Journal of the Civil Engineering Forum, September 2025, 11(3):334-350
DOI 10.22146/jcef.22067
Available Online at https://jurnal.ugm.ac.id/v3/jcef/issue/archive

Battery Electric Vehicle Adoption in Indonesia: Insights from Consumer Preferences and Stakeholder Perspectives

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SUBMITTED 04 June 2025 **REVISED** 21 July 2025 **ACCEPTED** 23 July 2025

ABSTRACT Indonesia's adoption of battery electric vehicles (BEVs) remains limited, posing a challenge to the government's ambitious targets for 2030 and beyond. This study adopts a mixed-methods approach, combining qualitative insights from focus group discussions and stakeholder interviews with quantitative analysis using a mixed multinomial logit (MMNL) model. The stated preference survey includes 1,360 respondents across six provinces in Java, providing broader geographic coverage than most prior studies in Indonesia. The analysis covers both two-wheeler (2W) and four-wheeler (4W) BEVs, while also differentiating preferences by brand, an often-overlooked factor in the Indonesian context. The MMNL results confirm that charging time, range, operational cost, and price significantly influence BEV preferences, with variations across vehicle segments and brand types. Shared concerns from both supply- and demand-side perspectives include affordability, underdeveloped charging infrastructure, and limited product-market fit. However, divergent priorities are evident: industry stakeholders emphasize the need for technological upgrades, consistent policy signals, and improvements in upstream supply chains, while consumers prioritize convenience and final purchase or operating costs, showing less sensitivity to advanced technical specifications. This study contributes to the literature by offering an integrated demand–supply perspective on BEV adoption in an emerging economy, while also introducing brand differentiation and wider geographic sampling as key novelties. Policy recommendations include accelerating fast-charging infrastructure, standardizing batteries, localizing battery production, and implementing stronger disincentives for internal combustion engine (ICE) vehicles. The strategic enforcement of Presidential Instruction No. 7/2022 is also highlighted as a critical step to demonstrate government commitment. Together, these insights provide actionable guidance for accelerating a more inclusive and effective transition to electric mobility in Indonesia.

KEYWORDS Battery Electric Vehicle Adoption; EV Consumer Preferences; Charging Infrastructure; Stated Preference Survey

1 INTRODUCTION

Electric vehicles (EVs) have gained global attention as a solution to transport-related emissions, which accounted for 15% of global emissions in 2020 (Ritchie et al., 2020), Indonesia faces significant challenges in reducing vehicular emissions due to rapid urbanization and its growing dependence on privately owned fossil fuel vehicles, totaling 148 million in 2022, with a 5% annual growth rate over the past seven years (BPS - Statistics Indonesia, 2022). In response, the government has identified EVs as a strategic solution and is actively prioritizing the development of a domestic EV ecosystem to support sustainable transport.

Indonesia's large nickel reserves, a critical raw material for battery production, have influenced its policy preference for battery electric vehicles (BEVs) over other EV types. Presidential Decree No. 55/2019 outlines a roadmap to accelerate the adoption of 2W and 4W BEVs. It mandates minimum local content, referred to as *Tingkat Komponen Dalam Negeri* (TKDN), for BEV manufacturers and includes provisions for purchase incentives and the development of key infrastructure, such as charging stations and battery-swapping facilities.

In addition, the Ministry of Energy and Mineral Resources, through the National Grand Energy Plan, targets a 77-barrel-per-day reduction in gasoline imports by 2030, relying on mass BEV adoption. The aim is to reach 13 million 2W BEVs and 2 million 4W BEVs by 2030 (National Energy Council, 2022). However, progress is slow: by September 2024, only 109,576 2W and 23,348 4W BEVs were registered (Erlangga, 2024), or about 1% of the target. Despite doubling since 2022, Indonesia's EV market share remains at 2%, far behind the global average of 18% and Thailand's 10% in 2023 (International Energy Agency, 2023).

BEV adoption in Indonesia faces price-related challenges, as most 4W models (USD 15,248–64,000) remain well above the ideal USD 14,000–20,000 range (Pandyaswargo et al., 2021; Abidin and L., 2023;

Febriati, 2023), while ICE vehicles are widely available for under USD 12,000 (Institute for Essential Services Reform, 2023). Despite this, the Hyundai Ioniq 5 and the more affordable Wuling Air EV have become best-sellers (Rahadiansyah, 2023), and in the 2W segment, around eight manufacturers offer electric motorcycles—mostly priced below USD 1,922 (Agung, 2023).

Beyond pricing barriers, charging infrastructure also plays a critical role in shaping consumer adoption of BEVs. As of late 2023, Indonesian BEV users rely on three charging options: home charging, public stations, and battery-swapping (limited to 2W EVs). The country had 932 public charging stations, mostly slow (44%) and medium speed (32%), with over half located in Java (Ministry of Energy and Mineral Resources, 2024*a*,*b*), far behind Thailand's 9,694 stations (Electric Vehicle Association of Thailand, 2023). Battery-swapping infrastructure includes 1,772 stations, 70% of which are in Java (Ministry of Energy and Mineral Resources, 2024*a*,*b*) while PT PLN installed 4,610 home chargers nationwide (PT PLN (Persero), 2024). This limited and uneven distribution continues to fuel range anxiety and hinders BEV adoption.

The Indonesian government has introduced a mix of financial and convenience-oriented policies to support BEV adoption. Financial incentives include purchase subsidies for 2W BEVs with local content, projected to lower prices by 22–40% depending on motor capacity, in 2023 (Institute for Essential Services Reform, 2023). For 4W BEVs, the 10% VAT has been removed, although it is still lower than Thailand's 15% or Singapore's 24% incentives (Institute for Essential Services Reform, 2023). Additional support includes reduced registration fees, motor vehicle tax discounts, and lower electricity rates for home charging. On the convenience side, some regions allow BEVs access to restricted roads, and in Jakarta, they are exempt from the odd-even traffic rule. However, the absence of disincentives for ICE vehicles or a national phase-out target limits Indonesia's long-term EV transition strategy.

Most EV adoption research focuses on developed markets (Li et al., 2017; Bryła et al., 2022; Ivanova and Moreira, 2023; Wicki et al., 2023), leaving a gap in understanding the specific socio-technical and policy challenges in emerging economies like Indonesia. The dominance of two-wheelers over four-wheelers, combined with the strong presence of Japanese automakers that prioritize hybrid electric vehicles (HEVs), makes Indonesia's BEV trajectory distinct (Veza et al., 2021; The Association of Indonesia Automotive Industry, 2023).

Previous studies on EVs or BEVs in Indonesia have primarily addressed either consumers or production. Most consumer studies were conducted before the introduction of key 2023 purchase incentives and were limited in geographic scope (Guerra, 2019; Choi et al., 2022; Belgiawan et al., 2024). Qualitative studies have examined multi-stakeholder views (Maghfiroh et al., 2021; Sasongko et al., 2024), but these lacked robust consumer representation or large-scale quantitative validation. Moreover, limited research has explored brand-level differences in BEV preferences, which is crucial for capturing heterogeneity in consumer choice during the early stages of market development.

This study addresses these gaps by combining multi-stakeholder insights with a stated preference survey of 1,360 respondents from six provinces across Java Island, Indonesia's most populous and economically active region. Conceptually, the study is grounded in a systems-oriented perspective that recognizes BEV adoption as a result of interaction between regulatory policies, industrial readiness, and user responses. By capturing the perspectives of key actors alongside consumer preferences for both 2W and 4W BEVs, the study bridges upstream and downstream factors affecting adoption. Furthermore, by differentiating preferences across vehicle brands, this study contributes to understanding how consumer decisions are shaped in an emerging and policy-driven market. This integrated approach offers strategic guidance to policymakers and industry stakeholders in designing interventions that are responsive to Indonesia's evolving EV ecosystem.

This study aims to address the following research questions:

1. What are the key product attributes influencing BEV adoption across the two-wheeler (2W) and four-wheeler (4W) segments in Indonesia?
2. How do these preferences align or diverge from the perspectives of key industry and policy stakeholders?
3. What strategies or policies are needed to enhance BEV uptake in Indonesia's emerging market?

