

# Efficiency, Cost Analysis and Carbon Footprint Assessment: A Comprehensive Two-Year Ownership Review of the BYD E6 Electric MPV

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## About the Author

Dr. Yogendra K., Professor and Chairman of the Department of Environmental Science, Kuvempu University, Karnataka, India. With extensive experience in research, teaching, and academic leadership, he has made significant contributions to the field of environmental science. Dr. Yogendra's work is highlighted by numerous publications and research projects that reflect his dedication to advancing knowledge in this domain.

## Data Collection and Analysis

This article is based on the comprehensive data collected and analyzed by Dr. Yogendra K. over a two-year period (from June 13, 2022, to June 12, 2024) for his BYD e6 electric MPV. The data collection involved meticulous recording of various aspects of the vehicle's performance, including mileage, energy consumption, charging patterns, maintenance costs, and overall cost of ownership. Dr. Yogendra utilized this data to conduct a detailed analysis, comparing the electric vehicle's efficiency, cost-effectiveness, and environmental impact with that of a conventional internal combustion engine (ICE) vehicle. The insights derived from this analysis provide valuable information on the long-term benefits and sustainability of electric vehicles.

## Abstract

**This research article provides an in-depth review of the BYD e6 electric MPV after two years of ownership, covering 73,432 kilometers. It assesses the vehicle's performance, cost efficiency,**

**maintenance, and carbon footprint. A detailed comparison with internal combustion engine (ICE) vehicle is included, highlighting significant cost savings and environmental benefits.**

**Keywords:** BYD e6, Electric MPV, Real-world performance, Energy efficiency, Carbon footprint, Cost efficiency, Emission reduction

## INTRODUCTION

The introduction of the BYD e6 electric MPV promised an eco-friendly and economical alternative to traditional gas-powered vehicles. Globally tested and proven successful, the all-new e6 offers best-in-class features in both driving comfort and interior amenities. Built on the BYD e-Platform, it integrates essential electric powertrain components to reduce weight, optimize efficiency, and enhance the driving experience.

Equipped with BYD's Blade Battery, renowned for being the only battery to pass the nail penetration test, the e6 is one of the safest electric vehicles available. It offers a remarkable range of 520 km WLTC (City). This review covers the real-world performance, costs, carbon footprint, potential carbon credits, and overall experience of owning and driving this electric MPV over an extensive period.

## I. Year 1 (2022-23): Detailed Overview

### Impressive Mileage and Efficiency

The BYD e6 stands out for its efficiency, averaging 15.1 kWh per 100 kilometers. This makes it a cost-effective choice for long-distance driving, especially considering its size and capacity as a multipurpose vehicle (MPV), suitable for both family needs and commercial use.

### Cost Efficiency

- Fuel Cost: ₹1.20 per km
- Maintenance Cost: ₹0.13 per km after free services
- Total Running Cost: ₹1.33 per km, excluding tire wear and tear

## Energy Consumption and Charging

- Total Energy Used: 5,587 kWh
- Fast Charging: 1,276 kWh (23% of total, cost: ₹27,331 at an average of ₹21.42 per unit)
- Home Charging (Solar): 4,311 kWh (77% of total, cost: ₹16,812)

### Fast Charging Utilization

The vehicle utilized fast charging from seven companies:

1. Zeon
2. TATA EZ Power
3. Shell
4. BESCOM- EV Mitra
5. Statiq
6. Jio BP
7. Relux

The lowest cost was at BESCOM- EV Mitra (₹8.54 per unit), while the highest was at Shell (₹24.37 per unit).

## II. YEAR 2 (2023-24): CONTINUED PERFORMANCE AND MAINTENANCE

### Maintenance and Servicing

Over 73,432 kilometres, the BYD e6 underwent seven services—three free and four paid. The free services ensured initial peace of mind, while the four paid services, totalling ₹23,660, maintained the vehicle's optimal condition.

### Tyre and Brake Performance

All four tyres were replaced at 47,000 kilometres, costing ₹52,000. The brake pads have not needed replacement, thanks to the regenerative braking system.

### Routine Maintenance Costs

Regular maintenance, such as wheel alignment and balancing, was conducted every 5,000 kilometers, costing ₹1,000 per session, totalling ₹14,000 over two years.

