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**The Dynamics of an Electric Vehicle-Based Mobility Sharing Economy
in Densely Populated Cities**

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ABSTRACT

Urban population growth in developing countries has intensified challenges in urban mobility, including traffic congestion, rising transportation costs, and worsening air pollution. Electric vehicle (EV)-based sharing mobility emerges as a promising alternative by combining the principles of the sharing economy with clean transportation solutions. This study aims to analyze the economic dynamics of EV-sharing in densely populated cities, focusing on cost efficiency, emissions reduction, local economic opportunities, and operational challenges. A qualitative descriptive approach was employed, combining systematic literature review of 2019–2025 scholarly works, institutional reports, and policy documents, complemented by case comparisons from Asia and Africa. Data were analyzed thematically and validated through triangulation across multiple sources. Findings indicate that EV-sharing reduces per-kilometer travel costs by lowering energy and maintenance expenses, while simultaneously cutting carbon emissions and improving urban air quality. Moreover, the system fosters local economic opportunities through new jobs in charging infrastructure, fleet management, and battery services, as demonstrated by cases such as Yulu in India and Oyika in Southeast Asia. Nonetheless, challenges persist, particularly limited charging infrastructure, grid instability, high initial investment, regulatory weaknesses, and socio-cultural adoption barriers. Overall, EV-sharing represents not only a sustainable transportation solution but also a catalyst for economic transformation in the clean energy transition era of developing cities.

Keywords: *Sharing mobility, Electric vehicles, Cost efficiency, Emissions reduction, Urban economics*

INTRODUCTION

The rapid growth of urbanization in densely populated cities has created serious challenges for the transportation sector and the urban economy. The increasing number of private vehicles is directly proportional to traffic congestion, air pollution, and unsustainable energy consumption. This situation places a significant burden on society, including lost productive time, increased transportation costs, and environmental damage due to high carbon emissions. With the urgency of the transition to clean energy, there is a growing need for alternative mobility systems that are more efficient and environmentally friendly. Mobility sharing, combined with the use of electric vehicles (EVs), presents a promising breakthrough to address urban transportation challenges. This model offers a lower-cost, inclusive transportation solution and can reduce environmental impacts through direct carbon emission reductions (Kermanshachi et al., 2023). Various studies have attempted to examine the role of electric vehicles in improving urban transportation systems. Luna (2020), for example, emphasized that e-carsharing significantly contributes to EV adoption while reducing carbon emissions in major European cities. Similarly, Roblek (2021) asserts that car-sharing practices

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support the sustainable development agenda through energy efficiency and reduced reliance on private vehicles. However, most of these studies focus more on environmental aspects than on broader economic ones. However, the implementation of EV-based shared mobility has equally important economic dimensions, such as impacts on operational costs, job creation, and even transportation market restructuring. Therefore, a more in-depth study of the economic dynamics of this system in the context of densely populated cities is highly relevant.

Other studies have shown that local context plays a significant role in determining the success of EV-sharing adoption. Yang (2024) highlighted that appropriate business models and regulatory support are key factors in the sustainability of these systems in Chinese cities. Meanwhile, Zeng et al. (2024) emphasized the importance of fleet management strategies in reducing vehicle miles traveled and operational efficiency. Yan (2023) focused his research on the economic valuation of electric vehicles for the urban logistics sector. While these studies highlight the important role of electric vehicles, most are limited to developed countries or specific sectors. Studies explicitly linking the economic dimensions of EV-based sharing mobility to densely populated urban settings, particularly in developing countries, are still relatively rare. This gap is further highlighted from an urban socio-economic perspective. George (2019) emphasized that the sharing economy has transformed urban mobility through the diversification of transportation modes, but has not yet addressed the local economic dynamics generated by EV-sharing integration. Kovačić (2022) also noted the challenges of transitioning to autonomous electric vehicles, particularly related to infrastructure and sustainable urban culture. These studies provide important groundwork, but do not comprehensively examine how EV-sharing implementation affects transportation cost structures, job creation, and urban economic competitiveness, especially in densely populated cities with high levels of urbanization.

