Title

Shaping India's Economic and Energy Security Outcomes through the Electric Vehicle Transition

Authors

Khan, Sarah
Das Banerjee, Anannya
Ramji, Aditya

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Global South Center for Clean Transportation
Institute of Transportation Studies

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Prepared By:
Sarah Khan
Anannya Das Banerjee
Aditya Ramji

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Global South Center for Clean Transportation
Institute of Transportation Studies
University of California, Davis

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Executive Summary

1. Electrification as a Strategic De-risking Tool

India is at a crossroads: it must choose between continued exposure to volatile global oil markets or a strategic shift toward electrification. India currently imports 90% of its petroleum fuel, making its financial and macro-economic stability vulnerable to "structural exposure" from OPEC+ decisions and geopolitical shocks, such as the 2026 Hormuz crisis which saw both crude prices surge to USD 112 –119 per barrel as well as fuel availability issues. Electrification offers a structural pathway to reduce this vulnerability by shifting mobility demand from recurring, imported fuel to domestically produced electricity.

2. Quantifiable Impact on Energy Security

- ***Crude Displacement:*** By 2030, EVs could displace between 0.35 million barrels per day (mb/d) in a Business-as-Usual (BAU) scenario and 0.92 mb/d in a High Growth (HG) scenario.
- ***Import Reduction:*** This displacement is equivalent to offsetting 7% to 19% of India's current daily crude oil imports.
- ***Compounding Benefits:*** Unlike fuel efficiency improvements in traditional vehicles, which offer diminishing returns, the impact of the EV transition is cumulative; by 2030, over 70% of oil displacement will come from the established stock of EVs already on the road.

3. Positive Fiscal Outcomes and the "Capital vs. Commodity" Argument

- ***One-time vs. Recurring:*** Crude oil is a recurring import required for a vehicle's entire life, whereas batteries are a one-time capital asset that can eventually be recycled to recover strategic minerals.
- ***Net Savings:*** Even assuming 100% battery imports, the transition generates significant net savings. By 2030, India could see net import savings of USD 5.3 billion (BAU) to USD 15 billion (HG).
- ***Price Resilience:*** The economics of EVs only improve as global battery prices decline and oil prices rise. In a high-oil (USD 100/barrel) and low-cell-price scenario, net savings could reach USD 26 billion.

4. Segment-Specific Strategies: High Volume vs. High Impact

To maximize energy security, India must pursue a dual-track strategy:

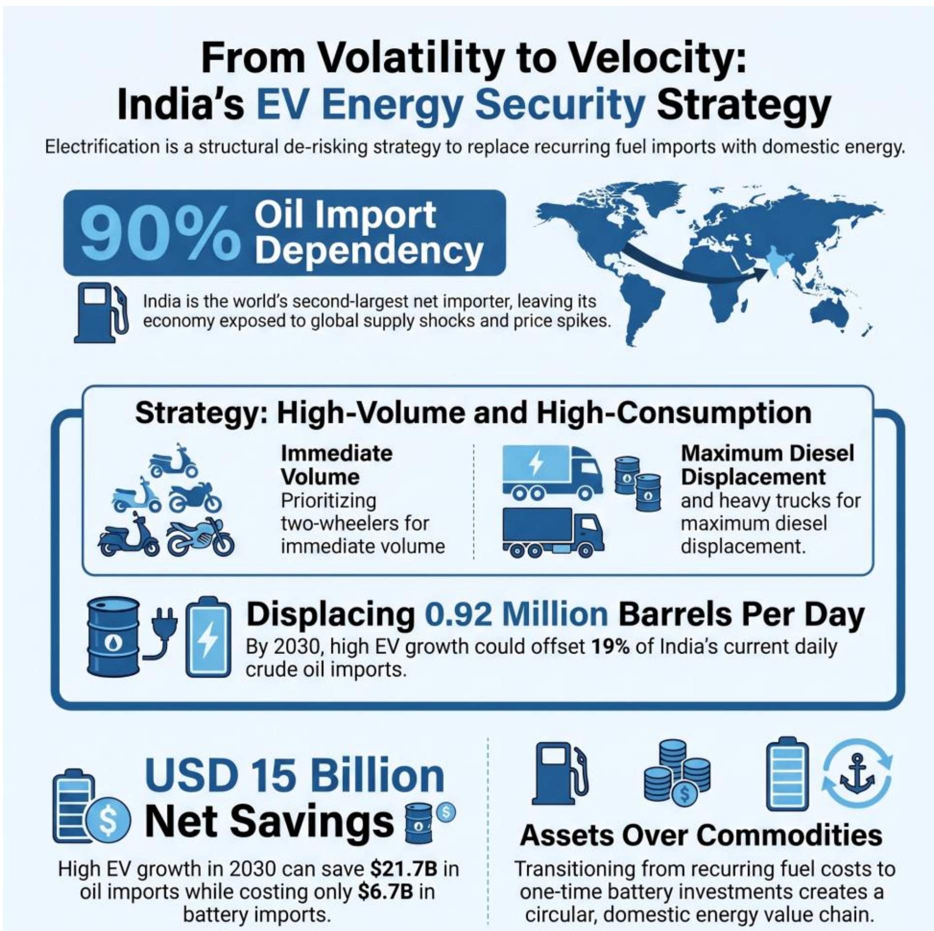
- ***Immediate Gains (Two-Wheelers):*** Currently, two-wheelers are the primary driver of petrol displacement, contributing 71% of total oil displacement under BAU by 2030 due to their sheer volume in the Indian vehicle fleet.
- ***Long-Term Impact (Heavy-Duty Vehicles):*** While currently in early stages, the electrification of medium and heavy-duty trucks (MHDVs) offers the greatest opportunity for long-term fuel dependency reduction. In a High Growth scenario, trucks could account for 34% of total oil displacement by 2030.

5. Industrial Transformation and Global Competitiveness

The EV transition is an industrial opportunity for India to leverage its position as the world's third-largest automotive manufacturer.

- ***Proven Track Record:*** India has seen success in industrial policy-led approaches in recent years building world-class industries (refining, electronics, steel) despite lacking primary upstream resources.
- ***Market Opportunity:*** The EV transition represents a USD 8.5 billion to USD 18.8 billion market opportunity for vehicles and a USD 6.6 billion to USD 15 billion opportunity in battery cell manufacturing by 2030.
- ***Domestic Resilience:*** Shifting to EVs aligns transport with a domestic grid that is targeting 500 GW of non-fossil fuel capacity by 2030, ensuring that vehicles become progressively cleaner and more secure over their lifetime.

Figure ES1 India's EV transition as an Energy and Economic Security Strategy



1 India's oil dependence in a volatile global oil market

As India's economy is expanding, so has its dependence on crude oil. Between 2015 and 2025, India's GDP grew at an average annual rate of 6%,[1] while crude oil demand increased by 3.8% per year,[2] making energy security an increasingly consequential concern for its financial stability and growth trajectory. India is the world's third-largest consumer of crude oil[3] and as of 2025, remains the second-largest net importer of crude oil[4] with domestic production meeting less than 15% of its refinery feedstock requirements.[5] This places India in a position of structural exposure to the international crude market, one shaped by OPEC+ production decisions, Gulf state fiscal strategy, and the geopolitical shocks that periodically restructure global trade flows.

This puts India's energy and national security strategy at an important crossroad: Should India continue to diversify and expand its crude procurement options or should it double down on electrification as a de-risking strategy eliminating significant risks from crude trade?

The past few years have illustrated this: the realignment of crude trade following Russia's invasion of Ukraine in 2022, tightening US sanctions on Russian energy companies in 2025, and the disruption to Strait of Hormuz flows following the US-Israel military conflict with Iran in 2026 — through which approximately 40% of India's crude imports are routed — have each had direct consequences for India's crude sourcing options and import costs. Underlying this exposure is the character of domestic demand, anchored in the road transport sector, driven by a growing vehicle population and a freight system heavily dependent on petroleum products, and set to rise steadily with economic growth.

The decline in domestic crude production, set against the scale of India's refining capacity, defines the structural asymmetry of its oil economy. Domestic crude oil production, with an annual average of around 32-33 million metric tonnes (MMT) over the past two and a half decades, peaked at 36 MMT in FY2012 and has declined steadily since, reaching 28.7 MMT in FY2025,[5] a decline of 22% from its peak. This reflects the maturity of producing basins, the absence of significant new discoveries, and a persistent pattern of production targets being missed by public sector producers – and importantly, an increasing risk of import dependency.

In contrast, India operates one of the world's largest and most complex refining systems. With installed capacity exceeding 250 MMT per annum,[6] India ranks as the fourth-largest refining hub in the world after the United States (US), China, and Russia. Over the past decades, India has expanded refining throughput and increased exports of petroleum products. India is now among the top seven exporters of petroleum products globally,[7] supplying refined fuels to more than 50 countries and generated export revenues exceeding USD 45 billion in FY2025.[8] The scale of this expansion has been closely tied to changes in crude sourcing patterns over the same period.

At the same time, the global narrative is shifting: electric vehicles (EVs) are increasingly viewed not only as a decarbonisation strategy, but also to hedge energy security by reducing exposure to crude markets. Recent geopolitical disruptions in 2026 have further reinforced the need to reduce structural dependence on imported crude. For India, with about 90 percent of crude oil requirements met through imports, EV adoption presents a strategic opportunity to address these vulnerabilities given that the transport sector remains the largest consumer of petroleum products.

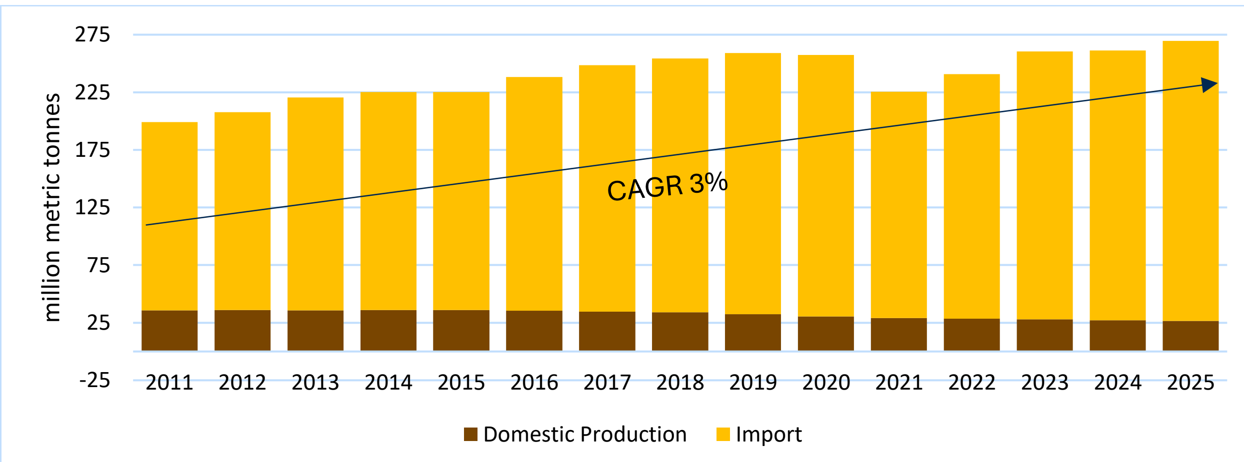
2 India consumes more petroleum fuel than it can produce increasing economic risks from high import dependency

2.1 India's crude imports have grown 3% CAGR between 2011-25, meeting 90% of its fuel demand

India imports 90% of its petroleum fuel and its crude oil demand has grown at 3% CAGR between 2011-2025 (Figure 1). By 2025, crude oil imports were nearly 30% higher compared to 2015 and about 50% higher compared to 2011, in absolute terms, underscoring India's growing dependence on imported crude to meet its rising energy demand.

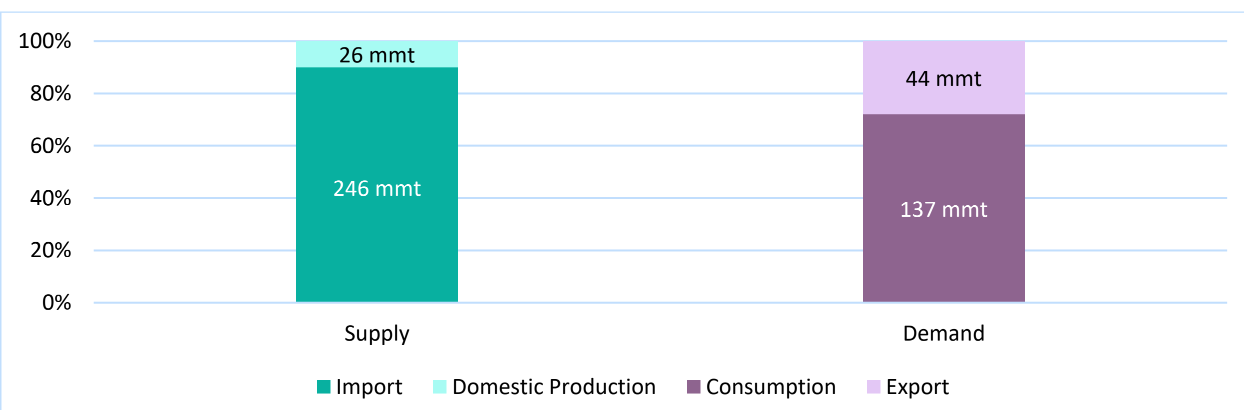
Although India has not been a large crude oil producer, its domestic reserves and production have also declined over the same period at -2% CAGR. In FY2026, petrol and diesel fuel consumption in the domestic market was 137 MMT, with an additional 44 MMT exported (Figure 2).

