal Mobil Listrik: Bebas Pajak Sampai Ganjil Genap*. CNN Indonesia. <https://www.cnnindonesia.com/otomotif/20221129203435-603->

- 880531/kebijakan-dki-soal-mobil-listrik-bebas-pajak-sampai-ganjil-genap
- Cochran, J., Denholm, P., Mooney, M., Steinberg, D., & Hale, E. (2021). *La100 : The Los Angeles 100 % Renewable Energy Study Executive Summary*.
- Cruceanu, D. (2019). The comparative method for policy studies: the thorny aspects. *HOLISTICA*, 10(1), 55–67.
- DEN. (2022). *DEN Dorong Penetapan Rued Dki Jakarta di 2022*. Dewan Energi Nasional. <https://den.go.id/index.php/dinamispage/index/1210-den-dorong-penetapan-rued-dki-jakarta-di-2022.html>
- detik.com. (2022). *PJ Gubernur DKI Jakarta: Izin Baru Gedung Wajib Punya SPKLU*. DetikOto. <https://oto.detik.com/berita/d-6368448/pj-gubernur-dki-jakarta-izin-gedung-wajib-punya-spklul/amp>
- Doaly, T. (2022). *Kendaraan Listrik dan Jalan Panjang Transisi Energi di Indonesia*. Ekuatorial. <https://www.ekuatorial.com/2022/10/kendaraan-listrik-dan-jalan-panjang-transisi-energi-di-indonesia>
- DPRD DKI Jakarta. (2023). *DPRD DKI Bertekad Wajibkan Penggunaan EBT dalam Raperda Energi*. DPRD DKI Jakarta. <https://dprd-dkijakartaprovg.go.id/dprd-dki-bertekad-wajibkan-penggunaan-ebt-dalam-raperda-energi/DTKTE>
- DKI Jakarta. (2022). *Naskah Akademik Raperda RUED DKI Jakarta*.
- Edelstein, S. (2015). *California Ends Electric-Car Rebates For Wealthy Buyers, Boosts Them For Poorest*. Green Car Reports. greencarreports.com/news/1098988-california-ends-eletrici-car-rebates-for-wealthiest-buyers-boosts-them-for-poorest
- EIA. (2023). *Electric Power Monthly*. Energy Information Administration. https://www.eia/gov/electricity/monthly/epm_table-grapher.php?t=epmt_1_1
- Eko, W., Joy, B., Setyawati, W., & Mahdi, R. (2022). Projection of CO2 emissions in Indonesia. In W. Eko, B. Joy, W. Setyawati, & R. Mahdi (Eds.), *Materials Today: Proceedings* (Vol. 63, pp. S438–S444). Elsevier Ltd. <https://doi.org/10.1016/j.matpr.2022.04.091>
- Fauble, B., Hoang, T., Jarvis, M., & Lopez, T. (2022). *California's Deployment Plan for the National Electric Vehicle Infrastructure Program*.
- Fisher, R., Tang, M., Le, T., Yee, D., & White, K. (2020). Accelerating beyond Early Adopters to Achieve Equitable and Widespread Electric Vehicle Use in the San Francisco Bay Area. *World Electric Vehicle Journal*, 11(3), 1–7.
- Fuad, Z. (2023). *Mobil Listrik: Solusi Polusi atau Konsolidasi Oligarki?* Pusat Riset Politik BRIn. <https://politik.brin.go.id/kolom/ekonomi-politik-isu-isu-strategis/mobil-listrik-solusi-polusi-atau-konsolidasi-oligarki/>
- Gerring, J. (2017). Qualitative Methods. *Annual Review of Political Science*, 20, 15–36.
- Hammarberg, K., Kirkman, M., & Lacey, S. De. (2016). Qualitative research methods: when to use them and how to judge them. *Human Reproduction*, 31(3), 498–501. <https://doi.org/10.1093/humrep/dev334>
- Heppy, A. (2023). *Perda RUED DKI Jakarta Ditargetkan Rampung Tahun Ini*. TEMPO.Cp. <https://metro.tempo.co/amp/1713779/perda-rued-dki-jakarta-ditargetkan-rampung-tahun-ini>
- HM Government. (2021). *Transitioning to zero emission cars and vans: 2035 delivery plan*.
