

Beyond the Marketing Hype: Analysis of Communication Campaigns of Electric Vehicles Eco-Friendly Image and Battery Waste Concerns

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Electric Vehicles (EVs) are gaining widespread attention for their environmentally friendly nature and potential to reduce air pollution. As non-renewable fossil fuels deplete, the need for sustainable alternatives like EVs becomes imperative. The EV market emphasizes the cost-effectiveness of electric fuel and extended travel range, despite the initial higher cost of purchasing an EV. In Indonesia, the government encourages EV adoption through subsidies and improved electric refuelling infrastructure, including exempting EV users from the odd-even vehicle license plate rule in Jakarta.

To promote EV adoption, brands employ diverse marketing strategies, urging customers to embrace EVs as agents of environmental change. However, the lack of transparency in how EV brands handle nickel-based battery waste, with a limited lifespan, raises environmental concerns. The accumulation of unusable batteries could pose soil pollution risks as EV usage grows. This research aims to explore the environmental implications of battery waste from EVs in Indonesia and analyze how EV brands address these concerns in their marketing communication campaigns.

Adopting a post-positivist paradigm, the study recognizes consumers' subjective views of EV eco-friendliness, shaped by marketing and limited battery waste knowledge. Qualitative research is utilized, drawing on various EV studies, facts about EV brand communication, and interviews with experts to provide a comprehensive analysis. Although battery waste might not be a pressing issue in Indonesia currently, inadequate waste handling raises potential future concerns about soil and water contamination. Addressing battery waste responsibly is crucial for promoting sustainable EV adoption.

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1. Introduction

The widespread discussions surrounding Electric Vehicles (EVs) stem from their reputation as more environmentally friendly alternatives that help reduce air pollution. Unlike conventional vehicles reliant on burning fossil fuels, EVs operate without producing carbon monoxide exhaust gas. This becomes particularly crucial given the finite nature of fossil fuel resources, which are expected to diminish over time. Furthermore, EV manufacturers consistently emphasize the cost-effectiveness and extended travel range of

EVs, despite the initial higher purchase price compared to conventional vehicles. To encourage EV adoption, the Indonesian government has implemented measures such as subsidies and the expansion of electric refuelling infrastructure. Additionally, EV users in Jakarta benefit from the exemption of the odd-even vehicle license plate rule, further motivating their uptake.

According to the Director-General of Land Transportation at the Ministry of Transportation, electric vehicles are seen as a projection of the future of transportation, contributing to cleaner and more environmentally friendly urban air quality (Dephub RI, 2021). To support the adoption of EVs, the Indonesian government has introduced subsidies to make them more affordable for consumers. These subsidies aim to reduce the initial cost of purchasing an EV and are administered by relevant government authorities or agencies. The Indonesian government has waived the Motor Vehicle Transfer Fee (BBN-KB) for electric vehicles, as stated in Governor Regulation (Pergub) No. 3/2020 (CNN Indonesia, 2022). This regulation specifically focuses on providing tax incentives for transferring motor vehicles with battery-electric technology for transportation in Jakarta.

Furthermore, EV users in Jakarta benefit from the exemption from the odd-even traffic rule, as stated in DKI Jakarta Governor Regulation Number 88 of 2019. This rule, a revised version of Governor Regulation 155/2018, allows EV owners to freely travel within the city, irrespective of the designated odd or even day based on their license plate number (CNN Indonesia, 2022). The Indonesian government has formalized these policies through various regulations. The conversion of motorcycles with internal combustion engines into battery-based electric motorcycles is regulated under the Ministry of Transportation Regulation (Permenhub) No. 65/2020 (Dephub RI, 2021). Additionally, the government has issued Presidential Regulation No. 22/2017 on the General Plan for National Energy, which includes policy regulations on EV development in Indonesia. Furthermore, Presidential Regulation No. 55/2019 was introduced to accelerate the implementation of battery electric vehicles (BEVs) in Indonesia (BKPM, 2021).

This situation has become a momentum for electric vehicle companies to take a leap forward in marketing their products. With increasing awareness of the negative impact of air pollution and the limited availability of fossil fuel resources, people are becoming more interested in transitioning to environmentally friendly electric vehicles. Electric vehicle manufacturers in Indonesia have recognized the immense potential of this shift and quickly adapted to seize the opportunity. They strive to create effective marketing strategies to attract consumer interest and promote the advantages of their electric vehicles. In their pursuit of success in an increasingly competitive market, they continue to develop innovations, improve product quality, and expand their distribution networks.