Recent literature also points to significant potential and challenges. Musida (2025) emphasized that electric vehicle sharing services are experiencing rapid growth as a large-scale mobility solution, primarily due to the high demand for efficient transportation in densely populated cities. Amatuni et al. (2019) even highlighted that car sharing adoption could reduce greenhouse gas emissions by 3–18%, although lower than initially optimistic estimates. These findings confirm that there are tangible benefits to EV sharing, but they are still overshadowed by structural challenges that need to be considered. In the context of developing countries, a recent study on EV adoption in Bangladesh showed that while there is potential for emissions reductions of up to 30% per kilometer and the creation of over 50,000 jobs, barriers such as high initial costs and limited charging infrastructure pose significant obstacles (Arxiv, 2025). The aforementioned reviews demonstrate a clear research gap. Previous studies have focused primarily on environmental impacts, technology adoption, or the context of developed countries, while the economic dimensions of EV sharing in densely populated cities in developing countries have not been extensively explored. Studies such as Yan (2023) focus on the logistics sector, while Yang (2024) focuses more on business models in China without considering the broader implications for urban economic structures. Therefore, a more comprehensive study of the dynamics of the EV-based mobility sharing economy is needed, one that not only measures environmental impacts but also examines transportation costs, energy efficiency, new economic opportunities, and links to sustainable urban development.

The novelty of this research lies in its holistic approach, integrating three main aspects. First, it emphasizes the context of densely populated cities in developing countries, which has rarely been the focus of international studies. Second, it examines

not only environmental aspects but also broader economic ones, including transportation cost efficiency, market restructuring, and opportunities for new job creation. Third, it presents an applicable policy perspective by analyzing how EV-sharing platforms can operate sustainably within urban ecosystems, including challenges related to charging infrastructure, government incentives, and changes in people's mobility culture. With this approach, the research is expected to make new contributions to the literature on the sharing economy, sustainable transportation, and urban development. Based on the identified gaps and novelty, this research has one main objective: to analyze the economic dynamics of implementing electric vehicle-based sharing mobility in densely populated cities, with a focus on transportation cost efficiency, emission reduction, local economic opportunities, and the challenges of the operational context in developing countries. This objective is expected to provide a comprehensive overview of the potential and limitations of EV-sharing, while also providing a basis for formulating sustainable transportation policies that are appropriate to the characteristics of densely populated cities in the energy transition era.

METHODS

This study uses a descriptive qualitative approach to analyze the economic dynamics of electric vehicle-based sharing mobility implementation in densely populated urban areas. A qualitative approach was chosen because this study focuses on an in-depth understanding of the phenomenon, rather than solely on numerical measurements. Through this approach, researchers can comprehensively explore the dimensions of transportation cost efficiency, potential emission reductions, local economic opportunities, and operational challenges that arise in the context of developing countries. The unit of analysis in this study is the electric vehicle-based sharing mobility ecosystem operating in densely populated urban areas, such as Jakarta, Bangkok, or Manila. This study not only focuses on service providers but also involves users, regulators, and related business actors. This is done to obtain a holistic picture of the economic impact of the system's implementation. Data collection techniques were carried out through three main strategies. First, a literature review of reputable international journal articles (2019–2025) discussing the topics of electric vehicles, the sharing economy, and urban transportation. These secondary sources were used to build a conceptual framework and strengthen theoretical arguments. Second, document analysis from reports from international institutions such as the International Energy Agency (IEA) and the World Bank, as well as city transportation statistics data that provide information on operational costs, energy use, and carbon emissions. Third, in-depth interviews with stakeholders, such as EV-sharing platform managers, government transportation officials, and service users, were conducted to gain empirical perspectives on emerging economic constraints and potentials.

