Assessment of electric two-wheeler, and three-wheeler industry in India

Greaves Electric Mobility Limited

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Argentina | Australia | China | Hong Kong | **India** | Japan | Poland | Singapore | Switzerland | UAE | UK | USA
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Contents

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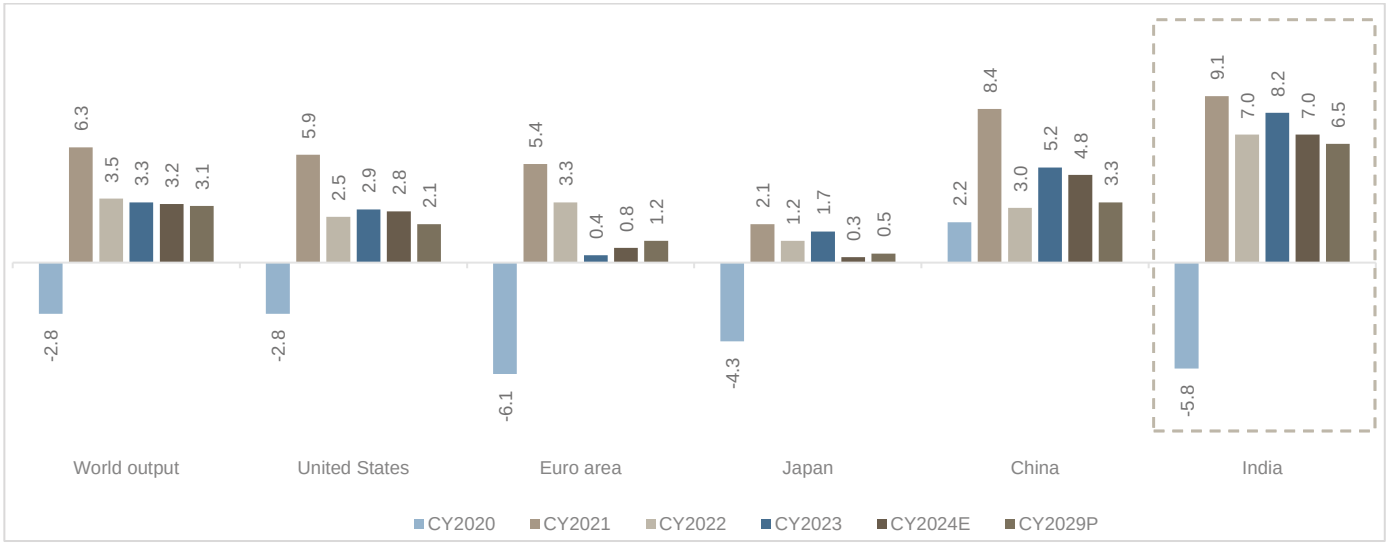
1. Overview of Macroeconomic Landscape

1.1 Overview of the Global Economy

Review and Outlook of Global GDP and GDP growth

Global economic growth remained steady during CY2023 with several large economies showing resilience despite geopolitical tensions, high interest rates and the growing intensity of extreme weather events. India has witnessed strong growth momentum despite these geopolitical tensions and uncertainties in the global economic environment. Major push to economic growth has been fuelled by investments and key sectors such as information technology, services, agriculture, and manufacturing.

Gross Domestic Product (GDP) growth of key economies (%)



Note: On Calendar Year (CY) basis

** Euro area comprises 19 member countries of the EU*

Source: International Monetary Fund (IMF); World Economic Outlook (WEO) – October 2024 update), CRISIL MI&A

As per World Economic Outlook by International Monetary Fund (IMF):

- The global GDP growth is estimated at 3.2% in CY2024 with the forecast 0.1% higher than the previous estimates due to upgrades for China, the United States (US), large emerging markets and developing economies. The forecast for CY2024 is however, below the historical (CY2000-2019) annual average of 3.8% due to elevated central bank policy rates to fight inflation, withdrawal of Fiscal support by major economies amid high debt weighing on economic activity and low underlying productivity growth.
- In the case of advanced economies, US witnessed growth due to stronger outruns in consumption and non-residential investment. The resilience of consumption is largely the result of robust increase in real wages especially lower income households and wealth effects whereas in Japan decline in growth majorly stemmed from temporary supply disruptions linked to the shutdown of major automobile plant in the first quarter of Fiscal 2025. In contrast, economic recovery is expected to shape up in Europe majorly due to falling inflation and interest rates encouraged domestic demand.
- Emerging and developing economies are expected to experience stable growth through 2024 and 2025 albeit with some regional differences.

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Growth in emerging and developing countries of Asia is expected to decline from an estimated 5.7% in CY2023 to 5.3% in CY2024, with an upgrade of 0.1% for CY2024 over previous IMF estimates. India is the fifth largest economy and among the fastest growing major economies. Growth in India is projected to remain strong at 7.0% in CY2024 with an upgrade of 0.2% over previous IMF estimates due to improved prospect for private consumption, particularly in rural areas.

Review and Outlook of Inflation in Key Economies

In advance economies, the pace of disinflation is expected to be slow in CY2024. The price for services is expected to be persistent and higher commodity prices are expected owing to inflation. As per IMF previous estimates global headline inflation is expected to fall from an average of 6.8% in CY2023 to 5.9% in CY2024. However, the gradual cooling of labour markets, together with an expected decline in energy prices, expected to bringdown headline inflation back to target by the end of CY2025.

Inflation is expected to remain higher in emerging market and developing economies than in advanced economies, however due to falling energy prices inflation is already reached close to pre pandemic levels for the median emerging market and developing economies.

Consumer price inflation (year-on-year, %)

	Jan-24	Feb-24	Mar-24	April-24	May-24	June-24	July-24	Aug-24	Sept-24	Oct-24
US	3.1	3.2	3.5	3.4	3.3	3.0	2.9	2.5	2.4	2.6
UK	4.0	3.4	3.2	2.3	2.0	2.0	2.2	2.2	1.7	2.3
Euro zone	2.8	2.6	2.4	2.4	2.6	2.5	2.6	2.2	1.7	2.0
Japan	2.2	2.8	2.7	2.5	2.8	2.8	2.8	3.0	2.5	2.3
China	(0.8)	0.7	0.1	0.3	0.3	0.2	0.5	0.6	0.4	0.3
India	5.1	5.1	4.9	4.8	4.8	5.1	3.6	3.7	5.5	6.2

Source: Statistical Bureau, respective countries

India to be the fastest growing large economy

- GDP grew 5.4% year-on-year in the second quarter of this Fiscal, a sharp deceleration from 6.7% in the first quarter of Fiscal 2025. This comes over high growth in the second quarter of Fiscal 2024, in which the economy had grown 8.1%. Moderation in manufacturing and investment were a drag on GDP growth.
- Inflation based on the Consumer Price Index (CPI) inched up to 6.2% in October 2024 from 5.5% in September 2024 as food prices remained high. Core (which excludes food and fuel) inflation rose to 3.8%. Continuing rise in food prices driven by vegetable and edible oil accelerated the CPI index to 14month high of 6.2%, a touch above Reserve Bank of India's tolerance band of 4-6%.
- India's merchandise trade deficit narrowed to USD 27.1 billion in October 2024 from USD 30.43 billion in the October 2023.Cumulatively, merchandise exports rose 3.2% to USD 252.3 billion during April-October from USD 244.5 billion in the year-ago period. Cumulative imports grew faster at 5.8% in April-Oct 2024 to USD 416.9 billion from USD 394.2 billion Apr-Oct 2023. As a result, trade deficit during the period widened to USD 164.7 billion from USD 149.7 billion in the previous year.
- Services exports grew at 14.6% in September 2024, up from 5.7% in August 2024. Services import grew at 13.2% year on year in September 2024 compared to 8.8% in August 2024. Hence, service trade surplus rose to USD 16.1 billion in September 2024 compared with USD 13.8 billion in September 2023 and USD 13.9 billion USD in August 2024.This is the highest surplus post January 2024.when it was USD 16.2 billion.
- As per CRISIL MI&A, the Fiscal 2025 seems to have started on a good note with merchandise exports registering growth in the first quarter of FY2025. This along with key multilateral organisations' forecasts of

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better year-on-year trade growth are encouraging. The government's increased focus on foreign-trade agreements (FTA) should also provide a thrust.

- The Fiscal deficit is budgeted to decline to ₹ 16.1 trillion (4.9% of GDP) this Fiscal from ₹ 16.5 trillion (5.6% of GDP) in Fiscal 2024. Accordingly, the government's gross market borrowings through dated securities are expected to be ₹ 14 trillion, 9.2% lower year-on-year.
- India's GDP has expanded at 8.2% in Fiscal 2024 that was higher than 7% in Fiscal 2023, aided by a greater than expected expansion of 7.8% in the fourth quarter of Fiscal 2024, according to provisional estimates of GDP growth released by the National Statistical Office (NSO).
- For the Fiscal 2025, IMF projected India's GDP growth rate at 7.0%. The development has come in the backdrop of notable rise in consumption prospects, especially in rural areas. With this, India continues to maintain its position as the fastest-growing economy among emerging markets and developing economies.

Global crude oil price

In 2023, Crude oil prices witnessed a steady decline of 17% year-on-year, supported by the easing of geopolitical tensions coupled with recessionary pressures globally. In H1 2023, crude oil prices averaged $80 per barrel, resulting in a decline of around 25% year-on-year, owing to the deterioration in economic conditions globally, such as banking crises in the US and lower-than-anticipated Chinese demand revival. The decision of OPEC+ in April 2023 to cut 1.16 mbpd of output, coupled with summer demand from the US, resulted in overall prices surging in H2 2023. Tight global supply resulted in declining inventories, pushing prices upwards in Q3 2023. The deteriorating demand scenario stemming from Europe and Japan, along with the easing of Venezuelan oil sanctions, affected global oil prices.

In 2024, Crude oil prices are expected to hover in the range of $80-85 per bbl, keeping prices volatile amidst geopolitical turmoil. In H1 2024, prices averaged around $84 per bbl, marginally up by around 2% from last year's prices. The impact of geopolitical uncertainties has resulted in prices jumping from $80 per bbl in December to $90 per bbl at the start of April 2024. With the effect of geopolitical risk stabilizing and stable demand scenarios, prices are expected to average in the range of $80-85.

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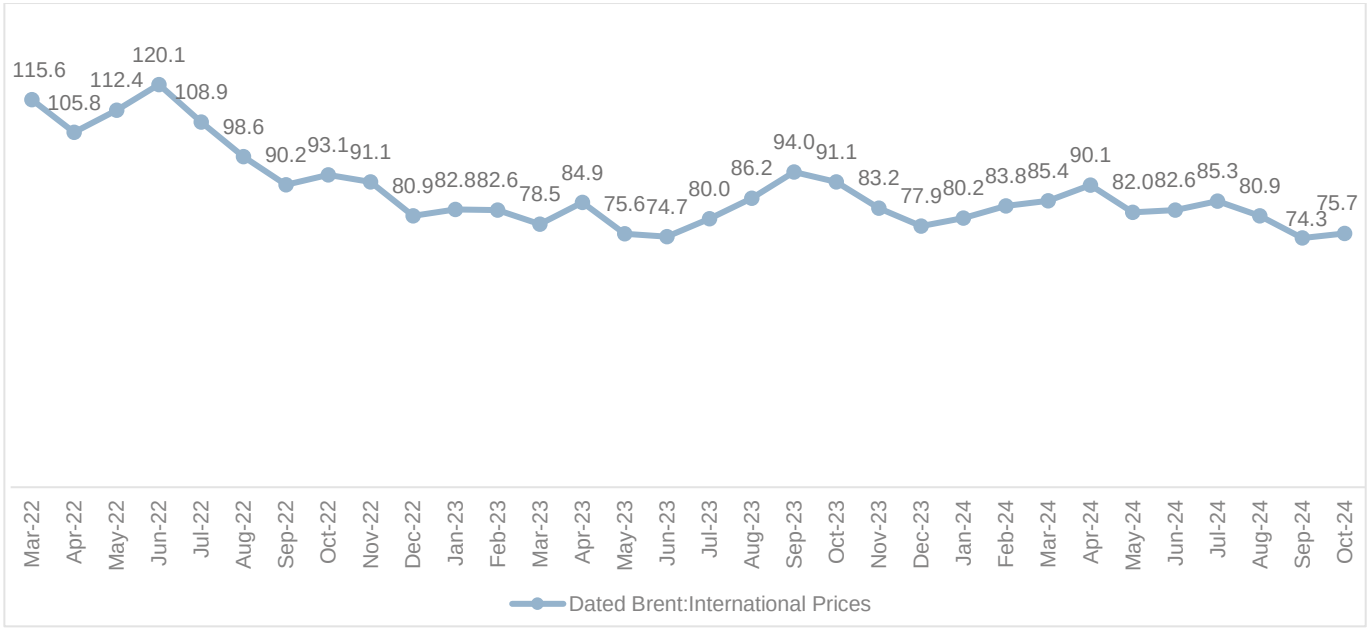
Brent crude prices (USD/barrel)



Note: Monthly average prices
Sources: CRISIL MI&A

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1.2 Overview of Indian economy

Review of GDP Growth Over Fiscals 2019-2024 and Outlook for Fiscals 2025-2030

India ranks as the world's 5th largest economy and is the fastest growing among major economies. The Indian economy logged 4.3% CAGR between Fiscals 2019 and 2024. This was a sharp deceleration from a robust 6.7% CAGR between Fiscals 2017 and 2019, which was driven by rising consumer aspiration, rapid urbanization, the government's focus on infrastructure investment and growth of the domestic manufacturing sector. Economic growth was supported by benign crude oil prices, soft interest rates and low current account deficit. The Indian government also undertook key reforms and initiatives, such as implementation of the Goods and Services Tax (GST), Insolvency and Bankruptcy Code, Make in India, financial inclusion initiatives, and gradual opening of sectors such as retail, e-commerce, defence, railways, and insurance for foreign direct investments (FDIs).

A large part of the lower growth between Fiscals 2018 and 2023 was because of the economy contracting 5.8% in Fiscal 2021 owing to the fallout of Covid-19. The pandemic's impact was more pronounced on contact-sensitive services and social distancing norms-affected services such as entertainment, travel, and tourism, with many industries in the manufacturing sector also facing issues with shortage of raw materials/components as lockdown in various parts of the world upended supply chains.

Over the period, India's economic growth was led by services, followed by the industrial sector, while in part impacted by demonetization, the non-banking financial company (NBFC) crisis, slower global economic growth, and the pandemic.

As lockdowns were gradually lifted, economic activity revived in the second half of Fiscal 2021. After a steep contraction in the first half, owing to rising number of Covid-19 cases, gross domestic product (GDP) moved into positive territory towards the end of Fiscal 2021. Subsequently, in Fiscal 2022, India's real GDP grew 9.7% from the low base of Fiscal 2021.

India's GDP exceeded expectations during all four quarters of Fiscal 2024. However, growth slowed down in fourth quarter but stayed strong. According to the National Statistics Office's (NSO) provisional estimates, GDP growth slowed to 7.8% year-on-year in the fourth quarter of last Fiscal from 8.6% of third quarter but was higher than 6.1% in the year-ago quarter. This prompted the NSO to revise upward the Fiscal 2024 GDP growth estimate to 8.2% (which is the provisional estimate), from the earlier estimate of 7.6%.

Growth surpassed forecasts in the Fiscal 2024, driven by strong government spending and a sharp rise in manufacturing and construction growth. Globally, growth in major economies such as the US and China beat estimates and has contributed to better export earnings for India.