Facing these challenges, electric vehicle companies also understand the importance of creative and consumer-focused marketing approaches. They invest in in-depth market research to understand the needs and preferences of potential consumers. With a good understanding of the market, they can design relevant and effective marketing campaigns and provide excellent customer service. One of the strategies widely used by electric vehicle companies is highlighting the environmental advantages as a key selling point. They emphasize the fact that electric vehicles do not produce harmful exhaust emissions like carbon monoxide, thereby contributing to reducing air pollution and the impacts of climate change. Additionally, they also emphasize the operational advantages of electric vehicles in terms of lower costs and longer range, despite the higher initial price.

Currently, there are numerous EV brands that have started introducing their products in Indonesia. They strive to promote their brand, products, and advanced EV technologies through various methods such as displaying large-sized billboards strategically placed on major roads for easy visibility by potential consumers, placing advertisements in print media, television, and even endorsing content creators. They also maximize digital ads to ensure that the Indonesian society becomes more familiar with EV products and technologies.

In essence, the marketing communication teams of these EV brands convey campaigns emphasizing the technological advancements that can enable users to experience life in the future and serve as a solution to air pollution caused by carbon monoxide emissions from conventional vehicles. Consumers are encouraged to actively participate as agents of change in environmental preservation. The campaign regarding zero emissions is also highlighted and conveyed through various assets owned by EV companies, ranging from social media to official websites. The promotional materials are accompanied by information on the range capabilities achievable with EV batteries, which becomes increasingly convenient as the number of charging stations grows. The cost of charging an EV with electricity is comparatively cheaper than the cost of purchasing fuel for conventional vehicles.

EV brands constantly update the battery technology used in their vehicles, and currently, the majority of EV batteries are made of nickel and lithium. These minerals are arranged into battery panels, enabling them to store electrical power of up to 40 kWh. However, they do not clearly communicate to consumers that these batteries have limited lifespan and usage. According to Bhattacharjee (2021), on average, lithium-based batteries have a lifespan of 20 years. After that, EV owners need to perform maintenance by replacing some or all of the battery cells.

Currently, the amount of EV battery waste may not be a significant environmental concern, especially in Indonesia. However, if the number of EVs used continues to increase in the coming years, there is a concern that the battery waste will become mineral waste that can contaminate the soil and become a new problem resulting from the use of EVs.

When batteries can no longer be used due to their limited lifespan, there is a concern that they may become mineral waste that can contaminate the soil if not properly managed. In this case, EV brands do not provide detailed explanations of how they handle batteries that are no longer usable. We believe that consumers need to know this information in detail when considering their purchasing decisions. Sometimes, consumers are enticed by the marketing communication packaging of EV brands that highlight sustainability and zero emissions, and they may not fully realize that EV batteries can also become mineral waste that can harm the environment. This information can lead to the false promise of more value than can be delivered or wrongly persuade people to buy something they don't need or purchase unsafe and substandard products (Polonsky, 2001).

This research is important to be conducted by postgraduate students in the field of communication science with a concentration in marketing communication because it relates to campaigns as part of a brand's marketing communication strategy to effectively introduce their brand and products to the target market. We aim to analyze a marketing communication strategy from a different perspective by concerning the transparency of information provided by EV brands in introducing their products.

We have observed an issue regarding many prospective consumers of EV brands who have a limited understanding of the technical aspects related to EVs. When prospective consumers try to find reference information about EV brands through various mass media and other official platforms owned by an EV brand, most of the information provided focuses on the advantages and benefits derived from EV technology, particularly in relation to zero emissions and environmental friendliness.

This context intends to ensure that consumers receive comprehensive information on how EV brands manage the battery waste generated from their products. So far, EV brands have only focused on highlighting the environmental friendliness of their products and technologies with zero emissions. Prospective consumers are encouraged to become agents of change in environmental preservation, while the detailed management of battery waste is not clearly explained. Prospective consumers have the right to know this information as further considerations in deciding to purchase EV products.

From the perspective of EV brands, we hope that this research can serve as an evaluation to further enhance their commitment to environmental sustainability. They can

clearly and elaborately communicate how they manage battery waste through the 4R approach (Reuse, Refabricate, Resell, Recycle). By providing this information, we believe that consumers will be more confident in purchasing EV products and making a mass transition from conventional vehicles to EVs.