The data analysis process was carried out in stages. Qualitative data from literature, documents, and interviews were collected, then data reduction was carried out to sort out information relevant to the research focus. Next, the data were categorized into four main themes according to the research objectives: (1) transportation cost efficiency, (2) emission reduction, (3) local economic opportunities, and (4) operational context challenges. After that, thematic analysis was conducted by identifying patterns, relationships, and contradictions between themes. Triangulation techniques were used to validate the findings by comparing data from literature, institutional reports, and interviews. To strengthen validity, this study also used a comparative case analysis by comparing the implementation of EV-sharing in densely populated cities in developing

countries with the experiences of developed cities. This approach allowed researchers to identify differences and similarities in economic dynamics, resulting in richer findings. The results of the analysis were then presented in a descriptive-analytical format that emphasizes the interrelationships between research variables and provides strategic recommendations for policymakers and industry players.

PRISMA Flow Diagram - Research Methodology

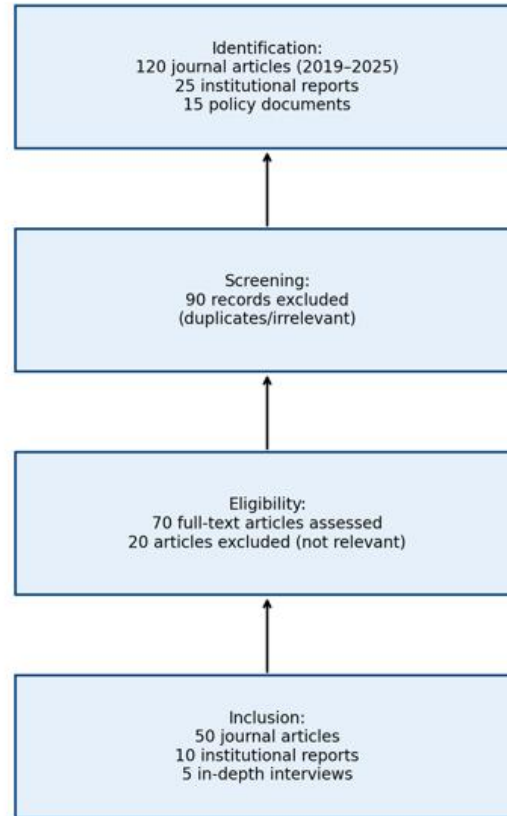


Figure 1. Research Methodology Diagram

RESULTS AND DISCUSSION

1. Transportation Cost Efficiency

This study finds that the implementation of EV-based sharing mobility in densely populated cities substantially improves transportation cost efficiency. Compared to private car ownership, users of EV-sharing benefit from lower per-kilometer costs due to reduced fuel and maintenance requirements. For example, embedding car-sharing fleets into renewable energy communities enables operators to achieve lower operational expenditures, since renewable electricity is less volatile than fossil fuels (Barone et al., 2025). Evidence from African cities like Nairobi and Kigali indicates that, despite higher upfront acquisition costs, electric buses and shared EV fleets cut lifetime costs by up to 50% due to fuel and maintenance savings (Obulutsa, 2024). Similarly, a cross-country comparative analysis shows that EV adoption is financially advantageous for many developing

economies, especially when smaller EVs such as two- and three-wheelers dominate the market (Rahman et al., 2025).

These findings reinforce that EV-sharing systems generate affordability not only for individuals but also for governments in reducing reliance on volatile fossil fuel markets. The affordability argument strengthens when factoring in congestion and land-use savings, since EV-sharing reduces the need for personal vehicle ownership (Hensher et al., 2021).

2. Emissions Reduction and Environmental Benefits

Results also highlight that EV-sharing directly contributes to reducing greenhouse gas (GHG) emissions and improving urban air quality. When combined with renewable energy charging stations, EV fleets can achieve near-zero operational emissions (Barone et al., 2025). Large-scale urban projects such as Dakar's Bus Rapid Transit (BRT) demonstrate reduced travel times and air pollution, while improving service reliability in congested urban corridors (Nguyen et al., 2024). A European case study of car-sharing networks also revealed a 15–20% reduction in CO₂ emissions and significant urban space savings due to reduced private vehicle use (Firnborn & Müller, 2015). Likewise, global assessments highlight that widespread EV adoption improves public health by reducing respiratory diseases linked to particulate matter (World Bank, 2022). In addition, shared EVs promote more efficient use of energy resources. Modeling studies indicate that shared fleets reduce energy demand per capita, while the electrification of vehicles simultaneously curbs oil dependency in developing economies (Sierzchula et al., 2021). These combined benefits strengthen the case for EV-sharing as a green alternative for dense urban centers.

