

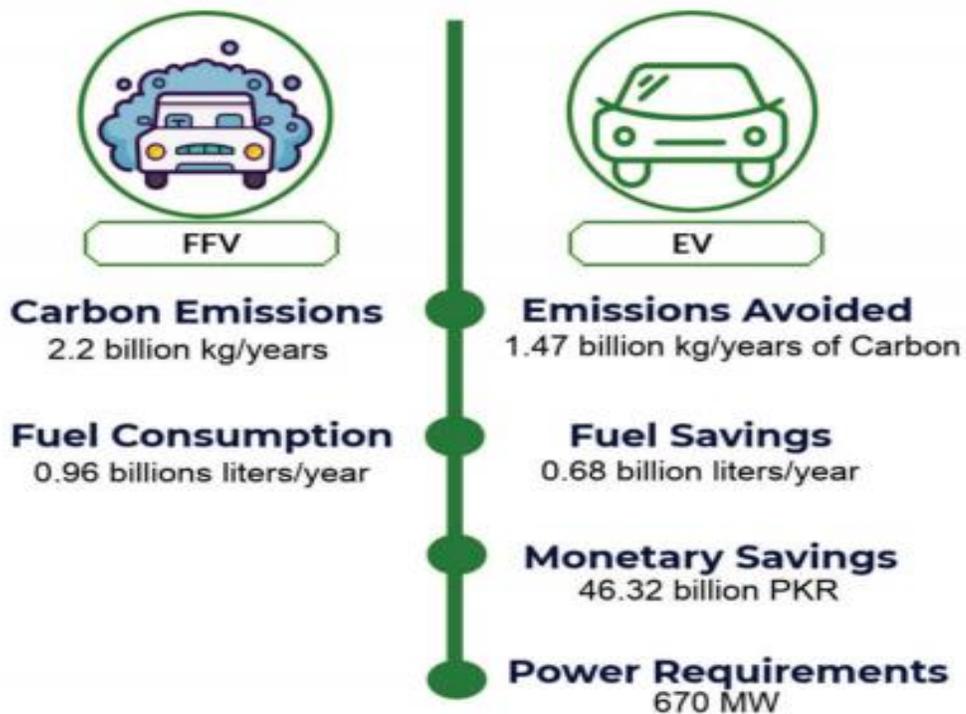
FCCI

Research & Development Center



EVS VS FFVS
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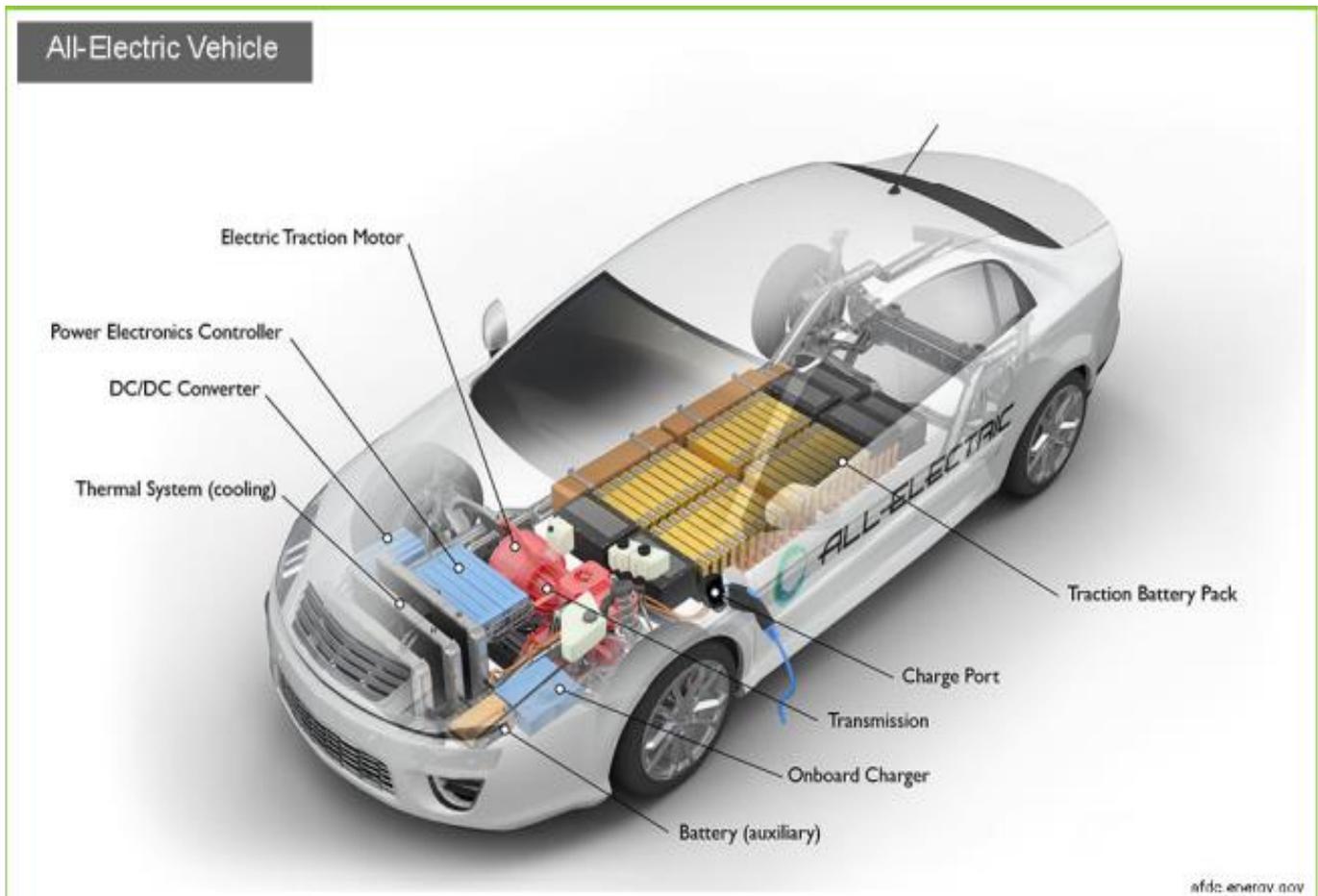
Electric Vehicles (EVs) & Fossil Fuel Vehicles (FFVs)