2 LITERATURE REVIEW

EVs are powered by electric motors and can be broadly categorized into battery electric vehicles (BEVs), hybrid electric vehicles (HEVs), and plug-in hybrid electric vehicles (PHEVs). While global literature on EV adoption is expanding, many studies aggregate all EV types, thereby overlooking the specific dynamics and challenges of BEV adoption. In addition, much of the existing research isolates either consumer preferences or supply-side issues without integrating perspectives from regulators, manufacturers, and users. This study addresses this gap by drawing on both multi-stakeholder and cross-national studies to examine three key dimensions shaping BEV adoption: consumer characteristics, product-related factors, and policy/infrastructure environments (Li et al., 2017; Bryła et al., 2022; Ivanova and Moreira, 2023).

Despite the growing body of work, the literature remains fragmented across these themes, especially in emerging markets like Indonesia. The following sections provide a thematic synthesis and highlight critical gaps that motivate this study.

2.1 Consumer-Related Factors

Socio-demographic characteristics have long been recognized as key determinants of EV adoption. Studies in developed countries find that higher education, income, home ownership, and vehicle access are associated with a greater likelihood of adoption (Ensslen et al., 2015; Brückmann et al., 2019; Mandys, 2021). Experience with EVs and access to neighborhood charging stations also positively influence willingness to adopt (Gehrke and Reardon, 2022).

Research from Southeast Asia, though still limited, reinforces some of these patterns. For instance, Kongklaew et al. (2021) found that in Thailand, younger individuals with longer driving experience were more inclined to adopt EVs. In Indonesia, Guerra (2019) and Febransyah (2021) identified income and age, particularly among young, high-income males, as key factors. These studies also point to lifestyle traits such as smoking and environmental perception as indirect influences on adoption.

While socio-demographic factors such as income, age, and education have been shown to influence EV adoption in various contexts, this study intentionally focuses on product-related attributes and stakeholder perspectives. The decision to exclude socio-demographic variables was made to maintain analytical focus.

2.2 Product-Related Factors

Product attributes, such as price, performance, range, and charging duration, have been widely studied in developed countries. Mandys (2021) identified these attributes, along with environmental benefits, as critical determinants of EV adoption. However, a systematic review by Ivanova and Moreira (2023) reveals inconsistent findings across different contexts. In China, Habich-Sobiegalla et al. (2019) found that price and range were not significant predictors, possibly due to the concentration of EV users in wealthier urban areas. In Japan, Miwa et al. (2017) observed that charging time had little influence compared to price, range, and vehicle capacity.

In the Indonesian context, Choi et al. (2022) found that Jakarta residents prefer EVs for environmental reasons, and are highly sensitive to vehicle price, charging time, and driving range. Similar findings were reported by Guerra (2019) in Solo, where attributes such as motorbike price, speed, and range significantly shaped preferences for 2W BEVs. Belgiawan et al. (2024) also emphasized that range extenders help reduce range anxiety, while Sasongko et al. (2024) highlighted affordability as a major barrier despite the appeal of lower operational and maintenance costs.

These insights are echoed in non-academic sources. Reports by the Institute for Essential Services Reform (2023) and Charta Politika Indonesia (2022) point to high upfront costs, long charging times, and limited driving ranges as key constraints in BEV adoption. Among these studies, four attributes, price, charging duration, driving range, and operational costs (derived from fuel costs), emerge as the most consistently cited factors influencing EV adoption.

Despite these contributions, most research typically examines only one vehicle type, either 2W or 4W. Comparative studies that assess how these attributes interact across BEV categories using realistic market options remain scarce. Furthermore, few studies contextualize these preferences within the broader institutional and infrastructural landscape, a gap this study addresses.

2.3 External Factors

External factors, particularly government policies and charging infrastructure, play a decisive role in shaping BEV adoption. Wang et al. (2017) classified policies into three categories: financial incentives, information provision, and convenience measures, all of which positively affect EV adoption in China. These findings have been supported in other countries, including Vietnam (Ha et al., 2023) and Indonesia (Belgiawan et al., 2024). However, Helveston et al. (2015) argued that in the absence of subsidies, consumers often prefer ICEVs or HEVs, while Qiu et al. (2019) cautioned that incentives lose effectiveness if price gaps between BEVs and ICEVs remain large.

There is growing recognition that convenience-oriented policies, such as access to charging stations, home-charging infrastructure, and preferential registration processes, may be more influential than financial incentives (Li et al., 2019; Qian et al., 2019). The Chinese example, where license-plate privileges outperformed purchase incentives, underscores this point. Moreover, policies that constrain ICEV growth, such as usage restrictions or bans, have been shown to complement EV-supportive measures effectively (Yu et al., 2018). In Indonesia, the policy framework is evolving, but it lacks long-term disincentives for ICEVs and still suffers from infrastructure deficits, particularly in charging station coverage. Although government initiatives exist, policy fragmentation and inconsistent local implementation continue to hinder BEV uptake.

While international studies emphasize the importance of coordinated and reinforcing policy packages, few studies have examined how such policies interact with consumer behavior and supply-side perspectives in Indonesia. This limits their relevance for designing context-specific BEV strategies.

3 METHODS

3.1 Interviews and Focus Group Discussions

This study used semi-structured focus group discussions (FGDs) and in-depth interviews (IDIs) to explore Indonesia's BEV ecosystem from the perspectives of key stakeholders, including BEV manufacturers, government bodies, and supporting industries. These participants were selected to provide diverse insights into the challenges, opportunities, and policies influencing BEV adoption, production, and infrastructure development.

Data collection included two FGDs with stakeholders from the Indonesian Electric Vehicle Industry Association, Indonesia Battery Corporation (IBC), and an Indonesian battery manufacturer, as well as government representatives from the Ministry of Industry, Ministry of Energy and Mineral Resources, and the Indonesian Investment Coordinating Board (BKPM). In addition, three IDIs were conducted with two 4W BEV automakers and one 2W BEV manufacturer to address their concerns about data confidentiality. IDIs allowed them to share insights on production challenges, sales strategies, and policy impacts in a private setting. The guiding questions varied slightly by stakeholder group but generally focused on themes such as production readiness, investment climate, regulatory and policy support, and infrastructure development (see Table 1). For automakers and industry associations, questions addressed production capacity, competition, operational challenges, policy impacts, and 5-year outlooks. For battery companies and infrastructure providers, topics included battery supply chains, energy availability, marketing strategies, and regulatory needs. For ministries, questions explored upstream and downstream industrial readiness, government incentives, and ecosystem coordination. For the investment board, discussions focused on the ease of doing business and the investment climate for BEV-related projects.

All discussions took place in mid-2023. Due to the consistent and policy-focused nature of the responses, the research team relied on detailed session notes rather than verbatim transcripts. The analysis was conducted collaboratively through note comparison and group discussion to identify emerging patterns, converging views, and shared challenges across stakeholders. Because the results were relatively clear and aligned across participants, formal thematic coding and qualitative software were not employed. This pragmatic, note-based approach allowed us to distill actionable insights to complement the quantitative analysis.

3.2 Stated Preference Survey

3.2.1 Study Area and Data Collection

The stated preference (SP) survey focused on six provinces in Java Island: Banten, DKI Jakarta, West Java, Central Java, Yogyakarta, and East Java. Java was chosen for its economic significance, large population, and relatively advanced EV infrastructure, making it a conducive environment for BEV adoption. The island hosts 50% of Indonesia's population (BPS - Statistics Indonesia Sulawesi Utara Province, 2024) and accounts for over half of the country's vehicle stock, including 11.7 million cars and 74 million motorcycles (BPS - Statistics Indonesia, 2022).

Two separate surveys were conducted, one for 2W BEVs and another for 4W BEVs, each consisting of demographic questions and a stated preference experiment. The online surveys were distributed based on respondents' domicile to ensure geographic representation and were administered separately in the last quarter of 2023.

