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Andreo Wahyudi Atmoko

Faculty of Administrative Science, Universitas Indonesia, Indonesia. (corresponding author: atmokowahyudi@gmail.com)

Asputia Damayanti

Faculty of Administrative Science, Universitas Indonesia, Indonesia.

Teoh Ai Ping

Graduate School of Business, Universiti Sains Malaysia, Malaysia.

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Atmoko, Andreo Wahyudi is a lecturer and researcher in the postgraduate programs at the Faculty of Administrative Sciences, Universitas Indonesia. He obtained his doctorate in Administrative Science in 2009, his master's degree in International Business Administration in 2002, and his bachelor's degree in Political Science in 1994, all from Universitas Indonesia. His teaching and research interests include systems thinking/system dynamics, organizational learning, public policy, governance, and innovation. He has contributed to research and consultancy projects on environmental governance, institutional development, and strategic planning for Indonesian public institutions. His publications address complex policy challenges, organizational learning, and sustainability. He has been a member of the System Dynamics Society since 2010.

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The Paradox of Electric Vehicle Policy in Indonesia A Systems Perspective Analysis

Abstract

As part of its plan to reduce carbon dioxide emissions, Indonesia has very supportive policies for electric vehicle (EV) users. This study investigates whether the technology that replaces internal combustion engines with electric vehicles (EVs) is sufficient to achieve the desired system emission levels for the mobility and energy subsystems. This study integrates academic literature, official statistics, policy documents, stakeholder documentary evidence, and causal loop diagrams (CLD) and system archetype modeling. This model is built at the national policy level and only incorporates urban mechanisms below the national level that are relevant, without considering this context as a representation of Indonesia as a whole. In fact, the following analysis found the presence of a balancing mechanism, meaning that while electric vehicle subsidies can drive technology substitution and emission reduction, they can also reveal reinforcing feedback on the growth of private vehicles, congestion, mode choice, sustainability of conventional vehicles, road development, and the condition of the electricity industry, which can mitigate the effects of electric vehicle subsidies. The following research can determine a structure consistent with the "Fixes That Fail" archetype and provide input to recalibrate subsidies for public transportation as a strategic leverage point to achieve more sustainable emission reductions and support Indonesia's long-term goal of achieving Net Zero Emissions.

Keywords: archetypes; policy paradox; policy resistance; subsidy policy; systems thinking

Introduction

In the transportation sector, Indonesia is heavily dependent on liquid fuels, requiring approximately 160 MtCO2e in 2023 (Institute for Essential Services Reform, 2025). However, liquid fuels account for approximately 99.86% of energy consumption in the transportation sector, with electricity contributing only around 0.05%. This indicates that the role of electrification

Damayanti, Asputia is a lecturer and researcher in management and public policy. She was born in Cirebon, Indonesia, on 20 February 1986. She obtained her Master of Administration degree in Public Policy from the Faculty of Administrative Sciences, Universitas Indonesia, graduating cum laude in 2024. She currently serves as a researcher at the Faculty of Administrative Sciences and a lecturer in the Vocational School at Universitas Indonesia. Her research interests include policy resistance, carbon governance, systems thinking, and sustainability, with particular attention to the interrelationships between public policy, organizational responses, and environmental challenges. These interests reflect her broader concern with understanding complex policy dynamics and their implications for sustainable development.

Teoh, Ai Ping is an Associate Professor at the Graduate School of Business, Universiti Sains Malaysia, where she has served since February 2011. She holds a Bachelor of Accounting with Honours from Universiti Putra Malaysia, a Master of Science in Information Technology, and a Doctor of Business Administration from Universiti Sains Malaysia. Her expertise includes accounting information systems, auditing, crisis and risk management, electronic commerce, and science and technology management. Her interdisciplinary background offers complementary perspectives on organizational responses to technological change and policy challenges. In collaborative research, these perspectives enhance the analysis of electric vehicle policy in Indonesia from a systems perspective.

in transportation energy use is very limited (Ministry of Energy and Mineral Resources, 2024). In Indonesia, decarbonizing transportation is a national policy priority, and the country has made a strong commitment to minimize emissions, aiming for a reduction of 31.89%, or 43.20% by 2030, with support from other countries (Limanseto, 2022).

The basic instrument for this change is electric vehicles (EVs). The government allocated approximately IDR 13.86 trillion in 2023–2024 to encourage the adoption of electric vehicles (EVs) under Presidential Regulation No. 55/2019 and its 2023 amendment (Arini, 2023). Although incentives can accelerate EV adoption and promote low-carbon mobility (Sang & Bekhet, 2015), most policy pushes have focused on privately owned EVs. The purpose of the above policy is to minimize carbon emissions, promote the adoption of electric vehicles (EVs), and substitute technology for internal combustion engine vehicles, which are the basic mechanisms for meeting the targets and objectives. This raises a fundamental question: can these mechanisms reduce system-level emissions as expected after considering feedback from broader mobility and energy systems?

Based on the research that has motivated the conduct of this study. If compared to traditional transportation, electric vehicles have the ability to create lower life cycle emissions. However, can electric vehicles be used to replace or serve as a substitute for existing vehicles, especially those that are very important and beneficial for the surrounding environment (Knobloch et al., 2020; Nunes et al., 2022). Basically, larger infrastructure or road capacity can increase the number of trips and lead to congestion (Aïkous et al., 2023; Duranton & Turner, 2011; Hymel, 2019), but traffic conditions and demand management methods can influence vehicle speed, fuel efficiency, and carbon emissions (Li et al., 2022).

Dependence on personal mobility can be reinforced by modal choices and the differences between public and private transportation (Sunitiyoso et al., 2022; Tonini et al., 2021)). In the automotive industry, infrastructure, public transportation provision, and consumption patterns can collaborate to maintain and protect the car-dependent system (Mattioli et al., 2020). Policy incentives can also help grow the EV market and its sector (Li et al., 2023). If linked, this technique can convey and explain why the shift in propulsion may not yet meet the expected transportation emission targets without significantly altering travel behavior and modal structure (Valencia et al., 2023).

Although in this discussion, electric vehicle subsidies are managed by national policies, some mechanisms are implemented using regulations and transportation systems at the subnational level. At the government level, transportation decarbonization involves collaboration between regulations, local infrastructure, mobility patterns, and national policy goals (Butterfield & Low, 2017; Lee & Koski, 2015). This is particularly implemented in Indonesia, where the urban climate management system links regional and national dynamics (Indraprahasta et al., 2023). Therefore, although the analysis is conducted at the national level, the following research selectively

integrates subnational mechanisms when they are causally relevant. Jabodetabek is used to represent Indonesia as a whole, monitoring specific mechanisms such as traffic demand management, mode choice, and congestion. The following mechanism is similar to system dynamics modeling, where the focus problem and causal structure to be described inform the model boundaries and level of aggregation (Ghaffarzadegan et al., 2011; Naugle et al., 2024).

The theory used to create linear policies is considered insufficient to explain these interactions. The institutions of policy goals, instruments, implementation, and evaluation must be explained from the perspective of the policy cycle (Easton, 1965, 1966; May et al., 1978); however, uncertainty, fragmented needs, nonlinear relationships, and transitioning actor configurations are characteristics of the policy environment (Edwards et al., 2001; Kay, 2006). Based on the results of examining accumulation, feedback, delays, and endogenous responses, system dynamics (SD) can enhance knowledge (Bianchi, 2016; Sterman, 2000). Energy policies, transportation regulations, fiscal incentives, business development, and urban planning can create policy outcomes, and electric vehicle subsidies should be carefully considered as part of these policies (Rogge & Reichardt, 2016).