Comparison of EVs & FFVs

1. Introduction

- According to the **Global EV Outlook 2021**, **global** electric car stock reached 10 million units, 41% higher than in 2019.
- Current average demand for power is around 18,000-20,000 MW, while the system has the capacity to generate 33,961 MW.
- Bill for fuel imports currently amounts to USD 10.42 billion, which is estimated to reach a staggering value of USD 30.7 billion by 2025.
- EVs can solve these dilemmas. EVs run on electric power instead of gasoline.
- Total no. of vehicles in Pakistan are approximately 23,588,268.
- Every year, the number of vehicles is increased by 9.6%.



2. Transportation Sector in Pakistan

The transportation sector has been growing with a double-digit growth in Pakistan. Almost all of the transportation sector is dependent on oil-based products and the country is spending around USD 13 billion on the import of oil every year. If our transport sector continues to grow at the same double-digit rate, the bill for oil import is expected to reach USD 30 billion by 2025 as already mentioned.

Pakistan is rated 5th most affected country due to adverse impacts of climate change.

The overall population in the country is growing at an annual growth rate of 2.1 percent.

The urban population is projected to reach almost 60% from 40% in 2018.

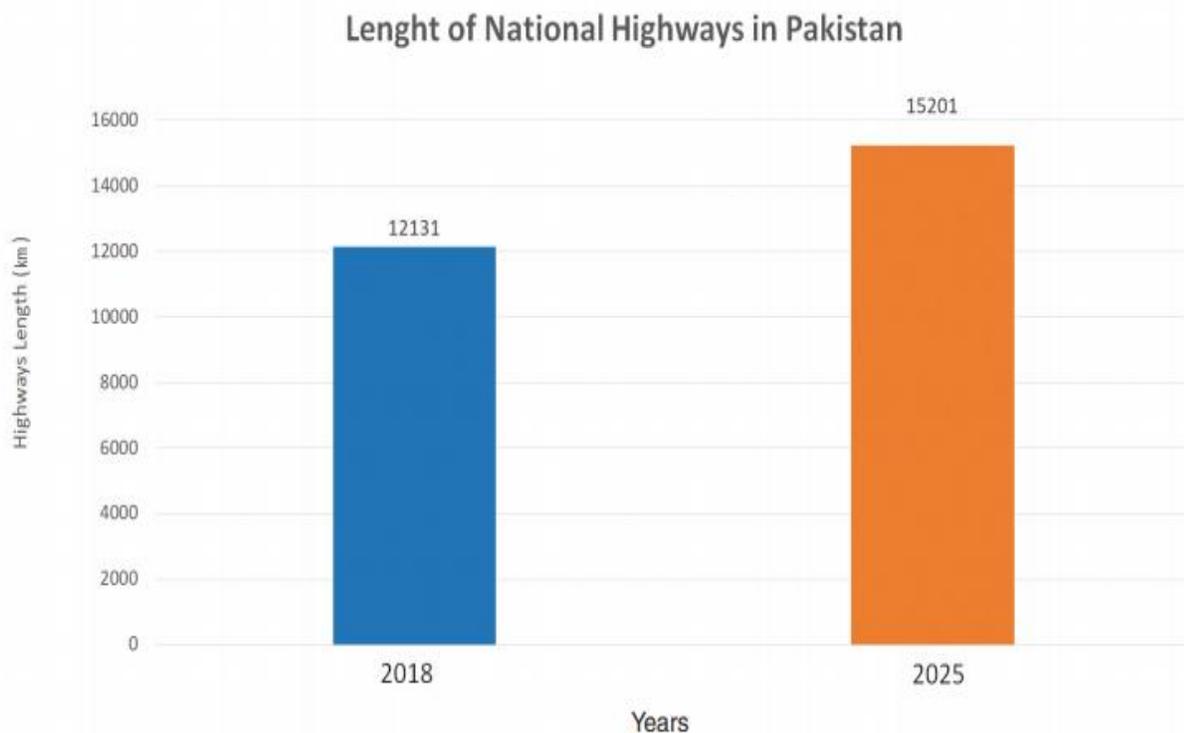


Figure 1: The magnitude of increase in the network of highways from 2018 to 2025 is substantial. Such vast and rapid expansion tends to significantly increase the vehicular transport on highways [7].

The density of cars per 1000 individuals is 16. This number is expected to double by the year 2025.

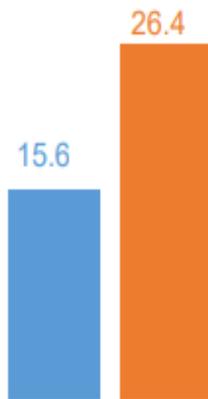
The total number of vehicles is estimated to reach 31.8 million by 2025 with 4.11 million cars only.