3.2.2 Questionnaire Design

The survey was designed to identify key product factors influencing BEV adoption through discrete choice analysis, a method used to model individual decision-making between discrete alternatives (Kroes and Sheldon, 1988; Louviere et al., 2000). This method captures purchasing behaviors in structured market conditions, where individuals make decisions based on a set of limited, distinct alternatives, reflecting real-world constraints such as financial considerations.

The questionnaire was structured into two main sections: (1) socio-demographic questions (e.g., age, gender, income), and (2) a stated preference (SP) experiment using discrete choice scenarios. The SP section presented respondents with a series of hypothetical vehicle choices to evaluate their preferences based on various vehicle attributes.

The vehicles included in the experiment were limited to BEV models available in Indonesia in 2023 that met the government's 40% minimum local content requirement—a condition for eligibility for purchase incentives. The 4W BEV alternatives included Hyundai, Wul-

Table 1. List of FGDs and IDIs participants

Institutional affiliations	Role	Discussion themes
Indonesia Investment Coordinating Board, Directorate General of Oil and Gas	Associate Expert of Investment Management	1. National investment climate for EV ecosystem 2. Bureaucratic challenges in investment procedures 3. Potential investment opportunities across the EV value chain
Ministry of Industry, Directorate General of Metal, Machinery, Transportation Equipment, and Electronics Industry	Senior Expert of Industry Mentor	1. Readiness of downstream EV industry infrastructure 2. Production capabilities in the downstream sector 3. Regulatory framework and policy effectiveness 4. Industrial climate for the downstream EV sector
Ministry of Energy and Mineral Resources	Head of the Electrical Survey and Testing Center	1. Readiness of upstream EV industry infrastructure 2. Production capabilities in the upstream sector (e.g., mining, processing) 3. Regulatory frameworks for the upstream industry 4. Policy instruments and government roles in the upstream EV sector
2W manufacturer 4W manufacturer (1) 4W manufacturer (2)	Sales and Marketing Manager Corporate Affairs Marketing and Business Development	1. Production readiness and capacity 2. Domestic and international competition in the EV industry 3. Operational and regulatory challenges 4. Government support needs 5. Investment climate for EV manufacturing 6. 5-year business outlook
Indonesia Battery Corporation	Vice President Business Development	1. Infrastructure readiness for battery production 2. Energy supply availability
Indonesian Electric Vehicle Industry Association	Marketing Director	1. Regulatory and incentive frameworks 2. Investment climate in battery production 3. Marketing and adoption strategies for EV-related tech

ing, and DFSK, alongside an internal combustion engine (ICE) vehicle and a "no purchase" opt-out option. For 2Ws, the BEV alternatives included Rakata, Selis, Viar, Volta, and Gesits, with a corresponding ICE and opt-out option.

The attributes included in the SP survey were selected based on their prominence in previous literature. These included: (i) purchase price (adjusted to reflect available incentives), (ii) driving range (on a full charge or tank), (iii) charging/refueling time (from empty to full), and (iv) operational cost. Operational cost refers to the fuel or electricity cost required to travel 40 kilometers. The distance of 40 kilometers was chosen as it reflects the average daily commute length of Jakarta citizens (Astutik, 2021). While specific commute data for other regions was unavailable, this benchmark provided a reasonable baseline. For 4W vehicles, this cost was expressed on a daily basis, while for 2W vehicles, it was presented as a weekly cost. The operational cost included only the energy consumption component (fuel or electricity) and excluded insurance or maintenance costs.

Additional attributes were incorporated to enhance relevance and reflect market realities. Battery capacity was included because it is directly related to range and is emphasized in BEV marketing campaigns. For Hyundai's EVs, which come in two distinct types, vehicle type was included as an attribute. Attribute values were primarily sourced from manufacturers' official specifications, with hypothetical values applied where necessary. The complete attribute levels are summarized in Table 2 (4W) and Table 3 (2W). The experimental design was developed using a D-efficient design assuming zero priors in the Ngene software. An example of the choice set generated from the Ngene was included in Appendix A.

3.2.3 Mixed Multinomial Model Estimation

In the initial stage, we conducted the analysis using a Multinomial Logit (MNL) model. However, this study ultimately adopts a Mixed Multinomial Logit (MMNL) model to further relax the Independence of Irrelevant Alternatives (IIA) assumption and to account for unobserved heterogeneity, thereby providing more reliable parameter estimates. The results of the MNL model are included in Appendix B for reference. Furthermore, the use of the MMNL model yields a higher log-likelihood and a higher adjusted Rho-squared compared to the MNL model, indicating a better overall model fit.

The MMNL model is notably flexible and capable of closely approximating any random utility model. MMNL is commonly utilized in policy analysis (Train, 2001). As a discrete choice framework, the mixed multinomial logit model includes both random parameters and error components (Sunitiyoso et al., 2025). This modelling framework accounts for random taste heterogeneity and unobserved correlations across alternatives by specifying both random parameters and error components (Belgiawan et al., 2025). From six attributes for 4W: price, range, battery capacity (EV) or fuel capacity (ICE), charging time (EV) or refueling time (ICE), daily cost, and type, the attribute of price was treated as generic random parameters (μ). While for

Table 2. Attributes and levels for 4W choice experiments

Attribute	Hyundai	Wuling	DFSK	ICE
Price (IDR million)	678; 748.5*; 819	222; 247.5*; 273.5	190; 210*; 230	160; 260; 560
Range (km)	384; 451*; 481	200; 250*; 300	180; 190*; 200	560; 580; 900
Battery capacity (kWh) or fuel capacity (L)	58; 65.3*; 72.6	17.3; 22*; 26.7	13.8; 15.3*; 16.8	35; 43; 80
Charging or refueling time (minutes)	18; 46; 300	120; 180*; 240	120; 135*; 150	5*; 7.5*; 10*
Daily cost (IDR thousand)	8; 12;16	4; 6; 8	4; 5.6; 7.2	30; 40; 50
Type	Prime; Signature	-	-	-

Note: Hypothetical numbers were marked with *

Table 3. Attributes and levels for 2W choice experiments

Attribute	Rakata	Selis	Viar	Volta	Gesits	ICE
Price (IDR million)	10, 12.55, 15.1	12,14*,15	14.5, 29.5*, 44.5*	11,26*,41*	20.9, 28.4*, 35.9*	18, 22.5, 26.5
Range (km)	60, 65, 70	40, 50, 60,	45*, 60, 75*	120,125,130	35*, 50, 65*	254, 257, 284
Battery capacity (kWh) or fuel capacity (L)	1.2; 1.872; 3.6	1.2, 1.44; 1.5	1.38, 1.44, 1.605	1.2; 1.38; 2.4	1.08*; 1.2*, 1.44	4.2, 4.85, 5.5
Charging or refueling time (minutes)	345*, 360, 375*	405*, 420, 435*	285*, 300, 315*	465*, 480, 495*	165, 180, 195	5,7.5,10
Weekly cost (IDR thousand)	4.457; 4.828; 5.2	6; 6.75; 7.5	5.6; 5.98; 8.32	2.6; 2.99; 11.96	4.3; 7.5; 9	41; 48; 53

Note: Hypothetical numbers were marked with *

2W, besides the price attributes that were treated as generic random parameters (μ). Range, battery capacity (EV) or fuel capacity (ICE), charging time (EV) or refueling time (ICE), and weekly cost are alternative specifics. To ensure theoretically consistent signs, a log-normal distribution was applied to the generic random parameter. In addition, error components (σ) were introduced for all four alternatives to account for potential unobserved heterogeneity not captured by the observed attributes.

The internal combustion engine (ICE) alternatives for two and four-wheeled vehicles were used as the reference category, and hence no alternative-specific constant (ASC) was estimated for it. ASCs were estimated for other alternatives: Hyundai, Wuling, DFSK, and an option out for 4W. Meanwhile, for 2W, there were Rakata, Selis, Viar, Volta, Gesits, and Option out. Model parameters were estimated using the maximum likelihood estimation method by using R Studio, incorporating 500 Modified Latin Hypercube Sampling (MLHS) draws per individual to simulate the distribution of random parameters.

