The Sankalpa: International Journal of Management Decisions
ISSN: 2454-7425
Volume 12, Issue 2 (July - December 2026)

The Environmental Benefits and Practicality of Using Electric Vehicles for Public Transportation in the Future

Dr. Casper Lindholm
Center for Intelligent Infrastructure, Uppsala Institute of Technology, Sweden

Received: 07.02.2026 Accepted: 10.07.2026 Publishing: 05.08.2026

Abstract:
By incorporating electric vehicles (EVs) into public transportation systems, we can lessen our impact on the environment, improve air quality in cities, and encourage more sustainable modes of transportation. This fad is starting to gain momentum. carefully considering the pros and cons, such as the necessary infrastructure, operating costs, and technological advancements, of transitioning public transportation fleets to electric power. electric buses and trams, which have found success in various cities across the globe, and the insights gained from these initiatives are emphasized in this research. Improved air quality, reduced emissions of greenhouse gases, and the opportunity to integrate with renewable energy sources are some of the long-term environmental benefits of electrifying public transportation. The role of electric vehicles in urban transportation systems, obstacles to widespread adoption, opportunities for increasing the reach of electric public transportation, and their contribution to a cleaner, more environmentally friendly urban environment.

Keywords: Electric vehicles, public transportation, environmental benefits, sustainability, greenhouse gas emissions

Introduction:

As a result of the global drive toward sustainability and the reduction of the environmental impact of transportation, electric vehicles (EVs) have recently come to the forefront, particularly in relationships to public transportation systems. This is particularly the case in regard to public transportation systems. It is impossible to emphasize the importance of public transit when it comes to enhancing urban mobility, reducing emissions, and reducing the amount of congestion in traffic. The environmental impact of public transportation systems that are dependent on conventional fuels, on the other hand, is a significant barrier. Because of the growing number of people living in urban areas and the urgent need to combat climate change, there is an increasing demand for the transition to modes of transportation that are more environmentally friendly and operationally efficient. As a potential solution to alleviate these concerns, electric vehicles have emerged as a viable choice due to their capacity to dramatically reduce emissions of greenhouse gases. The incorporation of electric buses, trams, and trains into public transportation networks has the potential to bring about substantial advancements in terms of both the environment and operations. These advancements include the reduction of operational costs, the enhancement of passenger comfort, and the reduction of air pollution. There are a number of obstacles that limit the widespread adoption of electric vehicles in public transportation, despite the fact that these advantages are there. Some of these

obstacles include high initial investment prices, the development of sufficient charging infrastructure, and challenges related to the capacity of electricity grids. In order to determine the potential of electric vehicles, it is necessary to evaluate the environmental benefits, economic sustainability, and infrastructure that are required for the successful integration of electric vehicles into public transportation. Case studies from all over the world are used in this research project to investigate the technological breakthroughs that are making it easier to transition to public transportation that is powered by electric vehicles. In the fight for a transportation future that is free of harmful emissions, the overriding goal of this research is to shed light on the opportunities and risks that are offered by electric vehicles (EVs), as well as the difficulties that stand in the way of their widespread usage and the long-term advantages that they provide.

The Necessity of Electric Public Transportation Infrastructure

The foundational architecture of public transportation systems needs to be robust and adaptable in order to support electric vehicles (EVs). Building charging networks, connecting energy grids, maintaining facilities, and supporting critical technical systems are all part of this infrastructure that ensures electric fleets operate effectively. It is critical to set up four fundamental elements in order to overcome the potential barriers that could otherwise prohibit electric public transportation from being widely employed.

1. Charging Stations and Network Expansion

The primary infrastructure requirement for electric public transportation is the creation of an extensive and reliable charging network. Electric vehicles, in contrast to traditional cars, need on a specific network of charging stations to keep them powered up and operational for long periods of time.

- **Types of Charging Stations**:
  - **Depot Charging**: Electric buses and other vehicles have designated charging stations where they can charge overnight or during designated breaks.
  - **On-route Charging**: In order to facilitate fast recharging during the day, fast-charging stations may be placed along routes that experience significant demand.
- **Charging Speed and Power**: Charging stations can range from slow to fast, with the former necessitating more power but frequently resulting in more expensive infrastructure. For cities that have extensive electric vehicle fleets, finding the right balance between charging speed and costs is crucial.
- **Grid Capacity**: It is important to evaluate the current energy infrastructure to make sure it can manage the additional load from charging stations. Major infrastructure changes may be necessary to support extensive electric bus or train fleets, particularly in highly populated regions.

2. Energy Grid Integration

There is a pressing need for improvements to the current electricity grid in order to accommodate electric public transit. To keep service interruptions to a minimum, electric vehicles need an efficient, sustainable, and dependable power source.