Figure 2 India's crude imports and domestic production, FY2011-25



Source: Petroleum Planning & Analysis Cell, Ministry of Petroleum and Natural Gas, Government of India

Figure 3 Composition of India's oil supply and demand in 2025-26



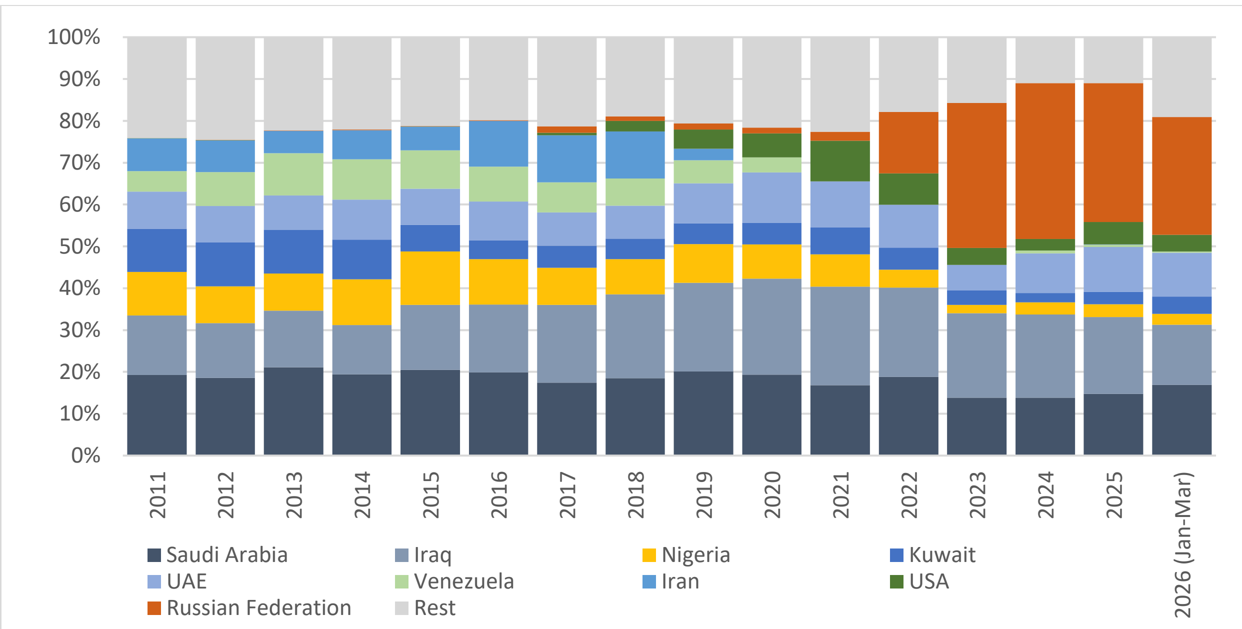
Source: Petroleum Planning & Analysis Cell, Ministry of Petroleum and Natural Gas, Government of India
Note: Import and production data refer to crude oil, while consumption and export data refer to petrol and diesel, based on PPAC statistics. All volumes shown are five-year average annual volumes.

2.2 *The global oil price disruption in 2022 reinforced India's need to diversify crude import dependency*

As imports continued to grow, shifts in global crude flows including exposure to costs and geopolitics led to structural changes in India's importing partners. Prior to 2022, more than half of India's crude inflows were heavily concentrated in the Middle East, particularly from Iraq, Iran, Saudi Arabia and the United Arab Emirates (UAE). Post 2022, this dependency shifted, and India started importing cheaper Russian crude supply which accounted for roughly one-third of India's total oil imports at the end of 2025. In the last quarter of 2025, India agreed to reduce Russian oil imports as part of its continued bilateral efforts with the U.S., but in early 2026 with the Iran crisis, India went back to relying on Russian crude, although a lower share compared to 2025 (Figure 3).

In the first quarter of 2026 where India's share of Russian oil imports declined from 33% to 28%, imports from Saudi Arabia and a broader group of suppliers increased, driven primarily by U.S. sanctions which raised the cost and risk of Russian purchases and pushed Indian refiners to diversify their supplier base.

Figure 4 Share of major suppliers in India's crude oil imports, 2011-2026 (January - March)



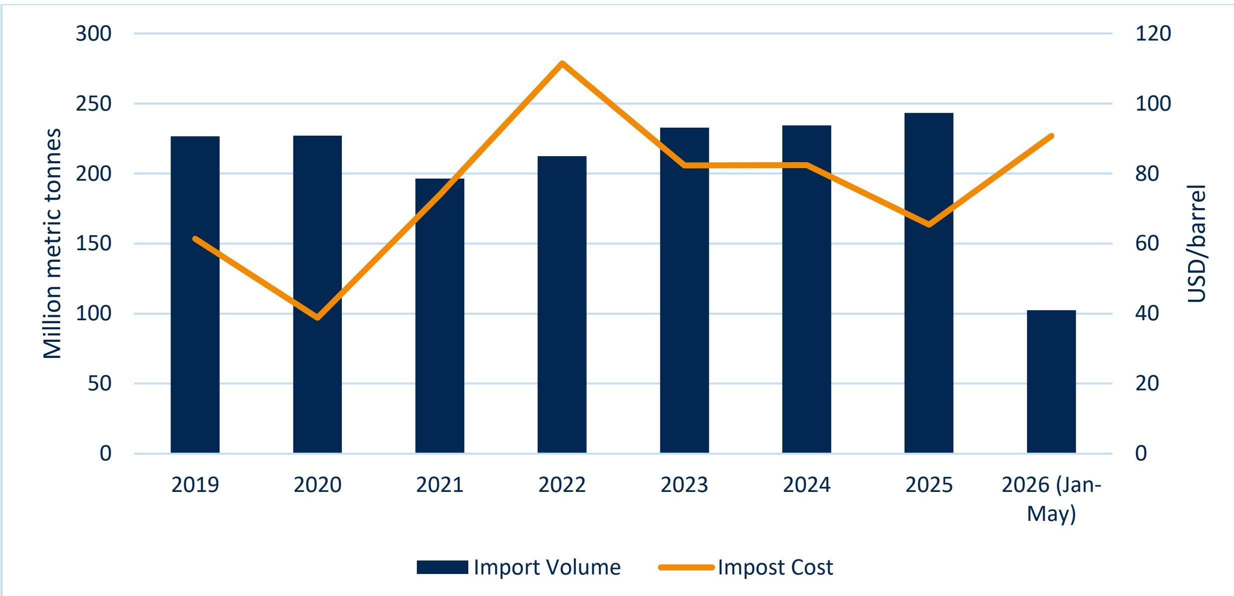
Source: UN Comtrade

Note: HS 2709.00 (Oils; petroleum oils and oils obtained from bituminous minerals, crude) is used for the analysis; 2025 data reflect January-October reporting period as per UN Comtrade; 2026 reflects January-March data from UN Comtrade

While India diversified its suppliers, it has not been able to diversify from global oil price risk. The Ukraine war in 2022 led to global oil supply shocks and higher prices, which resulted in a 63% increase in cost of crude oil imports in 2022 compared to 2021, for only an 8% increase in overall crude import volume in the same period (Figure 5).[8] During this time, when the global price of crude per barrel was between USD 88 – 104 in 2022, the average price of Russian crude imported by India was at USD 74 per barrel[9], significantly cheaper than other major suppliers and the global brent crude benchmark (Figure 6). Oil demand continued to grow, and the price advantage with Russian oil made it highly attractive for Indian refiners, leading to a rapid change in India's import basket in 2022, only to face risks in 2025 in light of U.S. sanctions.

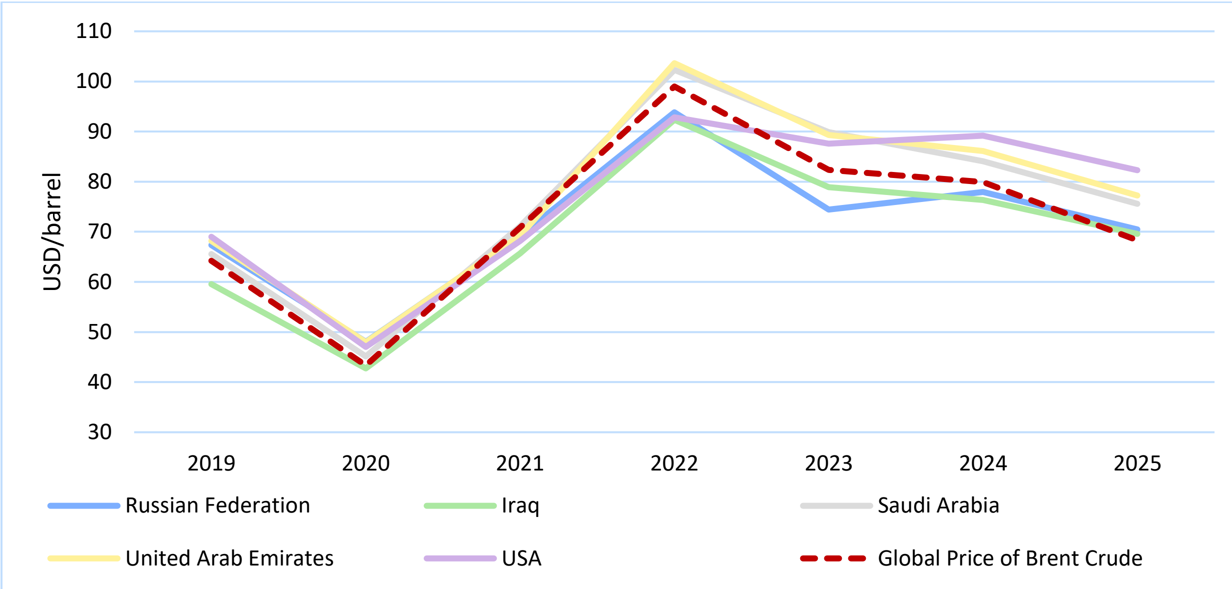
In early 2026, with the Iran crisis, crude oil import costs went up another 39% compared to 2025, from an average cost of USD 65 per barrel in 2025 to USD 91 per barrel in 2026. During April–May 2026, India's crude import volumes declined by 1.4%, while the import bill surged by 70% compared with the year-ago period, reflecting the fiscal impact following the disruptions in West Asia. As long the structural dependence on imported crude persists, geopolitical developments and fuel-related supply-chain disruptions will continue to shape India's economic resilience and security.

Figure 5 Volume and cost of crude imports by India



Note: 2026 import data cover January to May
Source: Petroleum Planning & Analysis Cell, Ministry of Petroleum and Natural Gas, Government of India

Figure 6 Crude Import prices for India from different countries



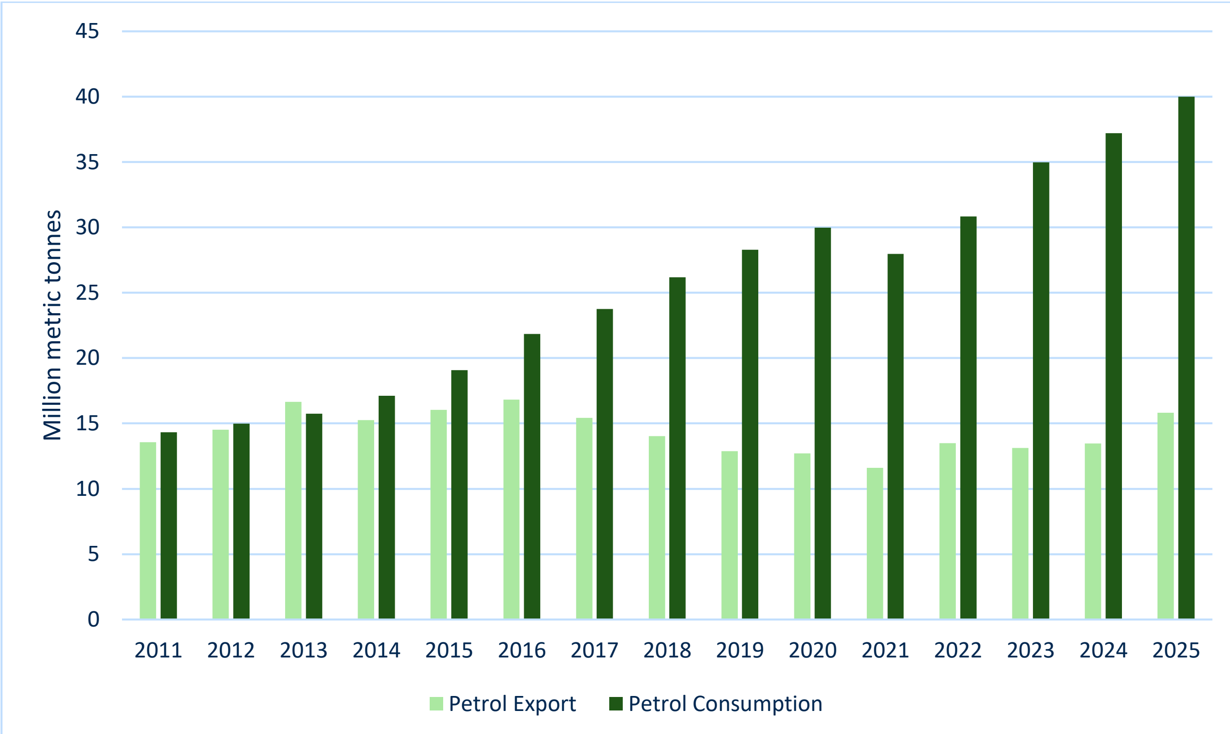
Source: UN Comtrade
Note: Import prices are reported in CIF

2.3 Consumption of petrol and diesel in India grew by 280% and 150% respectively, between 2011-2025, in absolute terms

While export volume of India's refined fuel remained stable, its domestic consumption of refined fuels grew substantially between 2011-2025, with petrol consumption increasing at a CAGR of 7.7% and diesel consumption at 2.8% CAGR. Petrol consumption almost tripled in absolute terms, rising from 14 MMT in FY2011 to 40 MMT in FY2025, while over the same period, diesel consumption increased from 60 MMT to 91 MMT (Figure 7 and Figure 8).