Based on these findings, which fall outside the policy objectives used in subsequent research, this could lead to unintended consequences. The definition of policy resistance is a response from an endogenous system that minimizes, delays, offsets, or shifts the expected outcomes of an intervention (Sterman, 2000). The paradox of policy can occur when a policy aimed at minimizing carbon emissions triggers feedback that undermines the goal of reducing emissions. This is similar to the System Dynamics archetype "Fixes That Fail," where corrective actions have the desired effect but also have delayed consequences that can undermine the initial resolution (Braun, 2002; Wolstenholme, 2003).

The relationship between cause and effect, as well as feedback design, is illustrated by SD using a Causal Loop Diagram (CLD) (Damayanti & Atmoko, 2024; Hassan & Atmoko, 2025; Senge, 1990; Winch & Joyce, 2006; Wolstenholme, 2000). In addition to the previously determined classifications, this study considers "Fixes That Fail" as the working structural hypothesis. Other archetypes, such as Limits to Growth, Shifting the Burden, and Success to the Successful, were considered; however, Fixes That Fail was retained because its structure most closely illustrates that interventions with the desired effect may be disrupted by opposing responses. Previous studies have shown that SD can be used to analyze transportation systems (Gupta et al., 2019; Valencia et al., 2023), energy transitions (Arias-Gaviria et al., 2019; Duan et al., 2024), and low-carbon policies (Jia et al., 2023). Additionally, it should be noted that technological, behavioral, institutional, and sectoral interventions must be coherent (Phatak et al., 2020).

Most importantly, this research does not consider EV technology to be ineffective. On the contrary, this study focuses on the policy paradox related to the fact that actions to reduce emissions can generate a reaction that partially offsets the impact of emission reduction. It also shows that, at a certain point, strengthening original technological interventions may not be sufficient. Demand-side mitigation research emphasizes the importance of improving technology alongside actions to shift travel to low-carbon modes (Creutzig et al., 2022), and evidence in Jakarta shows that better public transport services and integration support encourage people to switch from private vehicles to mass transit, which reduces associated GHG emissions (Sunitiyoso et al., 2022). As a result, this research seeks additional evidence that public transportation can serve as an additional balancing tool rather than assuming that public transportation is the best solution from the outset.

The number of studies on policy incentives to reduce emissions, decarbonize transportation, and adopt electric vehicles continues to increase, but little attention has been given to how the feedback structures created by policies explicitly aimed at simultaneously achieving emission reduction goals. Therefore, this study does not focus on whether electric vehicle technology can reduce vehicle-level emissions. Instead, they focus on how policies subsidizing private electric vehicles generate systemic resistance and whether structural interventions that do not involve technological replacements are needed to strengthen the intended emission reduction effects.

How **does the policy of subsidizing private electric vehicles in Indonesia cause systemic policy resistance, which can thwart the desired carbon emission reduction goals?**

This study aims to determine and analyze the feedback structure of Indonesia's private electric vehicle subsidy policy, using the "Fixes That Fail" archetype, and identify potential leverage points for policy redesign. This shows that when the neutralizing feedback structure has not yet been sufficiently developed, the system-level outcomes may be worse for interventions that can reduce emissions through EV adoption. This study contributes to the literature on the quality of dynamic systems and public policy.

Methods

This study used the qualitative system dynamics (SD) method to identify policy resistance in Indonesia's private electric vehicle subsidy policy. This method includes system archetypes and causal loop diagram (CLD) modeling. When detailed numerical data are not available, CLD-based conceptual modeling works well for analyzing feedback structures and policy behavior (Gupta et al., 2019; Jia et al., 2023). In the following research, the main research instrument is supported by a literature synthesis matrix, CLD worksheets, an SD framework, and policy document analysis. In a series of modeling consisting of five iterative stages, modified from Sterman (2000).

1. Defining the Problem: The focal point of the following research is the policy mechanism that is the focus: EV subsidies encourage EV adoption, which can subsequently lead to the replacement of internal combustion engine vehicles with EVs and reduce emissions. The main issue is whether these balancing effects still function at the system level while considering interactions with subnational policies, congestion, mode choice, sustainability of conventional vehicles, road development, and the electricity system.
2. Dynamic hypothesis: An initial hypothesis was made that endogenous responses in the broader mobility and energy systems could weaken the desired emission reduction effects. This structure is considered a "Fixes That Fail" structure, where the intervention not only produces the desired improvement but also generates delayed feedback that partially reduces the impact of the intervention. Compared to the previously determined classification, the archetype is considered a working hypothesis.
3. Model Formulation: Essentially, in designing a CLD, it must be created iteratively based on secondary documentation evidence, official statistics, policy documents, and research results that have passed the peer review stage. There are four groups of variables classified among them. The first group contains behavioral responses, such as vehicle ownership and travel preferences (Aïkous et al., 2023; Intan, 2023a; Islamiati, 2023a; Ni et al., 2016; Tonini et al., 2021; Valencia et al., 2023), while the second group includes responses related to infrastructure facilities, such as road capacity and charging stations (Ni et al., 2016; Santika, 2023; Syofiadi, 2024; Wang & Xie, 2024).

   The third group falls under the category of policy incentives, including subsidies and regulatory exemptions (Benvenutti et al., 2019; Gupta et al., 2019); and the fourth was the upstream energy-sector emissions shaped by the electricity mix (Duan et al., 2024; Marrero-Trujillo et al., 2023; Wibisono, 2022).

   This source is used in relation to the limitations of the model or evidence function. National regulations, official statistics, and research results that have passed the peer review stage can form the basis of the national policy framework. Although not standardized nationally, concrete sub-national evidence can be used to promote certain causal mechanisms. In reading the contextual and cross-examination followed by news and a question-and-answer session with the interested managers. Formal and official scientific documentation must prepare the main causal relationship.

   Not only the above, but qualitative data from secondary documentation should also be analyzed through public statements from policymakers, researchers, institutional experts, and related agencies compared to using question-and-answer media. Similarly to Bowen, exposition, and documentation literature are required to establish policy rationality, behavioral responses, issues,

and causal propositions (Bowen, 2009). By using a directed coding system according to Hsieh and Shannon, units of meaning are grouped according to the analysis theme, CLD variables, feedback, and evidence function (Hsieh & Shannon, 2005). The obtained matrix is shown in Appendix A.

Generally, documentary evidence is used in interpreting and triangulating compared to independently determining the core causal relationship (Luna-Reyes & Andersen, 2003). Researchers collect overlapping variables, striving for relationships where there is official or scientific evidence related to the direction of influence, and transforming causal statements into variables that can change over time. Each link is positioned in feedback with either positive or negative polarity. Does not have quantitative predictions related to future emissions created by the generated CLD; it is a qualitative dynamic hypothesis (Luna-Reyes & Andersen, 2003).