4 RESULTS

4.1 Qualitative Analysis (Interviews and FGDs)

4.1.1 BEV Industry Ecosystem

FGD participants emphasized Indonesia's strong foundation for developing a BEV industry, given its long-standing automotive manufacturing history. However, challenges remain, particularly the lack of an electric powertrain industry and domestic battery pack production. As one of the world's largest nickel producers, Indonesia aims to leverage its nickel reserves by establishing nickel smelters to support local production of nickel-based battery packs for BEVs. The Indonesian Electric Vehicle Industry Association considered this strategy crucial for strengthening the industry. Despite the resources to produce both nickel-based and LFP batteries, the government advocates for nickel-based battery production. However, the association believes that LFP batteries are currently more profitable due to their high market value and relatively lower material costs.

As of mid-2023, only one company had begun battery cell production, with another expected to commence in 2024. According to IBC, local battery production could reduce BEV prices by up to 35%. However, IBC, a consortium of state-owned enterprises aimed at developing an integrated BEV battery industry, faces challenges in securing investment and building trust with automakers. IBC suspects automakers may be hesitant to procure batteries from them due to their new presence in the market, so they plan to partner with foreign manufacturers (LG and CATL). In the upstream sector, Indonesia had only one operational nickel smelter, with two to three more planned. BKPM identified smelters as a priority for investment, projecting that nine smelters would be required to fully optimize Indonesia's nickel reserves. Total investment needs for downstream mineral and coal industries are estimated at USD 431.8 billion by 2040.

At the time of the discussions, Indonesia only permitted the import of completely knocked-down (CKD) and incompletely knocked-down (IKD) vehicle components, though there were speculations that completely built-up (CBU) BEV imports might soon be allowed. Stakeholders had differing views on this potential policy change. Some automakers supported a policy like Thailand's, which allows CBU BEV imports to stimulate market growth, while others feared this would disadvantage local manufacturers by increasing competition from lower-priced Chinese imports, harming automakers that had invested in local production. Participants also acknowledged the lack of battery standardization as a major barrier to BEV adoption.

Standardization is crucial for infrastructure development and could reduce consumer charging anxiety. According to the association, "The lack of battery and charging standardization requires automakers to invest more in charging infrastructure, since some models are only compatible with the company's charging systems. If we had standardization, automakers could collaborate to create an effective network of charging infrastructure." The Ministry of Industry has included battery standardization in its upcoming regulatory plans. IBC identified battery swapping as a key strategy for addressing range anxiety and planned to establish 600 battery-swapping stations for 15,000 BEV 2Ws. However, the success of a battery-swapping network depends on battery standardization.

4.1.2 BEV Sales and Production Plan

The two 4W automakers participating in the FGD manufacture both ICE vehicles and BEVs. Their maximum production capacity ranges from 50,000 to 250,000 units per year, but BEV production currently utilizes only up to 30% of this capacity. Transitioning a production line from ICE to BEV requires an investment of IDR 10–20 billion (USD 60,000–130,000). Meanwhile, the 2W BEV manufacturer in the FGD reported a maximum production capacity of 48,000 units per year. However, actual production remains at just 30% of this capacity due to low market demand.

A major barrier to reducing BEV production costs lies in the underdeveloped supply chain and the high battery cost. At the time of the meetings, batteries accounted for approximately 30% of the total cost of a 2W BEV and 40–50% of a 4W BEV. Local battery pack production remains limited, forcing manufacturers to rely on imports from China. However, importing batteries presents its own challenges. Batteries cannot be shipped together with other vehicle components. Chinese customs require an "Export Inspection Result Certificate for Dangerous Goods Packaging", which manufacturers report takes longer than expected, leading to production delays. By contrast, importing CKD or IKD kits is more efficient, as the required permits from Indonesia's Ministry of Industry are typically issued within three to four weeks.

Regarding sales strategies, most automakers have set conservative targets for local sales due to uncertainties in market readiness. However, they plan to introduce new models that better align with Indonesian consumer preferences, particularly SUVs and vehicles priced around IDR 200–300 million. Recognizing the critical role of charging infrastructure in BEV adoption, 4W automakers have already integrated charging station development into their long-term plans. Competition is another pressing concern. Automakers that have localized production expressed concerns about the increasing presence of Chinese BEV brands, which can offer lower-priced models.

In the 2W segment, manufacturers have started adopting the Battery-as-a-Service model, where consumers pay a monthly subscription fee for battery usage, helping lower the upfront cost of BEVs. Currently, only the 2W BEV manufacturer in the FGD has exported BEVs, targeting markets in Africa and South Asia.

4.1.3 Policy Response

To attract investment in the BEV sector, BKPM introduced policies to ease business operations and reduce financial burdens on investors. These include simplified permits and tax holidays for investments over IDR 1 billion. IBC also highlighted various government incentives supporting BEV production, such as tax holidays, a 30% tax reduction based on investment value, and up to six years of import duty exemptions for machinery and raw materials used in BEV manufacturing.

Beyond financial incentives, BKPM proposed strategies to strengthen the local BEV ecosystem, including banning raw commodity exports, applying export duties on raw materials, and subsidizing downstream sectors. The government also plans to reduce mining royalties for downstream producers to attract investment. State-owned banks have been encouraged to relax credit requirements for domestic investors, including lowering minimum initial equity. Another key strategy is acquiring foreign technology licenses to accelerate domestic innovation through triple-helix collaboration between government, universities, and the private sector. The Ministry of Industry also plans to exempt CKD and IKD component imports from duties to lower production costs.

From automakers' perspective, the most influential policies on BEV sales are purchase incentives and ICE disincentives. In mid-2023, purchase incentives were only partially implemented, causing consumer uncertainty and delaying purchases. One automaker noted: “We have received numerous requests for sales postponement from prospective buyers, indicating that they are aware of the government incentives and wish to wait until they are implemented. This impedes our sales and finances.”

Automakers also raised concerns about the incentive disbursement process, especially who bears the subsidy cost before government reimbursement. For 2W BEVs, the incentive is deducted upfront, requiring automakers to temporarily cover the cost, unlike 4W BEVs, where incentives do not directly affect final prices. Two different ministries (Industry and Energy and Mineral Resources) offered incentives for 2W BEVs. The Ministry of Industry focused on new BEV purchases, while the Ministry of Energy and Mineral Resources supported ICE-to-electric conversions.

Regarding ICE disincentives, automakers noted existing policies are limited to certain local areas where ICE vehicles are banned on specific roads. There is no national-level disincentive policy. Automakers expressed strong support for expanding these measures, including carbon taxes on ICE manufacturers and reducing gasoline subsidies, to further encourage BEV adoption.

Another concern was the implementation of Presidential Instruction No. 7 Year 2022, which mandates central and regional government agencies to shift their operational fleets to BEVs. However, unclear demand estimates and opaque procurement processes have created uncertainty. Stakeholders stressed that clearer guidelines and strategies are needed to help manufacturers plan investment and production more effectively.

4.2 Quantitative Analysis

4.2.1 Respondent Profile

The survey targeted individuals over age 25 and from the middle economic class (income > IDR 2,700,000 or USD 173), as they are most likely to afford BEVs. Proportional sampling across six provinces resulted in 680 valid responses per survey (2W and 4W), totaling 5,440 observations each (see Table 4).

Table 4. Java island population number and study sample size

Provinces	Total Population (Thousands)	Population Proportion	Sample Size		
			4W	2W	Proportion
DKI Jakarta	10,680	6.92%	47	47	6.91%
Banten	12,252	7.94%	54	54	7.94%
West Java	49,405	32.02%	218	218	32.06%
Central Java	37,032	24%	163	163	23.97%
East Java	41,150	26.67%	181	181	26.62%
Yogyakarta	3,761	2.44%	17	17	2.5%

Table 5 shows respondents’ general sociodemographic characteristics. Females comprised 59.1% of 2W and 60.3% of 4W participants. Income distributions were similar, though slightly fewer high-income (IDR 6.5+ million) individuals were in the 2W group. Most respondents were full-time workers.

