

Barriers on Electric Car Adoption Based on People's Perspective in DKI Jakarta

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Abstract

As one of the countries in Southeast Asia, Indonesia is making an energy transition in the transportation sector by using battery-based electric vehicles (BEV). The Indonesian government supports accelerating electric car use by issuing Presidential Regulation of the Republic of Indonesia Number 55 of 2019 concerning the Battery-Based Electric Motorized Vehicle Acceleration Program. The level of consumers buying electric cars is still low due to a lack of awareness about several aspects, including the economy, benefits, accessibility, and environmental concern. On the other hand, the relatively expensive purchase price of electric cars is a consideration or even an obstacle for people to switch to using electric cars. This study aims to understand which factors hinder the adoption of electric cars in DKI Jakarta. Using questionnaire method with probability sampling and cluster sampling research techniques based on cities in DKI Jakarta Province. Electric vehicle prices, infrastructure, and policies are the most important factors hindering electric car adoption in DKI Jakarta.

Keywords

DKI Jakarta, Electric Car, People's Perspective, Transition, Transportation

1. Introduction

The Paris Agreement, issued in 2015, aims to reduce emission levels. The growth rate of greenhouse gas emissions in Southeast Asia is second only to South Asia (Aleluia et al. 2022). The Indonesian government supports the acceleration of electric car use by issuing Presidential Regulation of the Republic of Indonesia Number 55 of 2019 concerning the battery-based electric motorized vehicle acceleration program (Presiden Republik Indonesia, 2019). The electric car market's ratio is still low compared to its planned usage and popularity (Tu and Yang 2019). The level of consumers buying electric cars is still low due to a lack of awareness about several aspects, including the economy, benefits, accessibility, and environmental concern (Almansour 2022).

On the other hand, the relatively expensive purchase price of electric cars is a consideration or even an obstacle for people to switch to using electric cars (Febransyah 2021). For example, the Hyundai Ioniq 5 released in Indonesia in 2022 (Waskita 2022) has a price of IDR 748,000,000 for the lowest type and IDR 859,000,000 for the highest type (PT. Hyundai Mobil Indonesia 2022). Based on (Kurniawan 2022), the purchasing power of cars in DKI Jakarta is around IDR 300 million. Comparing the number of cars purchased with prices around IDR 300 million, the Toyota All New Veloz (ICEV) of 7,626 units and the Wuling Air EV (BEV) of 4,799 units in 2022 (Gaikindo 2022). Based on the comparison, the number of conventional car sales is greater than the number of electric cars at the same price. It assumes that people prefer conventional cars over electric cars.

Previous research on electric vehicles was not specified in the DKI Jakarta area but is common throughout Indonesia. In addition, research only focuses on vehicle prices and existing policies without looking at external factors such as people's perspectives on electric cars. (Nizliandry 2020) discusses the cost of tax incentives, (Utami et al. 2022) discuss the implementation of electric vehicle policies to support energy security, (Marciano 2021) compare policies in several developed countries with existing policies in Indonesia, and (Prawesti 2022) discusses government efforts to address environmental issues through electric vehicles. The study (Raman et al. 2022) refers to the charging infrastructure. Therefore, this research is needed to understand which factors hinder the adoption of electric cars in DKI Jakarta.

1.1 Objectives

This study aims to understand which factors hinder the adoption of electric cars in DKI Jakarta so that they can assist the government and manufacturers in accelerating the use of electric cars based on the Presidential Regulation of the Republic of Indonesia Number 55 of 2019.

2. Literature Review

The development of electric cars cannot be separated from the development of batteries. Beginning with Gustave Trouvé in 1881, who introduced electric-based three-wheeled vehicles. High production costs are a problem for selling electric cars (Høyer 2008). Apart from the price, the distance and charging time for electric cars are also factors inhibiting sales, which until now have not been fully resolved (Arnold Clark Automobiles 2017). In 2018, Tesla Motor launched its first electric car, Tesla Roadster. Tesla aims to produce battery-based electric vehicles (EVs) for the mass market that deliver good customer value guarantees, such as flexible and remote charging options, energy efficiency, low cost of ownership, and high performance without compromising design or functionality (Perkins and Murmann 2018). Hyundai has become a pioneer of electric cars in Indonesia since launching the Hyundai Ioniq in 2020 (Waskita 2022). However, the highest electric car sales in Indonesia in 2022, based on (Gaikindo 2022), are held by the Wuling car manufacturer with the Air EV type with total sales of 5,921 units. This is because car prices are much lower than Hyundai car prices (PT. Hyundai Mobil Indonesia 2022), (PT. SGMW Indonesia 2023).