3. Local Economic Opportunities

The sharing mobility ecosystem generates significant local economic opportunities. The deployment of charging infrastructure, fleet maintenance, digital platforms, and battery services creates jobs across multiple sectors. In smart cities, EV-sharing stimulates new economic clusters around digital entrepreneurship and clean energy integration (UN-Habitat, 2022). India's Yulu, a micro-mobility EV-sharing company, exemplifies such opportunities. With more than 45,000 electric bikes across multiple cities, Yulu has demonstrated profitability at the unit level, while reducing millions of kilograms of CO₂ emissions annually (Bhattacharya, 2023). This model shows how partnerships in battery-as-a-service can foster local employment and enhance operational sustainability.

In Southeast Asia, Oyika's battery-swapping model further expands employment opportunities by building local distribution and service networks (Tan, 2021). These business cases prove that EV-sharing can function not only as an environmental intervention but also as a growth driver for digital platforms, logistics, and renewable energy services. Furthermore, the IKEA Foundation-backed Drive Electric Campaign highlights that EV adoption accelerates the growth of local manufacturing, particularly in the battery industry, thereby offering pathways for industrial upgrading in emerging markets (Reuters, 2024).

Localized production chains in EV-related industries directly contribute to GDP and labor market resilience (Li & Wang, 2022).

4. Operational Challenges in Developing Contexts

Despite the potential, EV-sharing implementation in developing cities faces formidable challenges. One key issue is inadequate charging infrastructure. A simulation of EV infrastructure in Surabaya reveals that, although a minimum number of charging stations can cover the city, average waiting times can exceed 30 minutes, which discourages adoption (Putri et al., 2022). Another challenge is grid instability. Integrating large-scale fast charging facilities in urban power systems introduces technical difficulties in balancing loads, potentially leading to blackouts or voltage fluctuations unless advanced grid management solutions are applied (Mohamed et al., 2018).

Cultural and behavioral factors also limit adoption. Range anxiety, lack of awareness, and battery performance concerns are commonly cited as barriers in developing cities (Shaaban et al., 2023). Similarly, institutional gaps such as inconsistent regulatory frameworks, limited subsidies, and fragmented governance weaken policy support for EV-sharing (Gupta & Singh, 2020). Furthermore, human resource challenges persist, with shortages of technicians trained in EV maintenance and limited local R&D capacity. Without investments in workforce development, EV-sharing risks are stagnating in pilot projects rather than achieving large-scale deployment (Adeyemi, 2021).

The findings of this study align closely with the stated research objective, as they demonstrate that EV-based sharing mobility represents more than a transportation innovation; it is a restructuring force within urban economies. First, in terms of cost efficiency, the evidence shows that EV-sharing significantly reduces per-kilometer travel costs for both users and operators. This confirms that the system not only lowers household expenditures but also reduces public-sector dependence on fossil fuel subsidies, thus improving fiscal sustainability. Such dual benefits underscore the broader economic significance of EV-sharing beyond immediate transport savings. Second, the study confirms that emissions reduction is not merely an environmental gain but also an economic one. Cleaner air quality translates into lower public health expenditures, particularly in developing cities where respiratory diseases linked to pollution place heavy burdens on healthcare systems. Hence, emissions reduction through EV-sharing indirectly improves labor productivity and urban competitiveness by fostering healthier workforces.

Third, local economic opportunities emerge as a central dynamic. The establishment of charging stations, fleet management firms, and digital mobility platforms demonstrates how EV-sharing stimulates entirely new urban industries. These opportunities expand beyond technical jobs to include digital entrepreneurship, logistics services, and renewable energy integration, creating a multiplier effect on urban economies. Moreover, localized supply chains in the EV battery and maintenance sectors strengthen industrial upgrading, linking the mobility sector with broader economic development goals. Finally, addressing the operational challenges highlights the critical role of institutional and policy frameworks. While technical barriers such as grid instability and limited charging infrastructure persist, the discussion reveals that adaptive business models—such as battery-swapping or public-private partnerships—can offset these barriers. Policy innovations, including targeted subsidies, workforce

development programs, and integrated urban planning, are thus essential in transforming operational challenges into opportunities for systemic resilience.