High Growth in Transportation Sector 2018-25



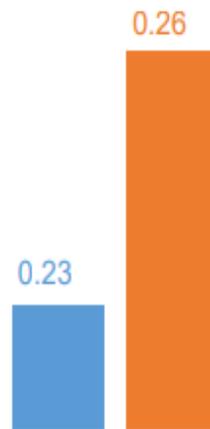
■ 2018 ■ 2025

37.5%



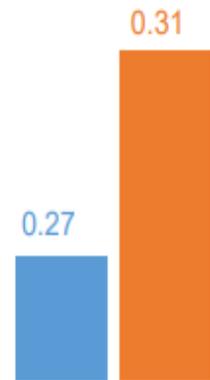
■ 2018 ■ 2025

69.2%



■ 2018 ■ 2025

13.0%



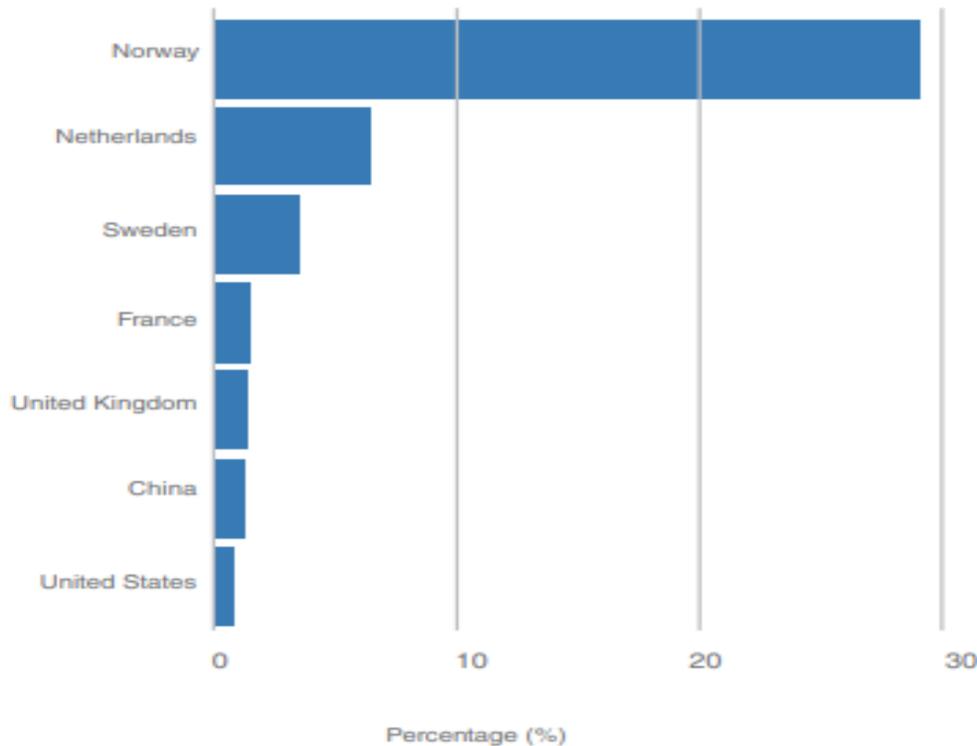
■ 2018 ■ 2025

14.8%

3. EV Targets and Estimates Around the Globe

According to the “30@30” initiative, many economies of the world have pledged to reach “30 percent sales share for EVs by 2030.”





Market share of EVs in the total vehicular transportation across various countries. Norway and The Netherlands possess significantly clean air as compared to most parts of the world. However, such countries have incorporated a sizeable number of EVs into their transportation network.

CHINA