4.2.2 MMNL Results for 4W

For the 4W choice experiment, ICE vehicles were used as the reference category. As shown in Table 6, the alternative-specific constants (ASCs) for Hyundai and Wuling were positive and statistically significant, indicating a general preference for these BEV brands over ICE vehicles, all else being equal.

Among the attributes, the purchase price was significant with a negative mean coefficient and a significant standard deviation, suggesting that higher prices reduced utility and that there was substantial heterogeneity in price sensitivity across respondents. In terms of capacity, only ICE vehicles showed a significant and positive effect, suggesting that larger fuel capacity was associated with higher utility. For BEVs, battery capacity was not significant. However, the range was positively significant for both Hyundai and ICE vehicles, indicating that a greater range increased the likelihood of being chosen.

Charging time was significant and negative for both Hyundai and Wuling, reflecting lower utility associated with longer charging durations. Daily operating cost was negatively associated with utility for DFSK and Hyundai, further reducing choice likelihood for higher-cost options. The vehicle type variable comparing Hyundai Prime (reference) to Signature showed a significant negative coefficient, indicating a preference for the more affordable Prime variant.

Finally, the standard deviation estimates (σ) for all alternatives were statistically significant, confirming the presence of unobserved heterogeneity in preferences across respondents for each vehicle option.

Table 5. Sociodemographic statistics of the respondents

Variable	4W		2W	
	N	%	N	%
Gender				
Male	278	40.9	270	39.7
Female	402	59.1	410	60.3
Monthly Income				
IDR 2,700,000–3,400,000	132	19.4	174	25.5
IDR 3,400,001–4,600,000	196	28.8	191	28
IDR 4,600,001–6,500,000	185	27.2	193	28.38
More than IDR 6,500,000	167	24.5	123	18
Occupation				
Student	4	6	102	15
Full Time	350	51	311	46
Part Time	57	8	52	8
Entrepreneur	74	11	64	9
Freelance	55	8	32	5
Housewife	79	12	108	16
Not Working	25	4	11	2

4.2.3 MNL Results for 2W

In the 2W choice experiment, ICE was set as the reference category. As shown in Table 7, all BEV alternatives exhibited positive and significant alternative-specific constants, indicating a baseline preference for electric two-wheelers over ICE models.

The purchase price coefficient was negative and statistically significant for both the mean and standard deviation, indicating that respondents preferred more affordable vehicles and that there was substantial heterogeneity in price sensitivity.

As with the 4W model, fuel capacity was only significant for ICE. For BEVs, battery capacity was only marginally significant for Viar, but with a negative sign, which may reflect trade-offs associated with larger batteries, such as added weight or cost.

Drivable range was positively significant for Gesits and Selis, suggesting that longer ranges increased utility for these models. However, range was not significant for ICE, in contrast to the 4W findings. Charging time was only significant for Rakata, with a negative coefficient indicating a lower preference for longer charging durations. Weekly cost was negatively associated with utility for Rakata, Viar, Gesits, and Volta, consistent with economic expectations, but was not significant for ICE and Selis.

Finally, the alternative-specific standard deviation parameters (σ) were all significant, indicating considerable unobserved preference heterogeneity across respondents for each vehicle type.

5 DISCUSSION

This study integrates quantitative and qualitative insights to uncover both aligned concerns and divergent perspectives between consumers and supply-side stakeholders in Indonesia's BEV market. As visualized in Figure 1, both sides agree that affordability, operational costs, and charging infrastructure are central to BEV adoption. However, key divergences exist: stakeholders emphasize technological upgrades and policy clarity, while consumers often show limited sensitivity to such improvements and are more responsive to financial factors like purchase price and operational cost. This framework illustrates the need for policies and industry strategies that not only address infrastructure and cost concerns but also bridge perception gaps between supply and demand.

5.1 Charging Infrastructure and Battery Standardization

The MMNL results indicate that charging time is a significant negative factor influencing the likelihood of choosing certain 4W BEVs. However, this effect is not consistent across all brands. Charging time was significant for Hyundai and Wuling, suggesting that respondents are sensitive to longer charging durations when evaluating these relatively higher-priced models. In contrast, charging time was not significant for

Table 6. MNL model estimation for 4W

Variable	Beta value	Rob t-test	Sig
ASC Hyundai	4.389	4.104	**
ASC Wuling	4.452	5.555	**
ASC DFSK	3.187	1.545	
ASC ICE	0.000	-	
ASC None (Opt-out)	-6.911	-3.692	
σ Hyundai	-2.866	-11.923	**
σ Wuling	-1.659	-7.720	**
σ DFSK	2.693	10.277	**
σ ICE	2.680	7.887	**
σ None (Opt-out)	5.048	5.826	**
Battery capacity DFSK	-0.001	-0.105	
Battery capacity of Hyundai	0.000	0.847	
Fuel capacity ICE	0.009	2.485	**
Battery capacity Wuling	0.000	-0.346	
Charging time DFSK	-0.002	-1.129	
Charging time Hyundai	-0.002	-5.167	**
Charging time Wuling	-0.002	-4.413	**
Fueling time ICE	-0.001	-1.725	*
Purchase Price	-0.001	-1.637	*
Purchase Price_s	-0.002	-3.386	**
Daily cost DFSK	-0.192	-4.199	**
Daily cost Hyundai	-0.044	-3.043	**
Daily cost ICE	-0.005	-0.638	
Daily cost Wuling	-0.077	-2.604	**
Range DFSK	0.003	0.360	
Range Hyundai	0.005	3.881	**
Range ICE	0.002	3.357	**
Range Wuling	0.001	1.252	
Hyundai type	-0.194	-2.111	**
Model fit			
Number of observations		5440	
Init log likelihood		-8755.34	
Final log likelihood		-4304.97	
Rho-square		0.330	
Adjusted Rho-square		0.326	

Note: ** significant at 95% confidence level;
* significant at 90% confidence level

Table 7. MNL model estimation for 2W

Variable	Beta value	Rob t-test	Sig
ASC Rakata	14.624	3.307	**
ASC Selis	8.958	1.919	*
ASC Viar	16.725	2.968	**
ASC Volta	18.131	2.119	**
ASC Gesits	9.016	2.216	**
ASC ICE	0.000	NA	
ASC None (Opt-out)	-2.168	-0.404	
σ Rakata	-1.939	-8.131	**
σ Selis	-1.417	-3.627	**
σ Viar	2.653	12.769	**
σ Volta	-2.771	-15.269	**
σ Gesits	4.283	11.630	**
σ ICE	4.977	10.250	**
σ None (Opt-out)	-4.890	-2.872	**
Battery capacity Rakata	0.001	0.123	
Battery capacity Selis	0.000	-0.144	
Battery capacity Viar	-0.130	-1.709	*
Battery capacity Volta	0.001	0.537	
Battery capacity Gesits	-0.002	-0.722	
Fuel capacity ICE	0.563	2.451	**
Charging time Rakata	-0.007	-1.809	*
Charging time Selis	-0.002	-0.426	
Charging time Viar	-0.013	-1.396	
Charging time Volta	-0.010	-1.073	
Charging time Gesits	-0.002	-0.301	
Fueling time ICE	0.090	1.462	
Purchase Price	-0.038	-7.736	**
Purchase Price_s	-0.065	-7.558	
Range Rakata	-0.009	0.733	
Range Selis	0.019	2.324	**
Range Viar	-0.002	-0.426	
Range Volta	-0.024	-0.848	
Range Gesits	0.013	2.420	**
Range ICE	0.007	0.738	
Weekly cost Rakata	-0.446	-2.740	**
Weekly cost Selis	-0.037	-0.416	
Weekly cost Viar	-0.100	-1.923	*
Weekly cost Volta	-0.058	-4.496	**
Weekly cost Gesits	-0.121	-3.701	**
Weekly cost ICE	-0.024	-1.052	
Model fit			
Number of observations		5440	
Init log likelihood		-9251.72	
Final log likelihood		-5776.22	
Rho-square		0.375	
Adjusted Rho-square		0.372	

Note: ** significant at 95% confidence level;
* significant at 90% confidence level

DFSK, possibly because its lower price point may have led respondents to adjust their expectations and become more tolerant of longer charging times.