4. Structural Analysis: Compared to numerical validation, the focus of model testing is on structural feasibility. Each link that can result in and polarity is supported by formal academic evidence and concluded in Table 2, which focuses on evidence for specific relationships compared to the general loop theme, similar to the suggestions explained by Barlas and Sterman (Barlas, 1996; Sterman, 2000). The adequacy of the boundary is evaluated using the main subsystems required to answer the research question. To test consistency on a geographical scale, it is necessary to distinguish between national structural evidence and subnational evidence that supports specific urban mechanisms. Local observations are maintained only when causally relevant and not considered as national representations (Ghaffarzadegan et al., 2011; Naugle et al., 2024). To confirm the closure and polarity of the loop, B1 and R1–R6 were tracked as a complete causal path. Before interpreting the structure as the most suitable for "Fixes That Fail," alternative archetypes are considered.
5. Policy Redesign: The feedback structure was diagnosed based on the principles of system archetype intervention (Braun, 2002; Senge, 1990). This was used to identify potential leverage points. This analysis examines how neutral feedback that maintains dependence on private vehicles and congestion can strengthen the balancing effect of technology substitution. This differs from the assumption that technology substitution is ineffective. To influence mode choice and reduce dependence on private mobility, potential balancing interventions for vehicle electrification are considered to provide stronger support for electric public transportation. There is no quantitative evidence to show that this is the best, but it is considered structurally possible.

Policy documents, official statistics, peer-reviewed research, and stakeholder evidence were triangulated. Structural propositions supported by documentary sources and connected to academic or official evidence are more effective than non-structural propositions. The structure of the CLD cannot be determined solely from contextual statements.

Results and Discussion

1. Reinforcement Factors

The interrelated systems of transportation, energy, mobility, industry, and regulation shape the policy of subsidizing private electric vehicles in Indonesia. National statistics, regulations, and sectoral evidence provide the main empirical context for the following research, as it focuses on national policies. However, some feedback mechanisms are revealed through the urban transportation system and specific local policies. Therefore, evidence from Greater Jakarta is used selectively to illustrate its mechanisms. From the perspective of System Dynamics, the following structural conditions are very important because interventions targeting symptoms rather than structures can create responses or feedback that weaken or shift the expected policy effects. In Indonesia, there are three structural conditions that can strengthen resistance, as explained below:

1) Transport Emissions and Persistent Motorisation

The type of liquid fuel, specifically gasoline and diesel, accounts for approximately 99.86% of the transportation energy demand in Indonesia (Ministry of Energy and Mineral Resources, 2024). In the metropolitan city known for its traffic congestion and dense population, DKI Jakarta is responsible for 46% of greenhouse

gas emissions from the transportation sector. This shows the value of transportation policies in minimizing greenhouse gas emissions (Audina, 2022; Yaacob et al., 2020). However, due to Indonesia's electricity system still being dependent on coal, decarbonization of the energy sector should be combined with transportation electrification to optimize environmental benefits (Danyang & Wenying, 2019). Therefore, if the mode structure and transportation demand do not change, the adoption of electric vehicles (EVs) alone may not be sufficient (Hill et al., 2019).

Table 1 shows the vehicle stock data that indicate persistent motorization over time (Table 1). The trend shows a continuous increase in the mobility system, which is dominated by motorcycles and passenger cars. The development of privately owned motor vehicles increases the potential interest in motorized traffic, and when it exceeds the effective road capacity, it can negatively impact congestion. Recent research in Indonesia has also emphasized the need for private car ownership and transportation demand management, particularly in Jakarta, Bandung, and Surabaya (Sefriyadi et al., 2023).

The above trend shows the extensive sustainability of the mobility system dominated by motorcycle and passenger car transportation. The development of privately owned motor vehicles increases the demand for traffic, and when it exceeds the effective road capacity, it can cause and exacerbate congestion. Researchers have found recent studies in Indonesia that similarly prioritize private car ownership and transportation demand management in Jakarta, Bandung, and Surabaya (Sefriyadi et al., 2023).

The term "traffic jam" is closely associated with the goal of reducing emissions because lower traffic speeds and ineffective traffic conditions reduce fuel efficiency. Based on the research findings, minimizing traffic congestion and increasing vehicle speeds can lower carbon emissions from conventional traffic (Li et al., 2022). The vehicle stock trend from 2021 to 2025 can structurally support a model pathway that links persistent dependence on private mobility with congestion pressure and then with emission pressure, although the total number of registered vehicles alone cannot determine the actual flow of traffic or emissions.

2) Political-Economic and Institutional Dynamics

In this context, particularly in the realm of political economy, it is suspected to be the main foundation of the mobility system. Based on the opinion of (Mattioli et al., 2020), the relationship between the transportation industry, road infrastructure, urban growth, public transportation providers, and the use of private vehicles can strengthen a system that is dependent on cars. Therefore, instead of changing the existing mobility design, electric vehicle (EV) incentives should operate according to the previously established design. Policy shifts can also accelerate the transition from internal combustion engine (ICE) vehicles to electric vehicles (EVs), but they must avoid greater dependence on personal mobility.

EV policies are also related to issues of energy systems and institutions. Indonesia has a continuous dependence on electricity generated from coal, which can impact the environmental performance of electrification, including changes in electric vehicles that face technical, financial, personal, social, and institutional barriers. This relationship underscores the need for a coherent policy mix rather than separate technological incentives (Asekomeh et al., 2021; Phatak et al., 2020; Sovacool et al., 2020; Valencia-Hernández et al., 2022).

Table 1. The number of vehicles in Indonesia

Type of Motor Vehicle	2021	2022	2023	2024	2025
Passenger Cars	16,414,098	17,168,862	19,710,434	20,444,507	20,907,972
Buses	237,607	243,450	272,793	293,991	308,613
Trucks	5,299,881	5,544,173	6,087,299	6,277,403	6,474,088
Motorcycles	120,050,112	125,305,332	133,051,310	139,450,013	145,247,420
Total	**142,001,698**	**148,261,817**	**159,121,836**	**166,465,914**	**172,938,093**

Source: (Badan Pusat Statistik, 2026).

3) Public Discourse and Policy Acceptance

In the context this public discourse provides detailed context regarding social acceptance and the consequences of the distribution perceived by EV subsidies. INDEF reported several analyses that determined substantial rejection regarding subsidies for private electric cars in the online discussions reviewed, as well as the motivations behind the numerous criticisms analyzed to shift the subsidies to public transportation (Intan, 2023b; Islamiati, 2023a, 2023b). Based on several findings that cannot be interpreted into public opinion that can only represent nationally. On the contrary, they also show the existence of other policy plans related to subsidy priorities, distribution justice, and public transportation alternatives. Adjusting to its measures, such signs can be used in contextual interpretation and triangulation rather than as independent evidence determining the causal structure of the CLD.

2. Policy Resistance in EV Implementation and Feedback Structure

Incentives for EV procurement do not always result in emission reductions, as found by Nunes (Nunes et al., 2022). Their analysis shows that the environmental benefits of EVs depend on vehicle utilization and ownership duration, as well as the counterfactual vehicle inventory of households. This study is interested in whether an EV replaces an existing ICE vehicle or serves as an additional vehicle in a multi-vehicle household. Therefore, the expected benefits in terms of emissions may be significantly reduced in certain ownership and behavioral contexts. This also applies to the larger mobility system. The availability of charging stations, initial price, and range remain relevant obstacles to EV adoption in Indonesia (Institute for Essential Services Reform, 2023b).