According to the National Statistics Office's (NSO) real GDP growth accelerated to 6.7% year-on-year in the first quarter of Fiscal 2025 compared to 8.2% in the first quarter of Fiscal 2024. Real Gross Value Added (GVA) has grown by 6.8% in the first quarter of Fiscal 2025 over the growth rate of 8.3% in the first quarter of previous financial year. This GVA growth in the first quarter of Fiscal 2025 has been accelerated by significant growth contributed by construction (10.5%), Utility services (10.4%) and manufacturing sector (7.0%). Private final consumption expenditure and gross fixed capital formation at constant prices have witnessed growth rates of 7.4%and 7.5% respectively for the first quarter of Fiscal 2025.

India's growth trajectory slows to its lowest in last seven quarters and decelerated to 5.4% year-on-year in second quarter of Fiscal 2025 as compared to 6.7% in the first quarter of Fiscal 2025 and 8.1% in a year ago quarter. On the demand side, moderation in consumption and investment growth were a drag on GDP growth. From the supply side, manufacturing growth slowed sharply compared to the first quarter of Fiscal 2025, weighed down by weaker domestic demand and worsening export performance.

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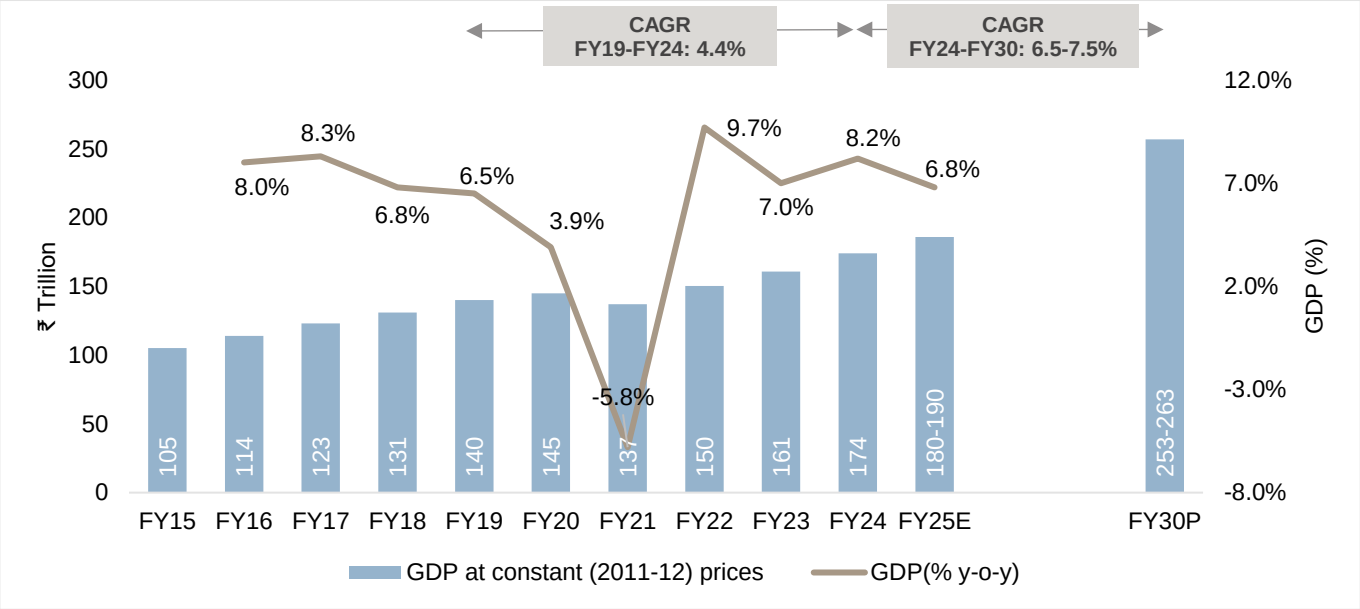
CRISIL MI&A expects GDP growth to moderate to 6.8% in Fiscal 2025 owing to slowing demand, particularly in United States and China, will weigh on global growth. Geopolitical tensions, particularly in the Middle East, remain a risk for trade flows and supply chain pressures for industry and along with the impact of high interest rates.

India's GDP growth trend and outlook



Note: E - estimated and P - projected

Source: National Statistical Office (NSO), IMF, CRISIL MI&A estimates

Outlook on GDP

After a strong GDP growth in the past three Fiscals, GDP growth is expected to moderate to 6.8% in Fiscal 2025. The growth will still be higher than the pre-pandemic decadal average of 6.7%, continuing to position India as the fastest growing major economy. GDP growth is weighed down by high interest rates and low Fiscal impulse. However, certain high frequency indicators from October such as automobile sales and export growth are showing encouraging signs of a revival in the third quarter, indicating the slowdown in the second quarter could be temporary.

Agricultural growth has risen and is likely to increase further due to expectations of a healthy kharif harvest on account of the monsoon being 8% above the Long Period Average at the season's end. Higher reservoir levels also bode well for rabi output. All this should provide a boost to agricultural incomes and rural consumption. Additionally, increased kharif arrivals into the market are likely to ease the pressure on food inflation, which has been elevated for several months, eroding the purchasing power of both rural and urban households.

While government capex has rebounded in the second quarter and is likely to pick up further as state capital expenditure revives, investment prospects largely hinge on a sustained pickup in private capex which, in turn, depends on the extent of increase in domestic demand.

Exports will have to navigate increased uncertainties arising from Donald Trump's re-election and the possibility of the United States (US) imposing tariffs on China and global exports. Any spike in the prices of commodities, particularly crude oil, remains a risk for the country's growth.

On the long term horizon, India's GDP is expected to continue its growth momentum and clock 6.5-7.5% CAGR growth till Fiscal 2030.

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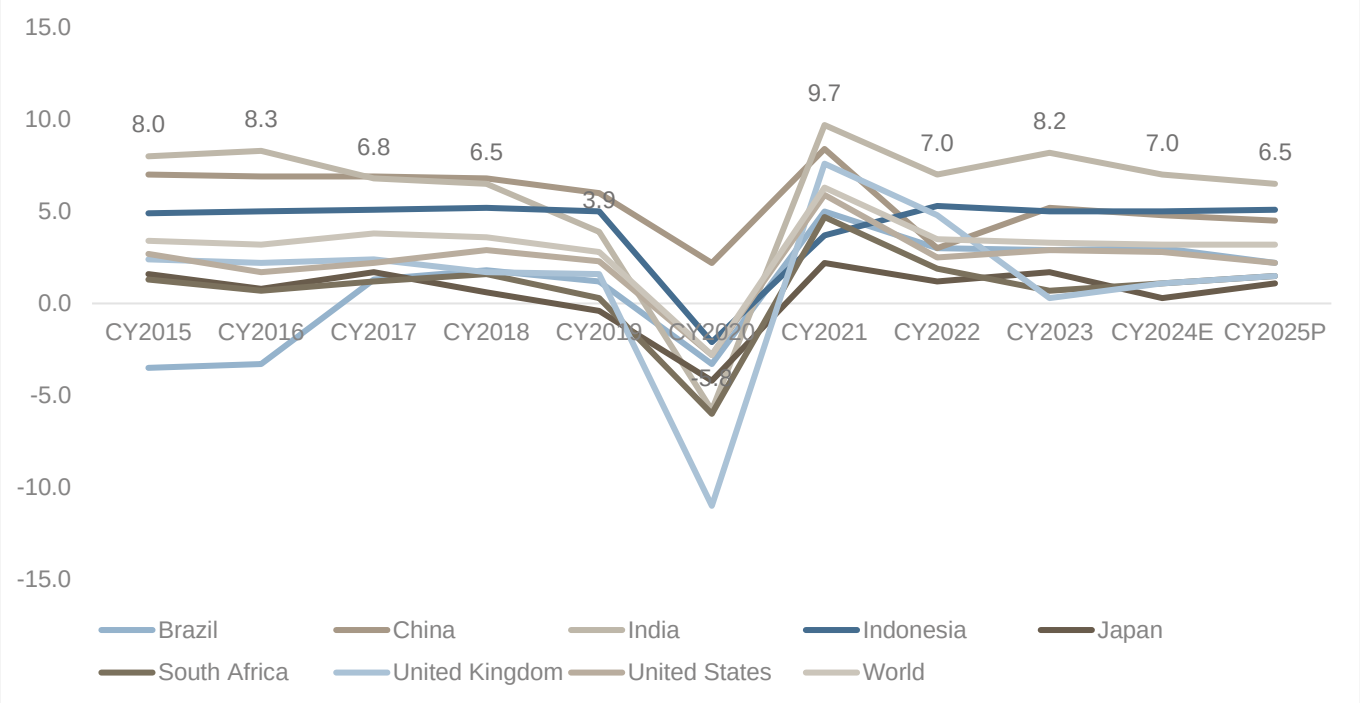
India is one of the fastest growing emerging economies (GDP growth, % year-on-year)



Real GDP growth (Annual % change)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024E	2025P
Brazil	-3.5	-3.3	1.3	1.8	1.2	-3.3	5.0	3.0	2.9	3.0	2.2
China	7.0	6.9	6.9	6.8	6.0	2.2	8.4	3.0	5.2	4.8	4.5
India	8.0	8.3	6.8	6.5	3.9	-5.8	9.7	7.0	8.2	7.0	6.5
Indonesia	4.9	5.0	5.1	5.2	5.0	-2.1	3.7	5.3	5.0	5.0	5.1
Japan	1.6	0.8	1.7	0.6	-0.4	-4.2	2.2	1.2	1.7	0.3	1.1
South Africa	1.3	0.7	1.2	1.6	0.3	-6.0	4.7	1.9	0.7	1.1	1.5
United Kingdom	2.4	2.2	2.4	1.7	1.6	-11.0	7.6	4.8	0.3	1.1	1.5
United States	2.7	1.7	2.2	2.9	2.3	-2.8	5.9	2.5	2.9	2.8	2.2
World	**3.4**	**3.2**	**3.8**	**3.6**	**2.8**	**-2.8**	**6.3**	**3.5**	**3.3**	**3.2**	**3.2**

E: estimated; P: projected

Note: GDP growth based on constant prices

Source: IMF (World Economic Outlook – October 2024 update), CRISIL MI&A

Drivers for India's economic growth:

- The government's future capital expenditures are expected to be supported by factors such as tax buoyancy, simplified tax structures with lower rates, tariff structure reassessment, and tax filing digitization.
- Medium-term growth is anticipated to be bolstered by increased capital spending on infrastructure and asset development projects, leading to enhanced growth multipliers.
- Strong domestic demand is expected to drive India's growth over peers in the medium term.
- Investment prospects are optimistic, given the government's capex push, progress of Production-Linked Incentive (PLI) scheme, healthier corporate balance sheets, and a well-capitalised banking sector with low non-performing assets (NPAs). India is also likely to benefit from diversification of the supply chain from incoming FDI flows, as global supply chains get reconfigured with focus shifting from efficiency towards resilience and friend shoring.

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Near Term Review and Outlook on Inflation

Continuing rise in food prices driven by vegetables and edible oils lifted the Consumer Price Inflation (CPI) based index to a 14-month high of 6.2% in October 2024 as compared to 5.5% in September 2024, a touch above the Reserve Bank of India's tolerance band of 4-6%.

Food inflation rose to 10.9% in October 2024, its highest since July 2023. On the positive side, core inflation stayed below 4% for the 11th consecutive month, while fuel inflation was negative for the 14th month in a row.

Inflation in vegetables surged to 42.2% in October 2024 due to excess rains in pockets. The surge in edible oil inflation in October to 9.5% from 2.5% in previous month, was driven by global prices that saw a steep 27% year-on-year rise because of supply disruptions in Southeast Asia. The non-food inflation inched up to 3.1% in October 2024 from 3% in previous month, as core inflation rose to a 10-month high of 3.8% driven by higher gold and silver prices.

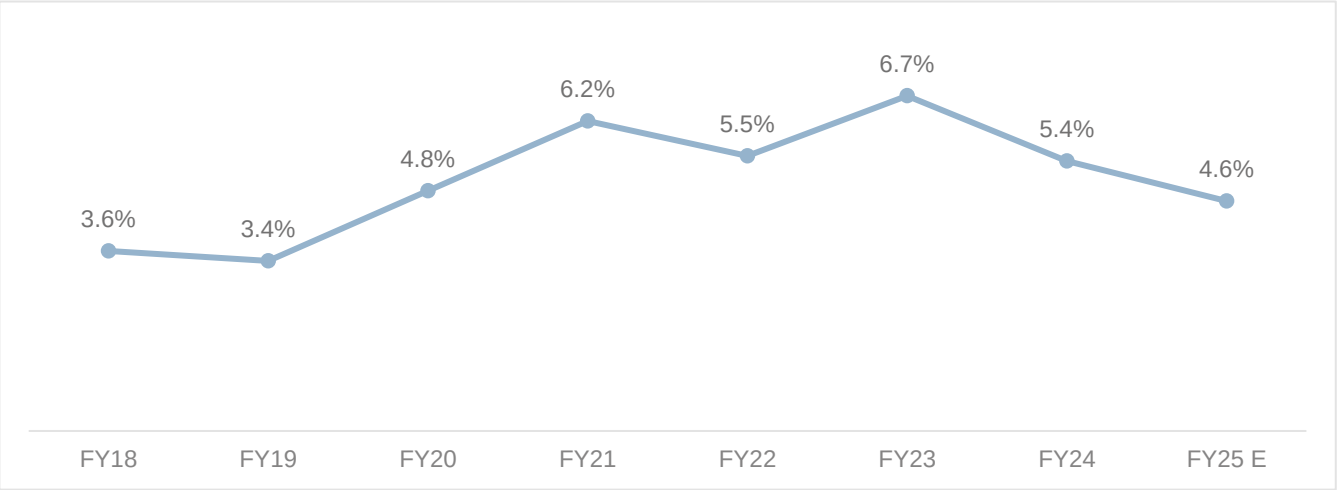
Outlook on inflation

CRISIL MI&A anticipates non-food inflation to remain manageable, supported by subdued consumer demand, the impact of previous year's oil price declines on domestic fuel prices (petrol and LPG), and expectations of stable crude prices.

CRISIL MI&A expects the Monetary Policy Committee (MPC) to hold rates steady in December, given the sharper-than-expected rise in food inflation in September and October. We expect rate cuts to begin towards the end of this Fiscal. CRISIL MI&A expects food inflation to be lower this Fiscal compared with the last, as kharif sowing has been healthy. Food prices can see some correction when fresh stocks enter the market. Data for November suggests some moderation in vegetable prices.

Overall, CRISIL MI&A expects retail inflation to ease to 4.6% this Fiscal 2025 from 5.4% previous Fiscal.

