Centre for Social Change
सामाजिक परिवर्तन केन्द्र

# Electric Vehicle

## AN ECONOMIC AND ENVIRONMENTAL ALTERNATIVE FOR NEPAL

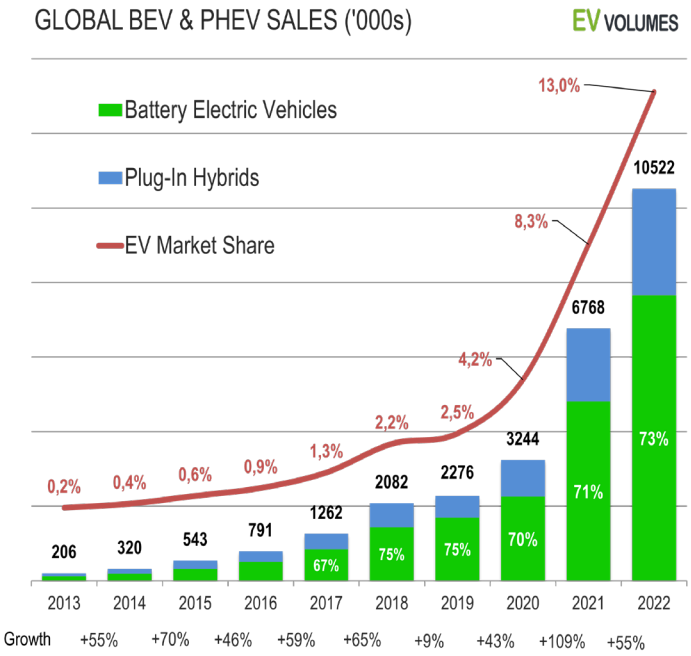
# INTRODUCTION

An Electric Vehicle (EV) relies on an electric motor for propulsion. It derives power from a battery, which can be recharged using an external power source. Moreover, the term EV encompasses two main categories: the battery electric vehicle (BEV), which solely relies on an electric motor drawing electricity from a battery, and the Plug-in Hybrid Electric Vehicle (PHEV), which can utilize both an electric motor powered by a battery and an internal combustion engine.

Many studies show that the transportation sector consumes a significant portion of the world's petroleum and stands as one of the primary contributors to air pollution and global greenhouse gas (GHG) emissions. Also, vehicle emissions are one of the significant sources of fine Particulate Matter (PM2.5) and Nitrogen oxide (NOx), which are major drivers of urban air pollution. In regard to this, the Intergovernmental Panel on Climate Change (IPCC) warns, that fossil fuel emissions must be halved in the next 11 years if the rapidly progressing effects of global warming are to be limited. As recent studies have also directly linked escalating effects of climate change to GHG emissions, its effective reduction is already a top agenda of countries around the world.

This makes EVs a potential alternative to conventional automobiles among the ongoing measures to combat escalating effects of pollution, climate change, and the depletion of fossil fuels and natural resources. Recognizing the various global and regional commitments made by countries to reduce GHG emission, the extent of the environmental impacts caused by automobiles is already being determined by people's ability to transition effectively to EVs and improve the fuel efficiency of cars.

*Figure 1: Global sales of EVs*




*Source:* www.ev-volumes.com

On this note, globally, sales of EVs reached a total of 10.5 million during the year 2022, which is an increase of 55% compared to EV sales in 2021.

As also showed by Figure 1, a massive incline of global interests towards EVs can be seen in that span but is this true for Nepal as well? A young federal developing nation that is one of the most vulnerable countries to the effects of climate change, yet whose capital city Kathmandu was recorded as the most polluted city in the world with hazardous level air quality in 2023. A country that has volatile political and policy grounds with varied socio-political interests and governance challenges of its own. Will EVs be able to make a mark in Nepal too?