Consumer adoption decisions are important to determine the actions of a wide range of choices (Jenkins and Hopkins 2019). Different perspectives of society are based on gender, age, finances, knowledge, and environment (Bergman et al., 2017). In addition, different perspectives on electric cars can hamper transitions, provide distractions, and even thwart them (Fuenfschilling and Truffer 2016). Usability, convenience, external influences, and conditions influence people's behavioral intentions and play a role in determining people's decisions to buy an electric car (Tu and Yang 2019). A rapid and comprehensive transition to electric cars will require various technological, economic, cultural, and behavioral changes in societal mobility (Sovacool et al. 2018). Combining efforts is needed at all scales (public institutions, companies, and individual actions) to achieve sustainable development goals (Puiu et al. 2022).

The Indonesian government has issued several regulations regarding electric cars. Such as Presidential Regulation Number 55 of 2019 about acceleration of the battery-based electric motorized vehicle program (Presiden Republik Indonesia 2019), Regulation of the Minister of Industry Number 6 of 2022 about domestic component level for specifications for calculation of battery-based electric cars, development roadmaps, and provisions (Menteri Perindustrian Republik Indonesia 2022a), Regulation of the Minister of Industry Number 7 of 2022 about battery powered electric motorized vehicles both in full and partial deconstruction (Menteri Perindustrian Republik Indonesia, 2022b), Government Regulation Number 74 of 2021 about changes in vehicle tax value (Peraturan Pemerintah Republik Indonesia 2019), Regulation of the Minister of Home Affairs Number 56 of 2020 about basic calculation of imposition of motorized vehicle tax and motorized vehicle title transfer fee (Menteri Dalam Negeri Republik Indonesia 2020), and Minister of Transportation Regulation Number 15 of 2022 about conversion of motorized vehicles other than motorcycles with fuel motors to battery-based electric motorized vehicles (Menteri Perhubungan Republik Indonesia 2022).

3. Methods

This study uses a quantitative method with a questionnaire, and the sampling method is probability sampling with cluster sampling research techniques based on cities in DKI Jakarta Province. Based on the existing literature, several factors hinder the adoption of electric cars in DKI Jakarta, including car prices (Tu and Yang 2019), income (Bansal et al. 2021), awareness of the environment (Zhang et al. 2011), technology (Wang et al. 2018), infrastructure (Ma et al. 2019), and government regulations (Utami et al. 2022). The influencing factors in this study are used as variables to understand the people's perspectives.

The population used is the population of DKI Jakarta Province, with a total of 10,562,088 people and produces a sample of 68. The research sample was obtained from the Isaac and Michael formula calculation results. The distribution of research samples can be seen in Table 1.

Table 1. Distribution of Research Sample

No	City	Population	Samples
1	Kepulauan Seribu	27,749	0
2	Jakarta Selatan	2,226,812	14
3	Jakarta Timur	3,037,139	20
4	Jakarta Pusat	1,056,896	7
5	Jakarta Barat	2,434,511	16
6	Jakarta Utara	1,778,981	11
Total		10,562,088	68

4. Data Collection

Data collection for electric car prices used secondary data obtained from the company's official website, while for people's perspective data on electric cars using a questionnaire with a Likert scale of 1 to 4, where a value of 4 means strongly agrees and a value 1 means strongly disagree. A questionnaire used to collect people's perspective data can be seen in Table 2.

Table 2. Research Questionnaire

Question	Sources
Domicile	(Dong et al. 2020), (Jung et al. 2021)
Job	
Number of electric cars owned	
Number of conventional cars owned	
Annual income	
The price of electric cars is relatively low	(Tu and Yang 2019)
Electric car costs are lower.	
I want to reduce the pollution generated by my vehicle.	(Wang et al. 2018), (Zhang et al. 2011)
Using an electric car is more environmentally friendly.	
The technology in electric cars is good.	(Bansal et al. 2021, (Ma et al. 2019)
The supporting infrastructure for electric cars in DKI Jakarta is good	(Ma et al. 2019)
Regulations for electric cars are good.	(Utami et al. 2022)

5. Results and Discussion

Electric car prices in DKI Jakarta vary and can be seen in Table 3 and demographics data in Table 4.

Table 3. Electric Car Prices in DKI Jakarta

Model	Price	Source
Hyundai Ioniq 5	IDR 748,000,000	(PT. Hyundai Mobil Indonesia 2022)
Lexus UX300e	IDR 1,240,000,000	(PT. Lexus Indonesia 2021)
Mini Electric	IDR 1,046,000,000	(PT. Plaza Auto Raya 2023)
Nissan Leaf	IDR 738,000,000	(PT. Nissan Motor Indonesia 2023)
Wuling Air EV	IDR 243,000,000	(PT. SGMW Indonesia 2023)
BMW i4	IDR 2,108,000,000	(BMW Indonesia 2023)
Mercedes-Benz EQE	IDR 2,215,000,000	(PT Mercedes-Benz Distribution Indonesia 2023)
Porsche Taycan	IDR 2,930,000,000	(Porsche Asia Pacific Pse Ltd 2023)

As we can see in Table 3 for electric car prices, the lowest one is Wuling Air EV at the price of IDR 243,000,000. Wuling Air EV is a type of city car that only can fit two people. On the other hand, if people in DKI Jakarta need an electric car that can fit more than two people, they have to pay much more (for example, Nissan Leaf, Hyundai Ioniq 5, or Mini Electric). Moreover, if people in DKI Jakarta want a luxury electric vehicle, they can choose between Lexus UX300e for an SUV, BMW i4 for a four-door coupé, and Mercedes-Benz EQE or Porsche Taycan for a four-door sedan.