CPI trendline



Source: Ministry of Statistics and Programme Implementation (MOSPI), CRISIL MI&A Research

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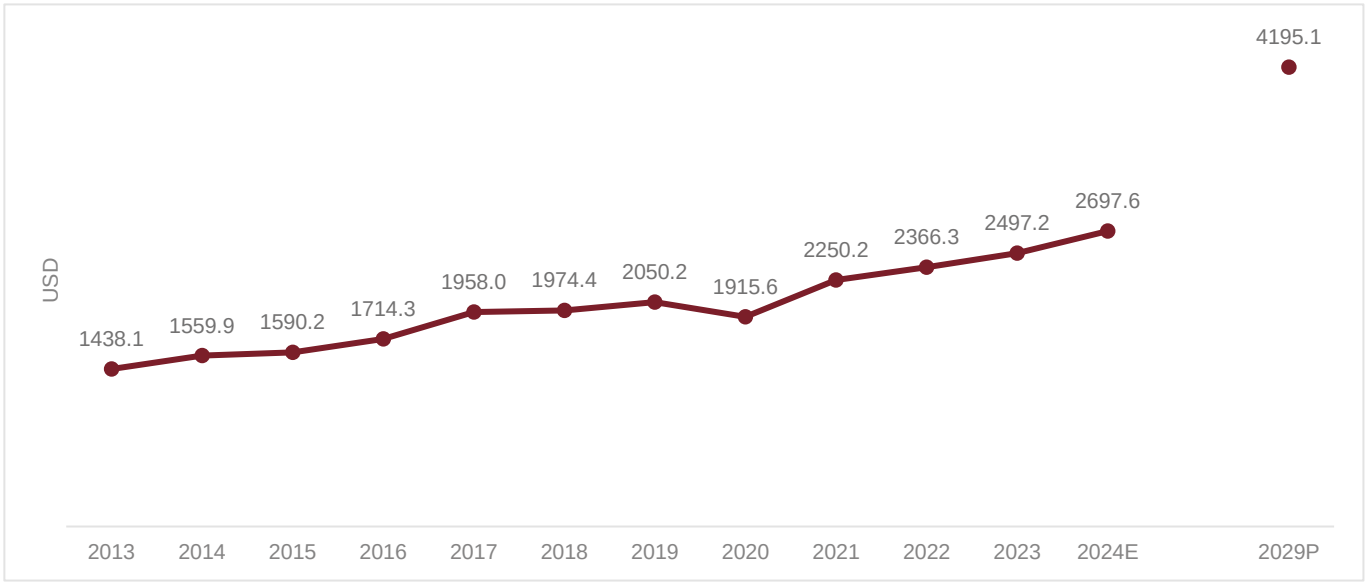
1.3 Factors with a direct bearing on Automotive Industry Demand in India

Per Capita Income

Per capita income shows the increase in income thereby indicating economic well-being and average living standard of population in a country.

According to the International Monetary Fund (IMF), India had a GDP per capita of USD 2,497.19 in 2023 compared to USD 1,438.06 in 2013. It has increased at a CAGR of 5.7% in the last 10 years. In 2020, the GDP per capita decreased by 6.6% owing to the pandemic and nationwide lockdown which impacted the manufacturing and service sector. However, in 2021 these sectors returned to normalcy and GDP per capita increased by 17.0% to reach USD 2,250.18.

GDP per capita in USD from CY2013-2029



Source: IMF October 2024 Database, CRISIL MI&A

Going ahead, IMF expects the GDP per capita to grow at a faster rate of 9.23% and reach USD 4,195.09 by 2029. Continued improvement in GDP per capita to aid automobile industry demand over the long-term horizon.

Private consumption

Private final consumption expenditure (PFCE) reflects the overall consumption patterns and spending capacity of households within an economy. When PFCE increases it often translates to increased demand for various goods and services.

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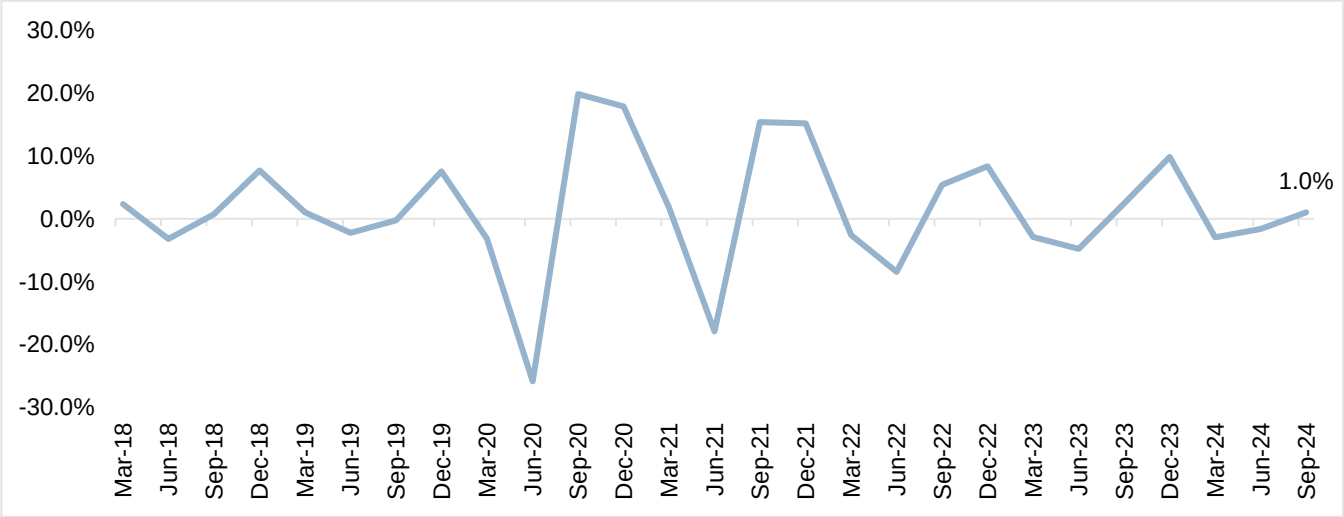
PFCE Quarterly Trend for India



Note: Mar refers Q4, June refers to Q1, Sep refers for Q2, Dec refers to Q3
Source: Industry, CRISIL MI&A

At the macroeconomic level, the rise in per capita income implies that as incomes increase, the proportion of expenditure allocated to discretionary items such as consumer durables and automobiles will increase. This will lead to a qualitative enhancement in consumption patterns, characterized by a growing demand for discretionary goods. The rise in per capita income and discretionary spending are expected to lead to a corresponding increase in demand for premium products and experiences,

Further improvement in the per capita income will aid automotive demand going ahead.

Stable agricultural output

Rural demand provides a sizeable support to the automotive segment demand growth especially for 2W, 3W and tractor segments.

Rural India is still primarily agrarian and with 86% of land holdings, small and marginal farmers dominate the Indian agricultural landscape. These farmers rely on monsoon for irrigation; hence, its timely arrival and adequacy are needed for a good crop. Any negative impact on crop supply due to low rainfall has a cascading effect on the rural economy, as it leads to reduced earnings and subsequently lower spending.

Monsoon has been favorable over the past few years with deviation in the acceptable range. In the last 5 years, the performance of the agriculture sector has been encouraging. In fact, the Agri Gross Value Added (GVA) grew at a healthy growth pace of 4.2% CAGR during Fiscal 2019-2024 period. This 4.2% growth is despite a slowdown witnessed in Fiscal 2024 (1.4% growth) due to the unfavourable monsoon.

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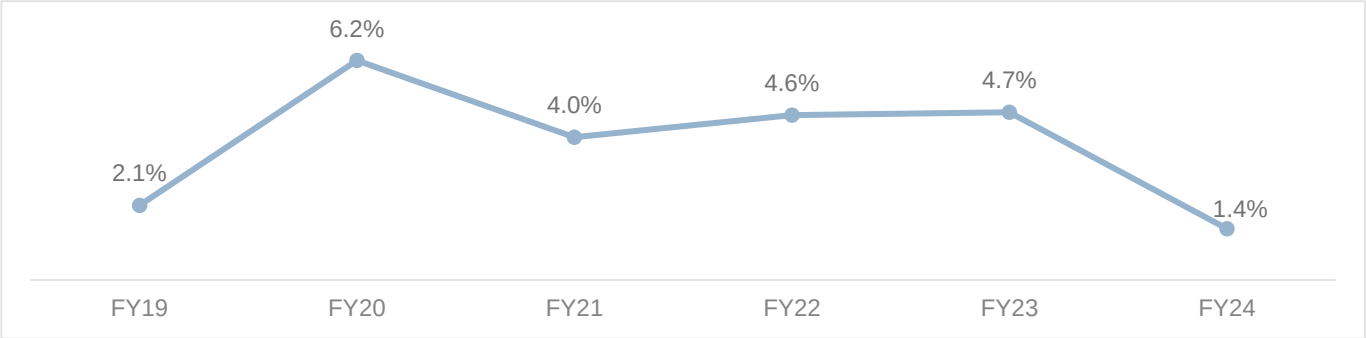
Agri GVA growth trend



Source: MOSPI

Fiscal 2024 witnessed an uneven spread of rainfall and overall monsoon levels were 6% deficient than the long-period average.

During the current year Fiscal 2025, India received favourable rains with 8% higher rainfall than its long period average (108% of the LPA) in the June to September 2024 period. From a region-wise perspective, the rainfall distribution turned more equitable with the deficit in the north-west region somewhat reversing, excess in the southern peninsula easing and the deficit in the north-east region moderating in the current year.

This year, the healthy, timely and well-distributed rainfall is expected to lift agriculture income by bolstering crop output, which was impacted in the past Fiscal and is currently showing signs of revival. The healthy rainfall in the current year, also aided the reservoir levels which are expected to support the Rabi crop in the second half of the current year aiding the rural economy.

Thus, Agri GVA is expected to grow at a healthy pace of 3.5% in Fiscal 2025.

Additionally, robust crop output is expected to help restrict food inflation, which has been high in the last 2/3 years. Combating food inflation, with non-food inflation already being low, can also provide policy room for interest rate cuts.

Steady growth in industrial and Services GVA

The industry sector holds a prominent position in the Indian economy, constituting 30% of total GVA. During Fiscal 2019-2024 period, Industry GVA clocked a healthy growth at 4.3% CAGR. Industry GVA is expected to grow at faster pace of 6% during Fiscal 2025 aided by expected improvement in manufacturing as well as construction activities.

Services GVA (approximately 55% share in total GVA) clocked a relatively faster growth at 4.8% CAGR in Fiscal 2019-2024 period. In 2024, the services GVA witnessed a healthy 7.6% growth. Even going ahead, the services sector is poised to grow at a healthy pace of approximately 8% in Fiscal 2025.

Improvement in the Industrial and Services GVA translates into higher demand for the automotive industry.

Rural Infrastructure

Rural infrastructure also has a pronounced impact on rural incomes and, in turn, the rural demand. Under the Pradhan Mantri Gram Sadak Yojana (PMGSY), launched in 2000, the government aims to build all-weather roads in rural India to improve connectivity as well as support the rural economy.

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Over the years government has successfully executed major portion of the PMGSY annual target set for the year. Even during Fiscal 2024, government achieved 89% of the target with an addition of 26 thousand km of rural roads constructed against the target of 38 thousand km.

Expansion of the rural road network not only improves connectivity but also aids the rural economy. Improvement of rural infrastructure impacts 2W demand in two ways - directly, by generating employment in the rural economy during the construction of roads, thereby increasing wages and overall income, and indirectly by enabling mobility and accessibility.

Thus, the continued expansion in rural infrastructure is expected to back two-wheeler demand growth over the long-term horizon.

PMGSY execution

Source: NHAI, MoRTH, CRISIL MI&A

Financing support

Financing plays an integral role in the automotive industry providing an additional support to the industry demand growth.

Over the years, amidst the intensifying competition, financial institutions have expanded their reach to gain further market share within the auto finance industry. Moreover, the entry of NBFCs which focus primarily on non-metros, expanded the reach of the financing system further as banks primarily catered to the urban and salaried customers.

Going forward, CRISIL MI&A expects the finance penetration to improve further and provide an added support to the growth of automotive industry.

Rising Middle Class Population

As per CRISIL estimates, India's GDP is expected to grow 6.7% between FY25 - FY31 to make it the third largest economy with a GDP inching closer to USD 7 trillion and lift per capita income to the upper middle-income category. By Fiscal 2031, India's per capita income will rise to approximately USD 4500, thereby making it an upper middle-income nation. (As defined by World Bank, lower middle-income countries are those with per capita income of USD 1,000 to USD 4,000 and upper middle-income countries are those with per capita income of above USD 4,000 to approximately USD 12,000).

As per PRICE ICE 360° survey report, India is poised for significant economic growth, if political and economic reforms yield the desired outcomes. With a projected conservative annual growth rate of 6-7%, the country could see substantial increases in average annual household disposable income, reaching around ₹ 2 million (USD

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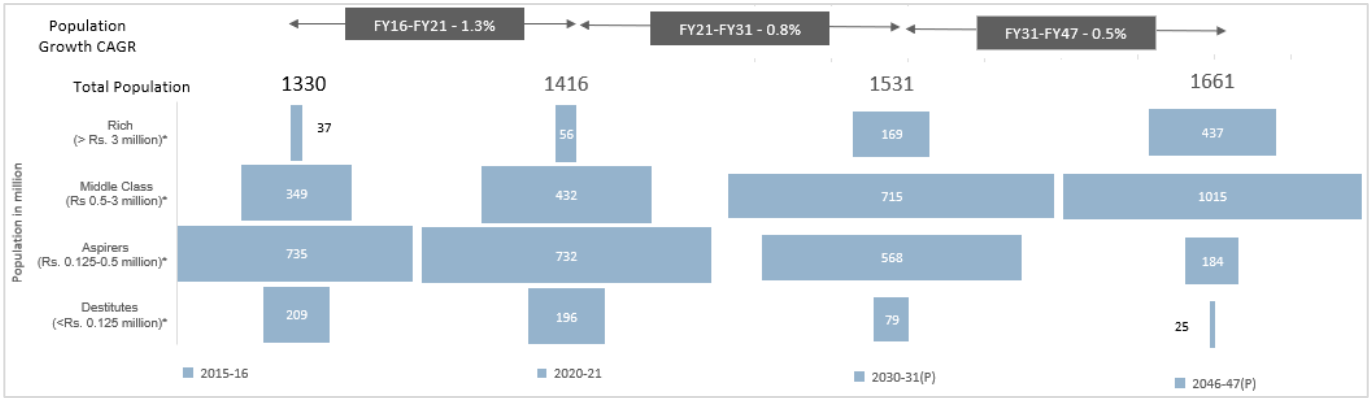
27,000) at 2020-21 prices. By the time India celebrates its centenary year of independence in 2047, the population is expected to exceed 1.66 billion. This growth trajectory will not only elevate the Indian Middle Class to the largest income group numerically but also position it as a key driver of economic, political, and social development.

Estimates from PRICE's ICE 360° Pan-India primary surveys indicate that the population of the Destitute and Aspirer groups is projected to decline from approximately 928 million in 2020-21 to 647 million by 2030-31 and further to 209 million by 2046-47. In contrast, the Rich segment is expected to increase significantly from 56 million to an estimated 169 million and 437 million. Meanwhile, the Middle Class is anticipated to expand substantially to nearly 1.02 billion by 2046-47, up from 715 million in 2030-31 and 432 million in 2020-21.

The Indian Middle-Class category, which is further divided into two categories, one with an annual household income ranging between ₹ 1.5 million and ₹ 3.0 million, has experienced an annual growth rate of 6.4% between 2015-16 and 2020-21. Another subgroup, with an annual household income between ₹ 0.5 million and ₹ 1.5 million, has seen a growth rate of 4.8% annually during the same period.