To answer this, a thorough study of the history and development of EVs and pros and cons of using them not only from a policy perspective but also from usage perspectives are discussed further in this short study:

# Brief history of EVs and its development

Records show that the history of EVs predates gasoline-powered cars. Although the experimental prototypes emerged in Hungary, the Netherlands, and the UK in the 1830s, the first practical EV is credited to American inventor William Morrison, who developed a viable EV around 1890. His invention marked an important milestone in the evolution of EVs and thereon it transitioned with trend as displayed in the following figure:

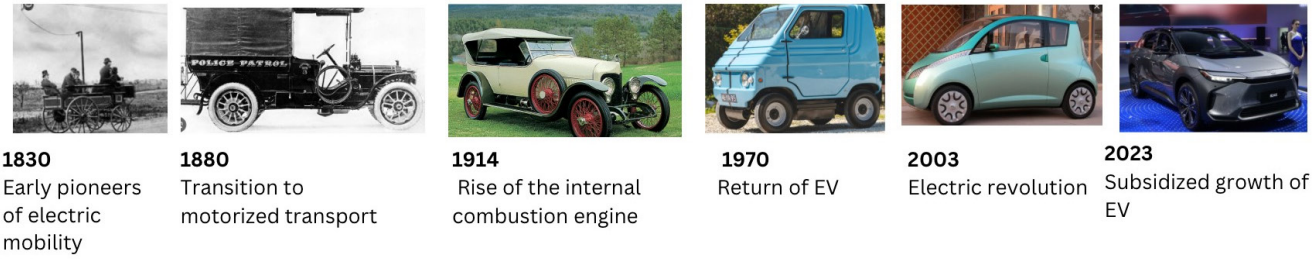



*Figure 3: Development of EVs from 1830 through 2023*

Globally, Norway and the Netherlands have emerged as leading countries in the widespread adoption of EVs. Norway's success can be attributed to its comprehensive range of incentives and long-standing policies, including purchase/ import tax exemptions, VAT benefits, and other financial advantages. Norway also abolished annual road taxes, waived toll road charges, and provided free municipal parking for EVs. Similarly, the Netherlands has made significant progress in EV adoption through taxation policies that exempt EVs from road and registration taxes. Both countries have also prioritized infrastructure development to support EV charging.

# Trolleybuses- the forerunner of EVs in Nepal

Although there stands a long history of production and adoption of EVs worldwide, they didn't make their way into the Nepali transportation industry, until 1970, with the introduction of electric trolleybuses in its capital city Kathmandu, with support of China. There were 22 standard electric trolley buses in operation by 1995 and 10 more were donated in 1997. This inter-urban electric transport line, spanning a 13 km route, was established in 1979 and served as a crucial transportation link for almost three decades for the Nepali commuters.

*Image source: www.nepalitimes.com*

However, over the years, the trolley bus transport line faced numerous challenges like persistent technical faults, theft of overhead wires, lack of maintenance efforts, insufficient investment, etc., that ultimately led to its eventual closure in the year 2009. Presently, as environment conscious alternative, 700 battery-run Safa Tempos continue to operate on 28 designated routes, effectively catering to Kathmandu's public transportation requirements.