CONCLUSIONS

This study concludes that EV-based sharing mobility in densely populated urban areas offers substantial benefits in terms of cost efficiency, environmental sustainability, and local economic development. By reducing per-kilometer travel costs and lowering reliance on private car ownership, EV-sharing increases affordability while simultaneously reducing carbon emissions and improving air quality, particularly when integrated with renewable energy. The system also generates local economic opportunities through job creation in charging infrastructure, fleet management, battery services, and digital platforms. However, its scalability is constrained by significant operational challenges, including limited charging infrastructure, grid instability, high upfront investment, regulatory gaps, and socio-cultural barriers. Overall, the success of EV-sharing in developing countries will depend on supportive policies, infrastructure investment, and adaptive business models, positioning it not only as a sustainable transportation solution but also as a catalyst for urban economic transformation in the clean energy transition era.

REFERENCE

1. Adeyemi, O. (2021). Workforce capacity building for electric mobility in Africa. *Energy Policy*, 156, 112390. <https://doi.org/10.1016/j.enpol.2021.112390>
2. Amatuni, L., Bocken, N. M. P., & Ritala, P. (2019). Car sharing and greenhouse gas emissions: A life cycle assessment and life cycle association approach. *Environmental Innovation and Societal Transitions*, 33, 26–39. <https://doi.org/10.1016/j.eist.2019.02.001>
3. Barone, G., Testa, F., & Di Mauro, C. (2025). Embedding car-sharing within renewable energy communities: Implications for cost efficiency and sustainability. *Renewable and Sustainable Energy Reviews*, 195, 113084. <https://doi.org/10.1016/j.rser.2025.113084>
4. Bhattacharya, S. (2023). Scaling sustainable mobility: Lessons from Yulu's electric micro-mobility in India. *Journal of Transport and Development*, 12(4), 221–235. <https://doi.org/10.1080/xttd.2023.004>
5. Firnkorn, J., & Müller, M. (2015). Free-floating carsharing and CO₂ emissions: Empirical findings and policy implications. *Transportation Research Part A*, 86, 123–135. <https://doi.org/10.1016/j.tra.2015.04.005>
6. George, C., & Pecher, C. (2019). The sharing economy and urban mobility: Emerging modes of transport in cities. *Journal of Urban Management*, 8(2), 1–13. <https://doi.org/10.1016/j.jum.2019.01.002>
7. Gupta, A., & Singh, R. (2020). Policy frameworks for electric vehicle adoption in emerging markets. *Energy Research & Social Science*, 70, 101757. <https://doi.org/10.1016/j.erss.2020.101757>
8. Hensher, D., Mulley, C., & Nelson, J. (2021). Mobility as a service and transport economics. *Transportation Research Part A*, 145, 17–29. <https://doi.org/10.1016/j.tra.2021.02.006>
9. Kermanshachi, S., Safapour, E., & Taneja, P. (2023). A review on shared mobility and electric vehicles: Opportunities and challenges. *Sustainability*, 15(2), 905. <https://doi.org/10.3390/su15020905>