Large scale introduction of EVs through indigenous development. In 2018, Chinese firms rolled out more than 0.68 million EVs. Presently, China has 1.2 million EVs on roads, with 214,000 public and 232,000 residential charging facilities. China plans to increase the number of residential charging facilities to 500,000 in next 4 years. Part of the “30@30” accord.

INDIA

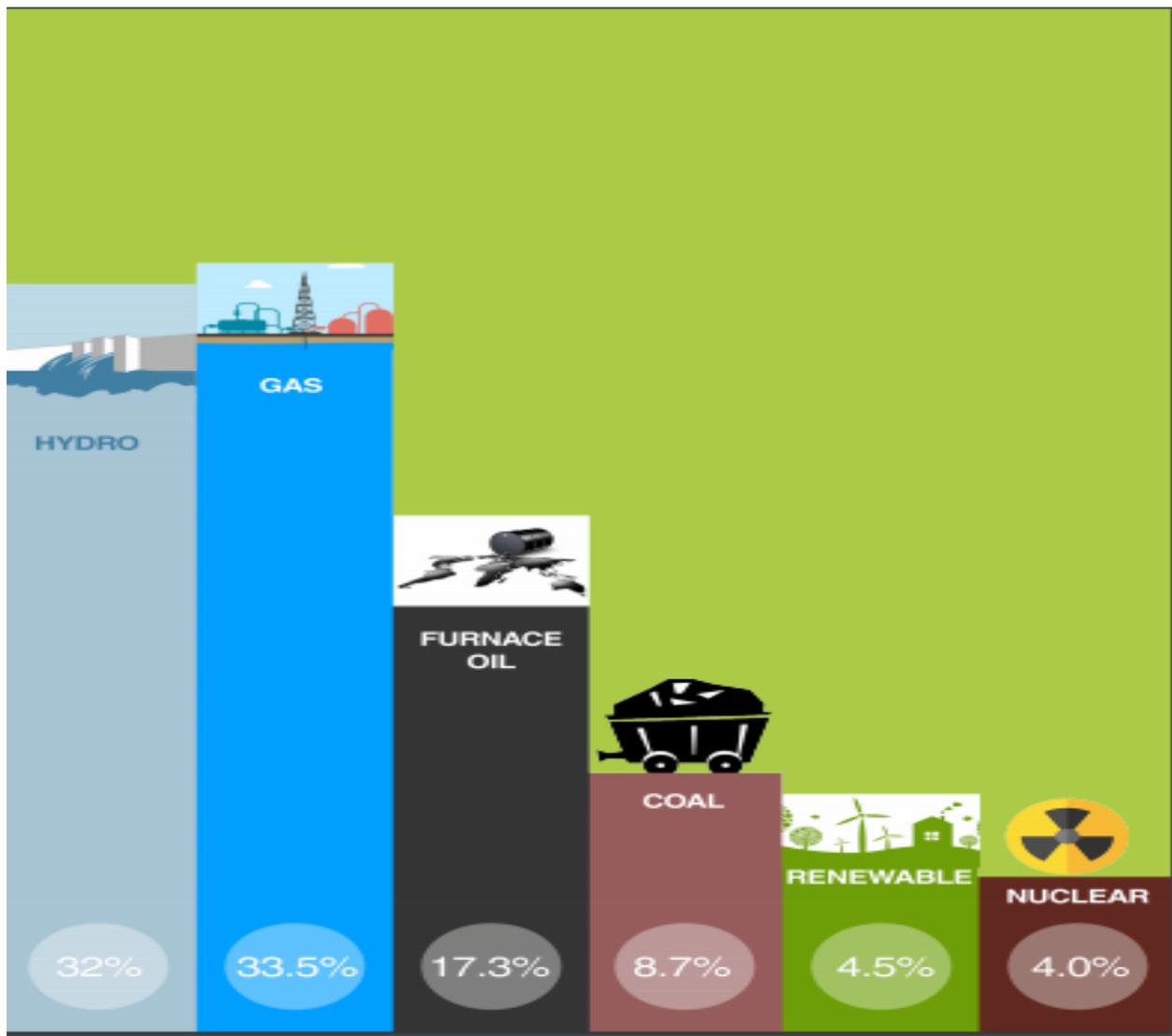
Ambitious plans have been set to electrify one-third of all vehicular transportation by 2030 under “National Electric Mobility Mission Plan.” Work on a rigorous plan has commenced to indigenously develop EVs and its batteries. Work on an elaborate charging infrastructure is in its final stages of completion. The federal and local governments are vigorously promoting use of EVs and their associated benefits. Role of renewables in electric mobility is being comprehensively examined. India is also a signatory to the “30@30” accord. India