### Speed Charging Costs in the Second Year

- StatiQ: 517 units at ₹4,976 (average cost ₹9.62 per unit)
- Zeon: 387 units at ₹9,913 (average cost ₹25.60 per unit)
- JioBP: 114 units at ₹2,139 (average cost ₹18.76 per unit)
- EV Mitra: 126 units at ₹1,164 (average cost ₹9.24 per unit)
- Charge ZONE: 87 units at ₹2,092 (average cost ₹24.04 per unit)
- Shell: 228 units at ₹6,095 (average cost ₹26.67 per unit)

### Home Charging Costs

For 36,432 kilometres, the e6 consumed 5,465 kWh:

- Speed Charging: 1,459 kWh at a total cost of ₹26,379
- Home Charging: 4,006 kWh at ₹3.90 per unit, amounting to ₹15,623

### Additional Accessories and Minor Replacements

Mud flaps and wiper blades were replaced once at a cost of ₹2,180.

### Total Cost of Ownership

#### Maintenance and Service Costs

- Paid Services: ₹23,660
- Tyre Replacement: ₹52,000
- Wheel Alignment and Balancing: ₹14,000
- Wiper Blade Replacement: ₹2,180
- Insurance: ₹61,842 (₹35,003 for the first year + ₹26,839 for the second year)

#### Charging Costs

- Speed Charging: ₹26,379
- Home Charging: ₹15,623

## III. TOTAL EXPENDITURE FOR TWO YEARS

- **Total Costs:** ₹194,684 (Maintenance + Service + Charging)

### Cost per Kilometer

- Total Kilometres Driven: 73,432 km
- Cost per Kilometer: ₹2.65

### Charging Breakdown

- Total Energy Used: 11,052 kWh
  - Speed Charging: 2,735 kWh (24.7%)
  - Home Charging: 8,317 kWh (75.3%)

## IV. CARBON FOOTPRINT ANALYSIS

### BYD e6 Electric Vehicle

Electric vehicles typically produce fewer carbon emissions compared to ICE vehicles. The carbon footprint for the BYD e6, based on its energy consumption and the electricity mix, is calculated as follows:

- Average Carbon Intensity of Electricity in India: ~0.82 kg CO<sub>2</sub> per kWh (source: International Energy Agency)
- Total Energy Used: 11,052 kWh
- Total Carbon Emissions: 11,052 kWh X 0.82 kg CO<sub>2</sub>/kWh = 9,061.44 kg CO<sub>2</sub>

### ICE Vehicle

An ICE vehicle with an average fuel efficiency of 12 km per Litre and a fuel cost of ₹89 per Litre produces significantly more emissions:

- Average Carbon Emissions per Litre of Diesel: ~2.68 kg CO<sub>2</sub> per Litre
- Fuel Consumption: 6,119 Litres
- Total Carbon Emissions: 6,119 Litres X 2.68 kg CO<sub>2</sub>/Litre = 16,402.92 kg CO<sub>2</sub>

#### Comparison of Carbon Footprints

- BYD e6: 9,061.44 kg CO<sub>2</sub>
- ICE Vehicle: 16,402.92 kg CO<sub>2</sub>

#### Carbon Credits

##### Calculation of Carbon Credits

Carbon credits can be earned by reducing emissions compared to a baseline. In this case, the baseline is the ICE vehicle's emissions:

- Emission Reduction: 16,402.92 kg CO<sub>2</sub> (ICE) - 9,061.44 kg CO<sub>2</sub> (BYD e6) = 7,341.48 kg CO<sub>2</sub>
- Carbon Credits Earned: 7.34 credits (1 credit = 1 ton CO<sub>2</sub>)
- Total Value: 7.34 credits X ₹1,000 = ₹7,340

#### Potential Financial Benefits

The financial value of carbon credits varies, but assuming a market rate of ₹1,000 per credit:

#### CONCLUSION

The BYD e6 electric MPV has demonstrated remarkable reliability, cost-efficiency, and a reduced carbon footprint over two years and 73,432 kilometers. With low energy consumption, minimal maintenance needs, robust performance, significant carbon emission reductions, and potential carbon credits, it is a viable option for sustainable and economical transportation. Its durability, especially in terms of tire and brake longevity, makes it suitable for both personal and commercial use. Comparing it to a conventional ICE vehicle, the BYD e6 offers substantial savings and environmental benefits, making it a worthwhile investment for environmentally conscious and budget-savvy consumers.

#### Comparison with an ICE Vehicle

##### Fuel and Maintenance Costs

An ICE vehicle with an average fuel efficiency of 12 km per Litre and a fuel cost of ₹89 per Litre:

- Fuel Consumption: 6,119 Litres
- Fuel Cost: ₹544,591
- Maintenance Cost: ₹72,500
- Insurance Cost: ₹61,842
- Total Cost of Ownership: ₹678,933
- Cost per Kilometer: ₹9.24

##### Cost Savings with BYD e6

- Total Savings: ₹484,249 (₹678,933 - ₹194,684)
- Savings per Kilometer: ₹6.59 (₹9.24 - ₹2.65)

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