By the end of this decade, the demographic structure of the country will shift from an inverted pyramid, which represents a small wealthy class and a large low-income class, to a rudimentary diamond shape. In this new structure, a significant portion of the low-income class will transition to the Middle Class. Consequently, the income distribution will feature a small lower layer comprising the Destitute and Aspirer groups, a substantial Middle Class, and a sizable wealthy Rich layer at the top by end of decade. The growth rate of the population is notably higher for the upper income groups compared to the lower income groups. In fact, the growth rate for the lowest income groups may even be negative.

India's Income Pyramid



*Note: *: Annual household income at 2020-21 prices*
Source: ICE 360 survey PRICE, CRISIL MI&A

Percentage of households owning two-wheelers

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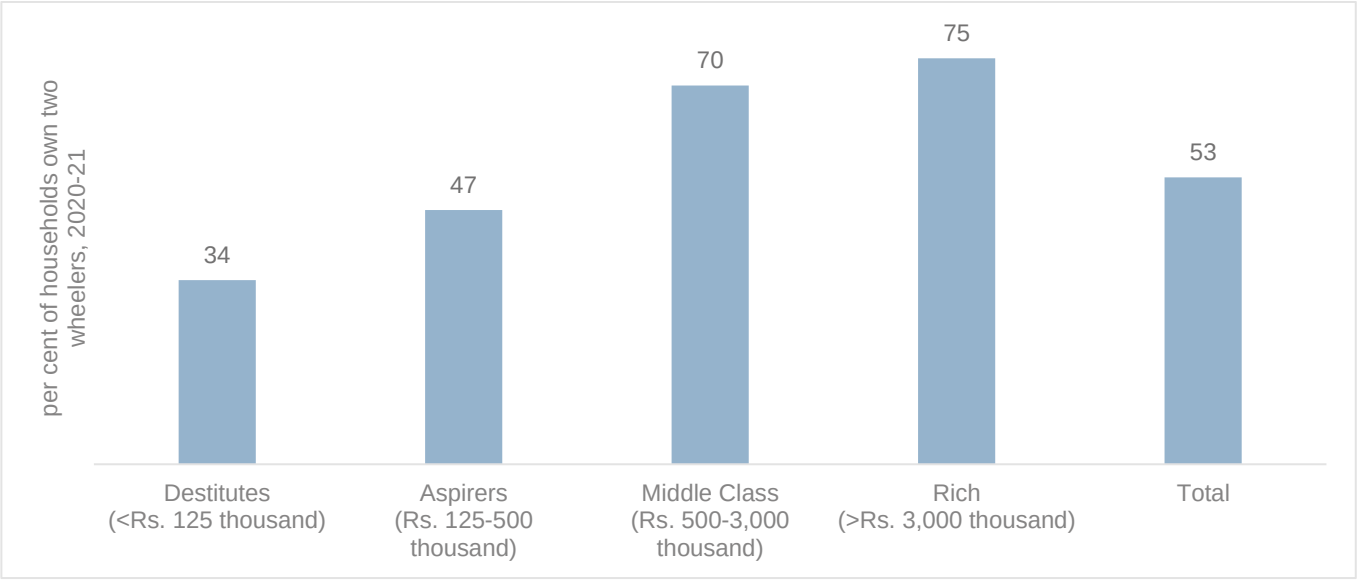

Source: ICE 360 survey PRICE, CRISIL MI&A

India's per capita disposable income is expected to grow by 8% in Fiscal 2024 to be about ₹ 0.214 million. This would peg India as a lower middle-income country as per World Bank. According to the International Monetary Fund's estimates, India's per capita income (at current prices) is expected to grow at 9.2% CAGR over CY2024 to 2029.

At the macroeconomic level, the rise in per capita income implies that as incomes increase, the proportion of expenditure allocated to discretionary items such as consumer durables and automobiles will increase. This will lead to a qualitative enhancement in consumption patterns, characterized by a growing demand for discretionary goods. The rise in per capita income and discretionary spending are expected to lead to a corresponding increase in demand for premium products and experiences. The improvement in per capita income over the years has helped 2W penetration to expand.

Rise of Urbanization

According to United Nations Population Division (World Urbanization Prospects: 2018 Revision) urban population constituted 36% of the total population in India, which had increased by 13% in the previous 10 years. The urban population accounted approx. 508 million people in CY2022, already the second largest urban community in the world. India's urban population is projected to be 675 million in 2035, which will be approximately43% of the overall Indian population. In the interim, the urban population is expected to be approximately 542 million in 2025 and 607 million in 2030 making urban areas key drivers of consumption. Today urbanization is not only confined to mega-cities but is also altering the landscape of Tier 2 and Tier 3 cities.

Managing urban growth will play a key role in India becoming a developed nation by 2047. Since nearly 70-80% of the urban infrastructure needed by 2047 is yet to be built, sizeable investments will be required in housing, commercial spaces, and public infrastructure. By 2036, India will need to invest USD 840 billion in infrastructure. This infrastructure growth will have to be supported by enhanced public services, improved access to healthcare, efficient public transportation, steady water security and public safety. The increase in urbanization will also increase the need for improving air & water quality, which will in turn give impetus to clean / green / renewable energy initiatives and clean transportation. Today urbanization is not only confined to mega-cities but is also altering the landscape of Tier 2 and Tier 3 cities.

With the rapid rise in urbanization, the demand for personal mobility is growing and demands cleaner public transport solutions. India's transportation sector is undergoing a significant change, spurred by the government's

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strong push towards clean energy and zero emission vehicles. This is drawing government attention towards electric vehicles, hybrid vehicles and other non-emission technologies. Hence, there is a growing adoption of electric vehicles in the public sector, which is backed by the establishment of a comprehensive charging infrastructure to ensure smooth transition towards electric mobility. Further government is incentivising adoption of e-buses through various schemes offered to state governments and State Transport Undertaking (STUs). In August 2023, the Central Government unveiled the PM e-Bus Sewa Scheme, dedicating $2.4 billion to facilitate the deployment and operation of 10,000 electric buses in 169 eligible cities. The initiative aims to complete these deployments by 2026.

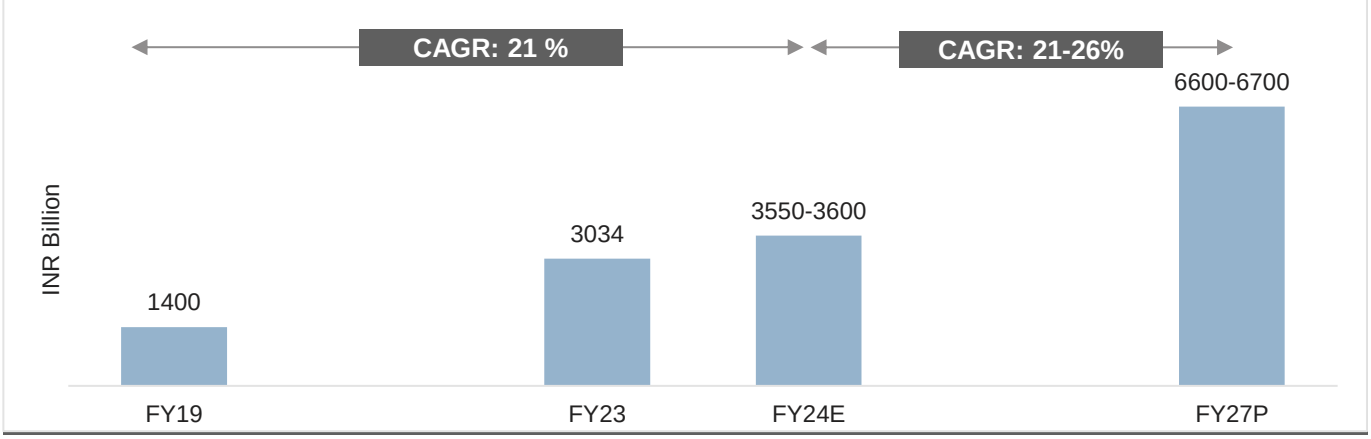
Growing Gig Economy

The gig economy is a significant contributor to the two-wheeler industry demand due to last mile delivery vehicle requirement.

According to NITI Aayog, there were nearly 6.8 million gig workers engaged in the gig economy including food, grocery, electronics, and e commerce last mile delivery work during Fiscal 2020. The gig workforce is expected to expand to 23.5 million by Fiscal 2030 backed by the expected rise in underlying industries of e-commerce and food delivery services.

The industry has managed to attract not only consumers but also investors across the world and has grown more than three-fold between Fiscals 2018 and 2023 on the back of rising internet penetration, increasing awareness of online shopping, and lucrative deals and discounts offered by well-established players and start-ups.

E-commerce Industry Outlook



Source: CRISIL MI&A

1.4 Policies impacting the Indian Automobile Industry

Union budget 2024-2025

Government announced Union Budget 2024-2025 in July 2024 with key priority areas being skill development, employment, manufacturing and services, infrastructure development and innovation. Automotive industry has largely reacted positively to the budget announcements. The emphasis of this budget to strengthen the MSME sector through credit support scheme and new assessment model for public sector banks for credit is expected to nourish automotive supplier base. Further, an outlay of ₹ 1.52 trillion for agriculture and provision of ₹ 2.66 trillion for rural development is likely to support rural demand for auto sector. Also, the government measure for employment and up-skilling through Employment Linked Incentive Program and Skilling Program is expected to

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support auto manufacturing and closing employment gaps in the sector. Incentivising job creation for manufacturing is expected to help auto OEMs, suppliers and start-ups equally.

India has definite target in terms of adoption of alternate fuel vehicles and EVs. To strengthen the domestic EV manufacturing ecosystem, foster development of EVs and give a fillip to processing and refining of critical minerals, budget fully exempted custom duties on 25 rare earth minerals like lithium and reduced BCD on two of them. The budget also outlined the establishment of a Critical Mineral Mission for production, and recycling of minerals.

Improving infrastructure for increasing efficiencies in logistics

The government's capex push has been focused largely on transport-related sectors, such as roads, railways, and urban infrastructure. The infrastructure policies would enhance the logistical efficiency there by strengthening the supply chain for automobiles and auto components.

- **National Infrastructure Pipeline:** CRISIL MI&A expects aggregate (government plus private) spending on infrastructure to double by 2030, i.e. from approximately ₹ 67 trillion between Fiscals 2017 and 2023 to approximately ₹ 143 trillion during Fiscal 2024 to 2030, primarily driven by spends on 'core' infrastructure, i.e. roads, railways, airports, ports, urban infrastructure, irrigation, warehouses, and telecom.
- **PM Gati Shakti** - National Master Plan for Multi-modal Connectivity: Gati Shakti Scheme or National Master Plan for multi-modal connectivity plan, was unveiled in October 2021, with an objective of curtailing the logistics cost for the country, by coordinating the infrastructure creation activity across different government entities. Major characteristics of the scheme are:
    - Digital platform for coordination across 16 ministries, including roadways and railways
    - 'Gati Shakti' platform will subsume the infrastructure projects announced under the National Infrastructure Pipeline (valued at ₹ 111 trillion)
    - Existing infrastructure schemes across ministries, such as Bharatmala (Roads), Sagarmala (Ports), UDAN (Air), Inland Waterways, Dry ports etc. will be incorporated in the platform

An integrated platform to monitor the progress of projects and logistics initiatives spanning across different ministries will certainly aid in increasing coordination and planning infrastructure creation and connectivity.

- **National Logistics Policy (NLP):** National Logistics Policy (NLP) was launched in September 2022 to complement PM Gati Shakti National Master Plan (NMP). NLP addresses the soft infrastructure and logistics sector development aspect, including process reforms, improvement in logistics services, digitization, human resource development and skilling.

Lowering supply chain dependency on China

India including other nations are actively pursuing strategies to reduce supply chain dependency on China in the wake of pandemic and growing geo-political tensions.

This includes diversifying the supply chain by sourcing inputs from various countries with a goal of reducing the risk of over relying on a single country for sourcing and manufacturing. Furthermore, India is also trying to strengthen the domestic manufacturing environment through various policy initiatives such as Make in India, Atmanirbhar Bharat, China plus one, PMP and PLI. Further India is attracting foreign investments by giving tax benefits, relaxing FDI norms and incentive schemes.

China plus one trend

The China Plus One Strategy is a supply chain strategy that encourages companies to minimize their supply chain dependency on China by diversifying the countries they source parts from. The goal here is to reduce the risk of over relying on a single country for sourcing and manufacturing.

Today, geopolitical, and economic factors drive much of the urgency behind businesses implementing a China Plus One approach. The approach gained traction due to the US–China trade war. Additionally, the COVID-19 pandemic exposed vulnerabilities in global supply chains, especially for those who relied on China alone.

Make in India

The 'Make in India' initiative was launched in September 2014 to give a push to manufacturing in India and encourage FDI in manufacturing and services. The objective of the initiative was to increase the share of manufacturing by boosting investment, fostering innovation, and intellectual property. The other objective was building best-in-class infrastructure for manufacturing across sectors, including, but not limited to automobile, auto components, aviation, biotechnology, chemicals, construction, defence manufacturing, electrical machinery, electronic systems, food processing, mining, oil and gas, pharmaceuticals, renewable energy, thermal power, hospitality, and wellness.

Some of the major steps taken included announcement of the National Infrastructure Pipeline (NIP) and reduction in corporate tax; various sectors such as defence manufacturing, railways, space, and single brand retail have been opened for FDI. Measures to boost domestic manufacturing were also taken through Public Procurement Orders (PPO), Phased Manufacturing Programme (PMP) and Production Linked Incentive (PLI) schemes, etc. Many states also launched their own initiatives on similar lines to boost manufacturing in their respective states.

Foreign Direct Investment (FDI)

FDI plays a pivotal role in economic growth, aiding development and shaping of the economic landscape.

According to Ministry of Commerce & Industry, FDI inflow in the last 9 Fiscal years (2014-23: USD 596 billion) has increased by 100% over the previous 9 Fiscal years (2005-14: USD 298 billion) and is nearly 65% of the total FDI reported in the last 23 years (USD 920 billion).

There are two FDI routes in India, the Government route and the Automatic route. The Automatic route allows foreign investors to invest in sectors without requiring prior approval from Indian government. Under this route, investors are only required to notify the RBI within a specified time frame. Whereas the Government route mandates prior approval from the Indian government or relevant authorities for investments in India.

Summary of FDI in Automotive sector

Sector	FDI Cap	Route
Automobile	100%	Automatic

Source: Department for Promotion of Industry and Internal Trade (DPIIT), CRISIL MI&A

Atmanirbhar Bharat Campaign

Atmanirbhar Bharat Abhiyan or the self-reliant India campaign was launched in May 2020 amid the Covid-19 pandemic, with a special and comprehensive economic package of ₹ 20 trillion, equivalent to 10% of the country's GDP.

The scheme was launched with the primary intent of fighting the pandemic and making the country self-reliant based on five pillars: economy, infrastructure, technology-driven system, demography, and demand. The stimulus package announced by the government under the scheme consisted of five tranches, intended to boost

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businesses, including Micro, Small and Medium Enterprises (MSMEs), help the poor (including farmers), boost agriculture, expand the horizons of industrial growth, and bring in governance reforms in the business, health, and education sectors.

PLI scheme to provide boost to industrial investments in the short-to-medium term

The PLI scheme's primary objective is to make manufacturing in India globally competitive by removing sectoral obstacles, creating economies of scale reduce dependency in other countries and ensuring efficiency. It will be implemented over Fiscals 2022 to 2029.

The PLI scheme is a time-bound incentive scheme by the government which rewards companies in the 5-15% range of their annual revenue based on the companies meeting pre-decided targets for incremental production and/or exports and capex over a base year.