also witnessed some of the worst forms of air pollution and 14 of the world's most polluted cities were once located there.

SRI LANKA

Despite feeble economy, the country aims to achieve a noteworthy transition from FFVs to EVs. Work on electrification of transport sector started in 2010 with introduction of electric buses. "Lanka Electric Vehicle Association", a private enterprise funded by government, has started development of EV parts and assembling units in the country. Program has been launched at community level to introduce benefits of EVs.

World Energy Generation Sources (Percentage-wise)

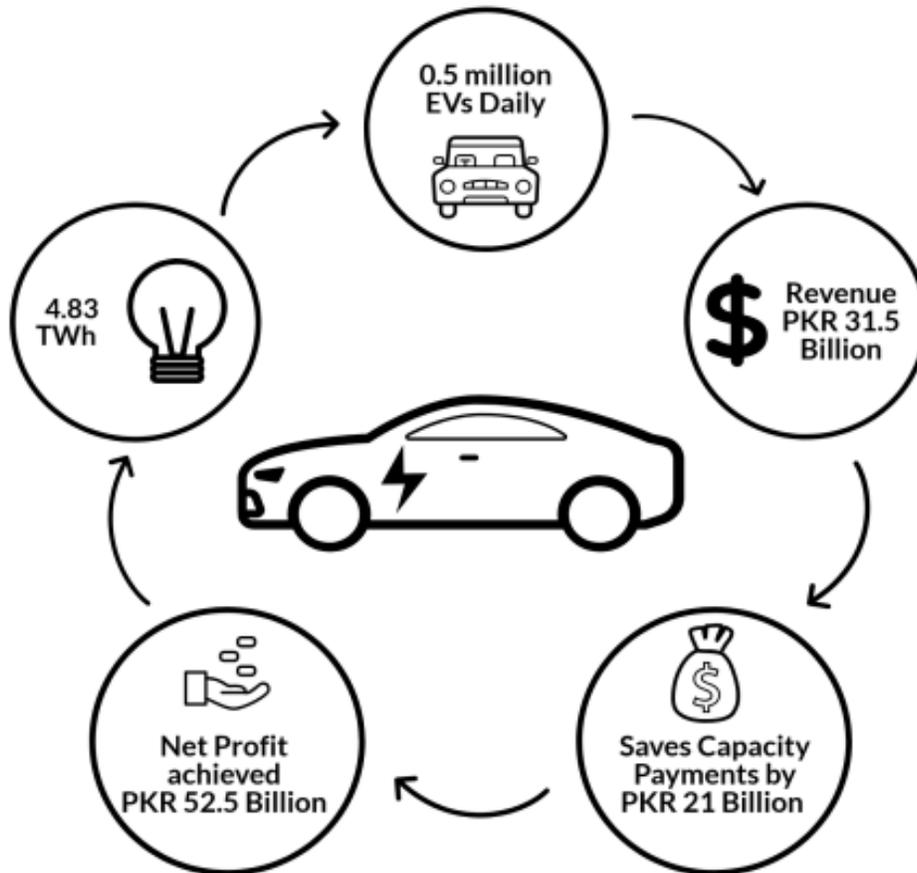


4. Power Sector of Pakistan



Effect of EVs on Grid Load in Pakistan

We suggest bringing 0.5 million EVs into the transportation grid by 2025. According to our estimates as per the context of Pakistan, each EV will require 28 kWh of energy per day. The daily energy consumption for 0.5 million EVs will be 16,100 MWh after transmission and other losses have been taken into account. Each EV can travel approximately 150-300 Km in a single charge. The total energy required by all EVs in a year will be 4.8 TWh.



5. Impact of Energy and Transport Sector on the Environment

Energy and transport sectors are the primary contributors towards deteriorating environment in the country.

The concentration of the Particulate Matter+ PM reported in Lahore by Pakistan Environment Protection Agency (Pak-EPA) far exceed the safe limits.

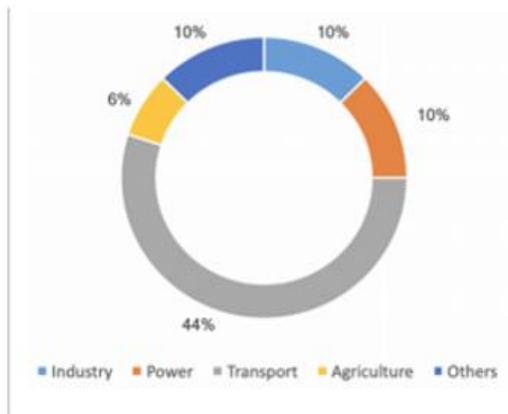