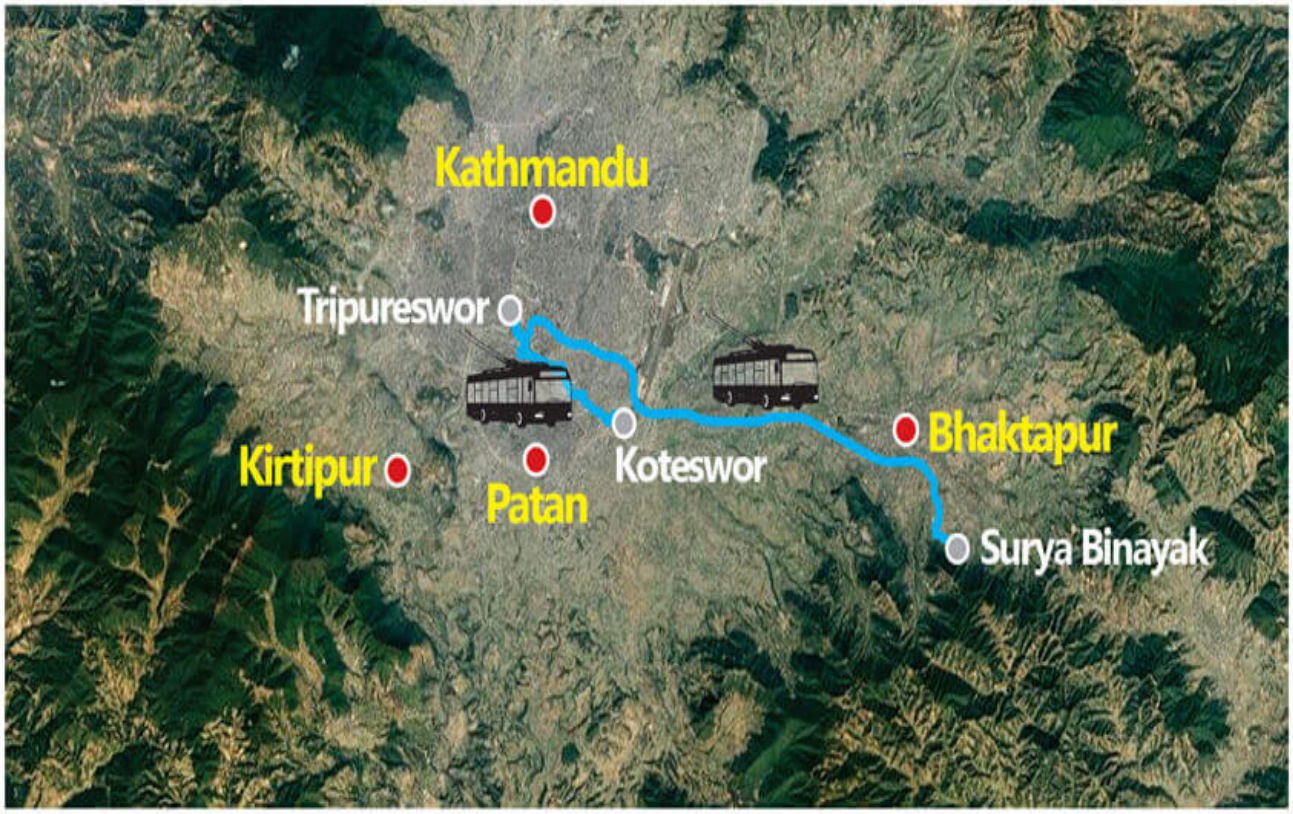



*Image source: www.nepalitimes.com*

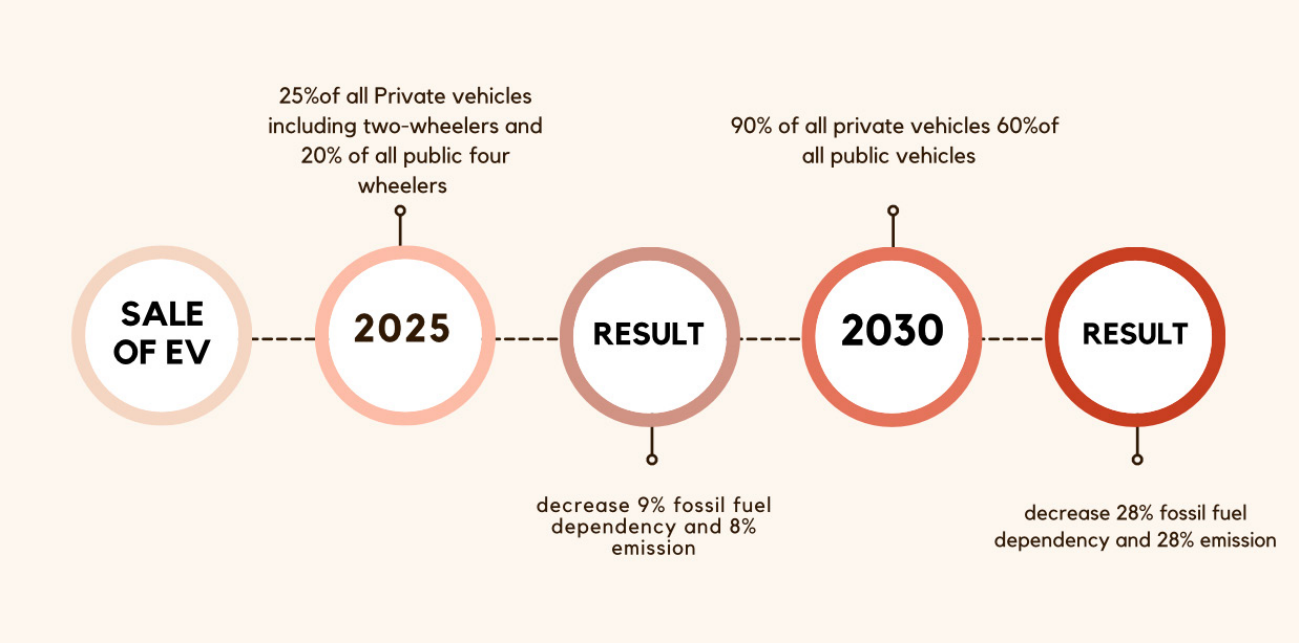
Reflecting upon this brief history, although the entry of EVs in Nepal was through public transportation system, the real growth and diversification of EVs did not take place un1993, in both private and public sectors, that has continued in the decades that followed. Currently, in addition to the Safa tempos, many other public transport companies are also switching to EVs in Nepal. A lot of small electric vans can be seen on the BP Highway, Nepalgunj, Surkhet, Birgunj, Dhangadi, and Mahendra Nagar as businesses realize the cheap operating costs of EV. Along with Kathmandu, Electric buses are also providing local transport services in Pokhara, Dang, and Butwal. Sajha Yatayat, the well-known means of local transport for its spacious and clean ambiance, has also started the operation of at least six of its EV models out of the 40 bought by the company and is in the process of running more of them gradually.

While restoration of EVs in the public sector is seemingly showing an increasing trend, similar inclination can be seen in import and purchase of private two-wheeler and four-wheeler EVs. A spur in adoption of EVs was witnessed in FY 2017/18 after Nepal Electricity Authority (NEA) successfully got rid of electricity load shedding. However, in the last couple of years, especially during the global pandemic era of 2020-2021, the EV import trend has slowed down as there are growing concerns over ambiguous policy changes, poor infrastructures, high prices, inadequate technical sustenance, but are these apprehensions valid? Further on, this article examines the factors that have the potential to influence adoption of EVs in Nepal.

# Nepal's commitment to mitigating the climate crisis by promoting EVs

As a part of Nationally Determined Contribution (NDC, 2020) which is the nation's self-defined national climate pledges under the Paris Agreement, Nepal has committed to increase the use of electric vehicles to 25%of all passenger vehicles (including two-wheelers) by 2025 with 20% of all four wheelers public passenger vehicle. Apart from this, in its long-term strategy to achieve net-zero GHG emissions by 2045, the country has committed to increasing sales of EV to cover 90% of all private passenger vehicles including two wheelers and 60% of all four-wheeler's public passenger vehicle sales. A snapshot of the results are shown as shown in Figure 2:

*Figure 2: Nepal's plan to increase EV sales to decrease fossil fuel dependency and GHG emission*




*Source: openknowledge.worldbank.org*

According to reports, around 12% of the GHG emissions from the energy sector in Nepal comes from transportation (public and private) sector and to tackle this problem, EVs have the potential to address air pollution and decrease a nation's reliance on imported petroleum. However, are the above-mentioned transitions viable for Nepal and are these goals achievable? Also, is there scope for efficient economic policies and development policies for establishing robust support infrastructure to further enhance the adoption and effectiveness of electric vehicles.