- Ibad, M. Z., Antiqasari, S. N., Hudalah, D., & Dirgahayani, P. (2022). Transisi Energi Terbarukan di Indonesia: Dinamika Kendaraan Listrik dengan Pendekatan Self - Organization di Kota Jakarta. *Jurnal Teknik Sipil*, 29(2), 161–170.

- <https://doi.org/10.5614/jts.2022.29.2.7>
- IESR. (2019). *Indonesia Clean Energy Outlook: Tracking Progress and Review of Clean Energy Development in Indonesia*.
- IESR. (2020a). *Meninjau Limbah Baterai IESR Begini Komponen dan Proses Daur Ulang Baterai Kendaraan Listrik*.
- IESR. (2020b). *The Role of Electric Vehicles in Decarbonizing Indonesia's Road Transport Sector*.
- IESR. (2023). *Indonesia Electric Vehicle Outlook 2023*.
- IQAir. (2022). *PM 2.5 Concentration in ASEAN Countries 2022*.
- ITDP. (2020). *Policy Recommendations for Electric Vehicle Implementation in Indonesia Supporting Jakarta's Transition to E-mobility*.
- Jackson, C. T. (2021). Expanding access to electric vehicles in California's low -income communities. *Journal of Science Policy and Governance*, 18(1), 1–6.
- Jumardi, Ruly, R., Abdulhadi, Siska, A., Viki, A., & Az, Z. (2020). Perkembangan Transportasi Kereta Api Di Jakarta. *Jurnal Pemikiran Pendidikan Dan Penelitian Kesejarahan*, 7(1), 40–48.
- Kementerian ESDM. (2023). *Handbook of Energy & Economic Statistic of Indonesia 2022*.
- KlikLegal.com. (2023). *Ombudsman RI: Regulasi Pengelolaan Limbah Baterai EV Urgent*. KLIKLEGAL. <https://kliklegal.com/ombudsman-ri-regulasi-pengelolaan-limbah-baterai-ev-urgent/>
- Krisdarmajati, Y. (2023). *Subsidi Mobil Listrik sebagai Bentuk Promosi dan Aspirasi*. KOMPAS. <https://www.kompas.id/baca/riset/2023/05/25/subsidi-mobil-listrik-sebagai-bentu-promosi-dan-apresiasi-1>
- Los Angeles City Council. (2022). *City of Los Angeles EV Master Plan Updates*.
- Macht, D. (2023). *California Boosts EV Incentives for People with Low, Moderate, Incomes. How to Check for Money Back*. KCRA. <https://www.kcra.com/article/california-ev-incentives-low-moderate-incomes-online-ev-tools-calculators-tesla/42806110>
- Mahalana, A., & Yang, Z. (2021). *Overview of vehicle fuel efficiency and electrification policies in Indonesia* (Issue July).
- McCormick, E. (2023). *Revealed: The 10 Worst Places to Live in US for Air Pollution*. The Guardian. <https://www.theguardian.com/us-news/2023/mar/08/10-most-air-polluted-places-to-live-us>
- Mohajan, H. K. (2018). Qualitative Research Methodology in Social Sciences. *Journal of Economic Development, Environment and People*, 7(01), 23–48.
- Nababan, H. (2023). *Bus Listrik Transjakarta yang Beroperasi Kini Jadi 52 Unit*. KOMPAS.Id. <https://www.kompas.id/baca/metro/2023/07/23/bus-listrik-transjakarta-bertambah-kini-total-beroperasi-52-unit>
- National League of Cities. (2022). *Equitable Electric Mobility Playbook* (Issue February). National League of Cities
- Nur, A. I., & Kurniawan, A. D. (2021). Proyeksi Masa Depan Kendaraan Listrik di Indonesia: Analisis Perspektif Regulasi dan Pengendalian Dampak Perubahan Iklim yang Berkelanjutan. *Jurnal Hukum Lingkungan Indonesia*, 7(2), 197–220.
- OICA. (2023). *World Motor Vehicle Production By Country / Region 2019-2022*. Peraturan Gubernur Daerah Khusus Ibukota Jakarta Nomor 88 Tahun 2019, 1 (2019).
- Peraturan Gubernur Provinsi Daerah Khusus Ibukota Jakarta Nomor 3 Tahun 2020, 1 (2020).

- PlugShare. (2023). *There are 4,769 Charging Stations in Los Angeles*. PlugShare. <https://www.plugshare.com/directory/us/california/los-angeles#:~:text=There%2520%25are204%252C771%2520Charging%2520Stations%2520in%2520Los%2520Angeles>.