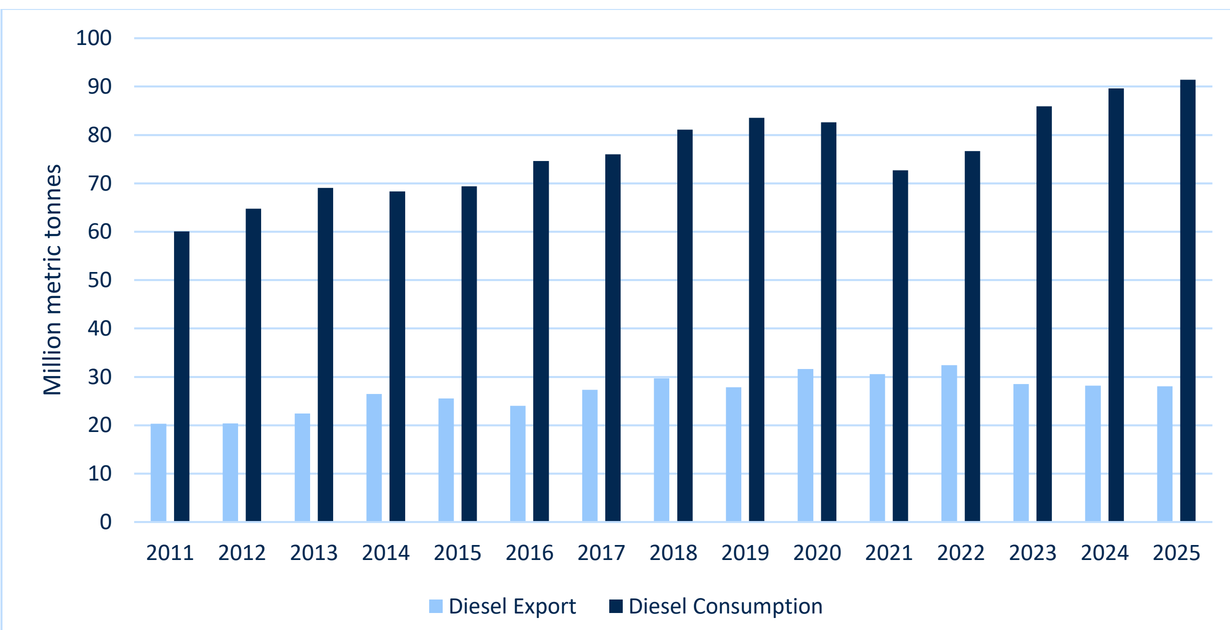
India consumed more than twice as much diesel (by volume) as petrol because freight transport, buses, and commercial vehicles that operate almost entirely on diesel account for a disproportionately large share of transport fuel demand, even though they make up only 5% of the fleet.[10] On the other hand, petrol demand has increased at a much faster pace, reflecting rising passenger mobility and vehicle ownership across both two-wheelers and cars. Further, regulatory changes such as the transition in emission norms from BS-IV in 2016 to BS-VI in 2020, and the ban on diesel cars older than 10 years in Delhi and the National Capital Region (NCR) have increased compliance costs and restrictions on diesel use, moderating demand of diesel growth.

Figure 7 Consumption and Export trends in petrol, FY2011–FY2025



Source: Petroleum Planning & Analysis Cell, Ministry of Petroleum and Natural Gas, Government of India

Figure 8 Consumption and Export trends in diesel, FY2011–FY2025

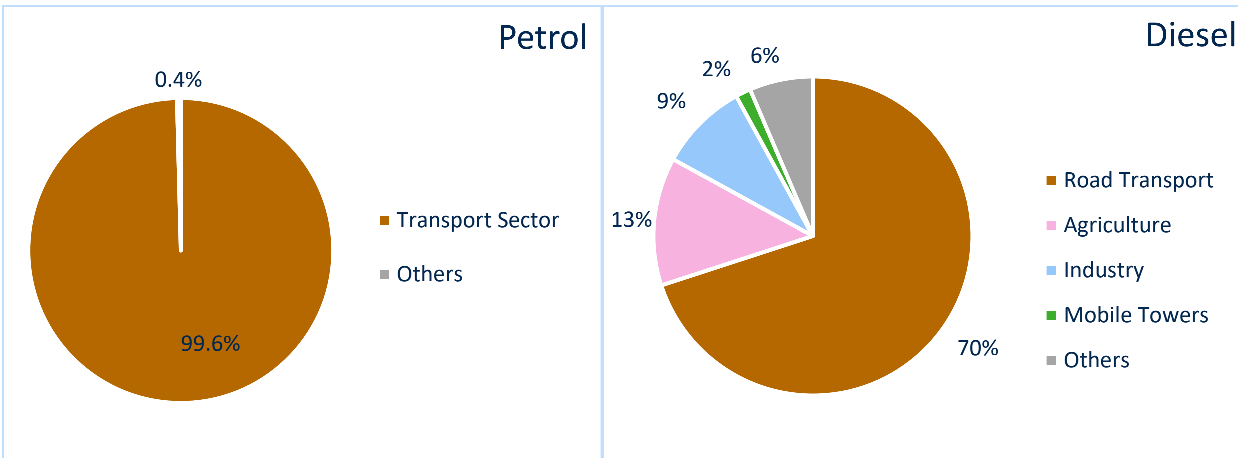


Source: Petroleum Planning & Analysis Cell, Ministry of Petroleum and Natural Gas, Government of India

2.4 *Domestically, 99% of petrol and 70% of diesel consumption is transport-driven*

The consumption of petroleum products across end-use sectors highlights the central role of road transport in India's fuel demand. Around 99% of petrol demand is transport-driven,[11] making petrol almost entirely a mobility fuel. Diesel consumption is more diversified, yet road transport remains the single largest end-use segment, accounting for roughly 70% of total diesel demand[11] (Figure 9).

Figure 9 End-use sector split of Petrol (left) and Diesel (right) consumption

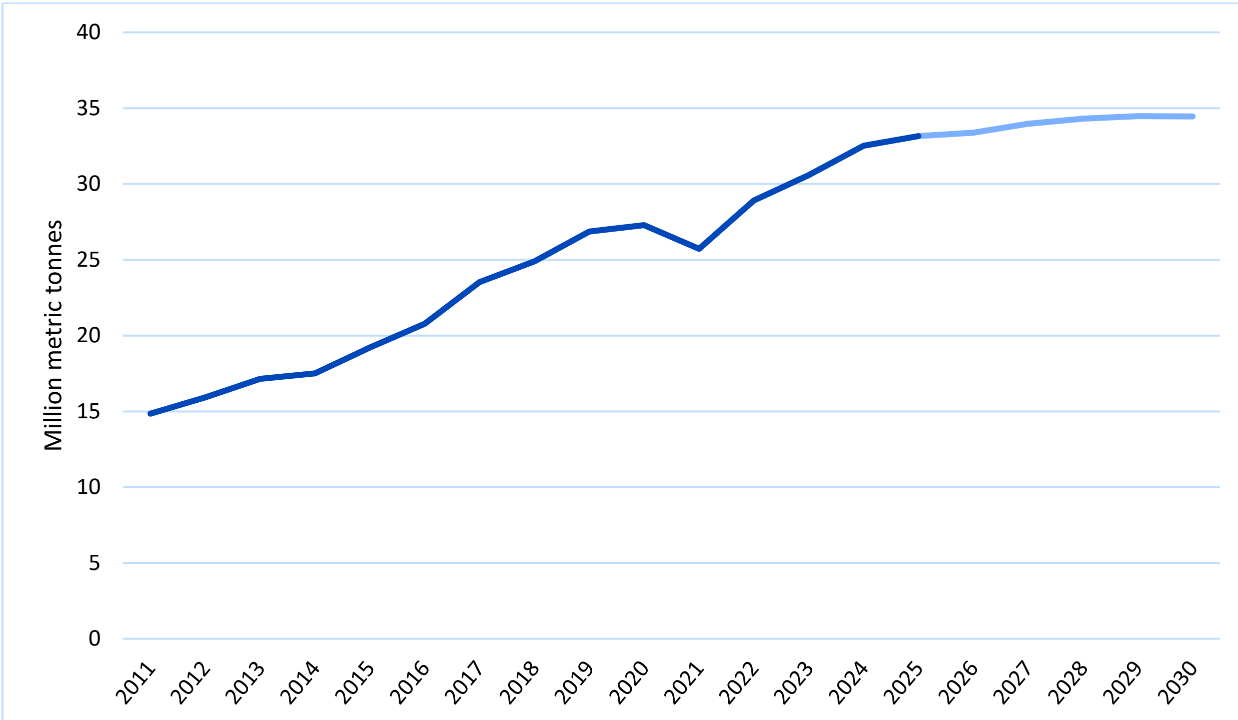


Source: Crisil - All-India study on sectoral demand for petrol and diesel for PPAC (2021); M/s Nielsen (India) Pvt Ltd for Petroleum Planning and Analysis Cell

During 2011–2025, fuel consumption in the transport sector grew at an annual rate of approximately 6% and 3% CAGR for petrol and diesel, respectively. At this rate (BAU), it is estimated that India's transport sector fuel consumption could be around 34 MMT of petrol (Figure 10) and 77 MMT of diesel annually by 2030 (Figure 11).

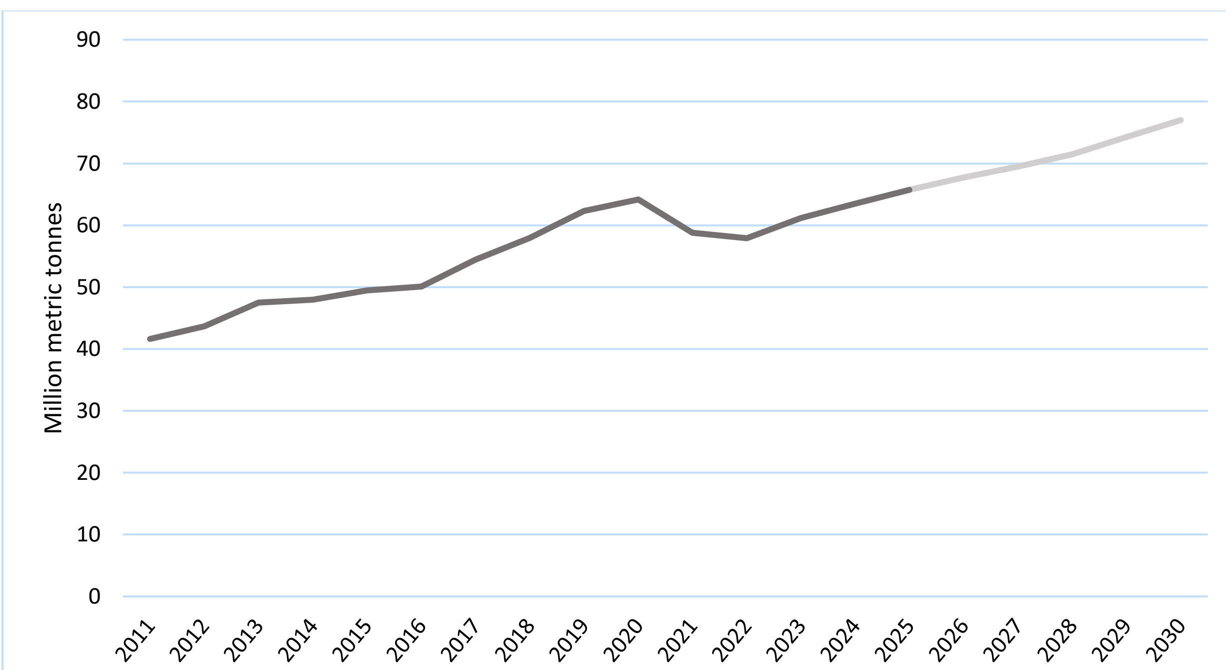
This growth in fuel demand will continue to increase India's exposure to imports and pose greater risks to economic and national security from supply shocks and price volatility. Geopolitical shifts in major producing regions can quickly influence the cost and availability of the fuels that power mobility. ***Electrification of the transport sector is therefore primarily an energy de-risking strategy for India. To what extent can the EV transition alter India's oil demand trajectory and its dependence on crude imports?***

Figure 10 Growth in Transport-Driven Petrol Demand - BAU Scenario



Source: Author's analysis

Figure 11 Growth in Transport-Driven Diesel Demand - BAU Scenario



Source: Author's analysis

3 Impact of electric vehicle transition on oil imports

Electrification of the transport sector presents a strategic opportunity to reduce the vulnerabilities associated with being an oil-import dependent country. To assess benefits from road transport electrification, this study analyses three potential pathways for vehicle electrification (Table 1), with the difference in fuel consumption providing an estimate of the fuel demand displaced by EVs:

a. **Counterfactual (CF):** The first represents a counterfactual scenario without EVs, where transport demand continues to be met entirely through conventional fuel vehicles.
b. **Business-as-Usual (BAU):** The second represents an EV transition scenario based on current trends in which EVs gain share across vehicle segments.
c. **High Growth (HG):** The third represents a high-growth EV transition scenario, where the measures needed to accelerate EV uptake across segments are assumed implemented.