The novelty of the topic raised is related to the recent phenomenon of various stakeholders actively engaging in environmental preservation by transitioning from conventional vehicles to EVs. The EV phenomenon is not only extensively discussed in Indonesia but also an international issue that continues to be studied in both developed and developing countries. Such studies are continuously conducted to assess the extent to which EVs can serve as a solution to various environmental issues, such as worsening global warming and greenhouse gas effects.

2. Method

Qualitative research methods were employed in this study to gain a comprehensive understanding of the communication campaigns of electric vehicles' eco-friendly image and battery waste concerns. In-depth interviews served as the primary method used to collect rich and detailed insights from participants. The selection of participants involved purposeful sampling, ensuring representation from various stakeholder groups related to electric vehicles. This included electric vehicle owners, potential buyers, industry experts, policymakers, and environmental activists. The aim was to capture a diverse range of perspectives and experiences relevant to the research topic (Parveen & Showkat, 2017).

Semi-structured in-depth interviews were conducted with the selected participants. These interviews provided an opportunity to explore participants' perceptions, experiences, attitudes, and knowledge regarding communication campaigns and battery waste concerns associated with electric vehicles. These standards cover their expertise in the industry, experience with communication campaigns, understanding of environmental sustainability, research background, grasp of policies and regulations, familiarity with media and public relations, critical thinking abilities, a broad perspective across disciplines, accessibility and availability, and a commitment to neutrality and objectivity.

Considering these criteria, we interviewed three informants for specific reasons. First, Mr. Nugroho Adi Sasongko – Director of Research Center for Sustainable Production System and Life Cycle Assessment BRIN, an environmental expert with expertise in sustainable production systems and life cycle assessment, providing insights into the environmental impact of electric vehicles. Second, Fitra Eri – EV Consumer, Professional Race Car Driver, and Automotive Journalist, an individual with roles as an EV consumer, race car driver, and automotive journalist, offering a firsthand perspective on consumer experiences and insights into the automotive industry. Third, Jethro Ringo – Marketing Communications Representative from Nissan Motor Distributor Indonesia, a marketing communications professional within the automotive industry, focused on examining communication strategies used by major companies to promote the eco-friendly image of EVs and manage concerns related to battery waste. The interviews were conducted face-to-face, via video conferencing, or through telephone calls, based on participants' preferences and feasibility.

An interview guide was developed to ensure consistency and cover the key aspects of the research topic. The guide included open-ended questions that allowed participants to express their thoughts and experiences freely. However, the interviewer also had the flexibility to probe deeper into specific areas of interest or follow-up on emerging themes during the interview (Parveen & Showkat, 2017). To enhance the validity and reliability of the study, measures such as reflexivity were employed. The researcher engaged in reflection to acknowledge their own biases and assumptions that may have influenced the research process and findings. Peer debriefing and member checking were also used, involving discussions with colleagues and sharing findings with participants to validate interpretations and enhance the credibility of the study.

By utilizing qualitative research methods, particularly in-depth interviews, this study gathered rich and nuanced insights from diverse participants. The findings contribute to understanding the communication campaigns surrounding electric vehicles' eco-friendly image and battery waste concerns, offering valuable perspectives on public perceptions, attitudes, and awareness in this domain.

3. Results and Discussion

The results of this study were obtained by conducting in-depth interviews with 3 informants from different related occupational backgrounds. From the interviews and accumulated data, we have organized them within the framework of research findings as follows:

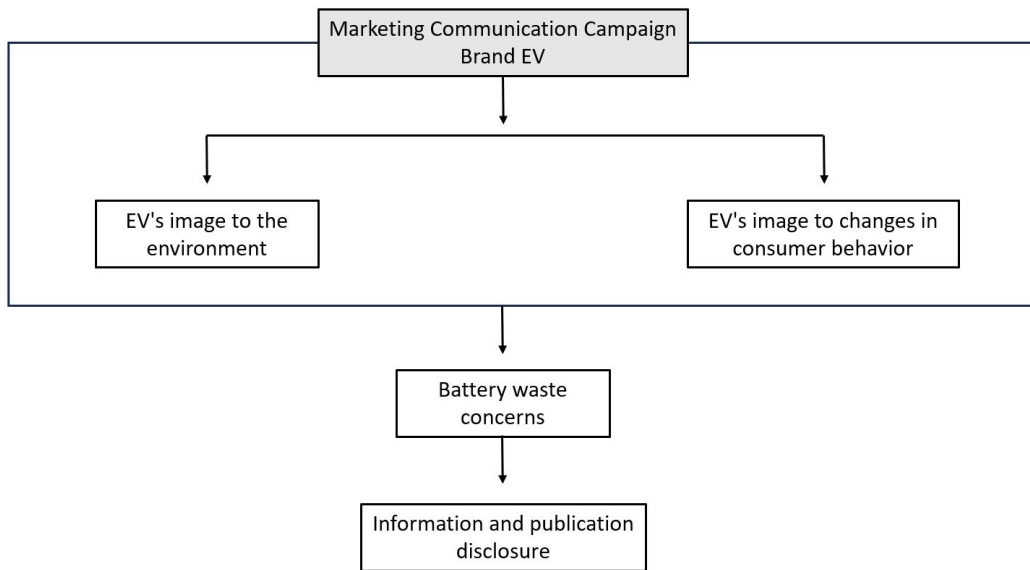


Figure 1. Author’s Conceptual Framework

a. Analysis of marketing communication activities of EV brands

Table 1
Analysis of Marketing Communication Activities of EV (Car) Brands in Indonesia 2023

NO	EV RBANDS	MARKETING COMMUNICATION ACTIVITIES	ANALYSIS
1	Hyundai Ioniq 5	<ul style="list-style-type: none"> ● Social Media Marketing (Instagram, Facebook, YouTube) Leverage influencer marketing with celebrities and eco-conscious personalities to target young professionals and families. Highlight design, technology, and sustainability features. ● Collaborations Partner with shopping malls with EV charging stations for test drive events and promotional displays. ● Events 	Hyundai aims to position the Ioniq 5 as a stylish, technologically advanced, and environmentally friendly option for the growing urban middle class in Indonesia. The influencer marketing and eco-driving workshops tap into Indonesia's rising environmental consciousness. Partnerships with malls and ride-hailing companies address range anxiety concerns and showcase real-world usage.

		Participate in automotive exhibition and organize eco-driving workshops or partner with ride-hailing companies to offer Ioniq 5 test drives.	
2	Wuling Air Ev	<ul style="list-style-type: none"> ● Social Media Marketing (Instagram, Facebook, YouTube) Utilize social media to target young families. Create content showcasing the Air EV's affordability, spaciousness, and family-friendly features. Partner with Indonesian mommy bloggers or family vloggers for product reviews. ● Collaborations Partner with family-friendly cafes or restaurants to offer Air EV test drives or discounts for customers arriving in EVs. ● Events Participate in family-oriented events or car shows, offering test drives and highlighting the Air EV's practicality for daily commutes. 	Wuling targets the budget-conscious family segment. Social media marketing with relatable influencers and collaborations with family-oriented businesses create a sense of approachability. Promotional events allow families to experience the Air EV firsthand and address concerns about practicality for everyday use.
3	BMW iX	<ul style="list-style-type: none"> ● Social Media Marketing (Instagram, Facebook, YouTube) Partner with Indonesian luxury lifestyle influencers to showcase the iX's luxurious design, performance, and technological advancements. 	BMW targets a niche market of high-income individuals. Their strategy revolves around exclusivity and brand association with luxury. Partnering with high-end establishments reinforces the iX's premium image.

NO	EV BRANDS	MARKETING COMMUNICATION ACTIVITIES	ANALYSIS
		<ul style="list-style-type: none"> ● Collaborations Partner with high-end hotels or exclusive clubs to offer test drive experiences and VIP events featuring the iX. ● Exclusive Events Organize invitation-only launch events or showcase the iX at luxury car shows. 	Exclusive events create a sense of prestige and cater to discerning clients.
4	Toyota bZ4X	<ul style="list-style-type: none"> ● TV Commercials Utilize prime-time TV slots to reach a broad audience, emphasizing the bZ4X's reliability, safety record, and Toyota's brand heritage. ● Social Media Marketing (Instagram, Facebook, YouTube) 	Toyota leverages its established brand presence to build trust and appeal to a wider audience. The TV commercials showcase the bZ4X's practicality and reliability, while social media marketing focuses on the car's sustainability aspects. The