To answer this, a thorough study of the history and development of EVs and pros and cons of using them not only from a policy perspective but also from usage perspectives are discussed further in this short study.

# Policies relevant to EVs in Nepal

As a part of initiative to promote EVs the Nepal Government issued a notice in 2022, announcing that individuals can now convert their petrol and diesel vehicles into electric or alternative fuel vehicles. They have granted a three-year exemption for environmentally friendly modifications to the fuel system. Previously, such conversions were not possible due to registration and approval requirements. However, the Ministry of Transport has yet to initiate the registration process for centers that will retrofit old vehicles with electric kits (Dhakal & Sakya , 2022).

Additionally, the following table shows some of the recent EV relevant policies Nepal has introduced:

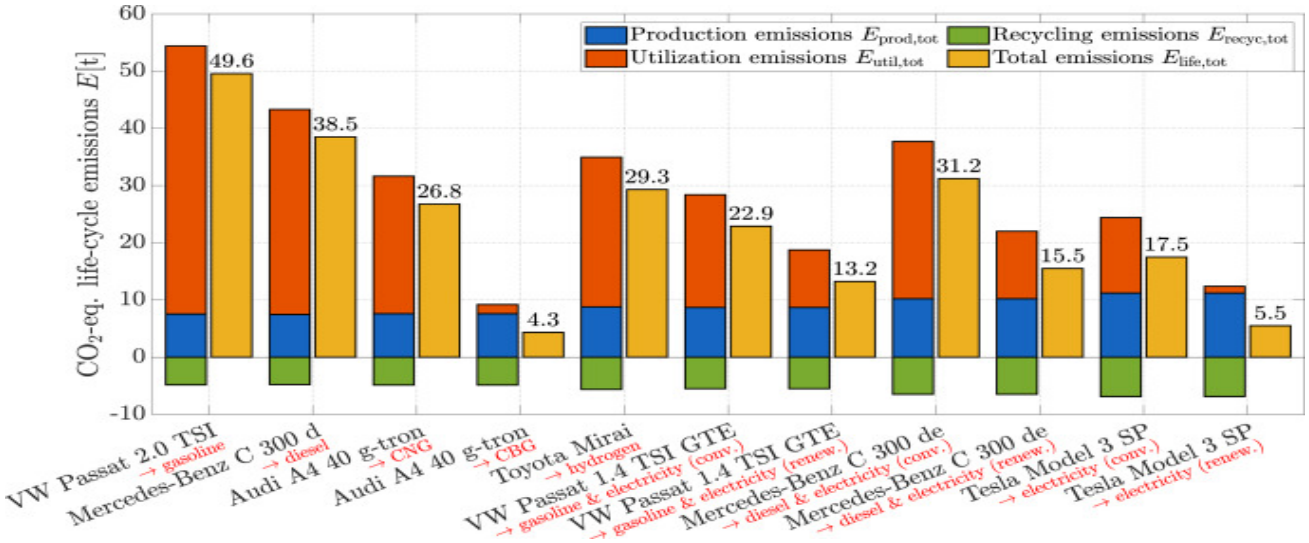
| Fiscal Year | EVs relevant budget policies in Nepal |
|---|---|
| 2023/24 | - 10% excise and 15% customs duty levied on EVs (50kw to 100kw)<br>- 20% excise and 20% customs duty levied on EVs (101kw to 200kw)<br>- 10% excise and 15% customs duty levied on EVs (50kw to 100kw) |
| 2022/23 | - 45% excise duty levied on EV imports (201-300kw)<br>- 60% excise duty on EVs (more than kw) |
| 2021/22 | - Excise duty removed on EVs<br>- Rolled back custom duties to 10%<br>- Slashed import duty on EVs (10- 40%) |
| 2020/21 | - Excise duty levied 30-80%<br>- Customs duty fixed at 60% |