Table 1 EV sales share across vehicle segment for the two scenarios

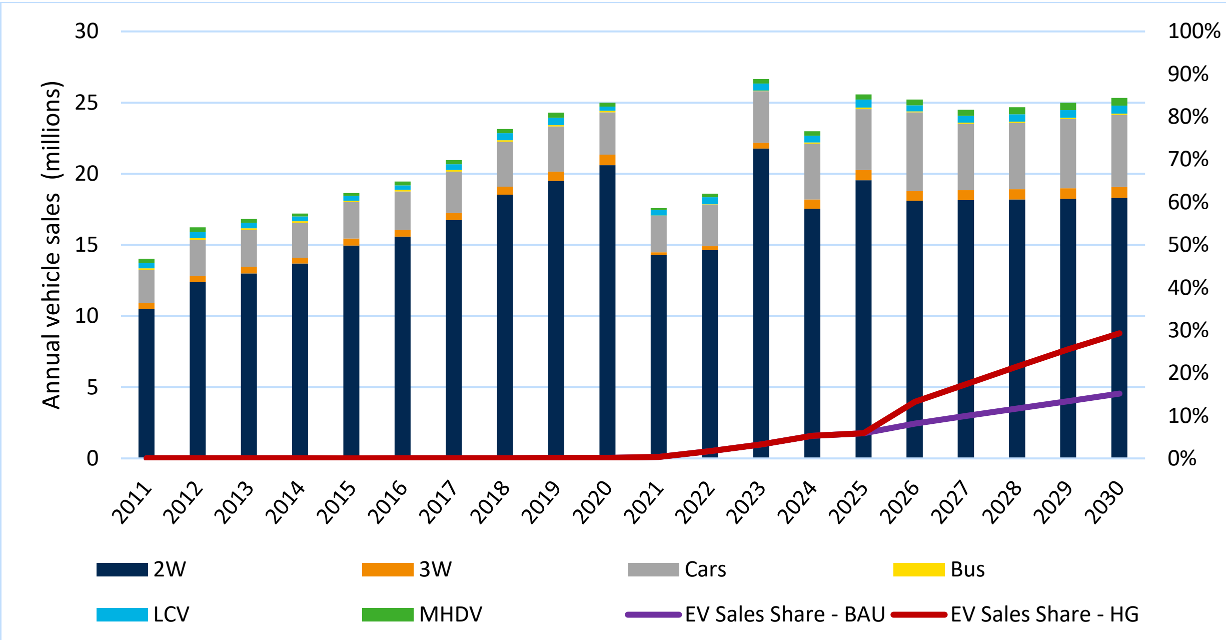
	FY2025	FY2030	
		BAU	High growth
Two-wheelers (2W)	6%	16%	30%
Three-wheelers passenger (3W-P)	23%	35%	70%
Three-wheelers goods (3W-G)	27%	54%	80%
Passenger Cars (PC)	3%	10%	25%
Buses	3%	5%	13%
Light Commercial Vehicles (N1)	1%	4%	15%
Medium Commercial Vehicle (N2)	0%	4.5%	9%
Heavy Commercial Vehicles (N3)	0.06%	0.9%	1.8%
Overall	6%	15%	30%

Source: UC Davis report (2025)[12,13]

As seen in Table 1, the projected total EV sales share is estimated at around 15% of all vehicle sales across segments under BAU and 30% under the High Growth scenario by 2030. While overall EV adoption increases steadily over the period (Figure 12), the shift is driven disproportionately by different segments based on their rate of electrification and segment sales volumes. In particular, the rapid uptake of EVs in two- and three-wheelers, followed by cars, are the primary driver for displacement of petrol, whereas the transition of buses and medium commercial vehicles determines the displacement of diesel. These underlying adoption patterns form the basis for estimating the magnitude of oil demand avoided under the electrification pathway.

The analysis draws on a bottom-up modelling framework that combines vehicle stock, vehicle activity, and fuel efficiency for Internal Combustion Engine (ICE) vehicles across segments to estimate fuel demand. This approach allows the estimation of petrol and diesel consumption under each scenario and the resulting displacement associated with EV adoption. Detailed methodological steps, modelling assumptions, electric vehicle sales shares, the estimation framework, and validation of modelled fuel demand are provided in Annexure A.

Figure 12 Segment-wise annual vehicles sales and EV sales share across BAU and HG scenario FY2011–FY2030

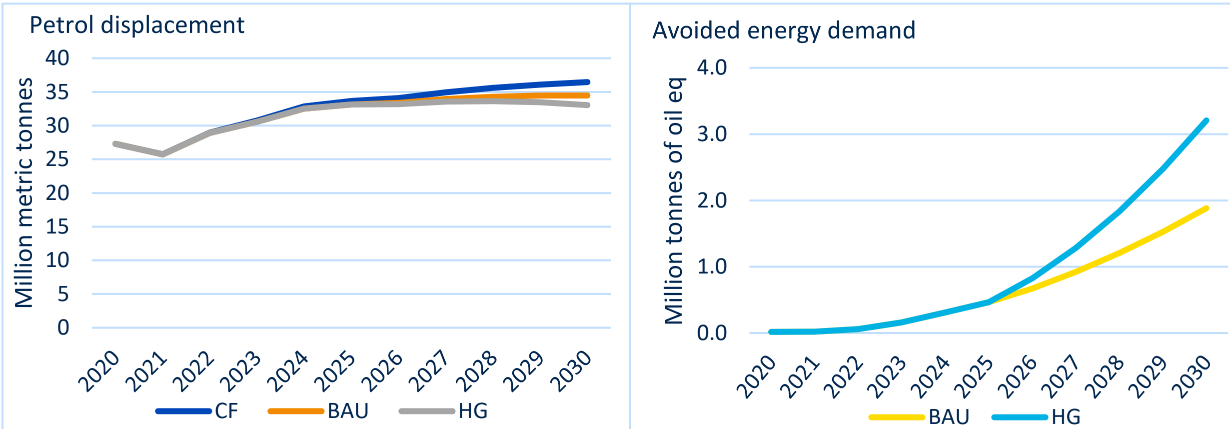


Source: Vahan dashboard & Author's analysis

3.1 EVs can displace 5.5-9% of petrol and around 1.2-11% of diesel demand by 2030

Estimates indicate that EVs displaced petrol demand by 0.04–0.09% between FY2015-2021, with the effect rising to around 1.5% by 2025. By 2030, EV adoption is projected to displace approximately 5.5% of petrol demand under BAU and 9% under HG scenario relative to an ICE-only transport system, with the HG scenario displacing 64% more of petrol demand compared to the BAU by 2030 (Figure 13, left). In energy terms, this corresponds to avoided energy consumption of around 1.9 million tonnes of oil equivalent (MTOE) under BAU and 3.2 MTOE under HG by 2030 (Figure 13, right).

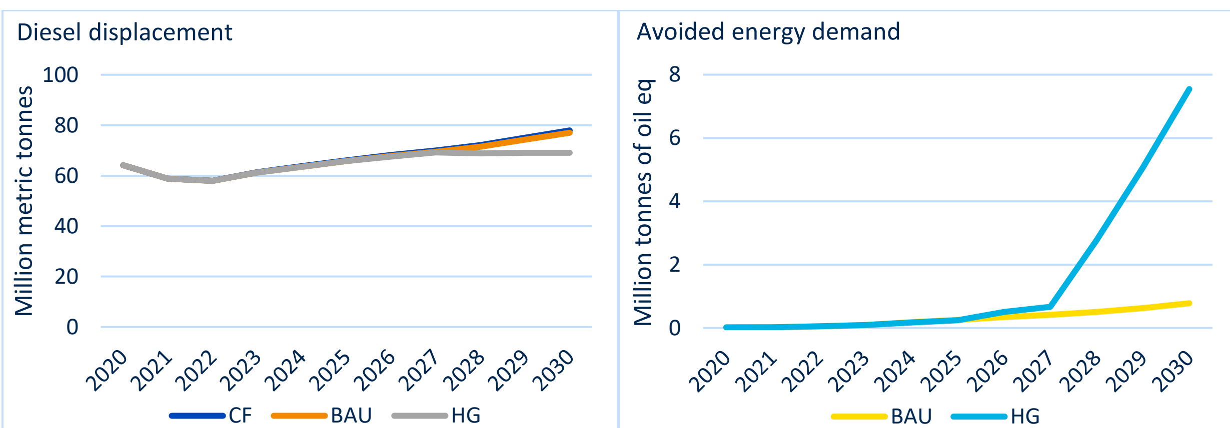
Figure 13 Petrol displacement (left) and avoided energy demand (right) from EV adoption (FY2011–FY2030)



Source: Author's analysis

In comparison, the impact on diesel consumption remains marginal over the same period. Diesel demand in India is largely driven by the heavy-duty freight segment, where EV adoption is progressing slower. As a result, the EV transition is projected to displace diesel demand by around 1.2% or 0.78 MTOE in the BAU and around 11% or 7 MTOE in the HG scenario by 2030 (Figure 14).

Figure 14 Diesel displacement (left) and avoided energy demand (right) from EV adoption (FY2011–FY2030)

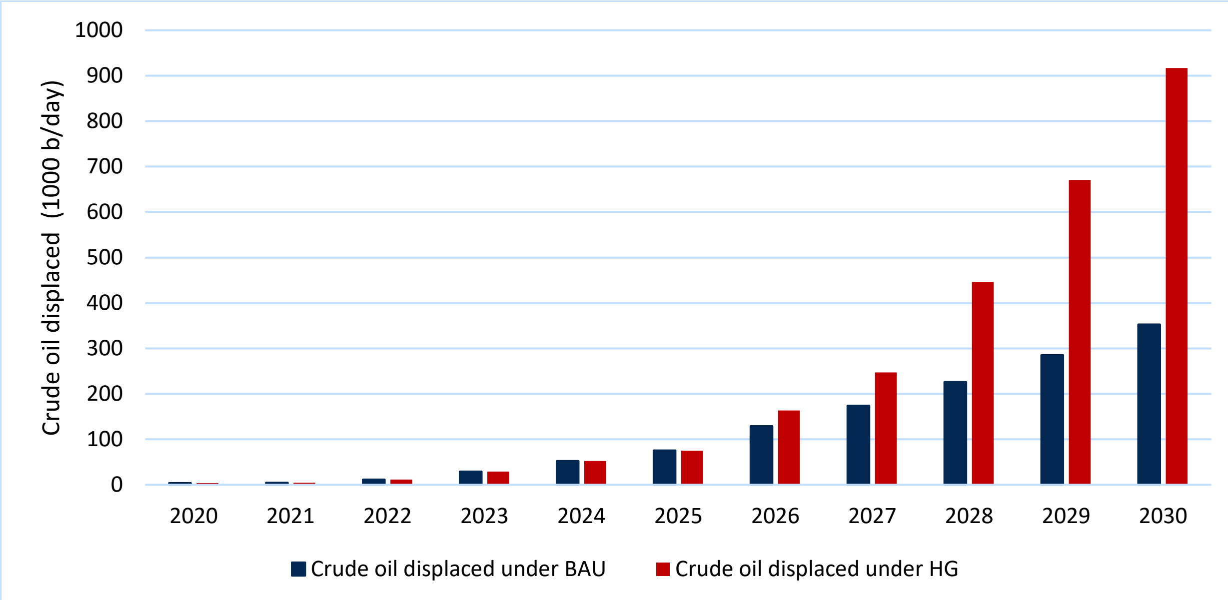


Source: Author's analysis

3.2 EVs could displace 0.35-0.92 million barrels of crude oil demand per day (mb/d) by 2030

Our analysis indicates that EV adoption had displaced approximately 75,000 barrels per day of crude oil demand in 2025. As electrification accelerates across vehicle segments, this impact is projected to increase substantially. By 2030, EVs could displace around 0.35 mb/d of crude oil demand under BAU and 0.92 mb/d under the HG scenario (Figure 15).