For 2W BEVs, the charging time was only significant for Rakata. This may be attributed to its relatively long charging duration (345–375 minutes) combined with a modest battery capacity (1.2–3.6 kWh), which makes the charging efficiency appear less favorable. By comparison, Gesits offers faster charging (165–195 minutes) while having a similar battery capacity range (1.08–1.44 kWh), potentially making it more acceptable to respondents.

These findings align with previous studies in Indonesia, which emphasize the role of charging duration in influencing consumer decisions to opt for BEVs over ICE vehicles (Guerra, 2019; Choi et al., 2022; Institute for Essential Services Reform, 2023; Belgiawan et al., 2024; Sasongko et al., 2024). Sasongko et al. (2024) argued that price alone is not the primary barrier to EV adoption; rather, it is the high cost of EVs equipped with fast-charging capabilities.

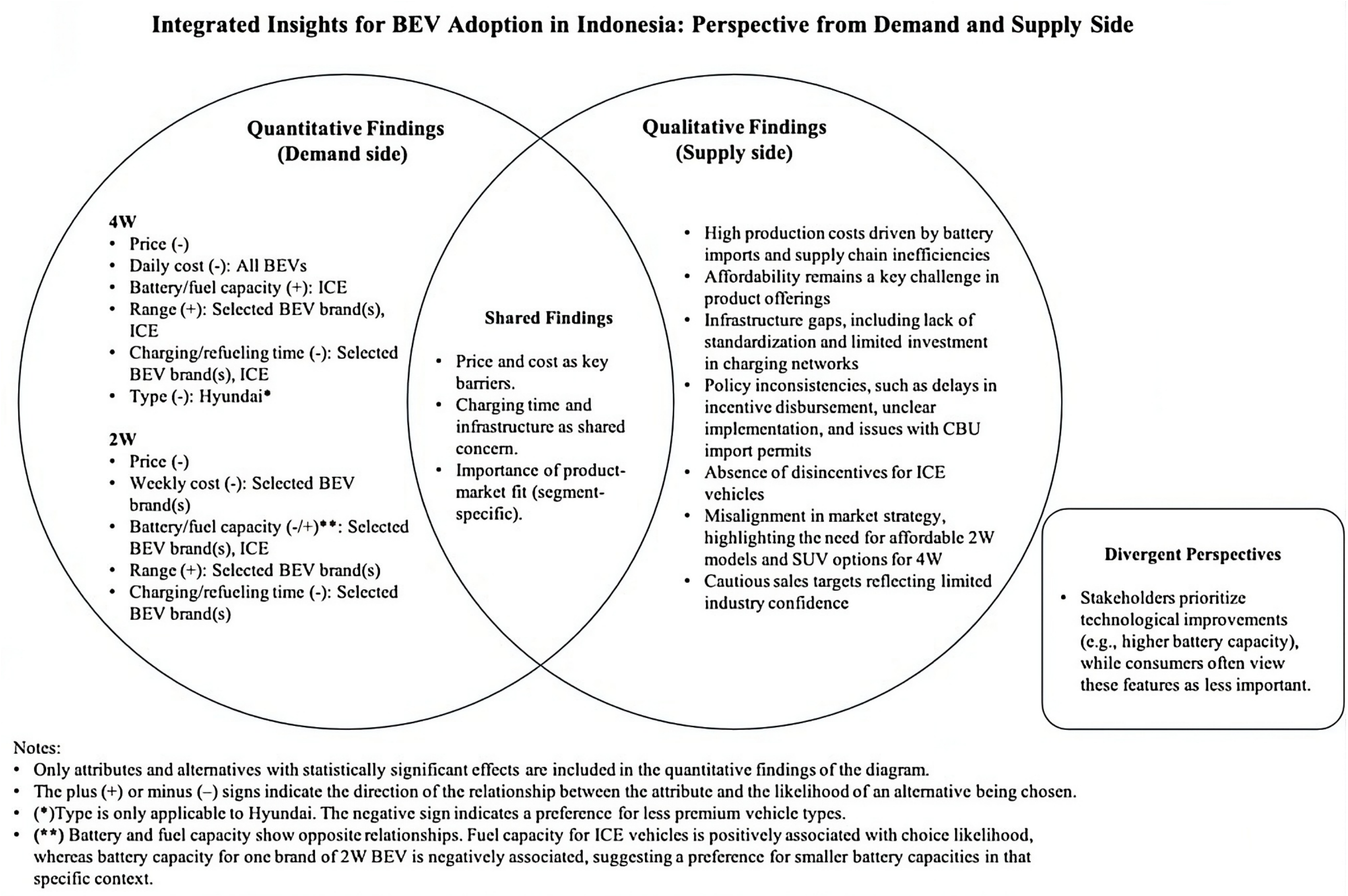

Figure 1 Integrated Insights for BEV Adoption in Indonesia

Given the importance of charging time, fast-charging capability, and station availability could boost BEV interest. Fast-charging technologies remain inaccessible for some of the affordable BEVs in Indonesia, and infrastructure development is still in its early stages, with a lack of battery standardization as a barrier. Consequently, ICE vehicles remain more appealing due to quick refueling and gas station availability, reducing anxiety associated with locating a charging station for BEVs.

Fast-charging improves the convenience of using BEVs, making it a key driver of adoption. Wang, Li et al. (2017) found that convenience-oriented policies had a strong impact on EV adoption. Therefore, Indonesian policymakers should prioritize measures that address charging-related concerns, including reducing charging duration through technological advancements, expanding the proliferation of fast-charging stations and battery-swapping networks, implementing battery standardization, as well as promoting the development of affordable BEV models equipped with fast-charging capabilities.

5.2 Affordability and Financial Incentives

BEV affordability depends on acquisition and operational costs. The quantitative study found operational cost significant for both 2W and 4W BEVs; these results are in line with the previous studies in Indonesia (Guerra, 2019; Febransyah, 2021; Choi et al., 2022; Institute for Essential Services Reform, 2023; Belgiawan et al., 2024; Sasongko et al., 2024) and internationally (Helveston et al., 2015; Miwa et al., 2017; Kongklaew et al., 2021; Mandys, 2021). Moreover, there is a stronger preference for the less expensive Hyundai model, as evidenced by the significance of vehicle type in 4W BEV, in addition to its lower acquisition and operational costs.

Similar to results from quantitative analysis, qualitative insights highlight that lowering BEVs prices effectively boosts adoption. Stakeholders agreed that government incentives stimulate sales, though partial implementation and unclear procedures hinder effectiveness. However, financial incentives without ICEV disincentives may yield only temporary effects (Yu et al., 2018). Without sustained incentives, consumers are likely to revert to ICEVs once the incentives are removed. This finding underscores the importance of complementing financial incentives with disincentives for ICEVs, such as introducing a carbon tax or reducing fossil fuel subsidies to reflect the true total cost of ICEV ownership. Such measures could create a more sustainable shift toward BEV adoption, aligning with Sasongko et al. (2024).

However, implementing nationwide ICEV disincentives may face significant challenges. Sasongko et al. (2024) noted government reluctance to disrupt the ICEV industry due to its economic contributions. Thus, a gradual and strategic approach to policy implementation to balance economic concerns with environmental and energy transition goals is necessary. While several regions have already introduced ICEV disincentives at the local level, these measures should be expanded and standardized at the national level to ensure consistency and effectiveness across the country.