Along with above policies, various other measures to encourage EVs in Nepal have also been introduced. The government has adopted certain measures to reduce the cost of production of EVs in order to give them a competitive edge in the market. It has also levied a marginal import duty of 1% on the electric components of EVs as compared to 20% for other electric goods. In addition, the Value Added Tax (VAT) Act 2054 has removed VAT on the chassis and the battery, which are the main components of the EVs. Also, Nepal Rastra Bank which is the authorized regulatory and monitoring body of the banking sector in Nepal has also included EVs in the priority sector. It has been made mandatory for all the government and joint venture banks to direct at least 12% lending of the total loan portfolio to the projects assigned under the priority sector. This decision has undoubtedly helped to increase the volume of finance for EV- related activities and a number of EV entrepreneurs have benefitted from this program.

# Lifecycle costs of EVs

If we critically observe the environmental impact of EVs during their lifecycle, the initial footprint during its production and recycling phase is higher than that of gasoline-powered vehicles. Also, the production of batteries used in EVs, which rely on lithium as a key component, involves mineral mining that contributes to GHG emissions. This can be observed in figure 3 that comprehensively compares various vehicle models to assess their lifecycle emissions cost:

*Figure 3: Comparison of lifecycle emission costs of vehicles*




*Source: www.sciencedirect.com*

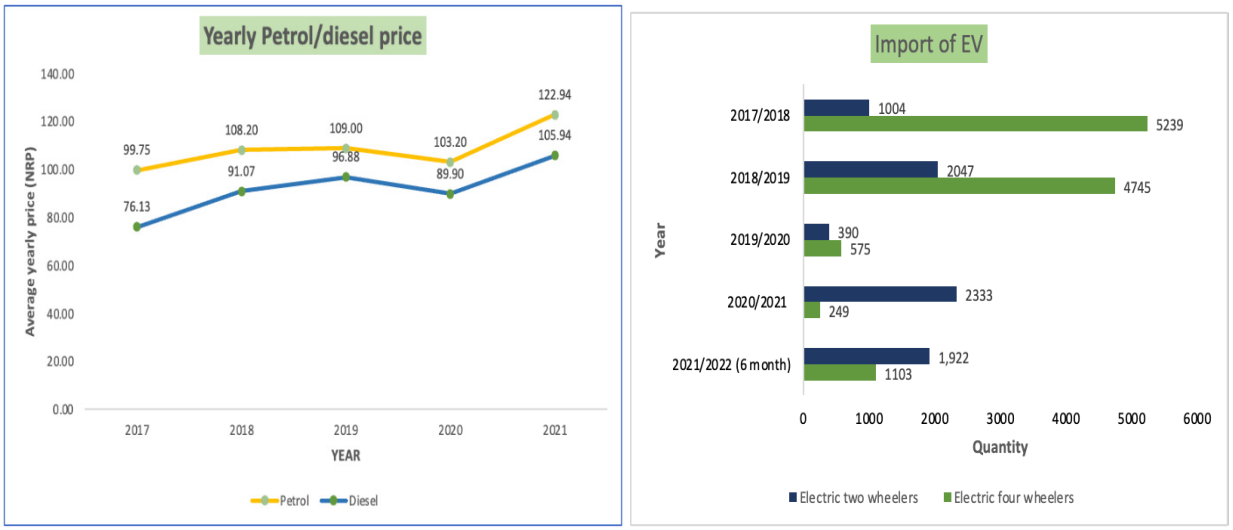
Even so, when comparing the high production emission cost to the entire lifespan emission cost of an EV from production to utilization, the total emissions are still significantly lower compared to traditional petrol or diesel-run vehicles. Also, realizing the escalating damages to environment and climate caused by GHG emissions, EVs lifecycle emissions are extremely low risk as compared to the conventional vehicles.