5	Nissan Leaf	<p>Partner with Indonesian environmental NGOs or sustainability influencers to promote the bZ4X's eco-friendly credentials.</p> <ul style="list-style-type: none"> ● Website Create a dedicated website section with detailed information on the bZ4X's specifications, government incentives for EVs, and charging infrastructure updates in Indonesia. ● Collaborations Partner with local governments or green energy companies to promote EV adoption and the benefits of the bZ4X. ● Social Media Marketing (Instagram, Facebook, YouTube) Partner with Indonesian green influencers or YouTubers to create content highlighting the Leaf's affordability, long history in the EV market, and its role in promoting sustainable transportation. ● Collaborations Partner with universities or research institutions conducting research on electric mobility in Indonesia. 	<p>website provides comprehensive information to address potential buyer concerns. Collaborations with NGOs and green energy companies demonstrate Toyota's commitment to environmental responsibility.</p> <p>Nissan, a pioneer in EVs, positions the Leaf as a reliable and affordable option. Social media marketing focuses on sustainability and leverages the Leaf's established presence in the market. The website provides practical information to address cost concerns, a major factor for Indonesian consumers. Collaborations with universities or research institutions enhance the Leaf's image as a technologically advanced and future-proof choice.</p>
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NO	EV BRANDS	MARKETING COMMUNICATION ACTIVITIES	ANALYSIS
		<ul style="list-style-type: none"> ● Promotions Clearly showcase government incentives for EVs and Total Cost of Ownership (TCO) comparisons between the Leaf and gasoline cars. 	

Source: Researcher observation

Based on publicly available information in 2023, it's unlikely that all these EV brands have explicitly addressed battery waste management in their marketing communication activities in Indonesia. Most brands prioritize highlighting an EV's range, features, and environmental benefits. Battery waste, while a crucial aspect of sustainability, might not be a focal point due to its technical nature and potential to create consumer anxiety. Indonesia's regulations regarding EV battery waste management might still be under development in 2023. Without clear regulations, brands might hesitate to make claims they can't fully support. Initially, the focus might be on establishing a network of charging stations and promoting EVs. Battery waste management responsibilities might be seen as shared between the manufacturer, government, and recycling facilities.

b. EV's impact on the environment

According to Sasongko (2023), the issue of the environment has become a concern during the Nickel mining process as a raw material for EV battery production, which impacts economic, social, and environmental issues.

From an economic perspective, there is intense competition among countries to dominate the raw materials used in battery production, which is currently dominated by China. They acquire raw Nickel from various countries such as Australia and Congo to be processed into finished battery products with higher market value. Moreover, from a social standpoint, there are distortions in labor issues and wages due to salary disparities between local and foreign workers. Stated by Director of Research Center for Sustainable Production System and Life Cycle Assessment of Badan Riset dan Inovasi Nasional (BRIN), Mr. Nugroho Adi Sasongko in our personal interview:

"Based on the survey results in 2020, the minimum wage in the Konawe region, Southeast Sulawesi, was IDR 4,500,000, and some smelter companies provide wages to their workers far above the minimum wage. This proves that there is a gap between smelter companies operating in the same region," (Sasongko, 7 June 2023).

Regarding environmental issues, Indonesia's electricity supply is still dominated by fossil fuel-based coal with emission factors of 800-900 grams CO₂e/kWh. EVs require electric charging through charging stations that are powered by power plants. The shift in consumer behavior from conventional vehicles to electric vehicles does not produce significant changes because it only transfers the emission source from the road to the power plants. An interesting finding is that environmental improvement is not the primary concern conveyed in every EV brand campaign. Stated by Marketing Communications person from Nissan Motor Distributor Indonesia, Jethro Ringo as our informant, that:

"We realize that the presence of EVs can be likened to a double-edged sword when it comes to the environment. During the battery manufacturing process, there is a higher carbon dioxide emission compared to the exhaust produced by conventional vehicles using fossil fuels. However, once EVs are used and operational, there will be no exhaust emissions like conventional vehicles using fossil fuels," (Ringo, 12 July 2023).

However, from the perspective of the carbon footprint, EVs are more environmentally friendly due to energy conversion according to the law of energy conservation. The energy conversion in EVs results in higher efficiency (between 35-50%) compared to the energy produced by internal combustion engine vehicles (only about 20-28%). Fuel cells have the highest energy conversion rate (60-70%) using hydrogen as the raw material.

c. Strategy to increase the number of EV users

We conducted an interview with the offline marketing team of a well-known EV brand in Indonesia. The brand has been involved in EV research and development since 1947 and has been solely focused on internal research and development activities. In 2010, they produced their first mass-produced EV for consumer use.