Lower BEV prices can also result from reduced battery costs via local production (Pandyaswargo et al., 2021). Indonesia's plan to produce nickel-based batteries locally is a step in the right direction. Still, automakers are exploring lower-cost materials like LFP (lithium iron phosphate) or LMO (lithium manganese oxide) for their vehicles. According to the FGDs and a study by Pandyaswargo et al. (2021), Indonesia possesses an abundance and diversity of raw materials suitable for producing lower-cost battery chemistries. Thus, exploring alternative materials may be a worthwhile strategy.

5.3 Consumer Preferences and Market Dynamics

The quantitative results indicate that several adoption factors beyond charging time, purchase price, and operational cost influence BEV choices across vehicle types. While fuel capacity and driving range were significant for 4W ICE vehicles, which reflects their typical use for longer intercity travel, range also emerged as a significant factor for Hyundai and some 2W BEV brands. This suggests that although BEVs are generally used for shorter, urban-oriented trips (Jensen and Mabit, 2017; Sasongko et al., 2024), range anxiety may persist for certain BEV consumers and brands. This overlap in significance calls for a more nuanced understanding of how BEVs and ICEVs are actually used in daily life, especially across different consumer segments and regions.

For 2W vehicles, fuel capacity remained a significant factor for ICE motorcycles, supporting the finding for ICE 4Ws. Interestingly, battery capacity for Viar emerged as a significant but negative factor. This may be attributed to Viar's association with battery swapping capabilities, where larger battery capacity is perceived as heavier and less convenient for frequent swaps, thereby reducing its attractiveness to consumers.

To address the diverse preferences and market dynamics identified in this study, policymakers and stakeholders should adopt a multi-pronged approach to accelerate BEV adoption in Indonesia. Aside from previously mentioned recommendations of reducing charging anxiety and lowering BEV's price through various policies and strategies, the stakeholders should consider understanding the unique use case of 2W and 4W BEVs across different segment groups. Moreover, having tailored marketing strategies to target different demographic segments might be beneficial for BEV adoption. Consistent with this recommendation, findings from the qualitative study highlight the importance of aligning BEV offerings with consumer preferences, such as providing more affordable models for 2W users and prioritizing SUV-type models for 4W buyers.

5.4 Policy Implementation and Industry Collaboration

Stronger policy support is essential to enhance Indonesia's BEV ecosystem. While stakeholders acknowledge government initiatives like battery localization and purchase incentives, they emphasize the need for better implementation. Moreover, Presidential Instruction No. 7 of 2022 could accelerate BEV market growth by facilitating government procurement of locally produced BEVs. This would create an early market, providing automakers with stable revenue to reinvest in technology and promotion.

Collaboration between automakers, the government, and supporting industries is also crucial for addressing infrastructure and standardization challenges. The collaboration could be expediting battery standardization regulations that would help build a more cohesive BEV ecosystem, overcoming adoption barriers and ensuring long-term market growth. In addition, charging port standardization plays a key role in enhancing both user experience and infrastructure efficiency. For consumers, it eliminates the need for additional adaptors and allows for seamless charging at any station without compatibility concerns. For charging service providers, such standardization reduces procurement and maintenance costs, as only a single port type needs to be installed, and improves scalability by enabling infrastructure to serve multiple vehicle brands.

6 CONCLUSION

This study examined the factors influencing BEV adoption in Indonesia by integrating insights from key stakeholders with consumer preference data obtained through a stated choice experiment. The research aimed to investigate how product-related attributes and policy interventions shape consumer choices in both the 2W and 4W BEV markets. Despite the Indonesian government's ambitious targets and various incentive schemes, BEV uptake remains significantly below expectations.

The findings highlight that purchase price and operational cost are consistently important across BEV segments, underscoring affordability as a key driver of adoption. On the supply side, stakeholders expressed concerns about high production costs and emphasized the urgency of accelerating local battery production to reduce dependence on imports. Charging infrastructure availability and charging time also emerged as critical factors, reinforcing the need for convenience-oriented policies such as fast-charging network expansion and battery standardization. Interestingly, the insignificance of range and battery capacity for most BEV brands suggests that consumers may have distinct use cases or expectations for BEVs. In response, several automakers have acknowledged the need to align better with market preferences.

This study contributes to the growing literature on sustainable mobility transitions by distinguishing the drivers of BEV adoption in an emerging economy context. Unlike many prior studies that focus solely on consumer-related factors or aggregate EV types, this research offers a nuanced understanding of BEV adoption by segmenting 2W and 4W preferences and triangulating these with insights from key institutional and industrial stakeholders. Methodologically, the study demonstrates the value of integrating qualitative stakeholder perspectives with discrete choice modeling to capture both supply- and demand-side dynamics. This mixed-methods approach offers a richer understanding of the structural and behavioral barriers to BEV adoption. As for policy contributions, the study emphasizes the importance of enforcing government procurement mandates (e.g., through Presidential Instruction No. 7/2022), supporting battery standardization, and local battery production to reduce BEV costs in the long term. The lessons from Indonesia's experience could be transferred to other emerging markets or countries with low BEV uptake, particularly those facing similar challenges such as price sensitivity, infrastructure gaps, or dominant motorcycle usage.

Like any empirical study, this research has several limitations that should be acknowledged to contextualize its findings and inform future work. First, the qualitative component did not involve formal thematic coding or inter-coder reliability procedures. While key themes were derived from detailed notes and team-based analysis, future studies could benefit from applying more structured qualitative methods, such as formal coding frameworks and reliability checks, to enhance analytical rigor and reproducibility. Expanding the range of qualitative participants and triangulating data across methods (e.g., in-depth interviews, focus groups, and document analysis) could also yield a more holistic understanding of BEV adoption dynamics.

Second, as with other SP studies involving emerging technologies, there is a risk that respondents' limited familiarity with BEVs may have influenced their interpretation of key attributes, such as charging time and driving range. While SP methods are well-suited for early-market contexts where revealed preference (RP) data are scarce, future research could combine SP and RP approaches to more accurately reflect actual market behavior and validate preference patterns.

Third, this study did not examine the role of socio-demographic variables in shaping BEV preferences. Future studies could integrate socio-demographic segmentation to uncover how preferences differ across population subgroups.

Lastly, the Indonesian BEV market has evolved rapidly during this study, with several new 2W and 4W models introduced. Future research should update the design to include a wider set of vehicle brands and models as the market matures. Additionally, incorporating HEVs and PHEVs into the choice set would allow for a more comprehensive analysis of consumer preferences across the full spectrum of low-emission vehicle technologies.

DISCLAIMER

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

No supplementary materials are provided for this study. The data used in this research are not publicly available due to data ownership and confidentiality agreements.