It is indeed true that the ownership and use of private vehicles remain structurally important in

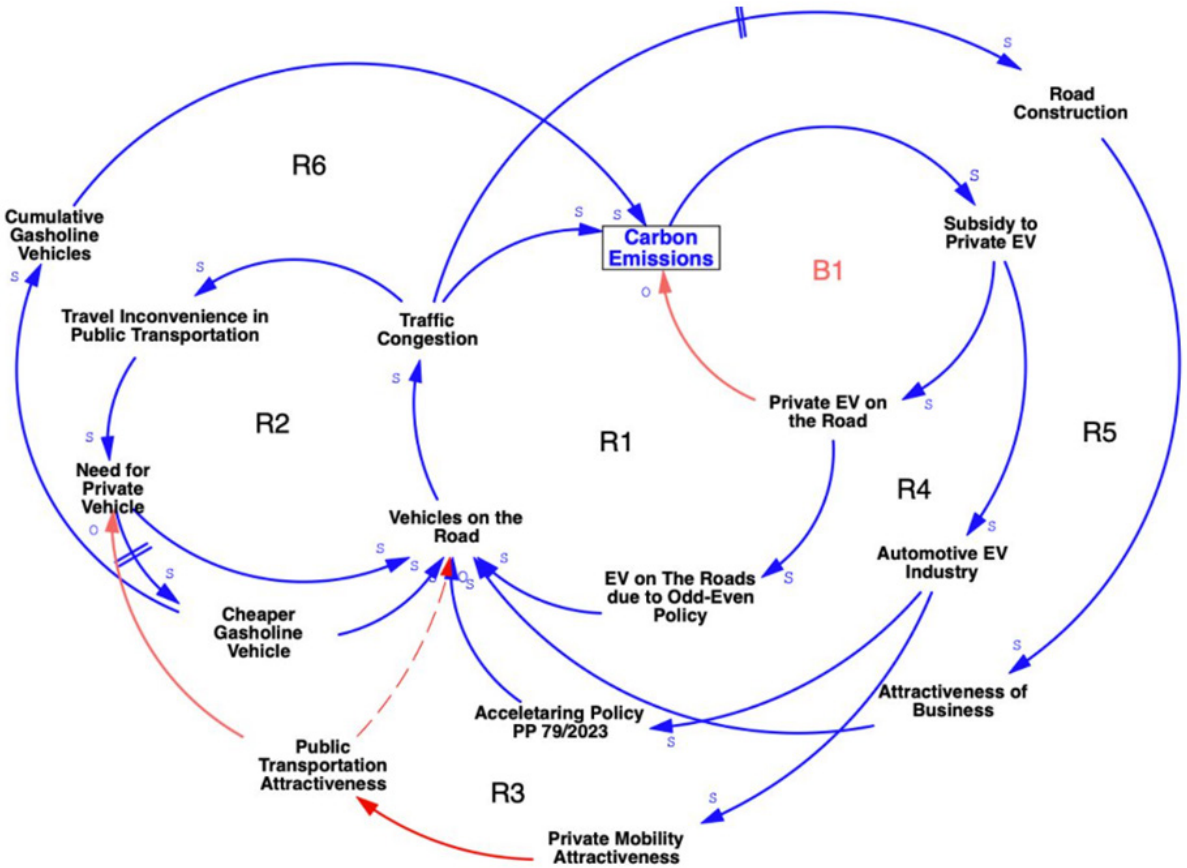


Figure 1. Policy Resistance Model of EV Private Subsidy
Source: Research Analysis

major urban areas. Recent studies in Greater Jakarta show a continuous dependence on private vehicles, with travel time, accessibility, service quality, and first/last-mile integration recognized as critical factors influencing the desire to switch to public transportation (Maulana & Yudhistira, 2020; Purwoko & Yola, 2022; Sunitiyoso et al., 2022). These studies provide evidence for certain urban behavioral mechanisms, not to estimate national travel behavior.

Documentary analysis provides complementary evidence for the mechanisms represented in the CLD (Appendix A), including the affordability and adoption of EVs, charging infrastructure constraints, vehicle replacement versus fleet expansion, and the relationship between personal mobility and public transport development. Documentary sources provide context and triangulation for these mechanisms of change. The academic and official

Table 2. Summary Feedback Loops

Loop and Sub-system	Main Mechanism	Supporting Evidence	Systemic Implication
B1 – Private EV Subsidy Policy (The Intended Fix)	Subsidies increase EV adoption and are intended to lower emissions. The effect depends partly on whether EVs replace rather than supplement existing internal combustion engine vehicles.	(Hill et al., 2019; Knobloch et al., 2020; Nunes et al., 2022)	represents the intended balancing effect of technological substitution on emissions.
R1 – EV Incentives vs. Urban Traffic-Demand Management	EV incentives and preferential regulations can increase the relative attractiveness and usability of private EVs. Where EV use is exempt from local traffic restrictions, additional vehicle activity may weaken congestion-management effects.	(Li et al., 2022) relevant to Jakarta traffic-demand-management regulation	Shows how a national technology incentive interacts with locally specific congestion-control measures.
R2 – Congestion Impact on Mobility Preference	Congestion and travel inconvenience interact with perceptions of comfort, reliability, accessibility, and travel time. Weak public transport attractiveness can sustain private mobility preferences.	(Maulana & Yudhistira, 2020; Nadrian et al., 2019; Purwoko & Yola, 2022; Sunitiyoso et al., 2022; Tonini et al., 2021)	Represents the behavioral mechanism through which private mobility dependence may persist despite congestion.
R3 – Private Mobility vs. Public Transport	Continued attractiveness of private mobility may reinforce private vehicle ownership and weaken the incentives for modal shift. Conversely, improved public-transport accessibility, service quality, and integration can encourage a shift away from private vehicles.	(Purwoko & Yola, 2022; Sunitiyoso et al., 2022; Tonini et al., 2021; Valencia et al., 2023)	Reinforces private mobility dependence when electrification changes propulsion technology without sufficiently changing the underlying modal structure.
R4 – Policy Incentives vs. EV Industry	Policy incentives increase the attractiveness of the EV market and stimulate automotive, financial, and commercial activity. The growth of the EV ecosystem can reinforce private EV adoption and continued policy support.	(Benvenutti et al., 2019; Mattioli et al., 2020)	This represents the reinforcement of automobile-centered electrification rather than evidence of individual political interests.
R5 – Road Development Impact	Road capacity expansion initially reduces congestion but can induce additional vehicle travel and land-use development. Increased traffic may progressively absorb additional capacity, renewing congestion, and potentially increasing emissions from conventional vehicles.	(Aïkous et al., 2023; Duranton & Turner, 2011; Li et al., 2022)	Induced demand may offset the initial congestion relief, reinforcing private vehicle activity and associated emission pressure.
R6 – Vehicle-Stock Persistence vs. Cumulative Impact	EVs may add to rather than replace existing vehicles. Continued ICE use, together with expanding private vehicle activity, increases congestion exposure and sustains fossil fuel-related emissions.	(Hill et al., 2019; Nunes et al., 2022; Sefriyadi et al., 2023; Li et al., 2022)	The cumulative feedback from R1 to R5 may partially offset the intended emission reduction effect of B1.

Source: Research Analysis

evidence supporting the core causal relationships is summarized in Table 2.

The CLD identifies one intended balancing loop (B1) and six reinforcing loops (R1–R6). These reinforcing loops do not imply that EV adoption inevitably increases emissions (Figure 1). Rather, they represent feedback mechanisms that may weaken the intended system-level emission reduction effect of B1.