- Purwanto, I. (2022). *Malaysia Tak Ingin Rakyatnya Susah Makanya Harga BBM Lebih Murah Ketimbang Indonesia*. Inilah.Com. inilah.com/malaysia-tak-ingin-rakyatnya-susah-bbm-murah-ketimbang-indonesia/
- Regina, D., & Ulmi, N. M. (2022). Tantangan Pengembangan Mobil Listrik Menuju Transportasi Berkelanjutan Di Indonesia. *Jurnal Penelitian Sekolah Tinggi Transportasi Darat*, 14(1), 22–29.
- Sadya, S. (2023). *Polri Catat 152,1 Juta Kendaraan di Indonesia pada 2022*. DataIndonesia.Id. dataindonesia.id/sektor-riil/detail/polri-catat-15251-juta-kendaraan-di-indonesia-pada-2022
- Searle, S., Pavlenko, N., & Lutsey, N. (2016). *Leading Edge Of Electric Vehicle Market Development In The United States : An Analysis Of California Cities* (Issue September).
- Solomon, S., Plattner, G.-K., Khutti, R., & Friedlingstein, P. (2009). Irreversible Climate Change due to Carbon Dioxide Emissions. *Proceeding of the National Academy of Sciences of the United States of America*, 106(6), 1704–1709.
- Subekti, R. (2022). Urgensi Regulasi Kendaraan Listrik Untuk Pengendalian Iklim Dan Penggunaan Energi Terbarukan (Analisis Komparatif Antara Indonesia, China, dan Amerika Serikat). *Jurnal RechtsVinding*, 11(3), 435–450.
- Suprobawati, G. D., Monica, G., & Apriliana, C. (2021). Indonesian Electric Vehicle Policy, Realization and Development. In G. D. Suprobawati, D. B. Kharisma, & Waluyo (Eds.), *Proceedings of the International Conference for Democracy and National Resilience* (Issue October, pp. 99–102). Universitas Sebelas Maret. <https://doi.org/10.2991/assehr.k.211221.018>
- Suryowati, E. (2022). *Heru Rencanakan Setiap Gedung di Jakarta Tersedia SPKLU*. JawaPos.Com. <https://www.jawapos.com/jabodetabek-01415034/heru-rencanakan-setiap-gedung-di-jakarta-tersedia-spkl>
- Tasroh. (2018). *Era Baru Transportasi Massal Hemat Energi*. Media Indonesia. <https://m.mediaindonesia.com/opini/196386/era-baru-transportasi-massal-hemat-energi>
- The Texas A&M Transportation Institute. (2021). *2021 Urban Mobility Report*.
- Tiseo, I. (2023). *Distribution of Carbon Dioxide Emissions Produced by the Transportation Sector Worldwide in 2021*. Statistica. <https://www.statistica.com/statistics/1185535/transport-carbon-dioxide-emissions-breakdown/#:~:text=The global transportation sector is,percent of global transportation emissions>
- UCLA. (2017). *Factors Affecting Plug-In Electric Vehicle*. United Nations. (2021). *COP26 Glasgow Climate Pact*.
- Infrastructure Investment and Jobs Act, Pub. L. No. 135 STAT. 432, 1 (2021).
- Wynkoop, O. (2022). *California Electric Vehicle Charging Stations*. Bohemian. <https://bohemian.com/california-electric-vehicle-charging-stations>
- Yuliani, P. (2023). *Harga Bus Listrik Lebih Mahal 30 Persen, TransJakarta Minta Pemerintah Beri Insentif*. Media Indonesia. <https://m.mediaindonesia.com/megapolitan/587488/harga-bus-listrik-lebih-mahal->

- 30-persen-transjakarta-minta-pemerintah-beri-insentif
Zahira, N. (2023). *TransJakarta Turunkan Target Pengadaan Bus Listrik 2023 Jadi 100 unit*. Katadata.Co.Id.
<https://www.katadata.co.id/tiakomalasari/finansial/64885cbb323f/transjakarta-turunkan-target-pengadaan-bus-listrik-2023-jadi-100-unit>
ZEBGO Partners. (2021). *Los Angeles County Metropolitan Transportation Authority: Final Rollout Plan* (Issue March).
Zulfikri, A. (2023). Effects of Pollution and Transportation on Public Health in Jakarta. *West Science Interdisciplinary Studies*, 1(03), 22–26.