# Price factor and purchase of EVs

A 2022 survey commissioned by The Motor Ombudsman, UK revealed that 48% of UK car owners are concerned about owning a fuel-powered vehicle due to high petrol and diesel prices. This has been a major encouraging factor to shift to EVs as their next vehicle purchase and this phenomenon of transitioning from conventional vehicles to EVs is observed in numerous other countries as well. However, in the case of Nepal, according to reports, Nepal's petroleum consumption has almost doubled in the last five years, yet there is a moderate positive correlation of 0.46 between petrol/ diesel prices and the import of four-wheeler electric vehicles.

While the emerging correlation between diesel prices and the import of EVs in the UK indicates consumers and businesses potentially respond to the increasing cost of petroleum by showing a growing interest in EVs, such a relation is not as relevant as expected in Nepal. As diesel prices rise, people may seek alternatives that can offer more cost-effective and environmentally friendly transportation options. However, despite the ongoing increase in petrol/diesel prices, the adoption of electric vehicles in Nepal has not been as rapid as one might expect. This trend can be observed in the following figures:

*Figure 4: Comparison of diesel/ petrol price and number of EVs imported between 2017 and 2021*




*Source: Nepal Oil Commission, Inland Revenue Department, Nepal*

One of the major factors hindering the widespread adoption of EVs in Nepal is the presence of unclear taxation policies. The government's approach to incentivizing EVs through tax breaks, subsidies, or reduced import duties are not well-defined and change frequently. This uncertainty creates hesitation among potential buyers who are unsure about the long-term financial benefits of owning an electric vehicle. Another crucial aspect that affects the adoption of EVs in Nepal is the state of charging infrastructure. The lack of confidence in finding charging stations along their travel routes may deter potential buyers from embracing electric vehicles as their primary mode of transportation. Therefore, unclear taxation policy, unreliable infrastructure, and changing policies in Nepal might be the factors that lead to hesitation toward the widespread adoption of EVs.

# Conclusion

From a thorough study of the developing trends, we can see that despite the challenges associated with carbon emissions during production and battery disposal phases, EVs offer promising environmental and economic benefits for Nepal. By adopting EVs, the country can significantly improve its worsening air quality and take significant steps to reduce its heavy reliance on petroleum imports, which has seen a staggering increase over the past decade. Given that transportation is a major contributor to Nepal's overall GHG emissions, transitioning to EVs becomes crucial in achieving the country's ambitious target of becoming carbon-neutral by 2050.

The adoption of EVs offers a promising solution to curb emissions from the transportation sector significantly. By promoting the widespread use of EVs and gradually phasing out traditional fossil fuel-powered vehicles, Nepal can make substantial strides towards its carbon-neutrality goal and play a vital role in combating climate change effects at regional scale. Additionally, it is essential for the government and other relevant stakeholders to invest in renewable energy sources to power EVs and ensure a truly sustainable and low-carbon transportation system for the country's future. Moreover, transitioning to EVs presents an opportunity for Nepal to address its trade deficit with countries as the country heavily imports petroleum products, which places a strain on its economy and trade balance. Embracing EVs would allow Nepal to decrease its dependence on foreign petroleum imports hence, the pursuit of environment sustainability and economic progress, EVs emerge as a promising solution for Nepal's transportation sector.

# References

Baral, A., Parajuli, R., & Aryal, B. (2000). Instututional Responses to Electric Vehicle Promotion in Nepal. Mandala Book Point.

Dhakal, S. D., & Sakya , S. R. (2022). Conversion of Petrol Driven Vehicles into Electric : Detail Case Assessment of Nepal. Pulchowk : IOE Graduate Conference.

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