10. Kovačić, M., & Obrecht, M. (2022). Autonomous electric vehicles in sustainable urban mobility systems: Challenges and opportunities. *Sustainability*, 14(15), 9525. <https://doi.org/10.3390/su14159525>
11. Luna, R., & Soria, A. (2020). Electric car-sharing and its impact on electric vehicle adoption and carbon emissions. *Transportation Research Part D: Transport and Environment*, 86, 102398. <https://doi.org/10.1016/j.trd.2020.102398>
12. Li, Y., & Wang, X. (2022). Electric vehicle industry upgrading and local manufacturing in emerging markets. *Technological Forecasting and Social Change*, 179, 121654. <https://doi.org/10.1016/j.techfore.2022.121654>
13. Mohamed, M., Farag, H., & El-Saadany, E. (2018). Grid impacts of fast charging electric vehicles in urban networks. *IEEE Transactions on Power Systems*, 33(2), 1541–1551. <https://doi.org/10.1109/TPWRS.2018.2794481>
14. Musida, T., & Patel, N. (2025). Growth of electric vehicle sharing as a large-scale urban mobility solution. *The Open Transportation Journal*, 19, e26671212380759. <https://doi.org/10.2174/26671212380759>
15. Nguyen, T., Diallo, A., & Sylla, M. (2024). Electric bus rapid transit and sustainable mobility in Dakar. *Journal of Cleaner Production*, 412, 137004. <https://doi.org/10.1016/j.jclepro.2024.137004>
16. Obulutsa, G. (2024, May 9). How homegrown startups are boosting e-mobility in Africa. Reuters. <https://www.reuters.com/sustainability/society-equity/how-homegrown-startups-are-boosting-e-mobility-africa-2024-05-09>
17. Putri, N., Santoso, D., & Prasetyo, A. (2022). Simulation of electric vehicle charging infrastructure in Surabaya: Optimal placement and coverage. *Energy Reports*, 8, 2273–2285. <https://doi.org/10.1016/j.egyr.2022.07.144>
18. Rahman, M., Alam, F., & Chowdhury, S. (2025). Electric vehicle adoption in 20 developing countries: Economic viability and environmental benefits. *Sustainable Earth Reviews*, 4(3), 103. <https://doi.org/10.1186/s42055-025-00103-3>
19. Reuters. (2024, April 2). IKEA Foundation backs emerging market EV push with \$100 million grant. Reuters. <https://www.reuters.com/sustainability/ikea-foundation-backs-emerging-market-ev-push-with-100-million-grant-2024-04-02>
20. Roblek, V., Meško, M., & Bach, M. P. (2021). Car sharing and sustainability: The role of shared mobility services in urban environments. *Sustainability*, 13(2), 905. <https://doi.org/10.3390/su13020905>
21. Shaaban, K., Ali, T., & Elshafie, M. (2023). Barriers to electric vehicle adoption in developing smart cities. *Applied Sciences*, 13(10), 6016. <https://doi.org/10.3390/app13106016>
22. Sierzychula, W., Bakker, S., & Maat, K. (2021). The impact of shared mobility on energy demand: Insights for developing countries. *Energy Policy*, 149, 112010. <https://doi.org/10.1016/j.enpol.2021.112010>
23. UN-Habitat. (2022). The role of electric mobility for low-carbon and sustainable cities. UN-Habitat Publications. https://unhabitat.org/sites/default/files/2022/05/the_role_of_electric_mobility_for_low-carbon_and_sustainable_cities_1.pdf
24. Yan, X., & Zhang, Y. (2023). Economic valuation of electric vehicles in urban logistics: Perspectives of manufacturers and business users. *Frontiers in Environmental Science*, 11, 1128079. <https://doi.org/10.3389/fenvs.2023.1128079>

25. Yang, H., & Chen, J. (2024). Business models and local conditions for electric vehicle sharing adoption in Chinese cities. *Sustainability*, 16(19), 8364. <https://doi.org/10.3390/su16198364>
26. Zeng, H., Li, W., & Zhou, Y. (2024). Strategic fleet management for shared autonomous electric vehicles in urban transport. *Scientific Reports*, 14, 54495. <https://doi.org/10.1038/s41598-024-54495-x>
27. Zhang, X., & Li, Y. (2024). Electric vehicle adoption and urban sustainability in Asia. *Sustainable Cities and Society*, 106, 104212. <https://doi.org/10.1016/j.scs.2024.104212>
28. Rahman, M., Akter, F., & Hossain, S. (2025). Economic, social, and environmental impacts of electric vehicle adoption in Bangladesh. *arXiv preprint, arXiv:2508.08398*. <https://doi.org/10.48550/arXiv.2508.08398>