According to Ringo (2023), the image they want to convey is that the brand is well-prepared to implement EVs in Indonesia. They have conducted extensive research on EV technology to make EVs more suitable for everyday consumer use. The EV campaign in Indonesia differs from the global campaign due to varying levels of readiness in each country. In Indonesia, the brand's focus is on increasing public awareness of the importance of using EVs as everyday transportation. They introduce and educate the Indonesian public about how EVs work, their components, the technology used, and the driving experience using simple language that is easily understood by the general population.

Ringo (2023) revealed that the media used to promote EV products to the public are quite diverse, including the brand's social media platforms (YouTube, Facebook, Instagram, and the website), collaborations with Key Opinion Leaders (KOLs), and coverage and reviews by automotive mass media. The marketing communication team of the brand extensively invites various media outlets during the launch of their latest EV products to disseminate information widely to potential consumers. The content presented includes articles and audiovisual videos on social media with the aim of providing a more vivid picture of the features and driving experience of EVs, thereby increasing brand and product awareness.

From the government's perspective as a policy-maker, they are currently providing incentives such as exempting EVs from odd-even license plate restrictions in Jakarta. According to Sasongko (2023), this policy is not without reason. Currently, there is an oversupply of electricity in Indonesia, particularly in Java and Bali, compared to the electricity consumption in these regions. Factors contributing to this:

- 1) Oversupply include the closure of many factories and manufacturing industries due to the impact of Covid-19 (Engineering Development Program (EDP) manufacturing declined by about 18.6% from 2010 to 2022), which correlates with a decrease in energy demand.
- 2) Customers are trying to be more energy-efficient by choosing electric products with lower power consumption and using solar panels.

Therefore, it is considered strategic to balance this oversupply of electricity with an increase in EV adoption, which can fulfill considerations from both the Indonesian government and customers.

d. EV's image to changes in consumer behavior

To attract and influence changes in consumer behavior, EV brands are very serious about developing and updating their technology, both in terms of smart driving features and engine capabilities. According to Ringo (2023), some of these outstanding technologies and features include:

- 1) The Intelligent Forward Collision Warning system can help alert the driver when there is a sudden braking of a second vehicle travelling in front of the vehicle ahead in the same lane.
- 2) Intelligent Emergency Braking monitors the surrounding area in front of the car for vehicles and pedestrians, helping to avoid or reduce damage caused by collisions. Not all intelligent Emergency Braking systems are designed to detect pedestrians.

- 3) Intelligent Cruise Control (ICC) measures the distance from the vehicle ahead and controls acceleration and deceleration to automatically maintain a suitable following distance. This distance is adjusted according to the speed of the vehicle ahead, up to the preset speed, and the ICC speed settings set by the driver. ICC reduces the driver's workload during long journeys such as expressway driving or in traffic congestion situations.
- 4) Rear Cross Traffic Alert system warns the driver with an audible alert when there is risk of collision with a vehicle crossing into the rearward direction of the reversing vehicle
- 5) 360 Camera provides drivers with a comprehensive view of their surroundings for improved safety and effortless parking. This feature minimizes blind spots, aids in avoiding obstacles, and enhances the overall driving experience in tight spaces.

The capabilities of EVs are continuously being developed by brands in terms of engine cubic capacity and the optimization of battery usage, which is becoming increasingly efficient. Currently, for a fully charged battery, EVs can travel a distance of 311 km. In addition to the capabilities of EVs in terms of engine cubic capacity and battery power optimization, low-cost maintenance is one of the significant advantages of EVs compared to traditional internal combustion engine vehicles.

Firstly, the design simplicity of electric vehicles plays a crucial role in their low maintenance requirements. Unlike internal combustion engines in conventional cars, EVs have simpler drivetrains with fewer moving parts. This streamlined design translates into fewer components that are susceptible to wear and tear, reducing the likelihood of mechanical failures. With a reduced number of parts, there is less need for regular maintenance and replacements, resulting in cost savings for EV owners.

Secondly, regenerative braking technology is a key feature in most electric vehicles. This innovation enables the conversion of kinetic energy into electricity during deceleration, which then gets stored in the vehicle's battery. The regenerative braking system reduces the reliance on traditional friction brakes, significantly extending the lifespan of brake pads and rotors. As a result, EV owners enjoy longer brake life and reduced maintenance costs associated with brake replacements.