1) Loop B1: Private EV Subsidy Policy (The Intended Fix)

   This loop represents an intervention expected to balance the system and reduce carbon emissions. However, the causality of Loop B1 triggers unintended consequences, leading to the emergence of many other self-reinforcing (endogenous) subsystems (R1-R6) that continuously weaken the initial subsidy policy goal of reducing emissions. This is because, in complex systems, policy implementation makes problems dynamic, changing, and shifting, with cause and effect occurring in different spaces and times (with delays). In other words, the symptomatic effect only emerges at a certain point in time under specific conditions.

   Subsidies increase the affordability and attractiveness of EVs, encouraging adoption and technological substitution away from conventional vehicles. EVs can generate lower life-cycle emissions than comparable fossil-fuel vehicles under many electricity-system conditions (Knobloch et al., 2020). However, the system-level effectiveness of B1 depends partly on whether EV adoption actually removes or reduces the use of existing internal combustion engine vehicles. When an EV becomes an additional vehicle rather than a replacement, the technological benefit remains, but the expected reduction in total vehicle-related emissions may be smaller (Nunes et al., 2022).

   B1 therefore represents a technologically valid intended mechanism, not a policy mechanism assumed to fail. The question addressed by the remaining loops is whether feedback from other subsystems weakens the magnitude of the system-level effect.

2) Loop R1: EV Incentives vs. Urban Traffic-Demand Management

   R1 represents the interaction between national EV promotion and urban traffic-demand-management instruments. Fiscal incentives on EVs tax increase the attractiveness, while locally specific non-fiscal benefits may further increase their relative usability. Jakarta, Bogor, Depok, Tangerang, and Bekasi (Jabodetabek) provide an illustrative case because EVs are exempted from its odd-even traffic restriction. Ironically, the odd-even policy was initiated to reduce congestion and, in the long term, was also expected to lower emissions. This condition is termed policy resistance. This local mechanism is not nationally representative; rather, it shows how national EV incentives can interact with a subnational congestion-management instrument.

   Traffic volume and congestion are the reasons why this interaction is important. Traffic restrictions have the ability to reduce the number of vehicles operating at the same time and increase the average traffic speed. In dense urban environments, higher speeds can result in more efficient fuel consumption and lower carbon emissions than conventional vehicles (Li et al., 2022). Therefore, the intended demand management effects can be partially mitigated by special treatment for electric vehicles (EVs) that generate greater vehicle activity than vehicle replacement. There is no evidence that the exemption for electric vehicles in Jakarta has led to an overall increase in emissions, but this model considers it as a potential feedback loop.

3) Loop R2: Congestion Impact on Mobility Preference

   Loop R2 is an influence resulting from the correlation of behaviors that are interconnected between travel and congestion conditions toward two-mode options. Although in a state of congestion that causes travel to take a long time, it does not deter people from abandoning their motorcycles, as there are factors that influence mode choice, such as the time spent on the journey being very relative, comfort, and accessibility that can be causes, and comfort can

be the cause of it all (Nadrian et al., 2019; Tonini et al., 2021). From the data collected in Jakarta, factors that can influence mode choice include car and motorcycle ownership, socioeconomic factors, and long travel distance, which have a significant impact (Maulana & Yudhistira, 2020). This opinion has been reinforced by Purwoko and Yola, who explained that the factors influencing mode choice include the use of personal vehicles, travel distance, time spent on the journey, and income, which contribute to the shift from private to public transportation (Purwoko & Yola, 2022).

Evidence from Greater Jakarta further indicates that public transport service quality, accessibility, and first-/last-mile integration affect the attractiveness of mass transport (Sunitiyoso et al., 2022). Thus, it can be said in reality that public transportation is often considered uncomfortable and not usable by everyone, yet traffic congestion continues to increase, which is expected to be similar to the preference for more sustainable personal mobility compared to achieving modal shifts. Therefore, R2 is needed to provide a solution to traffic congestion and to maintain the interest of riders, who are perceived to have a weak interest in public transportation, toward personal vehicles.

4) Loop R3: Private Mobility vs. Public Transport

The behavioral dynamics found in R2 are extended to a broader mobility structure through the R3 loop. As the need for practical and comfortable mobility increases, private vehicle ownership may become more appealing. The improvement of public transportation accessibility, service levels, and better integration can encourage a shift from private vehicles to public transportation. On the other hand, the growth of the electric vehicle industry and related policy incentives can strengthen the preference for private vehicles (Tonini et al., 2021; Valencia et al., 2023).

The cause of the existence of commuter mode options in Jakarta and Jabodetabek is similar to the factors of long travel times, limited access, and the characteristics of transportation services (Purwoko & Yola, 2022; Sunitiyoso et al., 2022). It is expected that from these factors, there will be a behavioral mechanism.

R3 obtained the concept of strengthening technological change without significantly altering the mobility. This could lead to a reduction in the B1 goal to decrease system-level emissions, maintain vehicle conditions, and reduce congestion.

5) Loop R4: Policy Incentives vs. EV Industry

R4: The current impact is the socio-economic aspect and interest in using electric vehicles compared to cars, which has been regulated in Presidential Regulation No. 55/2019, revised by No. 79/2023, where the government provided support for the domestic production of electric vehicles (EVs). Therefore, this can increase market demand and help develop businesses in the fields of electric vehicle charging facilities, automotive businesses, and financial businesses.

The development of technology in the field of electric vehicles has been planned in presidential regulations. However, from the perspective of electric vehicles, it creates a demand for someone to own and be able to use electric vehicles, which brings about a change in the structural political-economic mechanism (Benvenutti et al., 2019; Mattioli et al., 2020).

6) Loop R5: Road Development Impact

Loop R5 has taken steps to address congestion and widen the road, as stated by Duranton and Turner, who mentioned that the development of road expansion corresponds to an increase in the capacity of kilometers that vehicles will travel. Simply widening roads is considered effective in addressing congestion (Duranton & Turner, 2011). Another opinion was expressed by Hymel, who stated that widening the road can help accommodate additional vehicles, which will reduce congestion over time (Hymel, 2019). Changes in road widening, such as toll roads using land, have been studied by Aikous et al., who stated that there are impacts from outside direct traffic conditions (Aïkous et al., 2023).

Induced travel continues to suggest that there is more road space and congestion may return. Such conditions can increase fuel consumption

and carbon emissions from conventional vehicles. This is because lower speeds and fuel efficiency correlate with higher emissions under congestion (Li et al., 2022). Therefore, R5 illustrates how road expansion intended to alleviate congestion may create a reinforcing feedback loop that sustains traffic growth and may weaken the emission-reduction objective of B1.

7) Loop R6: Vehicle-Stock Persistence vs. Cumulative Impact

Failure to recognize this feedback causality causes the accumulation of impacts from R1–R5. Loop R6 represents the cumulative effect of R1–R5, particularly the distinction between vehicle substitution and fleet addition. The intended emission-reduction effect of B1 is strongest when EV adoption replaces actively used conventional vehicles. However, Nunes et al. show that the environmental benefit of EV adoption depends partly on the counterfactual household vehicle inventory: when an EV becomes an additional vehicle rather than replacing an existing ICE vehicle, the expected emission advantage can be substantially reduced (Nunes et al., 2022).

A mobility system in which private vehicle ownership continues to increase is highly relevant to this mechanism. Facts from Jakarta, Bandung, and Surabaya show that socio-economic attitudes, accessibility, and urban development influence private vehicle ownership. This study also indicates that sustainable urban development and population growth can lead to increased private vehicle usage without transportation demand management (Sefriyadi et al., 2023). This regional evidence complements the national vehicle stock trends reported in Table 1 but does not represent Indonesia as a whole..

