

LB/TH/46/2025
TH6052

**ANALYSIS OF ELECTRIC VEHICLE ADOPTION IN
SRI LANKA: TECHNO-ECONOMIC AND
ENVIRONMENTAL PERSPECTIVES**

Nuwanthi Jayawickrama Abeygunawardena

(228955P)

Degree of Master of Science

Department of Electrical Engineering

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Nuwanthi Jayawickrama Abeygunawardena

(228955P)

Dissertation submitted in partial fulfillment of the requirements for the degree Master
of Science in Electrical Engineering

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Declaration of the candidate & Supervisor

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the Masters Dissertation under my supervision.

Name of the supervisor: Prof. W.D.A.S. Wijayapala

UOM Verified Signature

Signature of the supervisor:

Date : 28.07.2025

Acknowledgements

First and foremost, I would like to express my sincere gratitude to my research supervisor, Prof. W.D.A.S. Wijayapala, for his continuous support since the beginning of this research in May 2024. All the virtual discussion meetings we had were insightful and enriched with valuable input from him, which greatly contributed to the success of this study.

Secondly, I would like to thank the 243 survey participants for taking the time to provide the data required for this research. Without their valuable support, the analysis would not have been as effective or meaningful.

Last but not least, I am deeply grateful to my husband, parents, and sister for their unwavering emotional support, which played a major role in helping me complete my Master's degree program.

Abstract

As a developing nation in Asia, Sri Lanka has become increasingly reliant on fossil fuel-based energy since the late 1900s. The transportation sector, in particular, heavily depends on fossil fuels, contributing significantly to environmental degradation and rising fuel demand. While battery electric vehicles (BEVs) have emerged globally as a sustainable alternative, Sri Lanka has yet to experience a major shift in BEV adoption.

This study aims to theoretically assess the techno-economic and environmental feasibility of switching from internal combustion engine (ICE) vehicles to BEVs in the Sri Lankan context. It also compares the environmental impact of BEVs with hybrid electric vehicles (HEVs) and ICE vehicles available in the local market.

A techno-economic model was developed using survey data. The Nissan Leaf was selected as the representative BEV, while the Toyota Aqua and Toyota Vitz represented the HEV and ICE categories, respectively. Using the net present value (NPV) method, the levelized cost of mileage (LCOM) was calculated. Results showed that the Nissan Leaf had the lowest LCOM at 14.72 LKR/km, followed by the Aqua at 24.26 LKR/km, and the Vitz at 31.27 LKR/km.

The Toyota Vitz has the highest greenhouse gas (GHG) emissions, at 0.261 kg CO₂/km, according to the life cycle assessment, followed by the Toyota Aqua with emissions of 0.153 kg CO₂/km. However, despite higher production-phase emissions from battery manufacturing, the Nissan Leaf has the lowest emissions, measuring 0.108 kg CO₂/km. Over their lifetime, BEVs are the most environmentally friendly choice due to the notable decrease in operational phase emissions.

In conclusion, BEVs are both economically and environmentally advantageous, particularly if Sri Lanka can further decarbonize its electricity grid. A greener energy mix would enhance the sustainability and appeal of BEVs as a viable transport solution for the country.

Keywords : Techno-economic analysis, electric vehicles, environmental impact assessment

Table of Contents

Declaration of the candidate & Supervisor	i
Acknowledgements	ii
Abstract	iii
List of Figures	vi
List of Tables.....	viii
List of Abbreviations.....	ix
1 Introduction	1
2 Literature Review	8
2.1 Introduction	8
2.2 EVs in developing countries	8
2.3 Economic feasibility of EVs	9
2.4 Environmental impact of EVs.....	13
2.5 Current status in Sri Lanka.....	16
2.6 Research gap and justification	16
3 Methodology	18
3.1 Techno-Economic Analysis (TEA).....	18
3.1.1 Vehicle selection	18
3.1.2 Inputs to the Techno-Economic Analysis	18
3.1.3 Survey	19
3.1.4 Developing the Levelized Cost of Mileage (LCOM) model	20
3.2 Environmental Impact Assessment (EIA).....	24
3.2.1 Production phase emissions	25
3.2.2 End-of-life emissions	26