Another maintenance-related benefit of EVs is the elimination of oil changes. Internal combustion engine vehicles require regular oil replacements to lubricate the engine and maintain its functionality. In contrast, electric vehicles do not have an engine that requires lubrication, making oil changes unnecessary. This not only saves EV owners money but also reduces their environmental impact by minimizing the consumption of oil and the generation of used motor oil waste.

Moreover, the cooling systems in electric vehicles are simpler and more efficient compared to traditional cars. Electric motors generate less heat than internal combustion engines, necessitating less elaborate cooling systems. The reduced complexity of cooling systems in EVs means fewer maintenance requirements and a decreased likelihood of cooling system failures, further contributing to the overall low-cost maintenance of these vehicles. Additionally, the absence of tailpipe emissions in electric vehicles eliminates the need for exhaust systems. Conventional vehicles rely on exhaust systems to expel harmful emissions generated during combustion. By not having an exhaust system, EVs avoid the associated maintenance expenses and environmental issues linked to exhaust system repairs and emissions.

Software updates represent another aspect of maintenance in electric vehicles. Manufacturers can deploy software updates remotely to optimize vehicle performance, battery life, and overall efficiency. These updates can address potential issues, improve vehicle capabilities, and extend battery lifespan, reducing the need for physical repairs and enhancing the overall ownership experience. Moreover, the simplified mechanics and lower wear and tear of electric vehicles may lead to a longer lifespan compared to traditional cars. The increased durability of EVs contributes to reduced long-term maintenance costs, making them an attractive option for consumers looking for cost-effective and sustainable transportation solutions.

In order to obtain a credible EV consumer's experience, we interviewed an informant who is an EV consumer and a professional race car driver and journalist with expertise in the field of automotive as well, Fitra Eri.

"The power of this car is instant and noiseless. The cost of electricity is also only 1:5 of the cost of conventional vehicles. Another aspect I've noticed is the convenience of charging, which is effortless as there's no need to go to a gas station." (Eri, 1 August 2023).

Another benefit that potential consumers consider nowadays is the government policies that support and facilitate the use of EVs, such as being exempted from the odd-even license plate rule in Jakarta. This regulation is stipulated in the DKI Jakarta Regional Regulation Number 88 of 2019 concerning Traffic with an Odd-Even System (CNN Indonesia, 2022). Furthermore, the increasing efficiency of aftersales services becomes a crucial point considered by consumers because it relates to the availability of parts, accessories, and service assistance in case of any issues with the EV.

e. Battery waste concerns

One of the largest components in an EV is the battery, which comprises approximately 40-60% of the total vehicle mass. The main components of the battery are the electrodes, which consist of three main materials: Lithium, Cobalt, and Nickel, with different compositions depending on the battery brand. According to Nugroho (2023), "The lifespan of an EV battery is only around 5 years, and if it can no longer be used, there must be a special process to repurpose it."

The marketing team of the EV brand we interviewed has not yet obtained information regarding how EV battery waste is managed. However, they do offer an 8-10 year warranty or a mileage of 180,000 - 210,000 km for their EV batteries. Additionally, they have a long-term mission for technological development in 2030 to create smaller-sized batteries with longer driving ranges.

Concerning environmental issues, particularly global warming, an action that can be made is to encourage the transition from fossil energy to renewable energy, with batteries playing a crucial role. This is related to reducing the carbon footprint resulting from air pollution, especially from conventional vehicles.

On one hand, carbon footprint can be reduced by lowering air pollution resulting from the use of fossil fuels in transportation or electricity generation. However, on the other hand, it can lead to new problems such as eco-toxicity, not only for the environment but also

for human toxicity, marine toxicity, and freshwater toxicity, as the extraction of minerals is often associated with various trace minerals such as Chromium, Tin, Radium, and Titanium.

Nickel, when present in normal concentrations (around 5-10%) in soil, can be beneficial. However, in large quantities, it can contaminate the soil and all living organisms related to it, including plants, animals, and humans. The raw Nickel material used for battery production is often combined with other minerals such as Lithium and Cobalt, taking into account their weight or mass. The higher the Nickel concentration, the heavier the battery.

In order to mitigate the adverse effects of end-of-life EV batteries, a concerted effort is required to achieve this goal. According to Eri (2023), there are several tangible initiatives that can serve as concrete steps toward addressing this issue.

“Some of the potential actions that can be taken include repairing or replacing the cells with new ones. Alternatively, the remaining battery capacity can be repurposed for other household uses. Lastly, recycling the waste by disposing of it in a recycling facility.” (Eri, 1 August 2023).