Figure 15 Projected crude displacement from EV adoption under BAU and HG



Source: Author's analysis

Note: A barrel is a standard unit of measurement used to measure the volume of crude oil and other petroleum products. One-barrel equals 42 US gallons, which is about 159 litres.

This reduction is significant in the context of India's energy security. With crude oil imports currently averaging around 4.9 mb/d, a displacement of 0.35 mb/d is equivalent to avoiding approximately 7% of India's current daily crude oil imports under BAU, while the 0.92 mb/d displacement under the HG pathway is equivalent to 19% (Figure 16). While this displacement will not fundamentally eliminate India's dependence on imported crude, it represents an important measurable pathway to achieve its energy and economic security goals while phasing out fossil fuel dependence and replacing it with domestically produced electricity.

Figure 16 Displaced crude under both the scenarios vs current import

Source: Author's analysis

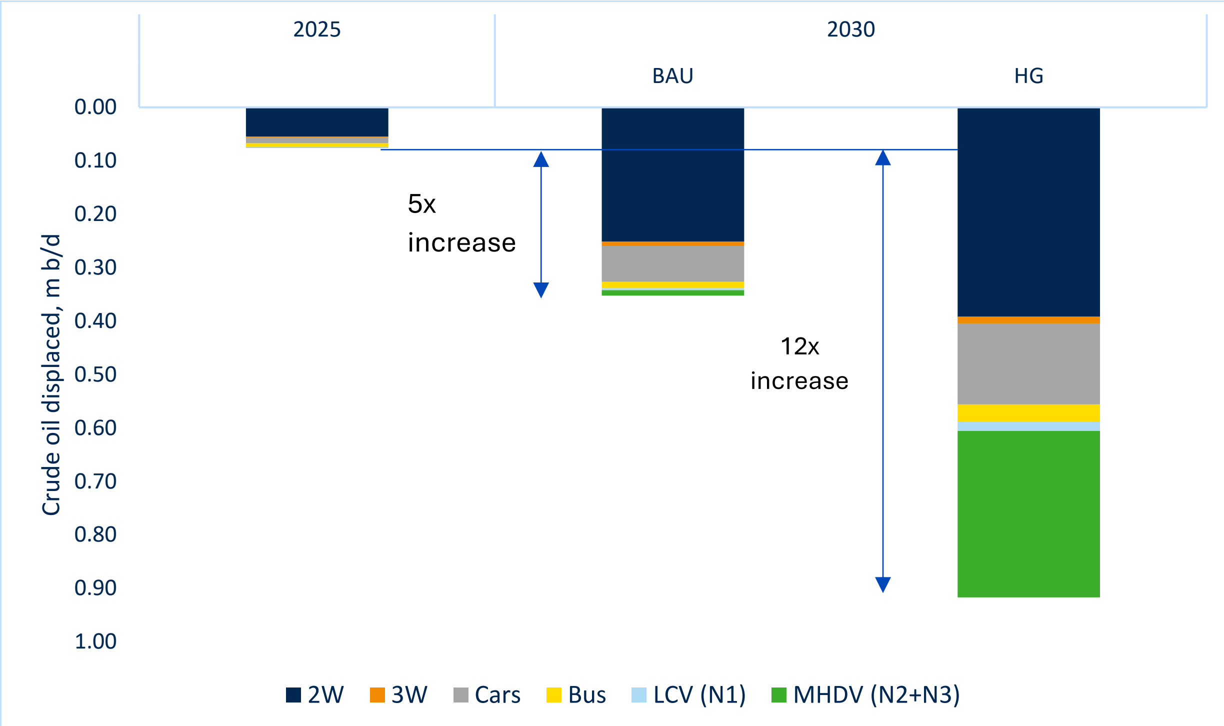
The findings suggest that the impact of transport electrification on oil demand is cumulative rather than immediate. As the stock of EVs grows over time, reductions in petrol and diesel consumption translate directly into lower crude oil requirements. However, it is important to note that these benefits do not accrue evenly across vehicle segments.

3.3 Two-wheeler electrification contributes to 71% of oil displacement under BAU but only 43% under HG as truck electrification brings significant benefits (+36%) by 2030

Interestingly, as of 2025 most of the avoided fuel consumption has been achieved by the electrification of two-wheelers, followed by passenger cars and buses (Figure 17). Under the BAU pathway, electric two-wheelers are expected to remain the single largest contributor to crude oil displacement by 2030, accounting for 71% of the total, while passenger cars contribute the second-largest share (13%). Under the HG scenario, however, the contribution of two-wheelers declines to 43% as truck electrification scales up, with trucks accounting for 36% of total oil displacement by 2030. As EV adoption accelerates, total oil displacement is projected to increase nearly five-fold between FY2025 and FY2030 under BAU, while HG scenario results in a twelve-fold increase over the same period.

The dominance of two-wheelers reflects the structure of India's transport system. Two-wheelers account for approximately 79% of India's registered vehicles annually[14], and consume roughly 71% of petrol demand within the road transport sector (2021-25). Consequently, as electrification progresses in the two-wheeler segment, even relatively small reductions in per-vehicle petrol use translate into large aggregate fuel savings, and materially affect transport fuel demand and by extension, crude dependency.

Figure 17 Oil displacement by vehicle segments



Source: Author's analysis

Table 2 Share of vehicle segments in fuel displacement (2025 and 2030)

Vehicle Segment	2025	2030	
		BAU	HG
2W	72%	71%	43%
3W	3%	2%	1%
Cars	13%	19%	16%
Bus	10%	3%	4%
LCV (N1)	1%	1%	2%
MHDV(N2+N3)	1%	3%	34%

In contrast, commercial vehicles, particularly medium and heavy-duty trucks, consume significantly larger quantities of fuel on a per-vehicle basis. Their contribution to oil displacement has remained limited up to FY2025, reflecting the early stages of e-truck adoption. Under the BAU pathway, medium- and heavy-duty trucks could account for only around 3% of total oil displacement by 2030. Under the HG pathway, however, their share could rise to 34%, demonstrating the substantial fuel-saving potential that can be unlocked through faster electrification of high-utilisation freight vehicles.

The findings underscore that the overall impact of the EV transition on oil demand depends not only on the number of vehicles electrified but also on which segment sees the electrification transition within the transport system. This distinction is important because it explains why two-wheelers dominate early oil displacement, but electrification of freight transport offers the greatest opportunity for long-term reductions in diesel consumption and crude oil imports. ***India's strategy to manage its crude oil import dependency leading to its energy and economic security outcomes will depend heavily on the transportation sector, and within that, on prioritizing a combination of high-volume sales and high fuel consuming vehicle segments.***

4 Fiscal impact of India's electric vehicle transition

A recurring concern in discussions on EV transition is that replacing petrol and diesel vehicles with EVs may simply substitute one form of import dependence with another, particularly since India also relies heavily on imported lithium-ion battery cells for its EVs[12]. However, this comparison overlooks a fundamental difference in these import dependencies. Crude oil is a recurring import, required continuously throughout a vehicle's lifetime to sustain its mobility demand. Batteries, by contrast are a capital asset – imported once. Once deployed, EVs operate on electricity, which can increasingly be generated from domestic renewable energy sources. More importantly, at the end of life, EV batteries can be recycled to recover valuable minerals that can be strategic inputs to domestic cell manufacturing, as opposed to oil – once spent, cannot be recovered.

Consequently, while battery imports are largely a one-time investment, EVs can generate recurring reductions in petrol and diesel consumption over their operational lifetime, leading to sustained savings in crude oil imports.

Assessing the full economic implications of EV adoption therefore requires comparing the value of avoided crude oil imports with the cost of batteries required for EV deployment, and their potential value at end of life. The key policy question is therefore whether the reduction in oil import expenditure outweighs the cost of battery imports.

4.1 Shifting to EVs can save up to USD 15 billion in crude imports in 2030 under the High Growth scenario

A comparison of avoided crude oil imports and battery import costs shows that the EV transition already generates net import savings under current market conditions (BAU). Between 2016-2025, India's EV adoption avoided an estimated USD 35.2 billion in crude oil imports cumulatively, while incurring a USD 12.9 billion import bill for lithium-ion batteries, a net saving of USD 22.3 billion.

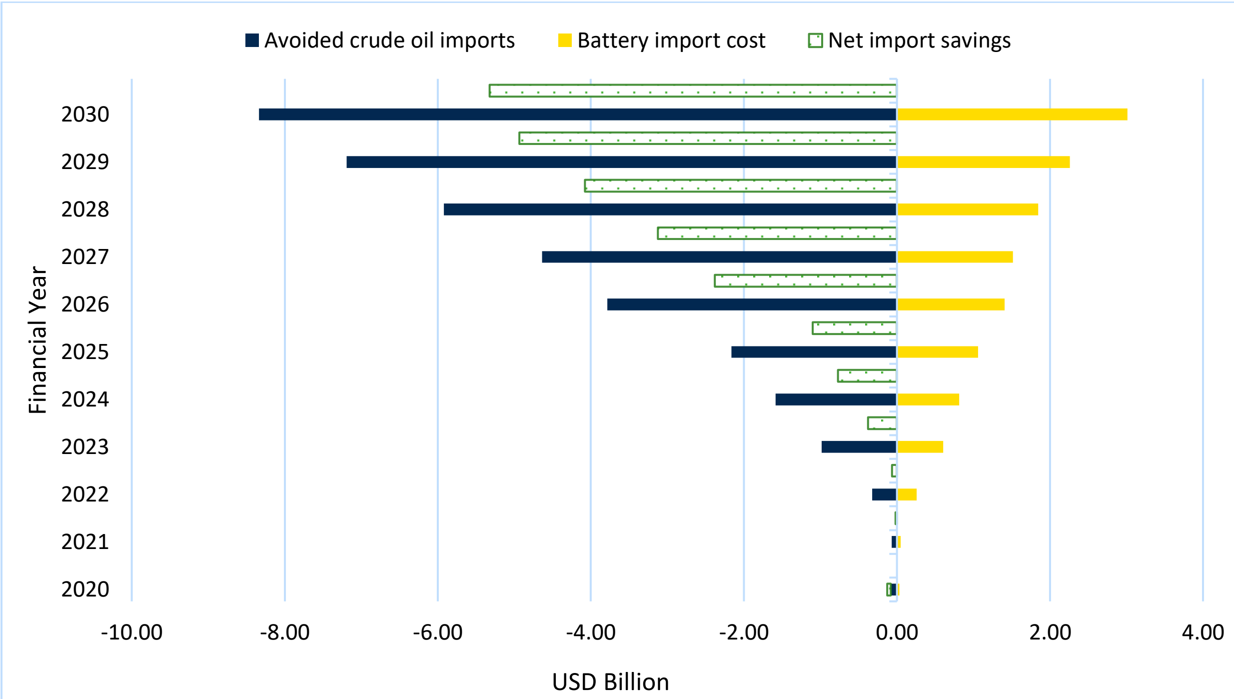
Further, looking forward, we estimate that India could generate a net import saving of USD 5.3 billion in 2030 in the BAU scenario (Figure 18), by avoiding USD 8.3 billion in crude oil imports and incurring USD 3 billion in battery cell imports (assuming 100% imports). In the HG scenario, in 2030, avoided crude oil imports are estimated at USD 21.7 billion, compared with battery cell imports of USD 6.7 billion (assuming 100% imports), leading to a net import saving of USD 15 billion in 2030 (Figure 19).

Two structural factors explain this outcome. First, transport fuels account for a large share of India's petroleum consumption, which translates into a substantial crude oil import bill. Since EVs directly displace petrol and diesel consumption, reductions in transport fuel demand translate into significant avoided oil imports.

Second, global lithium-ion cell prices have declined sharply over the past decade as global manufacturing capacity has expanded and technology has improved. Average cell prices have fallen from around USD 470 per kWh in 2010[15] to USD 75-80 per kWh (depending on chemistry) in 2026,[16] lowering the cost of battery imports required for EV deployment.