If electric vehicles and conventional vehicles continue to be produced, it will increase traffic congestion, as it will lead to higher vehicle density, thereby increasing the volume of congestion. Additionally, the speed will decrease, and with the reduction in speed, the risk of carbon accidents will also decrease. Electric vehicles are designed to reduce speed, which lowers the risk of carbon accidents compared to conventional vehicles (Li et al., 2022). R6 produces that the addition of vehicles leads to the continuous use of ICE and the increase in private vehicles can create the impacts R1–R5 and balance the impact of the reduction in emissions needed from B1.

8) Synthesis: The "Fixes That Fail" Pattern and Impact Accumulation

From the presence of the B1-R6 effect followed by the "Failed Fix" in the System Dynamics, it can address an issue in the short term but over a long period can erode the expected effect, which can be described as follows:

- Solution: The main goal is to reduce carbon emissions, and the government has significantly supported electric vehicle (EV) drivers who can replace internal combustion engine vehicles.
- Unintended Consequences: The reinforcing loops R1–R6 manifest a response that can control traffic demand in each city.
- Policy Paradox: The main goal of reducing emissions from carbon accident risks results in endogenous feedback that can undermine the emission reduction goal.

Because R1–R6 indicate the need for specific locations, the goal is not to block the reinforcing loops separately; rather, it is to balance the weaknesses of the reinforcing loops simultaneously. Owing to the loop's continuous dependence on personal mobility, this model can provide a logical rationale for transportation assessments as a balance loop supporter. Research results indicate that the decarbonization of transportation not only requires technological improvements but also a shift in modes and demand-side actions. In Greater Jakarta, the process of improving both the quality and integration of transportation simultaneously can support a shift away from private vehicles. Thus, the intervention completes technological substitution through mode options and reduces dependence on private vehicles.

3. Leverage Solution Based on Archetype

The "Fixes That Fail" archetype shows that, instead of merely improving the original intervention, policy redesign should focus on structural feedback

that replicates the original problem (Braun, 2002; Senge, 1990). Subsidies for private electric vehicles currently achieve the main policy goal of reducing carbon emissions through technological substitution. However, the B1–R6 structure indicates that the desired effects may diminish when private vehicles are adopted within a mobility system that continues to reinforce dependence on private vehicles, congestion, induced travel, and the sustainability of conventional vehicles.

In the CLD model, the logic for mapping problems is built through the following steps: (a) identifying the symptoms of the problem; (b) mapping the interventions and intended resolutions of the problem; (c) mapping the unintended consequences of these interventions in the causality loop; (d) identifying the root causes of the problem symptoms in another causality loop; and (e) finding the relationship between the two sets of causality: are the improvements and root causes related? Identify high-leverage interventions; (f) add or remove links in the diagram to build structural interventions; and (g) outline the potential side effects of each intervention to be prepared to address or completely prevent them (Braun, 2002).

Public transportation can reduce the number of private vehicles needed to carry the same number of passengers due to its greater capacity to transport passengers, which is a structural way to reduce congestion and emissions. Previous studies have shown that a stronger public transportation system correlates with a reduction in transportation emissions, environmental benefits, increased accessibility, and reduced congestion (AlKheder, 2021; Bakker & Konings, 2018; Goodspeed et al., 2019; Koushki et al., 1999; Nikolić & Teodorović, 2013; Šišak, 2022). It is said that transportation and traffic can have socio-economic impacts and also contribute to the increasingly developing environment, so there is a need to consider mobility policies for systemic transitions rather than just technological transitions (Iwata, 2006; Nadrian et al., 2019).

B2 works very differently from B1 (see Figure 2). B1 aims to reduce carbon emissions with the help of technology, for example, by changing vehicles from internal combustion engines to electric vehicles, whereas B2 aims to change modes and reduce dependence on private vehicles. Thus, it can be distinguished that this aligns with research findings stating that there is mitigation from the demand

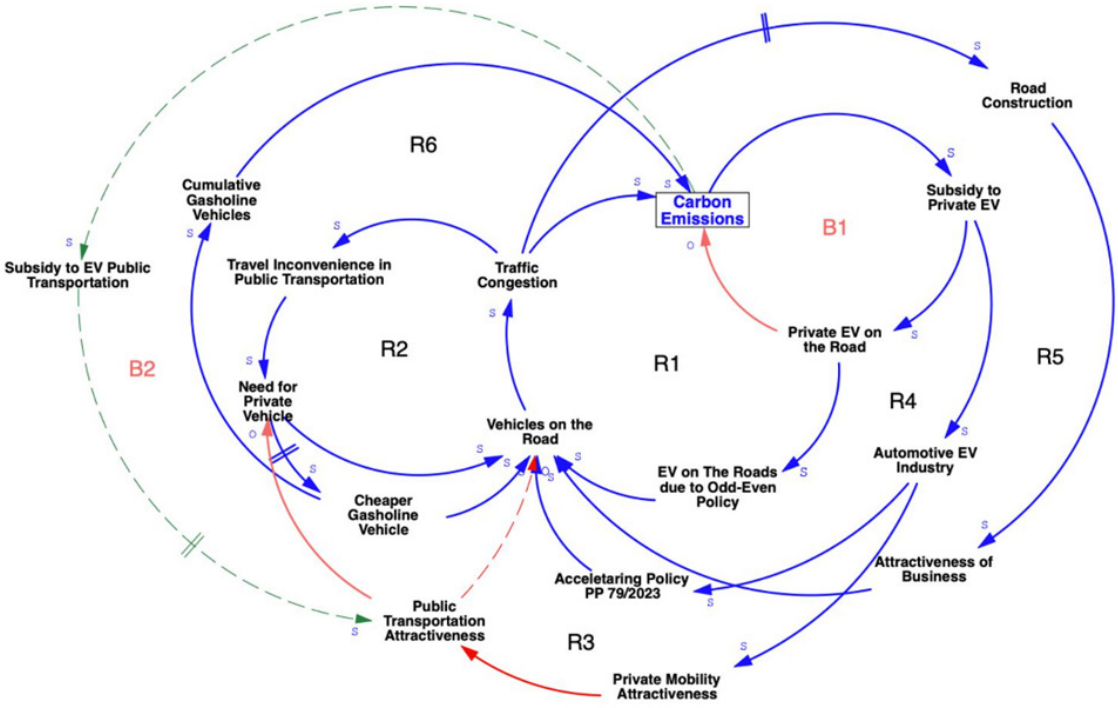


Figure 2. Solution Model by Reallocating Subsidy to Public Transport
Source: Research Analysis

side and changes in strategy and processes, but not merely technological changes (Creutzig et al., 2022). Researchers also argue that if there are no changes and shifts in travel behavior and modal structure, it will not be sufficient to decarbonize sustainable transportation (Valencia et al., 2023). This has been proven in the city of Greater Jakarta: the volume of public transportation services, accessibility, and integration from the initial step to the final step of the journey can impact drivers to switch to mass transit (Sunitiyoso et al., 2022).