In fact, some brands do not use Nickel as the battery material and replace it with Lithium Iron Phosphate (LiFePO₄) as it results in lighter batteries suitable for passenger cars. However, larger EVs typically require Nickel as it provides higher energy output. In other words, EVs can help reduce the carbon footprint associated with Nickel, but the management of EV batteries itself, which is still not clearly defined, can potentially become an environmental hazard. This is supported by a statement from one of our informants:

“In terms of waste management downstream, there is still nothing in place. PPLI, as a company handling hazardous waste in Indonesia for all industries, has only a few pilot plans as prototypes for EV battery waste management, but the capacity is limited and not sufficient for large-scale management. The remaining waste that cannot be managed in large quantities and high concentrations will become toxic to the soil, animals, and humans,” (Sasongko, 7 June 2023).

Battery waste itself basically needs to be concerned by the government instead of consumers. It would be much more efficient if the brands also convey it to the government to recycle scenarios of their battery waste. Eri (2023) stated that:

“The ones who should be concerned about environmental issues and recycling are the government, not the consumers. ... Brands should also communicate it with the government; if they fail to do so, then the government should be the one to inquire with the brand.” (Eri, 1 August 2023).

Indonesia already has regulations related to EVs, such as Presidential Regulation Number 55 of 2019 concerning the Acceleration of Battery-Based Electric Motor Vehicle (BEV) Programs for Road Transportation, which requires the government and all stakeholders to consider environmental issues and create a roadmap for EV component waste management.

However, this has not been well-implemented yet. A good regulation by policymakers is expected to solve this concern efficiently.

f. Information disclosure on public

Regarding information or EV brand campaigns communicated through media such as websites, they tend to highlight positive aspects related to advanced technological developments. Brands also provide information about energy density and fuel economic energy combustion engine, indicating the driving range achievable with EV batteries. As stated by our informant:

“What the brands convey is related to public skepticism about electric vehicles. However, there is no information regarding the price of battery replacement and how long the battery's lifespan is; only the length of the warranty is provided.” (Eri, 1 August 2023).

A good EV company will have a well-defined roadmap concerning sustainability reporting. We surveyed seven EV car brands in Indonesia, and all of them had included a sustainability report roadmap on their global websites. However, only two brands displayed this information on their Indonesian domain websites. The brands placed the roadmap within a relatively deep sub-domain, requiring website visitors to be more diligent in seeking such information. Yet, this is essential information that potential EV consumers should be aware of before making their purchasing decisions. Information regarding environmental concerns could be more openly communicated and need to be easily accessible for consumers.

4. Conclusion

This study emphasizes the importance of proper management for used electric vehicle (EV) batteries as a key factor in widespread EV adoption. Urban mining, which involves recovering valuable materials from used products like EV batteries, presents a sustainable solution. This method not only reduces waste and environmental damage but also fosters economic growth and technological advancements in material recovery (Aldebei & Dombi, 2021).

“As electronic waste, the batteries can be crushed into powder and then separated using magnetic separation to isolate magnetic and non-magnetic components. This process, when managed independently, holds the potential to create business opportunities,” (Sasongko, 7 June 2023).

Based on publicly available information in 2023, it's unlikely that all these EV brands have explicitly addressed battery waste management in their marketing communication activities in Indonesia. Most brands prioritize highlighting an EV's range, features, and environmental benefits. Battery waste, while a crucial aspect of sustainability, might not be a focal point due to its technical nature and potential to create consumer anxiety.

EV brands can showcase their commitment to responsible battery recycling through partnerships with waste management companies. Campaigns could explain the recycling process and emphasize the percentage of battery materials recovered. They also could collaborate with NGOs to develop educational campaigns targeted at consumers. These campaigns could explain the environmental impact of battery waste and provide clear instructions on proper EV battery disposal. EV brands could use infographics, animations,

and short documentaries can be powerful tools to educate consumers about battery lifecycle management and responsible disposal options.

By implementing these recommendations, all stakeholders, including policymakers, EV brands, and consumers, can play a vital role. Policymakers can support urban mining and responsible battery management through regulations and incentives. EV brands can leverage targeted marketing campaigns to educate and engage consumers. Consumers, empowered with knowledge, can make informed choices that contribute to a cleaner future. Ultimately, aligning consumer choice with sustainability through urban mining and targeted marketing is key to a successful and environmentally friendly electric vehicle future.

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