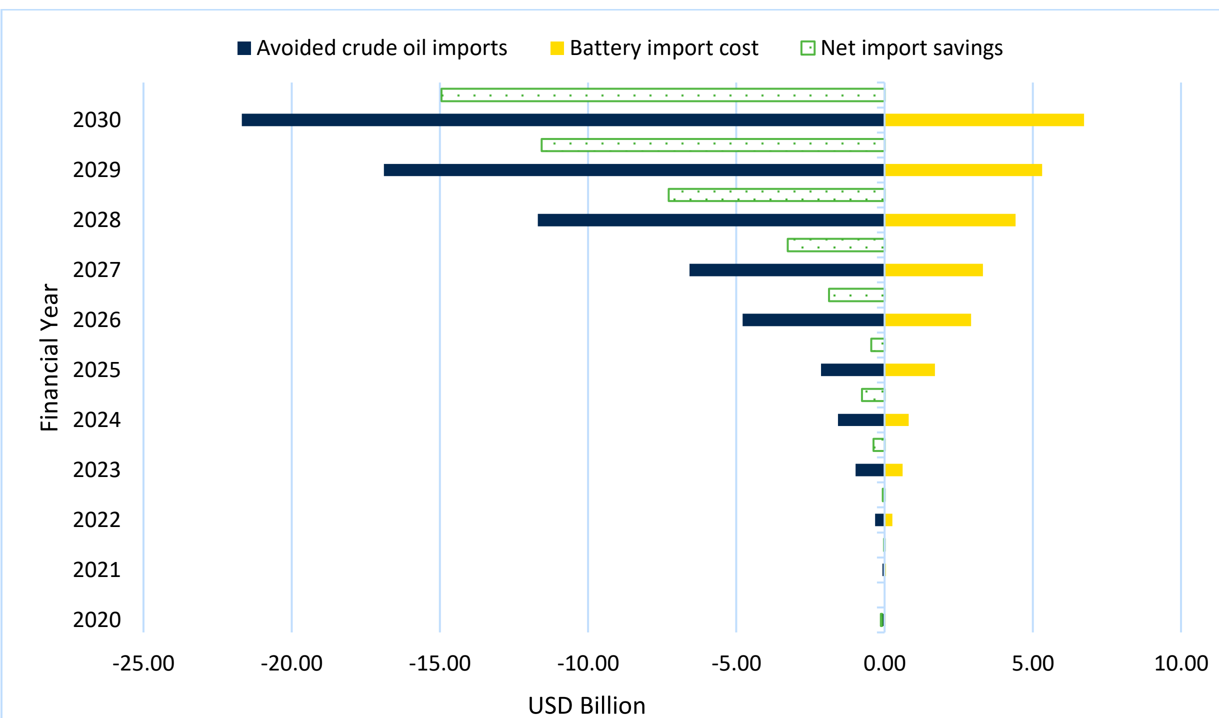
As a result, the EV transition substitutes high frequency recurring fuel imports with comparatively lower cost technology imports, generating net import savings.

Figure 18 Net import savings from EV-driven oil displacement in the BAU Scenario



Note: Negative values are indicative of cost savings
Source: Author's analysis

Figure 19 Net import savings from EV-driven oil displacement in the HG scenario



Source: Author's analysis

4.2 *Economics of the EV transition only get better as cost of crude increases and lithium-ion cell prices decline*

While the EV transition generates net import savings even under the BAU scenario, the magnitude of these savings depends on the interaction between two variables: the price of crude oil and the price of battery cells. Avoided oil imports are determined by the value of displaced petroleum consumption, which depends directly on global crude prices. Battery import costs, in contrast, depend on the price of battery cells, impacted by the scale of EV deployment. The economic outcome of the EV transition therefore varies depending on the relative levels of these two prices.

This relationship can be illustrated using a sensitivity analysis grid (Table 3), which evaluates net import savings across different combinations of crude oil prices and battery cell prices in 2030 for the HG scenario (*the corresponding BAU sensitivity analysis is provided in Annexure B)*.

Table 3 Net import savings under different crude oil and battery cell price for HG scenario in 2030

Cell price (USD/kWh)	Crude oil price (USD/barrel)				
	$50	$70	$85	$100	$120
$60	+9.39	+16.09	+21.11	+26.13	+32.02
$90	+5.72	+12.41	+17.43	+22.45	+29.15
$100	+4.49	+11.19	+16.21	+21.23	+27.93
$150	-1.63	+5.07	+10.09	+15.11	+21.80
$200	-7.75	-1.06	+3.96	+8.99	+15.68

Net loss ■ ■ ■ ■ ■ ■ Net savings (USD billions)

Source: Author's analysis

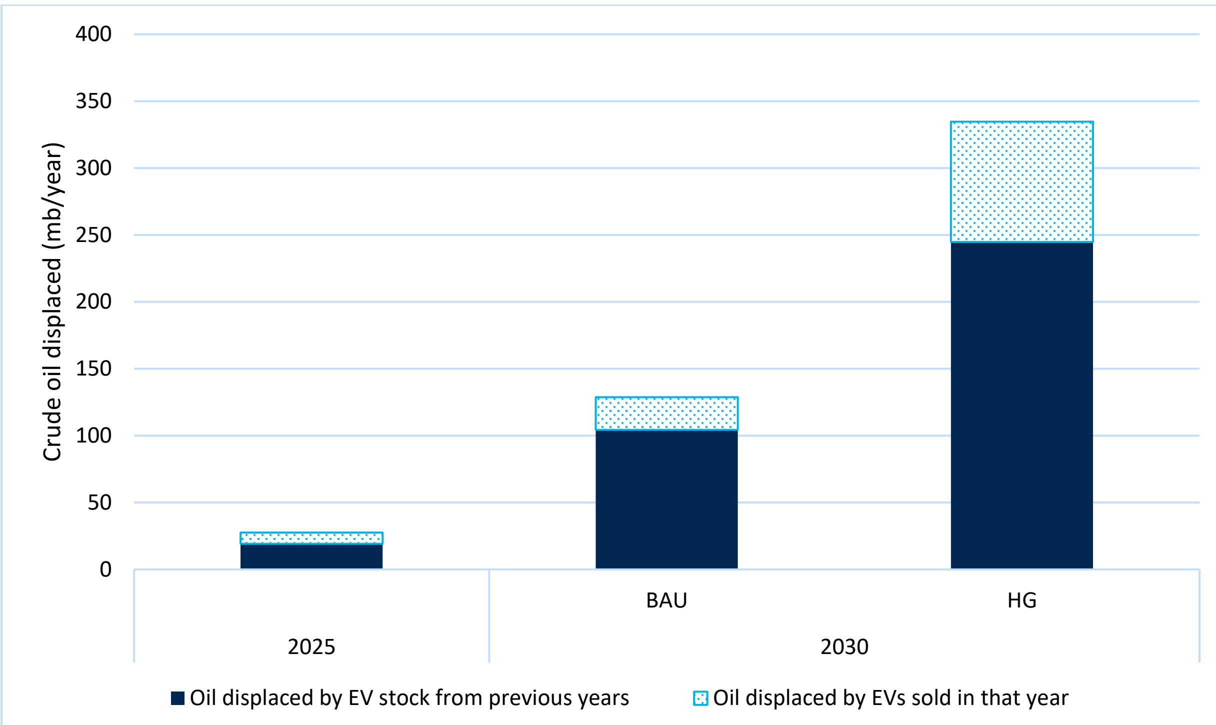
- ***When crude prices are high and battery prices are low,*** the EV transition generates large net import savings. For example, with battery cell prices around USD 60/kWh and crude prices at USD 100 per barrel, net savings reach approximately USD 26 billion, rising to USD 32 billion if crude prices reach USD 120 per barrel.
- ***Even at moderate battery cell prices around USD 90–100/kWh***, the EV transition continues to generate significant savings. With crude prices at USD 100 per barrel, net savings remain between USD 21.2 – 22.4 billion.

The sensitivity analysis shows clearly that the EV transition can potentially deliver net import savings for most cases, except when oil is below USD 70 per barrel and cell price is higher than USD 150/kWh, which is an unlikely outcome. The fiscal impacts reinforce that transitioning to EVs can generate measurable reductions in fuel demand and produce net savings in India's energy import bill, delivering both economic and environmental security outcomes.

4.3 Expanding EV stock accelerates oil displacement over time

The impact of the EV transition on oil demand has a multiplier effect each year as both stock and new sales accelerate over time. In Figure 20, we can see that for the vehicle stock in 2025, fuel efficiency improvements in ICE vehicles over time account for only 30% of total oil displaced, while the majority 70% comes from the stock of EVs already operating on the road. By 2030, the oil displacement from growing EV stock increases to over 70% across both the BAU and HG scenarios.

Figure 20 Contribution of EV stock and new EV sales to annual oil displacement from an all-ICE scenario



Source: Author's analysis

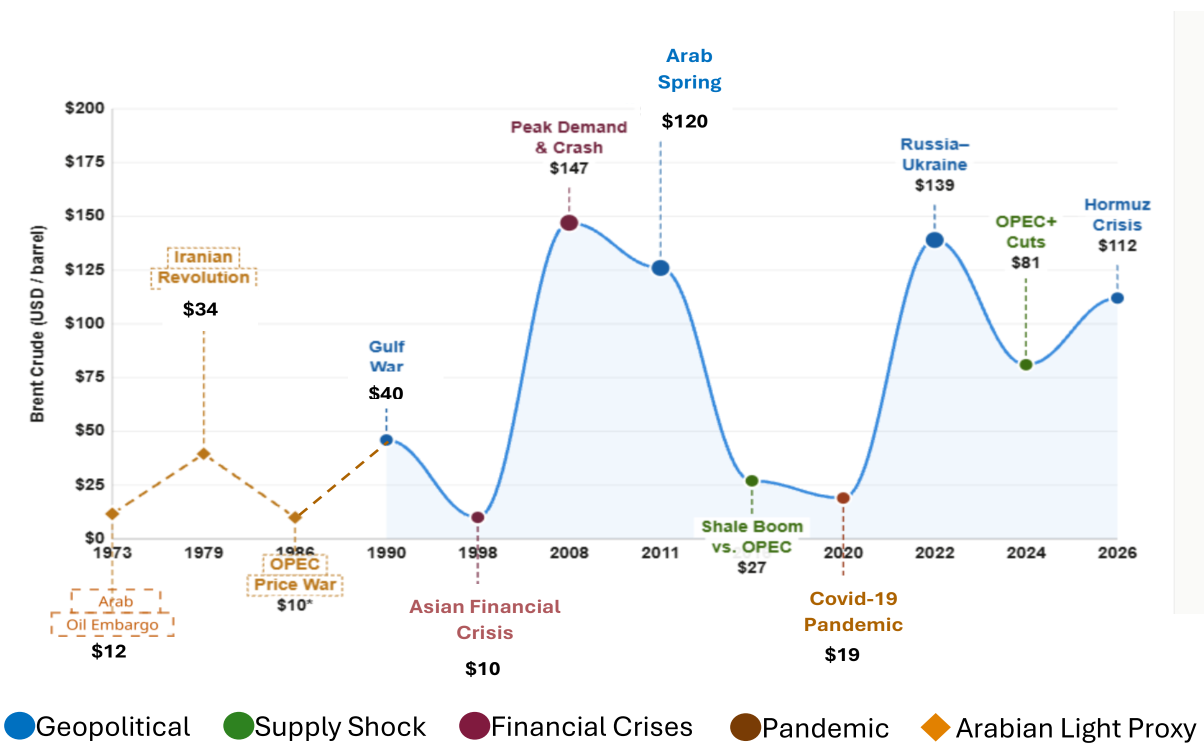
5 Market Risk, Energy Security and Industrial Opportunity

5.1 While oil markets continue to expose India to geopolitical risks and price volatility, diversification to electrification can shift this risk to resilience

Global oil markets are very sensitive to geopolitical development, supply disruptions, and production decisions by major oil-producing countries. Since crude oil is traded in an integrated and complex global market, changes in supply or even perceived risks to supply can trigger sharp price fluctuations within a short period of time (Figure 21). These fluctuations affect transport costs, national import bills, and the broader economy of oil-importing countries such as India.

Empirical evidence shows that a USD 1 increase in gasoline prices changes the market share of the most fuel-efficient quartile of new cars by +20 percent and the least fuel-efficient quartile by -24 percent,[17] indicating that fuel price shocks can significantly reshape demand within the automotive market. This linkage is significant because road transport alone accounts for around 45 percent of global oil demand,[18] making road-based mobility highly exposed to oil price volatility.

Figure 21 Global Oil Price Crises (1973 -2026)



Note: Pre-1983 proxy: Brent crude as a formal traded benchmark was established in 1983. Prices for 1973, 1979, and 1986 are based on Arabian Light / OPEC basket prices — the standard academic proxy used in historical oil market research. Brent crude — global benchmark: All post-1983 prices are Brent crude, the globally accepted benchmark used in approximately 70% of the world's oil trading, priced in USD per barrel and set in the North Sea.

Source: Author's Compilation

Recent events illustrate this vulnerability. Groups such as the Organization of the Petroleum Exporting Countries (OPEC) and its partners periodically adjust production levels to influence market conditions, leaving limited room for oil-importing economies. Production cuts by OPEC+

have periodically tightened global supply and pushed oil prices upward, while geopolitical tensions in West Asia and disruptions to critical shipping routes, particularly the Strait of Hormuz through which nearly one-fifth of global oil trade passes, have repeatedly exposed the fragility of global oil markets. This also led to crude prices temporarily rising to about USD 119 per barrel amid concerns over supply disruptions in 2026. Such events underscore the limited control oil-importing economies like India have over international fuel prices and supply conditions.

With roughly 85–88 percent of crude oil requirements met through imports[8], India's transport sector remains highly exposed to this volatility in global oil markets. As global oil prices rise, import costs increase, stressing the country's energy import bill, as already shown in earlier sections of this report. This highlights the strategic importance of transport electrification, offering a structural pathway to reduce this vulnerability. As estimated in this analysis, the EV transition under the BAU pathway could displace around 0.35 mb/d of crude oil demand by 2030, equivalent to offsetting 7% of India's current crude oil imports per day. If crude prices ranged between USD 65 – 100 per barrel, transportation electrification would translate into estimated annual import cost savings of around USD 8.3 – 12.8 billion for India by 2030.