PLI scheme for the automotive industry: The PLI scheme for the automotive industry intends to promote high-tech green manufacturing, Advanced Automotive Technology (ATT) vehicles such as electric and hydrogen fuel cell vehicles. This scheme excludes conventional petrol, diesel, and CNG segments (internal combustion engines), as they have sufficient capacities in India in the auto components category, more than 100 ATT components including hydrogen fuel cells, hydrogen injection systems, EV motors and lightweight cryogenic cylinders are eligible for PLI.

The PLI scheme targeting auto parts includes the following component schemes:

- Champion Original Equipment Manufacturers (OEM) Scheme: It is a sales value-linked plan, applicable to battery electric and hydrogen fuel cell vehicles of all segments.
- Component Champion Incentive Scheme: It is a sales value-linked plan for advanced technology components, complete- and semi-knocked down (CKD/SKD) kits, vehicle aggregates of two-wheelers, three-wheelers, passenger vehicles, commercial vehicles, and tractors, including automobiles meant for military use and any other advanced automotive technology components prescribed by the Ministry of Heavy Industries – depending upon technical developments.

The government approved the PLI Auto policy in 2021 with a budget outlay of ₹ 259.38 billion for a period of 5 years from Fiscal 2023 to Fiscal 2027. Total Incentive per entire group company is capped at ₹ 64.85 billion. The policy offers incentives for manufacturing of Advanced Automotive Technology (AAT) Products. This policy would promote localization for new technology products like EVs and enable creation of indigenous value chain. The policy consists of two components, incentivizing incremental sales of automobile and auto components named Champion OEM Incentive Scheme and Component Champion Incentive Scheme, respectively.

- Champion OEM Incentive Scheme: The Champion OEM Incentive scheme is a sales value linked scheme, applicable to Battery Electric Vehicles (BEV) and Hydrogen Fuel Cell Vehicles (FCEV) of all segments – two-wheelers, 3-wheelers, passenger vehicles, commercial vehicles, tractors, automobiles meant for military use, and any other AAT vehicle as prescribed by MHI. The incentive scheme targeted to address the cost disabilities related to Advanced Automotive Technology vehicles faced by OEMs. depending upon technical developments
- Component Champion Incentive Scheme: The Component Champion Incentive scheme is also a sales value linked scheme, applicable on pre-approved AAT components of all vehicles, CKD/SKD kits, vehicle aggregates of 2-Wheelers, 3-Wheelers, passenger vehicles, commercial vehicles, tractors and any other AAT components prescribed by MHI.

PLI scheme for the Automotive and Advanced Chemistry cells (ACC): The policy on Advanced Chemistry Cell (ACC) Battery Storage was approved by the Government of India on May 2021 with budgetary outlay of ₹ 181.0 billion for setting up manufacturing facilities with a total manufacturing capacity of 50 Giga Watt Hour (GWh). This policy will strengthen the ecosystem for electric vehicles and Battery Storage in the country. The policy aims to

enhance India's manufacturing capabilities of ACC by setting up of Giga scale ACC battery manufacturing facilities in India.

1.5 Key drivers of electrification in India

EV segment has transformed the automobile industry with operating cost advantages for the customers. Additionally, latest EVs also provide an array of features and innovations aimed at ensuring safer, more efficient, and environmentally friendly transportation, while also meeting diverse consumer needs.

Although the EV subsegment has witnessed healthy growth in the last few years, the subsegment is still at a nascent stage

Below are some of the key drivers for rising electrification in India:

Rising Air Pollution in India and Air Quality Impact of 2Ws

Air pollution has become a growing concern in India, especially in the urban centers, and the government has adopted various strategies to mitigate the same. The government is aligning themselves in accordance with the global climate related policies and standards to improve the air quality in the country. As per World Air Quality Report 2023, India ranked as the world's third most polluted country with an average annual PM2.5 concentration of 54.4 micrograms per cubic meter (µg/m³). Also, 9 out of the top 10 polluted cities in the world were from India. According to Air Quality Life Index (AQLI), air pollution shortens average Indian life expectancy by 5.9 years. Around 136 million Indians (96% of the Indian population) face PM2.5 concentrations that are seven times higher than the World Health Organization's recommended levels of 5 (µg/m³).

Pollution level in India at major cities in (µg/m³):

City	2023	2022	Change (%)
Delhi	102.1	92.6	10.3
Kolkata	47.8	50.2	(4.8)
Mumbai	43.8	46.7	(6.2)
Hyderabad	39.9	42.4	(5.9)
Bengaluru	28.6	31.5	(9.2)
Chennai	28.0	25.3	10.7

Source: World Air Quality Report 2023, CRISIL MI&A

According to International Energy Agency (IEA), road transport presently accounts for 12% of India's energy-related CO_2 emission and is currently responsible for 20-30% of urban air pollution. Also, among the 50 most polluted cities in the world, 35 are in India. In urban areas, road transport emissions are one of the prime contributors of air pollution. Road transport is the largest source of PM2.5 in major urban areas like Bengaluru, Surat, Chennai, and Indore. In the Indian context, some of the essential factors of high traffic emissions include lack of exhaust measures, highly heterogeneous nature of vehicles, and poor quality of fuel. Hence, reducing transport-related emissions is critical and would have direct public health benefits, given that a large share of emissions occurs in urban areas.

To address this issue, the government has implemented stringent emission regulations for vehicles including two-wheelers, aimed at reducing harmful pollutants and promoting sustainable mobility by moving towards

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electrification. In India, two-wheelers are a common mode of transportation and contribute significantly to air pollution. Also, two-wheelers continue to dominate India's vehicle fleet.

In 2016, Delhi government introduced odd-even rule which mandated that only cars with odd numbered license plates could ply on odd dates and even numbered in even dates. For example, vehicles with numbers ending in odd digits (1,3,5,7,9) are allowed to drive on odd dates, while those ending in even digits (0,2,4,6,8) can drive on even dates. This rule primarily applies during peak air pollution periods when Delhi experiences an increase in smog and deteriorating air quality. The rule aims to reduce vehicular emissions by limiting the number of vehicles on the road. The program also resulted in lowering of traffic congestion and improved the traffic flow.

India regulates vehicle tailpipe emissions by means of the Bharat Stage (BS) emission standards. In April 2020, India implemented BS-VI standards, which largely parallel Euro-6/VI norms, leapfrogging from BS-IV to BS-VI in only three years. The BS standards are based on European emission norms and are implemented to control and reduce the emission of pollutants from vehicles. The BS emission standards set the permissible limits for various pollutants, including hydrocarbons (HC), carbon monoxide (CO), nitrogen oxides (NOx), and particulate matter (PM), emitted by ICE vehicles. The permissible limits of HC, CO, NO_X and PM emissions as per the BS-VI policy is mentioned in the below table. The BS VI norms for two-wheelers comprises the requirement to have onboard diagnostics (OBD), that monitors a vehicle's operation and receives data from various sensors to ensure proper functioning. In April 2023, phase 2 of the BS6 emission standards, was introduced with several fundamental changes. The second phase of BS6 introduced the Real Driving Emission (RDE) test, which evaluates the actual emissions during real-world on-road driving, in addition to laboratory testing brought in Phase 1.

BS IV and BS VI Emission Standards for Two- Wheelers, g/km:

Stage	Engine category	CO	HC	NO_X	PM
BS IV	Class 1 & Subclass 2-1	1.403	-	0.39	-
	Subclass 2-1	1.970	-	0.34	-
	Subclass 3-1 & 3-2	1.970	-	0.20	-
BS VI	SI Engine	1.0	0.1	0.06	0.0045
	CI Engine	0.5	0.1	0.09	0.0045

Note: SI: Spark Engine; CI: Compression Engine
Source: CRISIL MI&A

Also, OBD 2 system was introduced to monitor oxygen sensors, catalytic converters, and engine misfires closely. In addition to emission standards, several policies, including vehicle electrification, green hydrogen etc. have strong benefits for air quality and public health.

Electric vehicles have gained significant traction in the 2W industry and emerged as a promising solution for reducing emission. With their ability to eliminate tailpipe emissions completely, the benefits of electric vehicles on the environment hold a huge potential for a healthier environment. Traditional internal combustion engines (ICE) 2Ws running on petrol produce exhaust emissions, including various pollutants, notably nitrogen oxides (NOx), and hydrocarbons. In contrast, electric vehicles do not rely on combustion engines and thus do not produce any tailpipe emissions. They operate on electric power stored in their batteries, leading to the elimination of direct exhaust emissions. Thus, due to the growing electrification in the 2W industry the share of emissions by two-wheelers in passenger transport is expected to decline gradually over the coming years.

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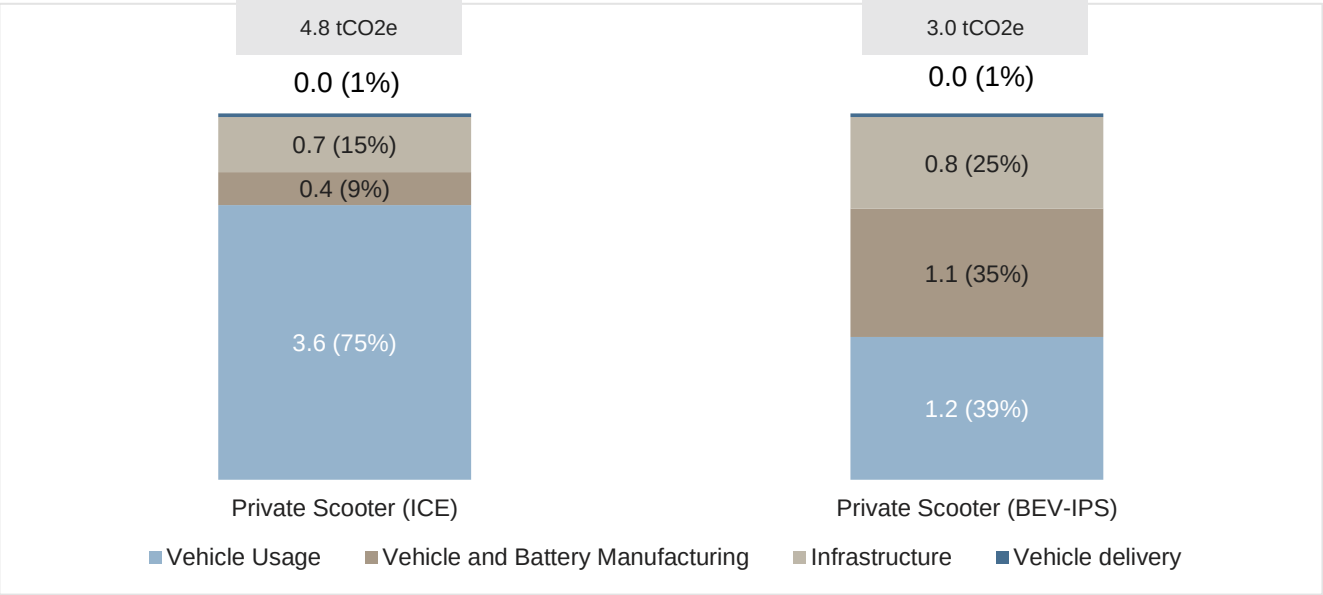
Lifecycle Emission Comparison of Electric vs ICE 2W

Life cycle emission, referred as well-to-wheel emission, is the total amount of greenhouse gases emitted throughout a product's life, starting from its production, operation, and disposal. It considers present and projected future greenhouse gas (GHG) emissions attributable to every stage in the life cycles of both vehicles and fuels, from extracting and processing raw materials through refining and manufacturing to operation and eventual recycling/disposal.

In terms of life-cycle greenhouse gas (GHG) emissions across different modes and vehicle technologies, vehicle operations contribute the largest share. This encompasses emissions from vehicle usage (tank-to-wheel emissions), and fuel production (well-to-tank emissions) for 2Ws. Private ICE 2W emit the most during the usage phase, whereas vehicle and battery manufacturing causes the most significant chunk of emissions for BEVs. 75% of ICE vehicle emissions are due to usage, 9% are due to manufacturing, and 15% are due to road/rail infrastructure creation. For BEVs, the vehicle and battery manufacturing shares are significantly higher at 35% for private 2W.

Share of GHG emissions by life-cycle phase



Source: International Transport Forum, CRISIL MI&A

The life cycle assessment by International Transport Forum (ITF) in the below section incorporates various decarbonization scenarios for India's energy supply/power grid. The grid energy mix for 2022 is considered as the base case. The Intended Policy Scenario (IPS) of grid decarbonization reflects India's commitment to the 2015 Paris Agreement adopted at COP21. The Net Zero scenario is an accelerated energy transition to meet Net Zero targets, as proposed by the government of India (COP26, 2021).

According to The World Bank and ITF, the transition of private scooters to battery electric vehicles (BEVs) can yield a decrease in their life-cycle greenhouse gas (GHG) emissions by roughly 1.8 to 1.9 tCO2e (tonnes of carbon dioxide equivalent) across all scenarios. An electric scooter for private use has about 38% lower GHG emissions than a petrol scooter (approximately 1.8 tCO2e). Similarly, transitioning private motorcycles to BEVs can lead to reductions of approximately 1.1 to 1.3 tCO2e, representing about 26% less GHG emissions compared to petrol

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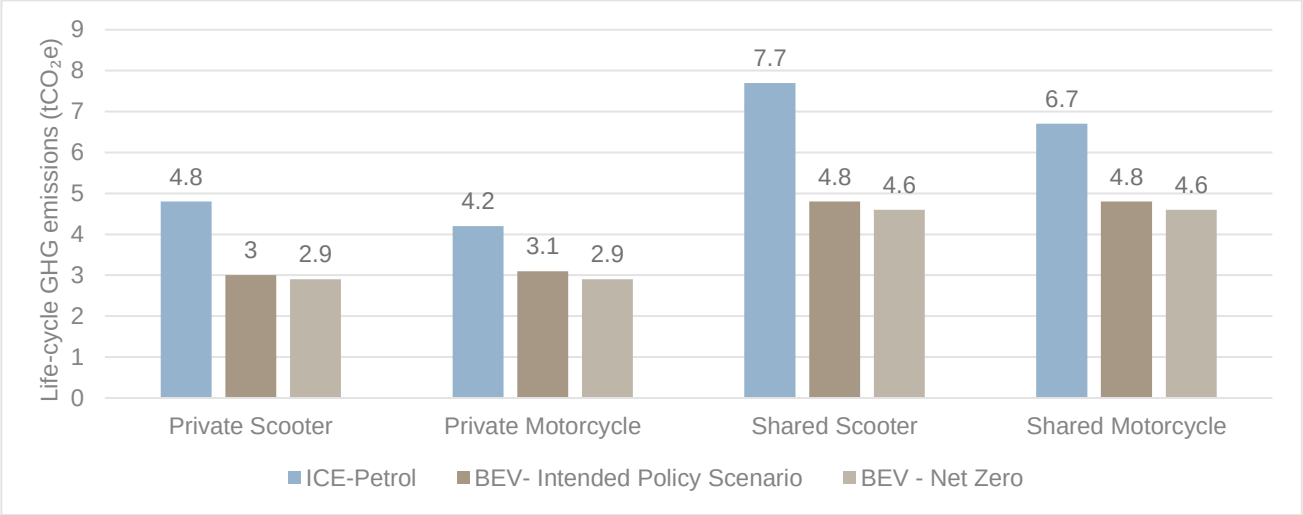
motorcycles. This decline in emissions is attributed to the enhanced efficiency of BEV scooters, supported by their smaller batteries and fewer manufacturing-related emissions.