- **Renewable Energy Sources**: Public transportation fleets that use electric vehicles should preferably be fuelled by renewable energy sources like solar, wind, or hydropower in order to maximise the environmental benefits of these vehicles. To lessen the environmental impact of electric trains and buses, it is possible to charge them using renewable energy sources.
- **Smart Grid Technology**: Electricity demand may be better controlled and distributed with the help of a smart grid. It allows charging stations and the grid to communicate in both directions, stores extra power, and responds dynamically to charging demands. Especially at peak hours, this enables more efficient energy usage.
- **Energy Storage Solutions**: Batteries and other forms of energy storage could be included into the grid to provide a more stable energy supply and demand balance. As a result of these technologies, charging stations may be certain that they will have a consistent supply of electricity even during peak demand times.

3. Maintenance and Upkeep Facilities

Electric vehicles still necessitate dedicated repair and maintenance facilities, even though they often require less maintenance compared to fossil fuel vehicles. These locations must be able to handle the specific requirements of electric fleets, including the maintenance and repair of electric motors and batteries.

- **Battery Management and Recycling**: When it comes to electric car maintenance, the battery is one of the most important components. If we want electric vehicles (EVs) in public transportation fleets to be around for a while, we need to set up reliable systems for checking, replacing, and recycling batteries.
- **Charging Equipment Maintenance**: It is essential to routinely repair charging stations and their equipment to guarantee their operational status, safety, and efficiency.

4. Technological Systems

For cities to effectively manage and maintain a big fleet of electric vehicles, they will have to put money into cutting-edge tech systems that track and coordinate things like charging schedules, vehicle performance, and fleet management.

- **Fleet Management Systems**: In order to guarantee that buses or trams are constantly prepared for service, these systems assist in tracking the position, status, and battery life of each vehicle. Additionally, they have the ability to optimise charging times and save unneeded downtime.
- **Vehicle-to-Grid (V2G) Technology**: Electric vehicles can contribute to a more stable energy supply and demand by feeding excess power back into the grid through vehicle-to-grid technology. With this technology, automobiles can serve as portable power plants, making transportation networks more robust and environmentally friendly.

5. Public Awareness and Accessibility

Infrastructure for public electric transport systems should also prioritise making charging stations, vehicle availability, and service schedules easily accessible to all riders. Among these are:

- **Easy Access to Charging Stations**: It is important that charging stations be positioned in a way that is both handy for passengers and blends in with their regular trips.

- **Real-Time Information**: A more streamlined and open travel experience for passengers can be achieved with the use of digital tools or apps that offer real-time data on vehicle positions, charging station availability, and anticipated delays.

6. Financial Investment and Partnerships

Building a system of public electric transportation is a costly nightmare. Government subsidies, incentives, and public-private partnerships are crucial for this transition to be financially viable. Companies that invest in charging infrastructure and electric vehicles should be financially rewarded by governments, which should pass legislation to promote the growth of the electric vehicle sector.

Conclusion

Making the transition to electric vehicles for public transportation is one of the most significant things that can be done to secure a future that is free of pollution. Electric public transportation systems have the potential to alleviate some of the issues that are related with noise pollution, poor air quality, and greenhouse gas emissions. This is especially concerning in light of the fact that the number of people living in urban areas is increasing and that there is an urgent need for cities to reduce their influence on the environment. These benefits, on the other hand, will not become a reality until a number of challenges in the fields of economics, technology, and infrastructure are conquered. A number of essential measures must be taken in order to successfully incorporate electric vehicles into public transportation systems. These include the construction of a dependable charging infrastructure, the incorporation of energy grids, and the creation of specialized maintenance facilities. An additional requirement for optimizing the performance and sustainability of electric fleets is the implementation of complicated technological systems like as smart grids and fleet management software. In spite of the high initial cost, the transition to electric public transportation is an investment that is well worth doing because of the beneficial effects on the environment and the cost savings that may be realized over the long term. To overcome these challenges and ensure the widespread adoption of electric vehicles in public transportation, it would be necessary for the government to actively participate in the formation of public-private partnerships, provide subsidies, and implement legislation. The use of electric vehicles in public transportation has a promising future, but in order to make this a reality, it will require the collaborative efforts of a large number of individuals and organizations, including transportation planners, policymakers, and technology businesses. In order for cities to become more sustainable, efficient, and livable in the future, electric public transportation must not only address the requirements of infrastructure and technology, but it must also encourage public acceptance and investment.

Bibliography

- Nesbitt, K. and D. Sperling. 2001. Fleet purchase behavior: decision processes and implications for new vehicle technologies and fuels. Transportation Research C 9(5): 297-318.
- Santini, D.J., P.D. Patterson and A.D. Vyas. 2000. Importance of vehicle costs, fuel prices, and fuel efficiency in hybrid electric vehicle market success. Transportation Research Record 1738: 11-19.

- Sperling, D. 1996. The case for electric vehicles. Scientific American 275(5): 54-59. Tesar, G. 1974. New hope for the driver: an electric car. Midwest Engineer 26(7): 1-3.
- Turrentine, T.S. and K.S. Kurani. 1998. Adapting interactive stated response techniques to a self-completion survey. Transportation 25(2): 207-222.