The benefits become substantially larger under the HG pathway, where crude displacement has the potential to increase to 0.92 mb/d by 2030. This would be equivalent to offsetting nearly 19% of India's current crude oil imports (2025 levels) and could generate an estimated annual crude import savings of around USD 22 – 34 billion (with crude prices ranging from USD 65 – 100 per barrel). Accelerated EV deployment can substantially expand the macroeconomic and energy-security benefits arising from lower crude oil import requirements.

Box 1: Historical timeline of global oil disruptions

- **1973 Arab oil embargo:** Around 4.5 mb/d (about 7 percent)[19] of global oil supply was removed from the market, pushing benchmark crude price from about USD 3/bbl to USD 12/bbl.[20] This led to fuel shortages, rationing, and restrictions on vehicle use across several oil-importing economies.
- **1979 Iranian revolution:** Iranian oil output declined by around 4.8 mb/d (7 percent of world production at the time),[21] causing crude prices to rise to around USD 34/bbl.[22] As a result, fuel costs increased globally, adding pressure on transport and industrial energy users.
- **1990 Gulf War:** Around 4.3 mb/d of supply from Iraq and Kuwait was disrupted, with Brent crude rising to around USD 40/bbl.[23] For India, this added to external-sector pressure during the balance-of-payments crisis, as the oil import bill increased by 72%, from USD 3.5 billion in FY1990 to around USD 6 billion in FY1991.[24]
- **1998 Asian financial crisis:** Unlike earlier supply shocks, this was primarily a demand-side shock, with brent crude falling to around USD 10/bbl.[25] Weaker industrial activity and lower freight and passenger movement reduced oil demand across affected Asian economies.
- **2008 oil price spike and global financial crisis:** Brent crude peaked near USD 147/bbl before collapsing during the financial crisis.[26] For India, the price spike translated into a sharp increase in the crude oil import bill, which rose by over 40%, from USD 48.4 billion in FY2007 to USD 68.0 billion in FY2008.[27]
- **2011 Arab Spring / Libya disruption:** Libyan supply losses of around 1–1.5 mb/d tightened global supply and pushed brent crude to around USD 120/bbl.[28] This raised fuel-cost pressure for import-dependent economies.
- **2016 shale boom vs OPEC:** Rising U.S. shale production, combined with OPEC's decision to maintain output, created excess supply in global oil markets. Brent crude fell to around USD 27/bbl,[29] reducing fuel-cost pressure for transport sector and lowering import-cost pressure for oil-importing economies.
- **2020 COVID-19 pandemic:** Lockdowns and mobility restrictions caused a sharp demand collapse, bringing brent crude down to around USD 19/bbl.[30] The impact was most visible in transport, where passenger mobility, aviation and freight movement declined sharply.
- **2022 Russia–Ukraine conflict:** Markets priced in risks to Russian crude and petroleum product exports, pushing brent crude to around USD 139/bbl.[31] India's crude oil import bill nearly doubled to USD 120 billion in FY2022,[32] reflecting higher global prices and post-pandemic demand recovery.
- **2024 OPEC+ production cuts:** OPEC+ voluntary cuts of around 2.2 mb/d tightened supply conditions and kept brent crude around USD 81/bbl.[33] Although India's import bill declined by 16% due to lower average prices, it still spent about USD 133.3 billion on crude imports in FY2024.[34]
- **2026 Hormuz crisis / West Asia tensions:** Disruptions or threats to critical shipping routes can have effects similar to direct supply shocks in global oil markets. The Strait of Hormuz, which links the Persian Gulf to global shipping routes, carries nearly one-fifth of global oil supply.[35] Recent tensions involving Iran and risks to shipping through the Strait heightened concerns over supply disruptions, contributing to crude prices temporarily rising to around USD 112/bbl.[36] For India, the immediate crude supply risk was partly moderated by diversification in import routes, with around 70% of crude imports routed outside the Strait of Hormuz, compared with around 55% earlier.[37] However, the episode still highlighted India's exposure to global oil supply disruptions. Although India had around 60 days[38] of crude oil and petroleum product. stocks available, prolonged disruption to global oil flows or sustained increases in crude prices would continue to pose risks for an import-dependent economy.

5.2 *EV transition can build a more resilient energy system and enhance energy security*

The EV transition changes the nature of India's energy dependence rather than eliminating external dependence entirely. The strategic advantage lies in shifting away from recurring fuel imports, where exposure is continuous and directly linked to global oil price volatility, towards a technology-linked supply chain where dependence is concentrated more at the point of vehicle and battery production. Once deployed, an EV continues to reduce petrol and diesel consumption throughout its operational life.

Battery supply chains also operate differently from oil markets. Battery cell manufacturing involves a large number of competing firms across multiple regions, including China, Japan, South Korea, Europe, and North America.[39]. While battery minerals and cells can be import-dependent, battery costs are shaped more by manufacturing scale, technological learning and industrial competition than by coordinated production decisions comparable to OPEC. Competition among manufacturers, expanding production capacity and improvements in cell chemistry have contributed to a sustained decline in battery costs over the past decade. This means that the economics of EVs are increasingly influenced by scale and innovation, rather than recurring exposure to global fuel-price shocks.

In addition, battery minerals are not consumed in the same way as fossil fuels. When a battery reaches its end of life, many of these minerals can be recovered and reused through recycling. This creates the potential for a circular supply chain, in which recovered minerals are reintroduced into new battery cell production, reducing long-term dependence on primary resource extraction. For India, developing domestic cell manufacturing, battery recycling and downstream processing capacity can therefore reduce the import intensity of the EV value chain over time.

This shift also changes the nature of energy dependence – EVs draw power from a 100% domestic grid. The grid itself is undergoing a structural shift in its generation mix with India targeting 500 GW of non-fossil fuel capacity by 2030 and already achieving a 52% share of non-fossil capacity (267 GW out of 514 GW) as of 2025.[40]

This creates an additional structural advantage for EVs over ICE vehicles. An EV becomes progressively cleaner over its lifetime as the grid decarbonizes, whereas an ICE vehicle remains locked into fossil fuel use, continuing to be both import-dependent and emissions-intensive throughout its operational life. Therefore, the transition to electric mobility not only reduces oil dependence but also aligns transport energy demand with India's long-term clean energy transition objectives.

5.3 *EV transition creates opportunities for domestic industrial development and investment attraction*

The transition towards electric mobility also opens opportunities for domestic industrial development. India has previously demonstrated the ability to build globally competitive industries even in sectors where domestic resource availability is limited. Despite limited domestic crude oil production, India has developed one of the world's largest refining industries and emerged as a significant exporter of refined petroleum products to global market.

A comparable pattern can be seen in electronics industry, where India continues to import substantial volumes of semiconductors, components and other high-value inputs, but has nevertheless developed a rapidly expanding domestic manufacturing and export base. Electronics production increased from ₹1.9 lakh crore in FY2015 to ₹11.3 lakh crore in FY2025, while exports rose from ₹38,000 crore to ₹3.27 lakh crore over the same period.[41]

India's steel industry provides another example. Although India has abundant iron ore, the limited domestic availability of suitable coking coal—a critical input for blast-furnace steelmaking—has resulted in substantial import dependence. This constraint has not prevented India from developing a major steel-manufacturing industry: the country has remained the world's second-largest steel producer since 2018, with crude steel production reaching approximately 168 million tonnes in FY2026.[42]

A similar opportunity exists in the emerging electric mobility ecosystem. India's EV transition could create market potential for approximately 3.85 million EVs under the BAU scenario and 7.42 million EVs under the HG scenario across two-wheelers, three-wheelers, cars, buses and commercial vehicles by 2030,[12] representing a market opportunity of USD 8.5 billion – USD 18.8 billion. The corresponding demand for EV batteries could reach 55 GWh - 122 GWh,[12] creating an additional USD 6.6 billion – USD 15 billion market opportunity in cell manufacturing (see Annexure C).

Unlike the mature and externally determined oil market, EV and battery supply chains are still evolving, creating an opportunity for India to capture a larger share of the value chain through domestic manufacturing, strategic partnerships and policy support. Several segments of the EV value chain, such as battery manufacturing, power electronics, electric drivetrains, battery management systems, and recycling technologies, represent areas where domestic industrial capacity can expand. leveraging its position as the world's third largest automotive manufacturer after China and the United States. The transition therefore represents not just a shift in energy use, but an opportunity for India to influence the structure of future supply chains, strengthen energy security, and most importantly, enhance its industrial competitiveness, leveraging its position as the world's third largest automotive manufacturer after China and the United States.

6 Strategic Implications for India's Energy Transition

The findings of this analysis suggest that transport electrification is not solely a climate mitigation approach, but also a structural industrial, economic and energy security strategy. As global energy systems transition from fossil fuels toward electricity and critical minerals, the nature of energy dependence is also changing. For India, the transition of the road transport sector to electrification can shift the country's recurring dependence on imported fuels towards greater reliance on domestic electricity, diversified supply chains, and industrial value creation.

6.1 Electric mobility can reduce India's structural exposure to oil imports

India's transport sector currently remains fundamentally dependent on imported crude oil, with every kilometre travelled by an internal combustion engine (ICE) vehicle requiring a continuous supply of petroleum fuels, hence sustained exposure to supply risks. Though India has diversified its crude sourcing in the recent years, this doesn't eliminate its risk exposure as seen in 2026.

- ***Crude Displacement:*** By 2030, EVs could displace between 0.35 million barrels per day (mb/d) in a Business-as-Usual (BAU) scenario and 0.92 mb/d in a High Growth (HG) scenario.
- ***Import Reduction:*** This displacement is equivalent to offsetting 7% to 19% of India's current daily crude oil imports.
- ***Compounding Benefits:*** Unlike fuel efficiency improvements in traditional vehicles, which offer diminishing returns, the impact of the EV transition is cumulative; by 2030, over 70% of oil displacement will come from the established stock of EVs already on the road.

6.2 EV transition reduces overall import burden rather than simply shifting dependence

The analysis shows that even when battery packs are assumed to be fully imported, the value of avoided crude oil imports exceeds the cost of battery imports under most of the price sensitive scenarios. The EV transition reduces overall import exposure rather than simply replacing one dependency with another. More importantly, the EV transition will offset the global oil price volatility as battery prices are expected to decline and remain stable with market maturity.

- ***One-time vs. Recurring:*** Crude oil is a recurring import required for a vehicle's entire life, whereas batteries are a one-time capital asset that can eventually be recycled to recover strategic minerals.
- ***Net Savings:*** Even assuming 100% battery imports, the transition generates significant net savings. By 2030, India could see net import savings of USD 5.3 billion (BAU) to USD 15 billion (HG).
- ***Price Resilience:*** The economics of EVs only improve as global battery prices decline and oil prices rise. In a high-oil (USD 100/barrel) and low-cell-price scenario, net savings could reach USD 26 billion.

6.3 Electrifying MHDVs can have the highest impact on oil displacement

Maximizing oil displacement also requires vehicle segment-specific strategies. The energy and economic security benefits of EV adoption depend not only on the overall number of vehicles electrified, but also on which segments are electrifying, at what pace. As of 2025, electrification of two-wheelers has delivered the largest immediate reductions in petrol demand because of their dominant share in India's vehicle fleet and fuel consumption. Continued momentum in this segment is critical for achieving near-term reductions in oil demand. At the same time, medium- and heavy-duty trucks consume disproportionately large volumes of diesel on a per-vehicle basis. Although their contribution to oil displacement remains relatively modest under current adoption trajectories, accelerating freight electrification can offer the greatest opportunity for long-term reductions in diesel consumption and crude oil imports.

- ***Immediate Gains (Two-Wheelers):*** Currently, two-wheelers are the primary driver of petrol displacement, contributing 71% of total oil displacement under BAU by 2030 due to their sheer volume in the Indian vehicle fleet.
- ***Long-Term Impact (Heavy-Duty Vehicles):*** While currently in early stages, the electrification of medium and heavy-duty trucks (MHDVs) offers the greatest opportunity for long-term fuel dependency reduction. In a High Growth scenario, trucks could account for 34% of total oil displacement by 2030.

6.4 The EV transition is also an industrial transformation story

The transition to electric mobility includes batteries, power electronics, electric drivetrains, charging infrastructure, software, critical minerals and recycling systems. These industries represent emerging sources of economic value, investment, and employment, providing India with an opportunity to strengthen its position within global clean energy value chains.

India has shown that with the right political and policy framework, industrial benefits can be achieved as seen with the electronics, steel and refining sectors. India has demonstrated that industrial competitiveness can be achieved in downstream energy industries even when upstream resources are imported. A similar approach could allow India to capture value by enhancing capabilities in the manufacturing and technology segments of the EV supply chain.