Figure 6: Share of some of the key sectors of economy in releasing Oxides of Nitrogen, NO_x, into the atmosphere. Transport sector is the largest contributor of compounds of nitrogen, such as nitrogen dioxide, into the atmosphere [26].

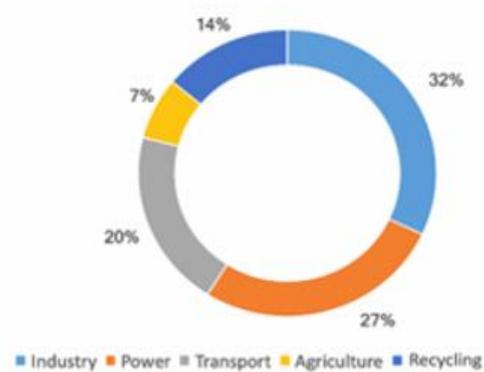


Figure 7: Share of some of the key sectors of economy in releasing Carbon Dioxide, CO₂, into the atmosphere. Transport sector is the third largest contributor in releasing Carbon Dioxide into the atmosphere [26].

POLLUTANT TYPE, DESCRIPTION AND ADVERSE EFFECTS:

Oxides of Nitrogen (NO_x):

Such oxides weaken the immune system and so make the human body susceptible to various respiratory disorders.

Volatile Organic Compounds (VOCs):

Such compounds are the fundamental components of smog and cause irritation to eyes and respiratory system. Exposure to significantly large quantities of Oxides of Nitrogen can also cause choking.

Carbon monoxide:

Carbon Monoxide reduces the ability of the red blood cells to carry oxygen, thus leading to breathlessness and in extreme cases it can prove to be fatal.

Sulphur Dioxide:

Sulphur Dioxide reacts with moisture to form fine particles that pose grave threats to infants and other people suffering from asthma.

6. Socio-Economic Cost of Transportation Sector in Pakistan

EVs utilize electric power rather than gasoline, so half a million EVs on roads by 2025 will reduce the bill for oil imports by USD 504 million and save up to 681 million liters of imported oil.

Taking an average traversing distance to be 25,000 km per year, each FFV costs PKR 127,000 more than an EV due to its fuel consumption.

By just introducing half a million EVs, USD 470 million can be saved in terms of gasoline usage.