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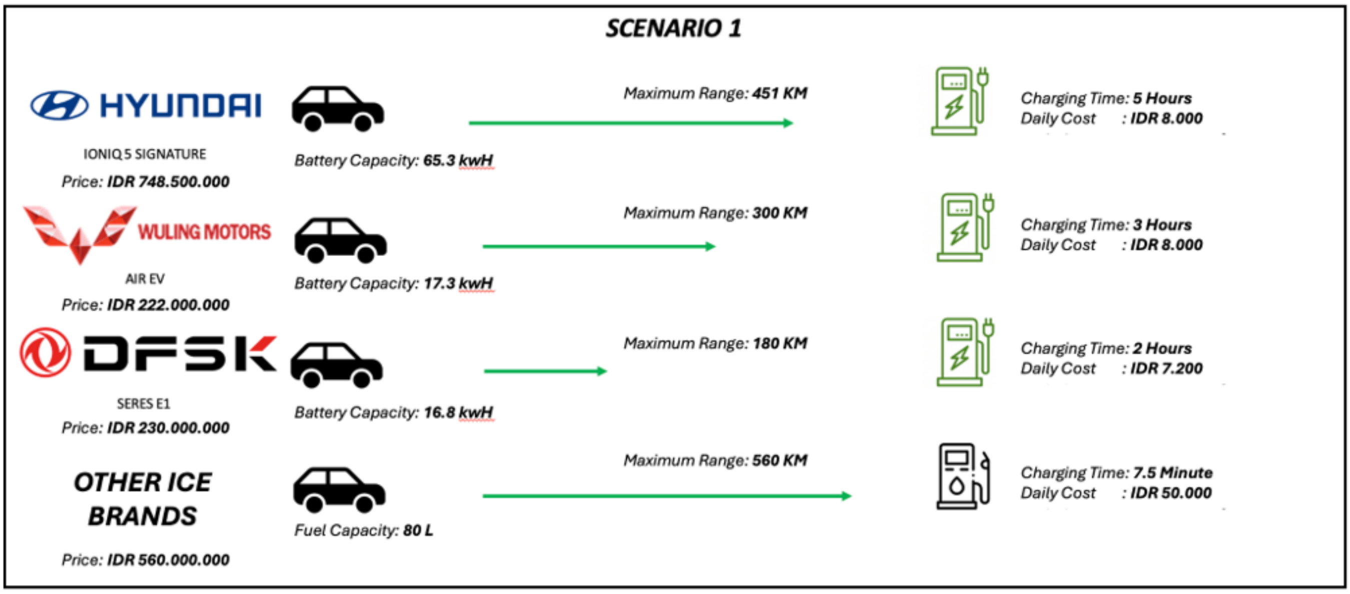
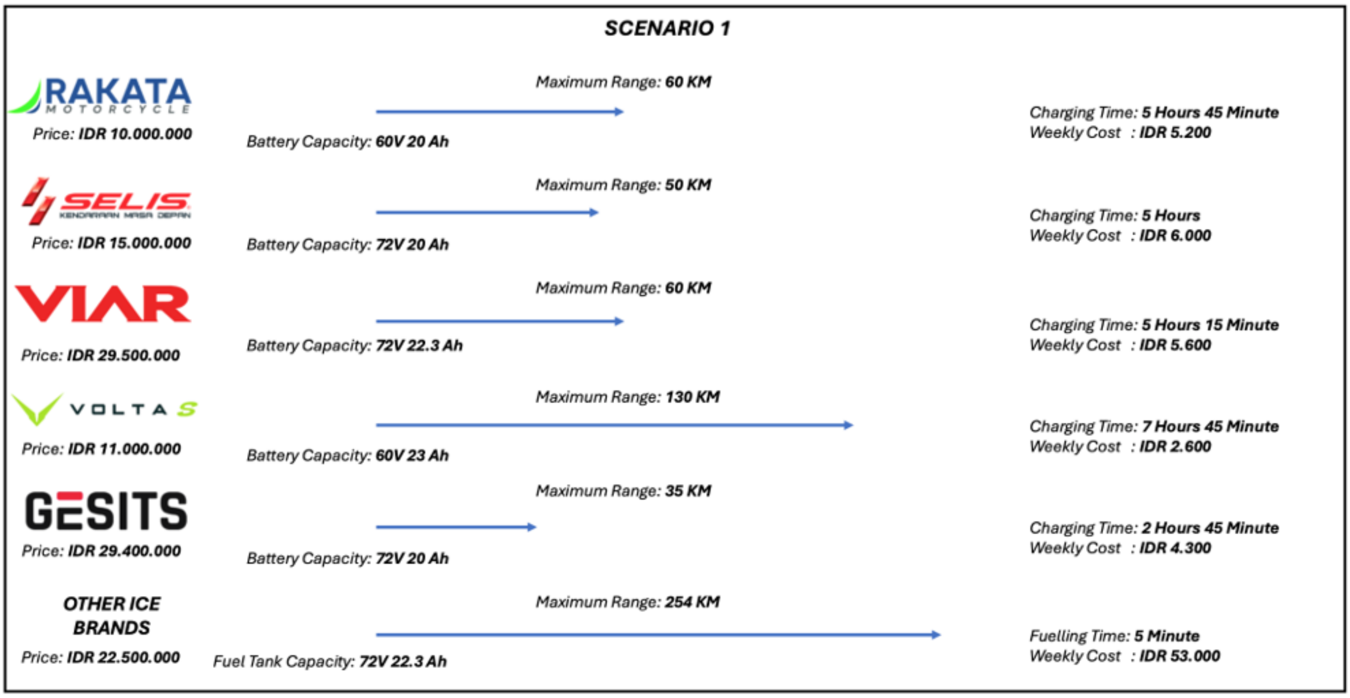
APPENDIX A

Choice Set Example for 4W



Choice Set Example for 2W



APPENDIX B

MNL Results for 4W

Variable	Beta value	Rob t-test	Sig
ASC Hyundai	-	-	
ASC Wuling	-1.420	-0.930	
ASC DFSK	1.210	0.406	
ASC ICE	-3.390	-2.190	**
ASC None (Opt-out)	-5.190	-3.630	**
Battery capacity DFSK	-0.004	-0.977	
Battery capacity Hyundai	0.000	-0.207	
Fuel capacity ICE	0.007	2.600	**
Battery capacity Wuling	0.000	-0.145	
Charging time DFSK	-0.001	-0.810	
Charging time Hyundai	-0.001	-3.510	**
Charging time Wuling	-0.001	-3.290	**
Fueling time ICE	-0.001	-1.320	
Purchase price DFSK	-0.004	-1.230	
Purchase price Hyundai	-0.001	-0.917	
Purchase price ICE	0.000	-1.330	
Purchase price Wuling	0.001	0.672	
Daily cost DFSK	-0.103	-3.240	**
Daily cost Hyundai	-0.020	-1.900	*
Daily cost ICE	-0.003	-0.426	
Daily cost Wuling	-0.036	-1.610	
Range DFSK	-0.005	-0.636	
Range Hyundai	0.001	0.871	
Range ICE	0.001	3.270	**
Range Wuling	0.001	0.908	
Hyundai type	-0.151	-2.730	**
Model fit			
Number of observations		5440	
Init log likelihood		-8755.342	
Final log likelihood		-6385.681	
Rho-square		0.271	
Adjusted Rho-square		0.268	

Note: ** significant at 95% confidence level;
* significant at 90% confidence level

MNL Results for 2W

Variable	Beta value	Rob t-test	Sig
ASC Rakata	-	-	
ASC Selis	-2.200	-0.713	
ASC Viar	-1.140	-0.554	
ASC Volta	-3.070	-0.5430	
ASC Gesits	-4.560	-2.760	**
ASC ICE	-9.380	-2.910	**
ASC None	-8.280	-5.320	**
Battery capacity Rakata	-0.025	-0.725	
Battery capacity Selis	1.140	3.850	**
Battery capacity Viar	-0.216	-0.969	
Battery capacity Volta	0.059	1.300	
Battery capacity Gesits	0.069	0.283	
Fueling time ICE	0.263	1.710	*
Charging time Rakata	-0.006	-2.080	**
Charging time Selis	-0.003	-0.730	
Charging time Viar	-0.010	-2.640	**
Charging time Volta	-0.001	-0.151	
Charging time Gesits	0.001	0.459	
Fueling time ICE	0.036	1.090	
Purchase price Rakata	-0.045	-2.730	**
Purchase price Selis	-0.176	-4.170	**
Purchase price Viar	-0.008	-2.590	**
Purchase price Volta	-0.016	-6.330	**
Purchase price Gesits	-0.009	-1.440	
Purchase price ICE	-0.019	-1.020	
Range Rakata	-0.001	-0.139	
Range Selis	0.011	1.870	*
Range Viar	0.001	0.409	
Range Volta	-0.001	-0.065	
Range Gesits	0.002	0.685	
Range ICE	0.007	1.050	
Weekly cost Rakata	-0.331	-2.930	**
Weekly cost Selis	-0.155	-1.770	*
Weekly cost Viar	-0.039	-1.180	
Weekly cost Volta	-0.026	-3.540	**
Weekly cost Gesits	-0.038	-2.090	**
Weekly cost ICE	0.010	0.588	**
Model fit			
Number of observations		5440	
Init log likelihood		-8755.342	
Final log likelihood		-6385.681	
Rho-square		0.271	
Adjusted Rho-square		0.268	

Note: ** significant at 95% confidence level;
* significant at 90% confidence level