3.2.3	Operational phase emissions	27
3.2.4	Calculating environmental impact	30
4	Results and Discussion.....	32
4.1	Techno-Economic Analysis (TEA).....	32
4.1.1	Survey results	32
4.1.2	Levelized Cost of Mileage	33
4.1.3	Sensitivity analysis – LCOM	37
4.2	GHG assessment	45
4.2.1	Vehicle production emissions	45
4.2.2	Battery production emissions	46
4.2.3	Vehicle end-of-life emissions	47
4.2.4	Battery end-of-life emissions	48
4.2.5	Operational phase Emissions	50
4.2.6	Greenhouse gas emissions in a lifetime	52
4.2.7	Sensitivity analysis.....	55
5	Conclusions and Recommendations	60
	Bibliography.....	62
	Appendix A: Default emission factors for stationary combustion in the energy industries	65
	Appendix B: Default net calorific values (NCVs)	66
	Appendix C: Survey form and worksheet.....	67

List of Figures

Figure 1. 1 Vehicle population over time in Sri Lanka.....	2
Figure 1. 2 Energy consumption by sector over the years	2
Figure 1. 3 EV usage around the world in 2024	4
Figure 1. 4 Number of EVs sold in 2024	5
Figure 1. 5 Vehicle population in Sri Lanka by 2023	5
Figure 1. 6 New registrations of electric cars	6
Figure 2. 1 Different phases of battery degradation during its lifetime.....	9
Figure 2. 2 Lifecycle stages of a typical vehicle.....	10
Figure 2. 3 Emissions of different Vehicles during the main phases.....	15
Figure 4. 1 Driving habits of survey participants	33
Figure 4. 2 Carbon cost per kilometer.....	35
Figure 4. 3 LCOM with fuel price	38
Figure 4. 4 LCOM with electricity price variation	39
Figure 4. 5 LCOM with distance travelled.....	40
Figure 4. 6 LCOM with interest rate	41
Figure 4. 7 LCOM with EV battery recycling cost.....	42
Figure 4. 8 LCOM during base case and worst case.....	44
Figure 4. 9 Vehicle production emissions.....	46
Figure 4. 10 Battery production emissions	47
Figure 4. 11 Vehicle end-of-life CO ₂ emissions	48
Figure 4. 12 Battery end-of-life CO ₂ emissions.....	49
Figure 4. 13 GHG emissions during the production and end of life of vehicles.....	50
Figure 4. 14 Annual CO ₂ emissions during the operational phase of vehicles	51

Figure 4. 15 CH ₄ and N ₂ O emissions during the operational phase	52
Figure 4. 16 GHG emissions during the production, operational phase and end-of-life stage of vehicles	53
Figure 4. 17 CO ₂ emissions per kilometer	54
Figure 4. 18 Percentage contribution from each phase to environmental emissions .	55
Figure 4. 19 GHG emissions with different battery sizes	56
Figure 4. 20 Change in GHG emissions with a greener grid	58
Figure 4. 21 GHG emissions per kilometer travelled	58

List of Tables

Table 3. 1 Data initialization.....	22
Table 3. 2 Vehicle curb weights.....	25
Table 3. 3 Hybrid Battery size	26
Table 3. 4 Emission parameters from IPCC.....	28
Table 3. 5 GWP-100 values for major GHG.....	29
Table 3. 6 Emission factors from IPCC	30
Table 4. 1 Survey participation over vehicle categories.....	32
Table 4. 2 Levelized cost of mileage without environmental costs	33
Table 4. 3 Levelized cost of mileage with environmental cost.....	35
Table 4. 4 Levelized cost of mileage with home solar charging.....	36
Table 4. 5 Sensitivity parameters with base cases	37
Table 4. 6 Parameters for the base and worst case comparison	43
Table 4. 7 Lifetime GHG emissions.	53
Table 4. 8 Electricity generation mix in Sri Lanka 2022	57

List of Abbreviations

Abbreviation	Description
TCO	Total cost of ownership
ICE	Internal combustion engine
EV	Electric vehicles
BEV	Battery electric vehicle
PHEV	Plug-in hybrid electric vehicle
HEV	Hybrid electric vehicle
CNG	Compressed natural gas
REET	Greenhouse gases, Regulated Emissions, and Energy use in Transportation
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
GHG	Greenhouse gas
NPV	Net present value
LCOM	Levelized cost of mileage
EOL	End of life
DMT	Department of Motor Traffic
EIA	Environmental impact assessment