Shared scooters and motorcycles have the potential to reduce life-cycle greenhouse gas (GHG) emissions by approximately 1.9 to 3.1 tCO2e, depending on various use-case and energy scenarios. However, in the Net Zero scenario, the long-term as well as the additional benefits in charging and other related efficiencies due to grid improvement/enhancement for two-wheelers (2Ws) are limited due to their range bound operations and minimal holding period.

Lifecycle GHG emissions for two-wheelers



Note: Energy supply was analyzed for two scenarios:

1. *Intended Policy Scenario (IPS): Transition of the electricity grid to clean energy based on previously announced policies (COP21, 2015)*
2. *Net Zero Scenario: An accelerated energy transition to meet Net Zero targets, as proposed by the government of India (COP26, 2021)*

Source: International Transport Forum, CRISIL MI&A

The transition to electric two-wheelers holds significant scope for reducing greenhouse gas (GHG) emissions and enhancing air quality, particularly in densely populated urban areas.

India’s Climate Commitments

With the world's largest population and an economy projected to reach USD 7 trillion by 2030, India has a significant growth potential. This growth will inevitably drive an increase in the country's resource demand and environmental impact. According to the International Energy Agency (IEA), India's energy consumption is expected to rise by 30% by 2030 and 90% by 2050, with carbon emissions from energy use increasing by 32% and 72% during the same periods. In response, India has announced and is actively pursuing ambitious climate targets, positioning itself as a key emerging market advocating for environmental protection.

The Paris Agreement or Conference of Parties 21 (COP 21) was adopted by India in 2015. It replaced the Kyoto Protocol which was an earlier agreement to deal with climate change. It is a global treaty wherein more than 200 countries agreed to cooperate to reduce greenhouse gas emissions and lead climate conservation. The Agreement aims to limit greenhouse gas emissions so that the rise in global warming by the end of this century does not

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exceed 1.5ºC above pre-industrial levels. Under the COP 21 National Determined Contribution (NDC) targets, India adopted three targets:

- To reduce emissions intensity of its GDP by 30-35% by 2030, from 2005 levels
- To achieve about 40% cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030
- To create an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030

At the COP 26 summit in Glasgow in November 2021, India made commitments to cut total projected carbon emission by 1 billion tonnes by 2030 and achieve net-zero carbon emissions by 2070. The 2022 NDC update is also a step towards achieving India's long-term goal of reaching net-zero emission by 2070; for which India has prepared and submitted a separate framework document titled 'India's Long-term Low Carbon Development Strategy' to the UNFCCC in November 2022. Further at COP 26, India pledged acceleration towards zero emission vehicles (ZEVs) and highlighted the need of electrification in 2W and 3W industry.

The EV30@30 campaign was launched at the 8th CEM (Clean Energy Ministerial) in June 2017 with the goal of accelerating the deployment of EVs with a target of at least 30% EV sales by 2030. Under CEM, the Electric Vehicles Initiative (EVI) was introduced, which is a multi-government policy forum dedicated to accelerating the adoption of EVs across the world including India.

The 28th Conference of Parties (COP 28) was held in Dubai in December 2023, where the representatives from 197 countries showcased their efforts to limit global warming and held discussions to prepare for future climate change. According to Ministry of Environment, Forest and Climate Change, India launched the Green Credit Initiative at COP28 on 1st December, to create a participatory global platform for exchange of innovative environmental programs and instruments. Recently the Conference of Parties (COP 29) was held in Baku, Azerbaijan in November 2024.

All these global commitments are navigating India towards a sustainable and emission free future. To aid this transition, adoption of emission free and green technologies needs to be promoted in the transport sector.

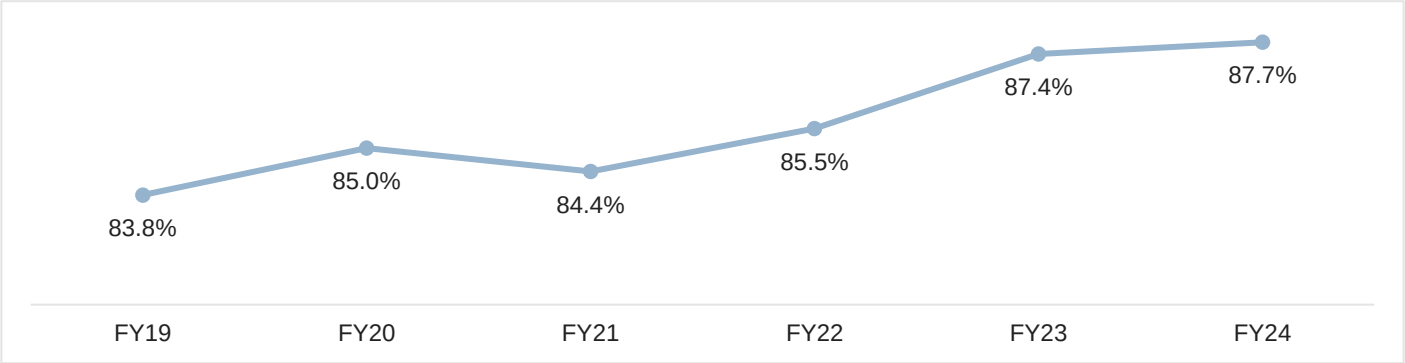
India's Dependence on Fuel Imports

According to Energy Statistics India 2024, crude oil contributes to more than 30% of India's total primary energy supply and is the second largest after coal, which contributed more than 58% of the primary energy supply in Fiscal 2023. According to Petroleum Planning and Analysis Cell (PPAC), India's total consumption of crude oil or petroleum products rose 4.6% in Fiscal 2024 to 233.3 million metric tonne (MMT). The growth in crude oil consumption during the Fiscal 2024 was driven by 6.3% growth in motor spirit (MS) or petrol, and 4.4% in high-speed diesel (HSD). Also, India imported 232.5 million tonnes of crude oil in Fiscal 2024, a marginal decline compared to previous financial year. Domestic production of crude oil rose marginally at 0.6% to 29.4 MMT in Fiscal 2024, compared to 29.2 MMT in the year-ago period. This shows that the country is primarily dependent on imports to meet more than 85% of its crude oil requirements. Import dependence of crude oil increased to 87.7% in Fiscal 2024, up from 87.4% in the previous Fiscal.

Crude oil has been the main source of energy in the transport sector over the past few decades. Due to high import dependence, India's energy security is severely impacted by price and supply shocks of crude oil in the international market. Crude oil imports also make a significant impact on the India's foreign exchange reserves.

Further, volatile crude oil prices are a threat to economy as it impacts the price stability of fuels in India driving inflationary pressure. Therefore, crude oil becomes an important parameter to determine reserve position and trade balance.

Import dependency of crude oil (FY19-FY24)



Source: PPAC, CRISIL MI&A

India could potentially lower its dependence on imports based on its ability to substitute/replace crude oil with other energy sources that can result in a positive effect in the Indian economy. The government has been trying to reduce its oil import dependence through a series of policy interventions. According to the Ministry of Petroleum & Natural Gas, the government has adopted a five-pronged strategy comprising increasing domestic production of oil and gas, promoting energy efficiency and conservation measures, giving thrust on demand substitution, promoting biofuels and other alternate fuels/ renewables, EV charging facilities and refinery process improvements for reducing the county's oil dependence on imported crude oil. This idea of reducing import dependence is paving way policies for ethanol blending and rise of alternate energies such as CNG, battery electric, hybrid and hydrogen in India's transport sector, as a potential replacement for fossil fuel vehicles.

Rise in Fuel Prices in India

The pricing of petroleum products was brought under Administered Price Mechanism (APM) with effect from July 1975. As a result, the pricing of petroleum products was shifted from import parity principles to cost plus principles. Under the APM (1975 to 2002) various oil pool accounts were maintained by the Oil Coordination Committee with the aim to

- Ensure stability in selling price
- Insulate consumers against international price fluctuations
- Subsidization of consumer price of certain petroleum products like kerosene for public distribution

Both the central and state governments of India levy taxes on petrol and diesel. The central authorities apply excise duty on petrol and diesel. This rate remains the same throughout the country. On top of this, the state governments levy VAT, sales tax, and other additional charges. The rates of these taxes tend to vary by state, leading to a difference in petrol and diesel prices across India.

The three major factors that decide crude oil prices are as follows:

- International crude oil prices are linked to geopolitics
- Fluctuation in the exchange rate
- Tax structure of the respective states and the Centre.

A surge in global crude oil prices owing to the war between Russia and Ukraine led to corresponding hikes in the price of diesel and petrol in India too. Fuel prices have risen significantly after Fiscal 2022. Further in March 2024, the Petroleum Ministry reduced petrol and diesel prices by ₹ 2 per litre across the country ahead of the general elections. The petrol prices are at ₹ 95 per litre in the current year Fiscal 2025.

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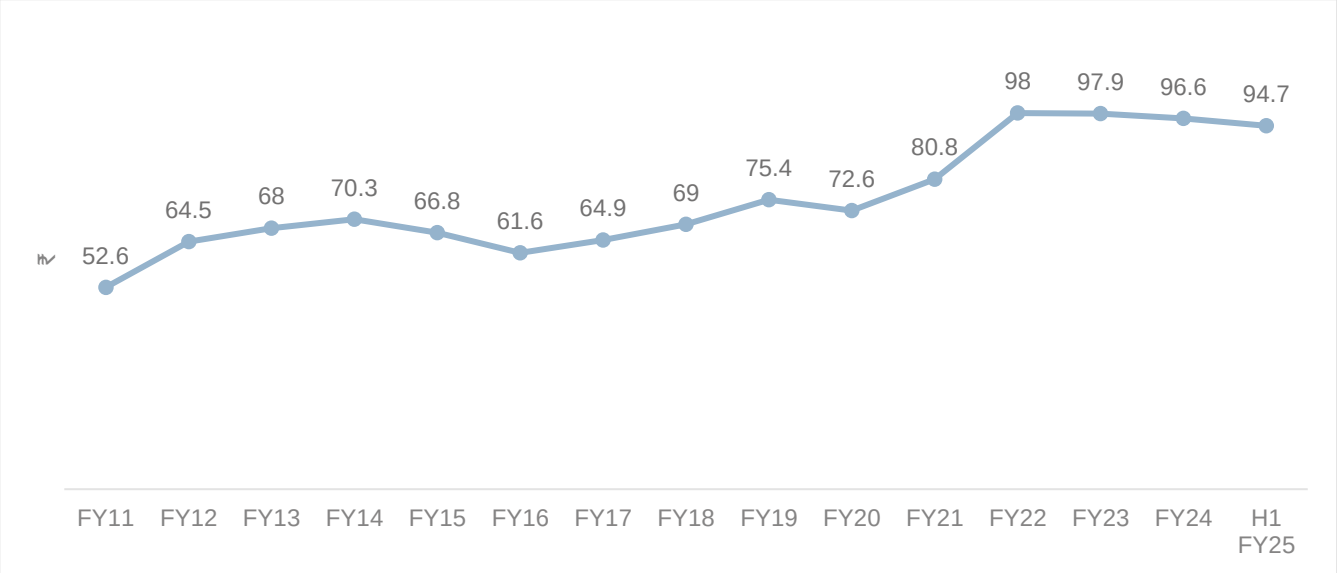
The two-wheeler industry is sensitive to fuel price fluctuations and consumers are cautious about total cost of ownership (“TCO”). The increase in fuel prices could result in higher fuel related expenses thereby elevating the TCO. Also, an increase or decrease in fuel prices is likely to affect consumer sentiments and may lead to slow down or pickup in purchase decisions.

Petrol Price at Delhi from FY2011 to H1 FY2025



Source: CRISIL MI&A

Battery Pack price glide path and drivers

The prices of lithium-ion cells and battery packs have been declining steadily in recent years. This is due to several factors, including increased demand, technological advancements, and economies of scale. The battery pack price fell by almost 14% between 2023 and 2022. As the price of all key battery metals dropped during 2023 with cobalt, graphite and manganese prices falling to lower than their 2015-2020 average by the end of 2023.

Compared to 2022, The US National Renewable Energy Laboratory (“NREL”) expects the costs of the batteries to fall by 47%, 32% and 16% by 2030 in its low, mid, and high-cost projections, respectively. By 2050, the costs could fall by 67%, 51% and 21% in the three projections, respectively.

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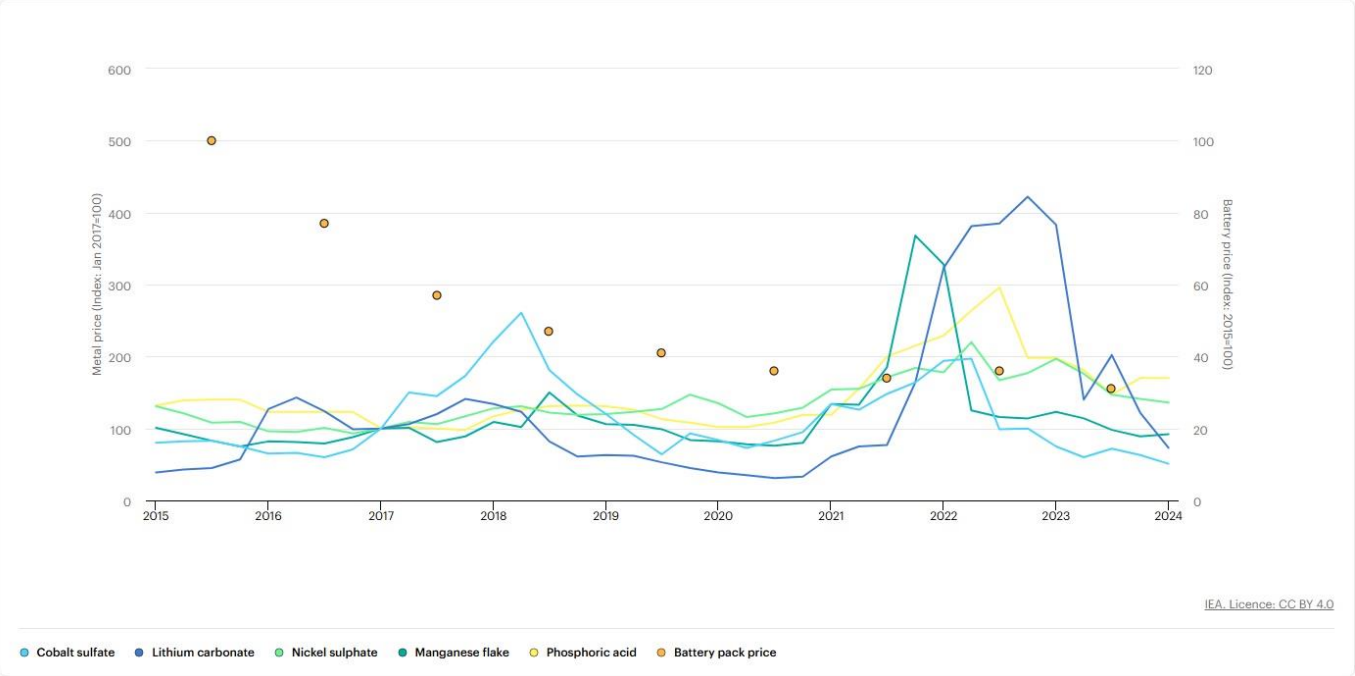
Price of selected battery raw materials and lithium-ion batteries, 2015-2024



Notes: "Battery pack price" refers to the volume-weighted average pack price of lithium-ion batteries over all sectors.
Source: IEA analysis based on data from Bloomberg and Bloomberg New Energy Finance Lithium-Ion Price Survey (2023). IEA. CC BY 4.0

According to Bloomberg New Energy Finance (BNEF), the price of lithium-ion battery packs has dropped 14% to a record low of USD139/kWh in 2023 after an unprecedented price increase in 2022. This was due to the fall in prices of raw materials and components as production capacity improved across the battery value chain.