Table 3. Expected Structural Effects of B2 on the Existing Feedback Structure

Loop	Structural Condition Before B2	Expected Structural Effect of B2	Implication for the Emission-Reduction Goal	Supporting Evidence
B1 – Private EV Subsidy Policy	Emission reduction relies primarily on EV adoption and the substitution of ICE vehicles.	B2 complements technological substitution by reducing dependence on private mobility rather than replacing B1.	The overall system-level emission-reduction effect can be strengthened by combining technological improvements with modal shifts.	(Creutzig et al., 2022; Valencia et al., 2023)
R1 – EV Incentives vs. Urban Traffic-Demand Management	Preferential treatment of private EVs may sustain vehicle activity and weaken congestion management effects where EVs are added to the fleet.	More attractive public transport can reduce private vehicle use, thereby easing the pressure on urban traffic-demand-management systems.	This potentially weakens the pathway through which additional private vehicle activity contributes to congestion.	(Li et al., 2022; Sunitiyoso et al., 2022)
R2 – Congestion Impact on Mobility Preference	Where public transport remains less attractive, congestion may coexist with a continued preference for private mobility.	B2 directly increases public transport attractiveness, thereby reducing the perceived need for private vehicles.	Weakens the behavioural feedback sustaining private-mobility dependence.	(Maulana & Yudhistira, 2020; Nadrian et al., 2019; Purwoko & Yola, 2022; Sunitiyoso et al., 2022; Tonini et al., 2021)
R3 – Private Mobility vs. Public Transport	Private mobility attractiveness reinforces vehicle ownership and weakens modal shift.	Improved public transport attractiveness strengthens modal-shift potential and counteracts private-mobility dependence.	It directly targets one of the central reinforcing structures identified in Figure 1.	(Purwoko & Yola, 2022; Sunitiyoso et al., 2022; Tonini et al., 2021; Valencia et al., 2023) Tonini et al. (2021)
R4 – Policy Incentives vs. EV Industry	EV incentives reinforce automobile-centered electrification and private EV market development.	B2 does not dismantle EV industry development, but rebalances policy support toward collective mobility.	This may reduce the relative dominance of private-vehicle-centered electrification within the policy mix.	(Creutzig et al., 2022; Mattioli et al., 2020)
R5 – Road Development Impact	Road expansion can induce additional vehicle travel, eventually resulting in congestion.	Reduced private-vehicle demand may lessen traffic pressure, which stimulates repeated road-capacity responses.	May indirectly weaken the reinforcing cycle between road expansion, induced demand, and renewed congestion.	(Aïkous et al., 2023; Duranton & Turner, 2011; Hymel, 2019)
R6 – Vehicle-Stock Persistence and Fleet Addition	EV fleet addition and continued ICE use can sustain the total vehicle activity, congestion, and fossil fuel-related emissions.	Higher public transport attractiveness reduces the need for private vehicles and, with delay, the number of vehicles on the road.	Directly weakens the accumulation pathway through which R1–R5 offsets B1.	(Li et al., 2022; Nunes et al., 2022; Sefriyadi et al., 2023)
B2 – Public Transport Leverage	No balancing mechanism directly addresses the persistent dependence on private mobility.	Rebalance subsidy support to EV Public Transportation	Adds a structural balancing pathway acting upstream of mobility behavior and vehicle activity.	(AlKheder, 2021; Bakker & Konings, 2018; Creutzig et al., 2022; Goodspeed et al., 2019; Sunitiyoso et al., 2022; Valencia et al., 2023)

Source: Research Analysis

This makes public transportation increasingly popular; therefore, this model introduces two impacts that are considered contradictory to personal mobility. First, greater public transportation attractiveness reduces the need for private vehicles. Second, it has a delayed negative effect on vehicles on the road, reflecting the time required for changes in mobility preference to become observable changes in actual vehicle use. These mechanisms are consistent with demand-side mitigation research emphasizing the complementary roles of avoid, shift, and improve strategies (Creutzig et al., 2022). Furthermore, Valencia et al. showed that when the modal structure and travel behavior largely remain unchanged, a mere shift in propulsion may not be sufficient for the decarbonization of sustainable transport (Valencia et al., 2023).

B2 is important because of the events that occur when this leverage link is activated. The existing reinforcement structure is reduced because of the lack of private vehicles and traffic. The emission pressures identified across R1–R6 can be reduced, traffic congestion can be alleviated, and conventional vehicle activities can be limited. As a result, B2 does not directly control every downstream outcome. On the contrary, he altered upstream structural variables and allowed the system to endogenously develop different behavioral styles.

Consequently, this model does not demonstrate that EV technology naturally increases emissions. Life cycle evidence generally shows that, compared to internal combustion vehicles, battery electric vehicles (BEVs) produce lower greenhouse gas emissions. However, the existence of these benefits depends on the carbon volume in the power grid, the vehicle's function and emissions during manufacturing, and the vehicles that have already been converted. Electric vehicles reduce carbon emissions from electricity (H. Chen et al., 2024; J. Chen et al., 2022).

If B1 is currently directly replaced by government-subsidized electric vehicles (EVs), carbon emissions can be reduced. However, if conventional vehicles and electric vehicles are produced simultaneously, it will create traffic congestion, leading to an imbalance. According to survey results in the city, electric cars can directly reduce emissions and increase traffic congestion (Straubinger et al., 2022).

Thus, the leverage proposal is not merely a part of replacing subsidies for private electric cars with subsidies for public transportation. However, this can achieve a strategic balance within a series of structured and planned policies. The shift from using ICE-powered vehicles to electric-powered vehicles is to create cleaner vehicles.

Finally, B2 is not considered an optimal solution quantitatively or free from effects. Expanding electric public transportation services on a large scale can increase electricity demand, which requires a very large charging and depot infrastructure, and only results in a limited mode shift if service quality, accessibility, reliability, and network integration are not improved. Decarbonization of the electricity sector is an important component of its environmental benefits. Therefore, B2 is considered a potential leverage structure. Its effectiveness depends on complementary improvements across the transportation and energy systems. To obtain a summary of the expected structural effects of B2 on the existing feedback structure, see Table 3.

Conclusion

Executing policy within complex systems deviates from a linear path where intensifying an intervention yields directly proportional benefits. Rather, the final results are shaped by the intersections of the policy with the behavioral, institutional, infrastructural, and technological feedback mechanisms it activates. As the EV subsidy rollout proves, even a well-designed instrument can yield subpar results when these systemic reactions are neglected. Therefore, long-term effectiveness requires more than selecting an appropriate tool; it demands a system that can identify feedback loops, pivot its approach, and recalibrate structural elements to keep the core objective intact. Governance must possess the adaptive capacity to absorb the system dynamics generated by its own execution.

Thus, the view that B2 has been proposed to respond structurally with adjustments rather than making changes to electric vehicle policies. Increasing interest in public transportation creates a leverage point where changes in mobility preferences can impact the volume of vehicles on the road, traffic congestion, demand for private vehicles, and level of emissions pressure.

Therefore, this research can be produced and recommended for future researchers: (1) research that can strategically balance policies toward electric public transportation and the revolution of mode shift; (2) strengthening strategies in replacing and transforming vehicles so that electrification can change the currently used ICE vehicles rather than increasing the number of fleets; (3) linking transportation electrification to demand management and decarbonization of the electricity sector; and (4) the use of quantitative assessments that can be employed in future research to determine allocation and increasingly appropriate policy instruments.