Table 4. Demographics Data

Questions	Samples	Percentage
Domicile		
Jakarta Utara	11	16%
Jakarta Pusat	7	10%
Jakarta Timur	20	29%
Jakarta Barat	16	24%
Jakarta Selatan	14	21%
Job		
Private employees	37	54%
State-owned enterprises employee	10	15%
Government employee	14	21%
Teacher/Lecturer	2	3%
Entrepreneur	5	7%
Electric cars owned		
0	60	88%
1	8	12%
> 1	0	0%
Conventional cars owned		
0	12	18%
1	37	54%
> 1	19	28%
Annual income		
< IDR 50 million	13	19%
IDR 50 million – IDR 100 million	22	32%
IDR 100 million – IDR 150 million	15	22%
IDR 150 million – IDR 200 million	7	10%
> IDR 200 million	11	16%

Most respondents live in Jakarta Timur with a total of 20 people or 29% because the population in Jakarta Timur is the highest in DKI Jakarta with a total population of 3,037,139 people. In comparison, respondents who live in Jakarta Pusat are the lowest because the population of Jakarta Pusat is only 1,056,896 people. The people in the Kepulauan Seribu were deliberately not given a questionnaire because, based on sample calculations using the Isaac-Michael formula, there were 0 respondents.

Out of 68 respondents, 37 were private employees, with a percentage of 54% of all respondents. Fourteen people or 21% were civil servants, 10 people or 15% were state-owned enterprises (BUMN) employees, 5 people or 7% were entrepreneurs, and the lowest was teaching staff (teachers/lecturers) as many as 2 people or 2%.

Based on respondent data, the ratio of electric car ownership to conventional cars in DKI Jakarta is 1:7, with 8 respondents owning an electric car compared to 56 respondents owning a conventional car, where 37 respondents own one electric car and 19 respondents have more than one conventional car.

Most respondents' yearly income ranges from IDR 50 million to IDR 100 million with 22 people or 32%. The lowest annual income category is below IDR 50 million, with 13 people or 19% of respondents, while the highest annual income is above IDR 200 million, with 11 people or 16% of the total respondents.

Table 5. Questionnaire Data

Questions with a Likert scale (4 = strongly agree, 1 = strongly disagree)	4	3	2	1
The price of electric cars is relatively low	0	7	38	23
Electric car costs are lower	15	43	10	0
I want to reduce the pollution generated by my vehicle	15	50	3	0
Using an electric car is more environmentally friendly	19	41	7	1
The technology in electric cars is good	11	47	10	0
The supporting infrastructure for electric cars in DKI Jakarta is good	1	8	26	33
Regulations for electric cars are good	2	22	29	15

The research questionnaire uses a Likert scale of 1 to 4. Where a value of 1 means strongly disagree, 2 means disagree, 3 means agree, and 4 means strongly agree. Seven questions were generated based on the indicators used, including costs, awareness of the environment, technology, infrastructure, and policies.

Sixty-one respondents stated that the price of electric cars is still relatively high in contrast to the cost of fuel for electric cars, whereas 58 respondents stated that the cost of electric cars was relatively low. In the environmental awareness indicator, 65 respondents in DKI Jakarta want to reduce the pollution produced by their vehicles, and 60 respondents are aware that using an electric car is environmentally friendly. Fifty-eight respondents stated that the technology contained in electric cars was good. Based on 59 respondents, the supporting infrastructure for electric cars in DKI Jakarta could be better. According to 44 respondents, the policy regarding electric cars in DKI Jakarta is still considered unfavorable.

6. Conclusion

The Indonesian government supports accelerating electric car use by issuing Presidential Regulation of the Republic of Indonesia Number 55 of 2019 concerning the Battery-Based Electric Motorized Vehicle Acceleration Program. On the other hand, the level of consumers buying electric cars is still low due to a lack of awareness about several aspects, including the economy, benefits, accessibility, and environmental concern. Moreover, the relatively expensive purchase price of electric cars is a consideration or even an obstacle for people to switch to using electric cars. Using data collected from a few electric car manufacturers, we can see that the usual family car (Nissan Leaf and Hyundai Ioniq 5) costs twice the purchasing power of DKI Jakarta people. Based on the questionnaire distributed, the most hindering factor for people in DKI Jakarta was prices, followed by supporting infrastructure and regulations.

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