Battery prices vary across different regions, with China having the lowest prices on average, and the rest of the Asia Pacific region having the highest. This price difference is because more than 60% of battery cells and almost 80% of cathodes are manufactured in China. Battery packs in the US and Europe were 11% and 20% higher, respectively. Higher prices are due to the higher production cost, undeveloped market, lower volumes, and the diverse range of applications. Over the last few years, the cell-to-pack cost ratio has risen from the traditional 70:30 split, and the cell cost now contributes to more than 75% of the pack cost. This is due to improved changes in pack design, along with introduction of cell-to-pack approaches, which have helped reduce costs.

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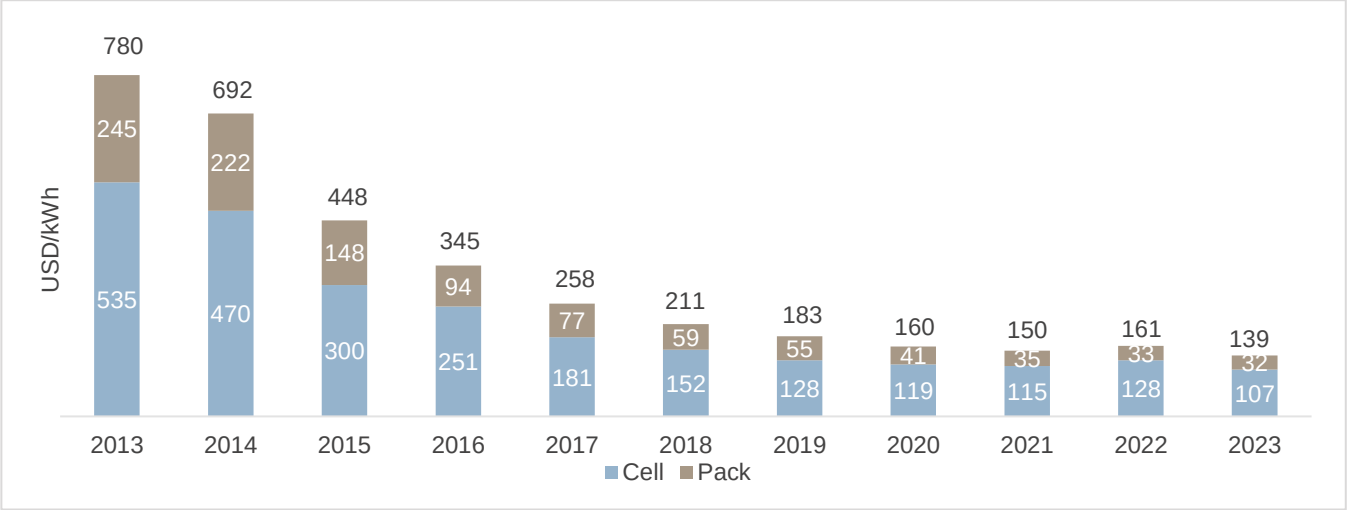
Volume weighted average lithium-ion battery pack and cell price (2013-2023)



Notes: Historical prices have been updated to reflect real 2023 dollars. Weighted average value includes 303 data points from passenger cars, buses, commercial vehicles, and stationary storage.
Source: Bloomberg NEF

Bloomberg New Energy Finance (BNEF) expects average battery pack prices to drop again in 2024, reaching USD133/kWh due to decreasing raw material costs for metals like lithium, nickel, and cobalt. In the medium to long term, advancing technological innovations along with manufacturing improvement should further drive decline in battery pack prices, to USD113/kWh in 2025 and USD80/kWh in 2030. Manufacturing process improvements, continued R&D investment, and capacity expansion across the battery value chain would help improve battery technology and reduce costs over the next decade. With lowering costs of battery, vehicle prices are expected to decrease thereby reducing the acquisition cost and operational costs of an EV. This would create a positive sentiment among EV buyers and drive EV adoption further.

Government Policies

Government policies like FAME (I & II), EMPS, PM E-DRIVE etc. have helped drive EV growth in India, especially in the E-2W segment. Supply side policies like PLI and PMP along with overall government agenda of Atmanirbhar Bharat are also promoting localisation and manufacturing in India, which could bring down electric vehicle manufacturing costs in the future and subsequently their prices, thereby enabling more people to purchase them. Such Government policies will also enable OEMs and other players to make further investments to develop newer technologies and capabilities in the e-mobility space.

FAME policy (I & II)

As part of the National Electric Mobility Mission Plan (NEMMP) 2020, the Department of Heavy Industry (DHI) formulated the FAME I policy in 2015 with a budget outlay of ₹ 8.95 billion. The FAME I policy was aimed at promoting EV ecosystem through technology development, demand creation, pilot project, and charging infrastructure thereby ensuring its sustainable growth. In the FAME 1, about 278 thousand EVs were supported via demand incentives. In addition, 465 buses were sanctioned to various cities/states under this scheme. Phase-II of the FAME policy was implemented with an outlay of ₹ 100 billion in 2019 for a period of 5 years, with the aim to support demand for EVs by supporting 7,000 e-Buses, 500 thousand E-3W, 55,000 E-4W (Commercial purposes) and 1 million E-2W (including commercial & private). The Ministry of Heavy Industries (MHI) had sanctioned 520 Charging Stations/Infrastructure under the FAME I policy. Further, this Ministry has also sanctioned 2,877 Electric Vehicle Charging Stations in 68 cities across 25 States/UTs and 1576 charging stations across 9 Expressways and 16 Highways under FAME II.

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Segment	Maximum vehicles supported	Approx size of battery (kWh)	Incentive offered (₹/kWh)	Maximum Ex-factory price to avail incentive (₹)
2W	1,000,000	2	10,000	150 thousand
3W	500,000	5	10,000	500 thousand
4W	35,000	15	10,000	1.5 million
Bus	7,090	250	20,000	20 million

In June 2021, demand incentive for 2Ws was increased to ₹ 15,000/ kWh capped at 40% of the vehicle cost. In June 2023, this was again revised and reduced to ₹ 10,000 per kWh of battery from ₹15,000 per kWh earlier and the maximum subsidy cap was reduced from 40% to 15%.

With the expiry of FAME II in Fiscal 2024, the government introduced Electric Mobility Promotion Scheme 2024 (EMPS) to support the adoption of EV 2Ws and 3Ws.

Electric Mobility Promotion Scheme 2024

MHI introduced Electric Mobility Promotion Scheme 2024 (EMPS 2024) in March 2024 with a budget outlay of ₹ 5 billion for a period of 4 months, starting from 1st April 2024 to 31st July 2024, for faster adoption of electric two-wheeler (E-2W) and three-wheeler (E-3W). The scheme was further extended for two months, till September 2024.The scheme was aimed at providing incentives for the purchase of E-2Ws and E-3Ws in the country. Under the FAME-II scheme, PMP was implemented, and manufacturers were obligated to follow the PMP guidelines outlining the localization of EV components over time. These PMP guidelines for EVs will have to be followed by OEMs to be eligible for support under Electric Mobility Promotion Scheme 2024.

E-2Ws got a subsidy of ₹ 5,000 per kWh with a maximum limit of ₹ 10,000 per vehicle under the new scheme. E-rickshaws and carts got a subsidy of ₹ 5,000 per kWh with a limit of ₹ 25,000 per vehicle. The E-3Ws in the L5 category also got a subsidy of ₹ 5,000 per kWh with maximum incentive capped at ₹ 50,000 per vehicle. Subsidies plays vital role in driving sales for EVs in the country. With FAME II having expired in March 2024, the introduction of EMPS provided an impetus to the EV market in the short term.

The EMPS subsidy ended on 30th September 2024 and has been replaced by PM E-DRIVE scheme.

PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) Scheme:

The PM E-DRIVE scheme with an outlay of ₹ 109 billion, will be implemented from October 1, 2024, to March 31, 2026, for faster adoption of electric vehicles (EVs), setting up of charging infrastructure and development of EV manufacturing eco-system in the country.

Incentives under PM E-DRIVE Scheme for E-2W and E-3W segments:

Vehicle Segment	No. of vehicles to be supported		Incentives for vehicles		Maximum ex-factory price
	FY25	FY26	FY25	FY26	
E-2W	1,064,000	1,415,120	₹ 5,000/- kWh capped at ₹ 10,000 max	₹ 2,500/- kWh capped at ₹ 5,000 max	₹ 150 thousand
E-3W (L3)	43,371	67,225	₹ 5,000/- kWh capped at ₹ 25,000 max	₹ 2,500/- kWh capped at ₹ 12,500 max	₹ 250 thousand

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E-3W (L5)	80,546	124,846	₹ 5,000/- kWh capped at ₹ 50,000 max	₹ 2,500/- kWh capped at ₹ 25,000 max	₹ 500 thousand

Source: Ministry of Heavy Industries (MHI)

The scheme aims to establish a robust network of public charging stations, including 22,100 fast chargers for e-4Ws, 1,800 for e-buses, and 48,400 for E-2Ws and E-3Ws, boosting user confidence. These charging points to be installed in key cities with high electric vehicle penetration and along select highways. The total outlay for charging infrastructure under the scheme is ₹ 20 billion.

The subsidy for E-3W has now been reduced to ₹ 2,500 per Kwh capped at ₹ 25,000 from November 2024 as the sales reached the upper limit of 80,546 for the year FY25.

Increasing Charging Infrastructure

To support the rising electric vehicle population, EV ecosystem in India is evolving and there is a growing focus on expanding the supporting charging infrastructure network across the country. Public charging stations are being installed in cities, highways, and commercial areas, making it more convenient for EV owners to charge their vehicles. There is an increasing adoption of fast charging technologies, such as DC fast charging, to reduce charging times and provide greater convenience to EV users.

Setting up charging stations demands a considerable quantum of investment, which includes capital expenditure, grid connection fees, and operations and maintenance expenditures. Another issue for charging infrastructure development is assuring charger compatibility. As a result, in the charging infra segment, capital availability as well as technical skill is required.

To address this issue, the leading EV charger manufacturers in India are currently engaged in manufacturing a diverse product portfolio of AC and DC chargers.

Additionally, to aid the charging infrastructure, the government has allotted ₹ 20 billion as the total outlay in the recently launched PM E-DRIVE scheme, to establish a robust network of public charging stations, including 22,100 fast chargers for e-4Ws, 1,800 for e-buses, and 48,400 for E-2Ws and E-3Ws.

Overall charging infrastructure has expanded at a healthy pace from 14 thousand units in Fiscal 2022 to around 23 thousand units by Fiscal 2024.

CRISIL MI&A estimates the overall public charging infrastructure in India to rise from nearly 23 thousand in Fiscal 2024 to 120-140 thousand by Fiscal 2029. Increased charging infrastructure is expected to provide further impetus to the electrification within the three-wheeler segment.

Financing Support

There was an initial inhibition from financers regarding financing of electric vehicles amidst the uncertainty about the vehicle resale and its end-of-life valuation. However, for leveraging the sharp growth in the E-2W segment, banks as well as NBFCs have been expanding their product offerings in the e2W space.

Over and above the traditional financers, digital commerce platforms and fintech companies like OTO, MufinGreen, LoanTap have entered the E-2W segment, offering competitive financing terms for EV buyers. These new age financing companies offer novel customized financing options for EV buyers offering improved transparency, accessibility, and simplify the entire financing processes for E-2Ws. Besides the fully digital financing solutions, instant approval-disbursal and flexible EMIs, these financers also offer flexibility in financing components like battery replacements, system upgrades, exchange option, allowing consumers who wish to exchange their existing ICE two-wheeler for a new E-2W.

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Additionally, financers also offer leasing and subscription schemes for e-commerce players opting for E-2Ws for their logistics operations.

Thus, the expanding financer scope and intensifying competition within the E-2W financing space will help scale up the vehicle electrification in the two-wheeler industry.

Barriers to adoption of electric vehicles and challenges in the Indian EV ecosystem

The government is actively pushing for EVs, and in order to drive adoption, various measures are being taken like building public EV charging infrastructure, incentives for players investing in R&D to develop EV components, and alternate chemistry cells. However, by far the biggest challenge faced by the EV industry is the dependencies in the EV manufacturing supply chain. The industry continues to rely on imports of critical parts including motors and batteries. The current domestic supply chain still needs to advance before it becomes 100% indigenous. Some of the key challenges to the large-scale adoption of EVs are:

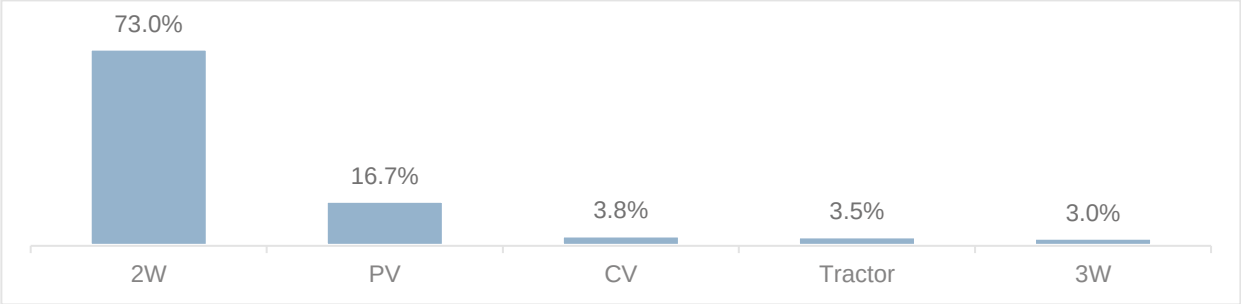
- **Limited charging infrastructure:** One of the major hurdles in adoption of EVs in India is the unavailability and slow development of public charging infrastructure. While E-2Ws are sold with dedicated personal chargers, currently India has limited public charging infrastructure which poses a threat to mass scale adoption of EVs in the country. This is primarily because of range anxiety and anxiety of being unable to find a functional charger in case of sudden need.
- **Uncertainty about vehicle resale value:** Another major challenge for EV adoption is the uncertainty about the vehicle resale values. Given that the battery contributes the majority of vehicle cost and there is still uncertainty about the battery valuation, battery health/life and the overall resale ecosystem, EV resale ecosystem remains one of the biggest unknowns for the segment.
- **Limited-service network:** Given the nascent stage of the EV subsegment, the supporting service and repair infrastructure is relatively limited compared to the infrastructure of its ICE counterpart.
- **Limited vehicle portfolio:** In the last 2-3 years, EV offerings of the industry increased multifold with entry of new players, expansion of legacy players into EVs as well as portfolio expansion by current players. Despite this, compared to the ICE portfolio, EV options are still at a nascent stage.
- **Lower Awareness:** Over and above the environmental benefits, EVs offer notable gains over their ICE counterparts. However, limited awareness and understanding of these benefits restricts the mass scale adoption of EVs.
- **Dependency on raw material imports for batteries:** Metals like lithium, magnesium, cobalt, nickel, etc. are needed for manufacturing EV batteries. Countries deficient in these resources need to depend on imports for manufacturing EVs from limited countries that possess the production capability as well as control the mines for these elements. Imports increase the cost of procurement of raw materials and hence overall cost of EVs. Also, any unprecedented global event could further elevate the raw material prices along with disrupting the entire supply chain for the same. Currently, India is highly dependent on imports for Lithium-ion cells and the dependency on imports along with the lack of robust supply chain network threatens the current supply of the batteries. While India recently discovered Lithium reserves in the country, commercialization and setting up the production capabilities of the same will take time, thereby making India dependent on imports for the medium term.
- **Import of EV components**: While many EV suppliers have reached domestic content requirement as mentioned by the government, there are still a lot of component parts that need to be imported. For example, permanent magnets in electric motors, semiconductor chips, electronic child parts, and printed circuit boards (PCBs). Capability of Indian OEMs to manufacture and design these complex systems is currently limited owing to limited technical expertise, less availability of raw materials and intense investment requirement.