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Appendix A

ID	Analytical Stage	Stakeholder / Documentary Source	Analytical Meaning	Analytical Code/ CLD Variables	Causal Proposition	Relevant Loop	Evidence Function
D01	Intended policy mechanism	(Institute for Essential Services Reform, 2023b)	The government explicitly links EV incentives to greater affordability, purchasing power, mass adoption, and the development of the domestic EV industry.	EV subsidy; affordability; EV adoption; EV-industry attractiveness	Increased policy support is expected to improve EV affordability and adoption while simultaneously stimulating development of the EV industrial ecosystem.	B1 / R4	Official policy rationale. Establishes the intended subsidy–adoption mechanism and provides documentary support for the policy–industry reinforcement represented in R4.
D02	Implementation condition	(Institute for Essential Services Reform, 2023a)	EV adoption remains constrained by acquisition cost, charging infrastructure, range anxiety, and related operational barriers. The report also notes the uneven distribution of charging infrastructure.	EV affordability; charging infrastructure; range anxiety; EV adoption	Implementation constraints can weaken or delay the intended pathway through which incentives generate EV adoption.	B1	Institutional empirical evidence. It contextualizes the conditions affecting the intended B1 mechanism rather than independently establishing a reinforcing loop.
D03	Implementation condition	(Ferdiansyah, 2024)	PLN reported 624 SPKLU at 411 locations and positioned charging infrastructure as part of supporting the national EV ecosystem.	Charging infrastructure; EV convenience; EV ecosystem; EV adoption	Greater charging availability can reduce implementation barriers and support the intended EV-adoption pathway.	B1	Implementation triangulation: Supports the enabling role of infrastructure within B1; not used independently to establish causal feedback loops.
D04	Replacement versus addition	(Padhilah et al., 2023)	The government's conversion programme explicitly targets the conversion of fossil-fuel motorcycles into electric motorcycles and recognizes both reduced BBM consumption and additional electricity demand.	ICE replacement; EV conversion; vehicle stock; electricity demand; emissions	Compared with simply adding more vehicles to the system, EV transformation replaces existing fossil fuel vehicles.	B1 / R6	Official implementation of the evidence. Supports the distinction between substitution and addition, which becomes central to the cumulative mechanism represented in R6.
D05	Counter-position / policy rationale	(Nugroho, 2022, 2023)	EV subsidies are interpreted positively as reducing acquisition costs, creating a domestic EV market, and accelerating the migration from fossil-fuel vehicles to EVs.	Subsidy; affordability; market creation; ICE-to-EV migration; EV industry	Lower prices can encourage the adoption and development of electric vehicles, paving the way for new technologies.	B1 / R4	Counter-position. Prevents documentary evidence from being constructed only around criticism of EV subsidies and supports a more neutral model formulation.

ID	Analytical Stage	Stakeholder / Documentary Source	Analytical Meaning	Analytical Code/ CLD Variables	Causal Proposition	Relevant Loop	Evidence Function
D06	Policy interaction / traffic-demand management	(Pergub DKI Jakarta No. 88/2019 Tentang Perubahan Atas Peraturan Gubernur No. 155/2018 Tentang Pembatasan Lalu Lintas Dengan Sistem Ganjil-Genap, 2019)	In odd-even traffic restrictions, Jakarta has made exceptions for electric vehicles. Although the BPHN analysis links the benefits of this regulation to the appeal of electric vehicles (EVs), the development of EVs may only add to the fleet of cars, rather than truly replacing fossil fuel-powered vehicles.	EV non-fiscal incentive; traffic restriction; EV usability; Vehicles on the Road; fleet addition	Preferential treatment for EVs can increase their relative usability and may weaken traffic-demand management, where EVs are added to rather than replace the existing fleet.	R1 / R6	Legal and documentary triangulation were also used. It establishes the policy interaction underlying R1 while providing contextual evidence for the fleet addition mechanism in R6. It does not establish the aggregate emission effects.
D07	Behavioural feedback	(Badan Pengelola Transportasi Jabodetabek, 2019)	BPTJ identifies unmet expectations for safe, comfortable, reliable, affordable, and timely public transportation and explicitly links inadequate service to the continued preference for private vehicles.	Travel inconvenience in public transport; service quality; reliability; Need for Private Vehicle	Lower perceived convenience and reliability of public transport increased the perceived need for private vehicles.	R2	Official documentary evidence is also available. Directly supports the behavioral proposition represented by R2.
D08	Behavioural feedback → leverage bridge	(Kementerian Perhubungan Republik Indonesia, 2024)	The Ministry explicitly describes safer, more comfortable, integrated public transport as a means of attracting private-vehicle users to shift to mass transport and reduce private-vehicle use, congestion, and pollution.	Public Transportation Attractiveness; modal shift; Need for Private Vehicle; Vehicles on the Road; congestion	Improving public transport attractiveness can reduce dependence on private mobility and, after behavioral adjustment, reduce vehicle activity.	R2 / R3 / B2	Official documentary bridge: Connects the behavioral problem diagnosed in R2–R3 with the leverage mechanism introduced later in B2.
D09	Mobility structure/policy response	(Kamila, 2024; Kementerian Perhubungan Republik Indonesia, 2024)	The Ministry notes that private-vehicle use remains high and explicitly promotes the accelerated electrification of urban public transport. It also acknowledges implementation challenges, including charging infrastructure, local-government commitment, and high investment costs.	Private-mobility dependence; public-transport electrification; infrastructure; implementation constraints	High dependence on private vehicles provides a policy rationale for strengthening low-emission collective transport, although its effectiveness depends on complementary implementation capacity.	R3 / B2	Official stakeholder evidence is also available. Supports public transport as a structural complement to private EV electrification and provides evidence of possible B2 implementation constraints.

ID	Analytical Stage	Stakeholder / Documentary Source	Analytical Meaning	Analytical Code/ CLD Variables	Causal Proposition	Relevant Loop	Evidence Function
D10	Infrastructure feedback	(Institute for Essential Services Reform, 2023b; Santika, 2023; Sefriyadi et al., 2023)	The ITDP describes road expansion as generating induced demand: new capacity initially makes driving more convenient, attracting additional motorized travel until congestion re-emerges.	Road Construction; driving convenience; induced travel; Vehicles on the Road; Traffic Congestion	Increased road capacity can stimulate additional vehicle travel, progressively absorb capacity, and reproduce congestion.	R5	Stakeholder documentary evidence is also used. Provides an Indonesia-relevant qualitative articulation of the induced demand mechanism represented in R5.
D11	Structural leverage rationale	(Institute for Essential Services Reform, 2023a; Padhilah et al., 2023; Syofiadi, 2024)	EV incentives can support adoption; however, the IESR argues that transport decarbonization also requires an avoid–shift–improve approach, including reducing unnecessary travel and shifting toward public transport.	EV adoption; travel demand; modal shift; Public Transportation Attractiveness	Technological improvements should be complemented by changes in travel demand and modal structure to address transport emissions more systemically.	B1 / R3 / B2	Expert triangulation and leverage rationale. Supports the transition from diagnosing technological substitution in B1 to introducing complementary structural interventions in B2.
D12	Policy discourse / contextual evidence	(Islamiati, 2023a)	Analysis of online conversations found substantial opposition to private EV subsidies and support among the analyzed accounts for redirecting support toward electric public transport. The dataset consisted of social media conversations and should not be interpreted as a nationally representative public opinion.	Policy acceptance; subsidy priority; public-transport preference	Digital discourse demonstrates contestation over the orientation of EV subsidies and provides contextual evidence of alternative policy preference.	B2 – contextual only	Contextual evidence only. This variable was used to interpret policy discourse and policy acceptance; it was not used to establish causal relationships or justify B2 independently.