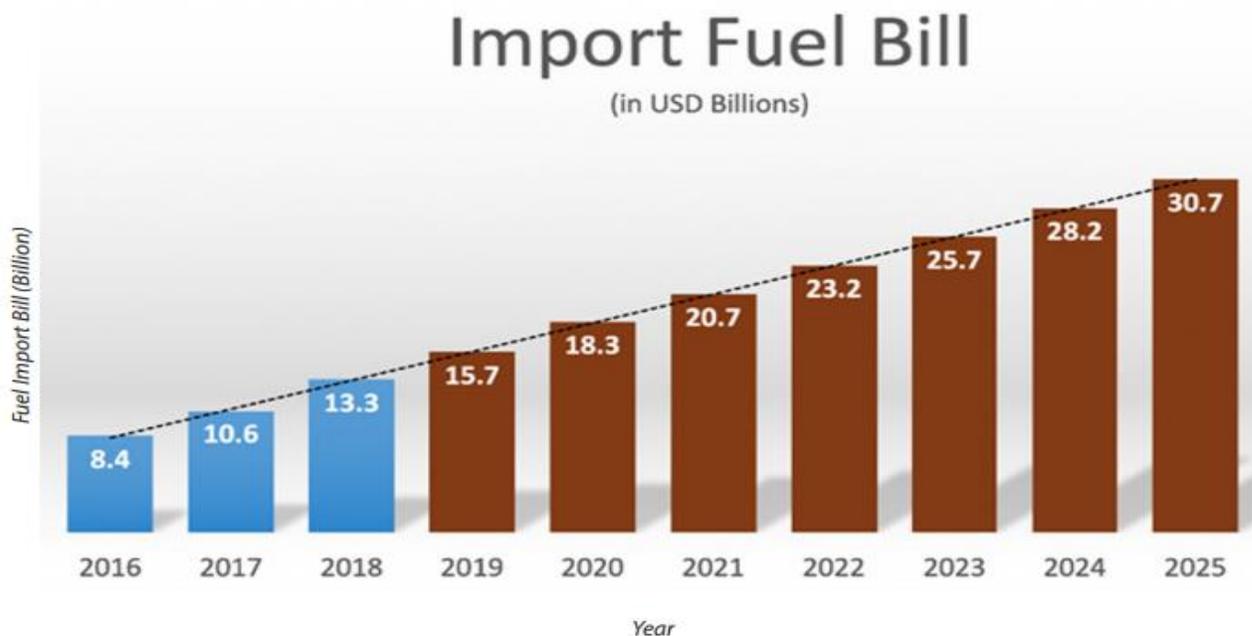


Figure11: Present and anticipated bill for fuel imports in Pakistan [34].

7. EV vs. FFV Comparison

Initially, an EV costs more than an FFV due to its higher price tag. However, in the long run, EV's cost becomes comparable to its similar FFV.

This is due to a number of factors such as minimal maintenance cost, less duties, cheap price of electricity and so on.

According to our estimates, after both the cars have been driven for about 200,000 km, an EV costs less than its similar FFV.



Chargers for EVs



Level 1 Charger

- 120V/1.4kW-3.3kW power rating
- Full charge: 10 to 20 hours
- For home and workplaces



Level 2 Charger

- 240V/5.0kW-19.2kW power rating
- Full charge: 4 to 8 hours
- For home, workplace, and public settings



Level 3 /DC Fast Charger

- 200-500V/50kW-120kW or more power rating
- Full charge: 20-30 minutes
- For commercial use only

Penetration of EVs in Pakistan

2018

Fossil Fuel Vehicles (FFVs)



100%

Electric Vehicles (EVs)



0%

2025

Fossil Fuel Vehicles (FFVs)



90%

Electric Vehicles (EVs)



10%

8. Policy Recommendations

- We propose that the duty and taxes on EVs should be reduced to a total of 5 percent.
- We propose that the tax relaxation should also be offered to PHEVs since they offer a mix of both EVs and FFVs.
- To better manage EV charging, smart metering of EV charging stations is necessary.
- To encourage charging infrastructure, the government may form public-private partnerships to encourage entrepreneurship in this area.
- The charging infrastructure may need to be in place at major cities and on major roads across the country. Initially, the charging infrastructure could be prioritized for Motorways followed and Highway.
- To maximize the benefits of EVs in Pakistan, an R&D facility is required. This facility should pursue activities for indigenous development of technologies for EVs and its ancillary services.

Reference:

- Lums EVs Study Report
- Climate Change Index
- Economic Survey Report
- PBS