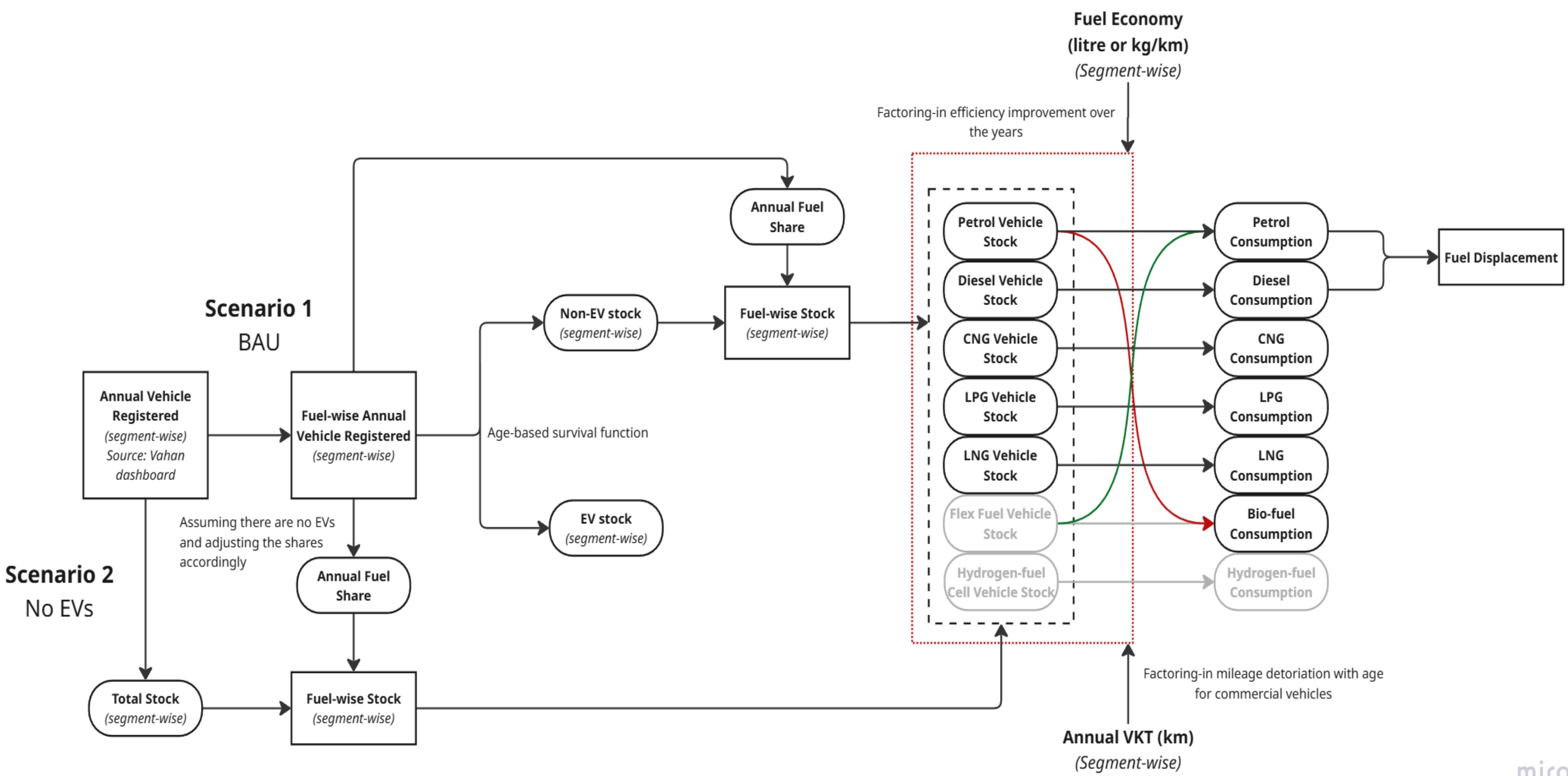
- ***Proven Track Record:*** India has seen success in industrial policy-led approaches in recent years building world-class industries (refining, electronics, steel) despite lacking primary upstream resources.
- ***Market Opportunity:*** The EV transition represents a USD 8.5 billion to USD 18.8 billion market opportunity for vehicles and a USD 6.6 billion to USD 15 billion opportunity in battery cell manufacturing by 2030.
- ***Domestic Resilience:*** Shifting to EVs aligns transport with a domestic grid that is targeting 500 GW of non-fossil fuel capacity by 2030, ensuring that vehicles become progressively cleaner and more secure over their lifetime.

Annexure A

Methodology for Estimating Fuel Demand and Crude Oil Displacement

The analysis adopts a bottom-up stock-based modelling approach, combining vehicle registration data, vehicle survival patterns, segment-wise fuel economy assumptions, and vehicle usage intensity to estimate fuel consumption across different vehicle categories. The resulting estimates are validated against historical fuel consumption data reported by the Petroleum Planning and Analysis Cell (PPAC), Ministry of Petroleum and Natural Gas, Government of India.

Figure 22 Methodological flow of fuel demand estimation and crude displacement



A1. Data Sources

The model integrates multiple data sources to estimate vehicle stock, fuel demand, and crude oil displacement.

Vehicle fleet and registration data

- Annual vehicle registration data obtained from the VAHAN dashboard, disaggregated by vehicle segment.
- Vehicle stock estimates used in the modelling framework are derived from previously established stock modelling exercises:
  - Two-wheelers, three-wheelers, passenger cars, buses, and N1 vehicles are based on the vehicle stock estimates presented in Building Certainty in Critical Minerals: A Strategic Framework for India's Lithium Sourcing.[7]
  - Medium and heavy-duty trucks (N2 and N3 categories) are derived from the stock modelling framework presented in *Turning the Wheel: Fuel Efficiency Standards for a Low-Carbon Trucking Future in India.*[43]

Fuel consumption data

- Historical petrol and diesel consumption data are sourced from the Petroleum Planning and Analysis Cell (PPAC).

Energy conversion factors

- Conversion factors used to translate petroleum products into crude oil equivalents are derived from TERI commercial energy balance tables**.**

A2. Estimation Framework

The analysis estimates fuel demand through a bottom-up modelling framework that links vehicle stock, vehicle usage, and fuel efficiency. Vehicle stock is first disaggregated by vehicle segment and fuel type. Segment-wise vehicle kilometres travelled (VKT) and fuel economy assumptions are then applied to estimate annual fuel consumption across the fleet.

To quantify the impact of EV transition, the framework compares three scenarios:

- <u>Scenario 1 or No-EV Counterfactual:</u> A hypothetical scenario assuming no EV adoption is constructed by adjusting fuel shares accordingly.
- <u>Scenario 2 or Business-as-Usual (BAU):</u> Fuel demand is estimated based on historical and projected EV adoption trend across vehicle segments.
- <u>Scenario 3 or High Growth (HG):</u> The third represents a high-growth EV transition scenario, where fuel demand is estimated based on accelerated EV uptake across segments.

The difference in fuel consumption between scenario 2 and 3 with respect to scenario 1 represents the fuel demand displaced due to EV adoption.

A3. Fuel Demand Estimation

Fuel consumption for each vehicle segment is estimated based on three primary parameters:

- Vehicle stock
- Annual vehicle kilometres travelled

- Segment-wise fuel economy

Fuel consumption is calculated by combining these parameters for each vehicle category. The model also incorporates efficiency improvements over time as well as mileage deterioration for ageing commercial vehicles.

A4. Estimation of Crude Oil Displacement

Fuel demand displaced by EV adoption is estimated by comparing petrol and diesel consumption in the BAU and No-EV scenarios. The difference in fuel consumption is converted into crude oil equivalents using refinery yield conversion factors.

The following conversion factors are applied: [44]

- Petrol: 8.53 barrels per tonne
- Diesel: 7.46 barrels per tonne

This allows crude oil displacement to be expressed in barrels per day (b/d) or million barrels per day (mb/d).

A5. Model Validation Against PPAC Data

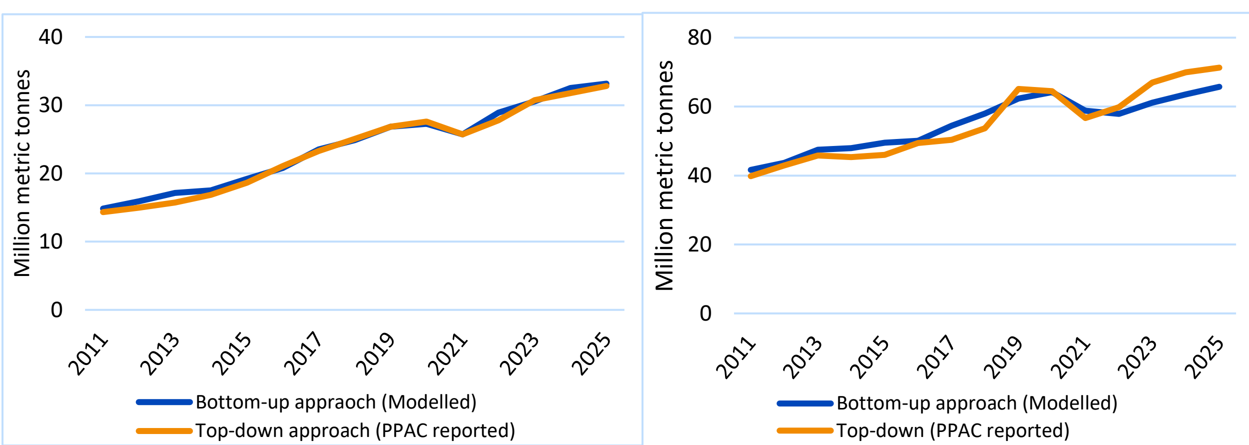
To assess the robustness of the modelling framework, the estimated fuel demand was validated against historical fuel consumption data reported by PPAC. Modelled petrol and diesel consumption trends were compared with PPAC-reported values for the period 2011–2025.

The validation results show a close alignment between modelled and reported fuel demand:

- Petrol: deviation ranges between −8.9% and +1.4%
- Diesel: deviation ranges between −8% and +9%

The small deviation range suggests that the bottom-up modelling framework captures historical fuel demand trends with reasonable accuracy.

Figure 23 Validation of bottom-up fuel demand estimates against PPAC data



Source: Author's analysis

Annexure B

Table 4 Net import savings under different crude oil and battery cell price for BAU scenarios in 2030

Cell price (USD/KWh)	Crude oil price (USD/barrel)				
	$50	$70	$85	$100	$120
$60	+3.15	+5.72	+7.65	+9.58	+12.16
$90	+1.51	+4.08	+6.01	+7.94	+10.52
$100	+0.96	+3.53	+5.46	+7.39	+9.97
$150	-1.78	+0.79	+2.72	+4.65	+7.23
$200	-4.52	-1.94	-0.01	+1.92	+4.49

Net loss … Net savings (USD billions)

The sensitivity grid shows how the net economic outcome changes across a range of plausible price scenarios:

- ***When crude prices are high and battery prices are low,*** the EV transition generates large net import savings. For example, with battery cell prices around USD 60/kWh and crude prices at USD 100 per barrel, net savings reach approximately USD 9.6 billion, rising to more than USD 12 billion if crude prices reach USD 120 per barrel.
- ***Even at moderate battery cell prices around USD 90–100/kWh***, the EV transition continues to generate significant savings. With crude prices at USD 100 per barrel, net savings remain between USD 7.4 – 7.9 billion.

Annexure C

Methodology for estimating the 2030 EV and battery market opportunity

The market opportunity associated with India's EV transition was estimated for vehicle sales and battery cell manufacturing under the BAU and HG scenario.

C1. EV market opportunity

The EV market potential was estimated for two-wheelers, passenger three-wheelers, goods three-wheelers, cars, buses, light goods vehicles, medium-duty vehicles and heavy-duty vehicles.

For each segment, projected annual EV sales in 2030[12] were multiplied by the corresponding average vehicle price in 2030.[45] The total EV market potential was calculated by summing the market potential across all vehicle segments (Table 5).

Table 5 EV market potential calculations

Segment	EV sales in 2030 (lakhs)		Average vehicle price in 2030 (INR lakhs)	EV market potential (INR crores)	
	BAU	HG		BAU	HG
Two-wheelers	30	55	1.16	34781	63710
Three-wheelers - Passenger	2.1	4.2	2.55	5395	10742
Three-wheelers - Goods	0.87	1.3	2.75	2395	3577
Cars	5.1	12.7	10.69	54865	135403
Buses	0.04	0.1	97.61	4199	10298
LGV	0.24	0.85	8.07	1906	6841
MDV	0.05	0.1	27.94	1372	2798
HDV	0.04	0.08	81.35	3130	6545
Total	38.45	74.24		108043	239913
Adjusted industrial opportunity (INR crores)				81032	179935
Billion USD				8.5	18.8

Note: INR values were converted to US dollars using an exchange rate of US$1 = ₹95.60, based on the prevailing exchange rate in 2026.

C2. Battery cell-manufacturing opportunity

Projected EV battery demand in 2030 was multiplied by the capital cost required to establish one GWh of battery cell-manufacturing capacity. A capital-cost assumption of US$120 million per GWh was applied under both scenarios, based on the NITI Aayog–PwC report[46] (Table 6).

Table 6 Battery manufacturing potential calculation

Parameter	BAU	HG
Battery demand in 2030 (GWh)	54.8	122
Capital cost per GWh of cell-manufacturing capacity (USD million)	120	120
Battery cell-manufacturing opportunity (USD billion)	6.6	15

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