2. Review of the Indian Two-wheeler Industry

India is the largest motorised two-wheeler market by volume in the world as of CY 2023 (according to Mordor intelligence) and had domestic sales of 18.4 million units in Fiscal 2024. Indian automobile segment primarily consists of two-wheelers (2W), passenger vehicles (PV), commercial vehicles (CV), three wheelers (3W) and tractors. Two-wheeler is the largest segment and contributed 73.0% to the total auto market by volume followed by the passenger vehicle segment which contributed 16.7%. The three-wheeler segment contributed 3% to vehicle sales in Fiscal 2024.

The share of Two-wheeler segment in total auto market reached to approximately 75% by volume as of H1 of Fiscal 2025, followed by passenger vehicle segment with approximately 15% share.

Segment wise split of the Indian Automobile market by volumes (Fiscal 2024)



Note: Low speed 2W and L3 segment have not been considered in the analysis
Source: SIAM, VAHAN, CRISIL MI&A

2.1 Review of the Indian Domestic High Speed Two-wheeler Industry

Two-wheelers industry sees a healthy demand in India and are preferred over four wheelers by a majority of the Indian population especially for their regular commute. This is primarily due to the lower acquisition cost, higher mileage, lower maintenance costs, ease of navigation especially during the traffic hours, hassle free parking and suitability of two-wheelers on rugged roads.

In the last 15 years (Fiscal 2009 to Fiscal 2024), the domestic two-wheeler industry has grown at a CAGR of 6.2% and reached a volume of 18.4 million in Fiscal 2024. Within this period, the industry accelerated at a much faster pace of 11.1% CAGR over the 10-year period from Fiscal 2009 to Fiscal 2019 and reached a historic high of volumes of 21.2 million in Fiscal 2019.

From this historic high, in the next 4-year period, Fiscal 2019- Fiscal 2022, the industry witnessed contraction at 13.6% CAGR amidst the pandemic, nationwide lockdowns, reduced mobility, unfavourable macroeconomic scenario, closure of schools, colleges and offices, and work from home impacting the demand for two-wheelers.

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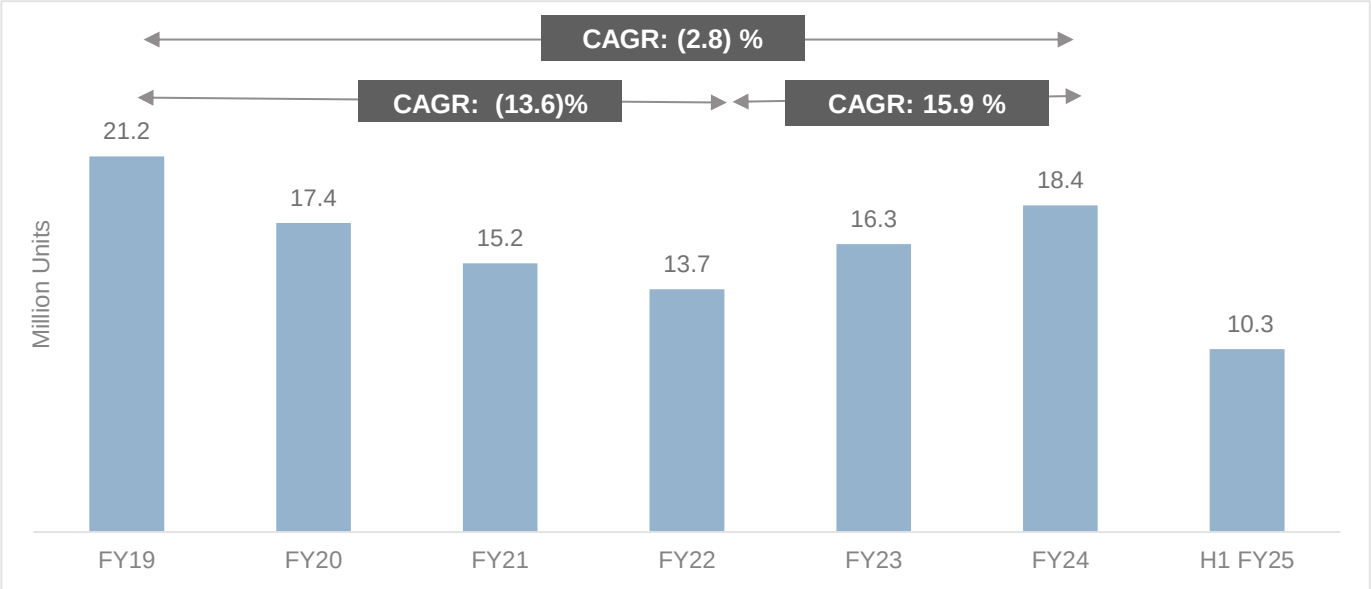
Domestic High Speed two-wheeler sales volume trend



Note: Figures in bracket to be read as negative (Eg. (10) to be read as minus 10), Data for ICE and EVs; EV retail data from VAHAN has been considered. In case of EVs, only high speed EVs have been considered and low speed have not been considered.
Source: SIAM, VAHAN, CRISIL MI&A

On the reduced base of Fiscal 2022, two-wheeler sales rebounded in Fiscal 2023 and recorded a healthy growth of 19%, driven by improving demand sentiments, normalization of economic activities and increased mobility. The pent-up demand, because of the postponement of purchases during the pandemic period and sharp rise in scooters demand with restarting of colleges and offices provided thrust to the industry demand. Despite normalization of public transport, improved frequency of intracity bus and railway services, the demand for last mile mobility and in turn the demand for two-wheelers remained buoyant during the year.

Additionally, the EV segment retails nearly tripled giving an added fillip to the overall sales in Fiscal 2023.

2W industry sales further increased by 13% during Fiscal 2024 backed by improvement in macro-economic scenario, rural support, continued traction for greater or equal to 125cc motorcycles as well as scooters. Furthermore, continued demand for electric two-wheelers despite the subsidy cut supported the growth in Fiscal 2024.

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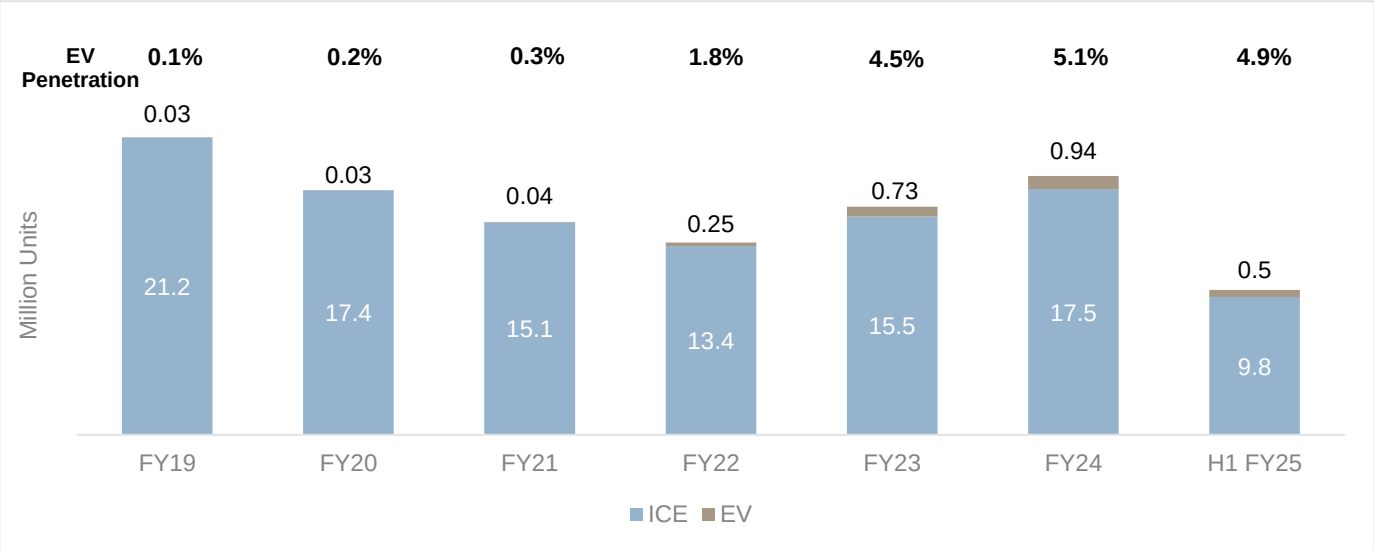
Domestic High Speed two-wheeler sales volume trend (ICE vs EV)



Note: Only high speed EVs have been considered in the above graph
Source: SIAM, VAHAN, CRISIL MI&A

y-o-y growth	FY19	FY20	FY21	FY22	FY23	FY24	FY19-24 CAGR
ICE	4.9%	-17.8%	-13.2%	-11.1%	15.5%	12.7%	-3.7%
EV	1393.6%	-4.1%	67.0%	464.1%	187.9%	28.5%	101.7%

Note: Only high speed EVs has been considered
Source: SIAM, VAHAN, CRISIL MI&A

In the last 5 years, the electrification within the industry has helped grow the industry sales. Even during the years when the ICE vehicle sales slid, the sharp rise in EV retails restricted the drop in the overall 2w sales volumes. During Fiscal 2019 to Fiscal 2024 period, ICE segment contracted at 3.7% CAGR and EV retails grew with a 101.7% CAGR, albeit from a lower base.

EVs, especially, E-2Ws have witnessed significant growth in the last 5 years. In fact, in Fiscal 2024, E-2Ws formed approximately 82% of EV sales (including 2W, 3W, PV & CV excluding low speed 2W and L3 segment) in India.

Seasonality of sales

Demand in the automotive industry typically peaks between January and March, reduces from April to July before increasing again during the festive season from September to December. These festive months account for maximum of the festivals like Ganesh Chaturthi, Onam, Dushhera, Diwali and Christmas and are usually the best months from retail perspective. The Fiscal year end month of March also sees higher dispatches to comply with the annual targets. Post the higher offtake, the beginning of the new Fiscal (April-June) sees relatively lower dispatches after the increased inventory built up done during the previous financial year end coupled with lower retails during the rainy season.

Segment wise domestic sales trend

Motorcycles dominate the domestic two-wheeler industry sales with more than 60% contribution to the annual domestic sales volumes. However, their contribution has gradually contracted over the years, from 64% in Fiscal 2019 to 63% by Fiscal 2024 and approximately 62% by first half of Fiscal 2025.

On the other hand, the scooters segment expanded its presence over the long-term horizon; from 32% in Fiscal 2019 to 34% in Fiscal 2024 and increased to approximately 35% by first half of Fiscal 2025. The mopeds segment

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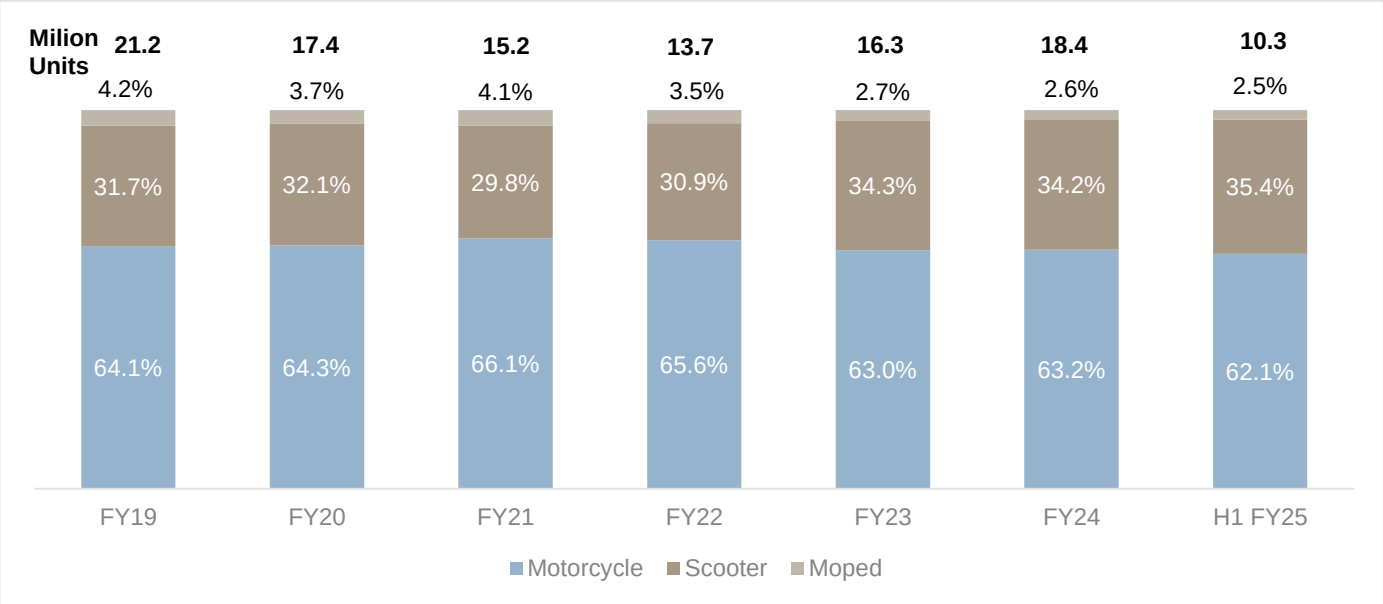
lost some ground to scooters over the years, from approximately 4% share in Fiscal 2019 to approximately 2.5% in Fiscal 2024 and H1 Fiscal 2025.

Domestic High Speed two-wheeler sales segmental trend



Note: Data includes ICE and EVs; EV retail data from VAHAN has been considered. In case of EVs only high speed EVs have been considered.
Source: SIAM, VAHAN, CRISIL MI&A

Scooters

In the last 5 years, scooters witnessed gradual expansion, and their share increased from 31.7% in Fiscal 2019 to 34.2% in Fiscal 2024. The strong demand for new model launches (like the Dio 125, Avenis, upgrades of Activa, Jupiter as well as e-scooters), increasing usage of scooters by working professionals, especially women in urban areas (due to high convenience) and a growing preference as a second vehicle in households enabled demand for scooters. There has also been a rise in multiple vehicle ownership within a family including a passenger vehicle coupled with multiple two-wheelers.

They are being increasingly accepted in rural areas with increasing road penetration and utility purposes.

Within the scooters segment, e-scooters witnessed growth at an accelerated pace and contributed significantly to overall scooter sales in the last 5 years. Launch of new models, government incentives, rising awareness, increased acquisition & operating costs for the ICE equivalents provided a boost to the EV sales during the Fiscal 2019-2024 period.

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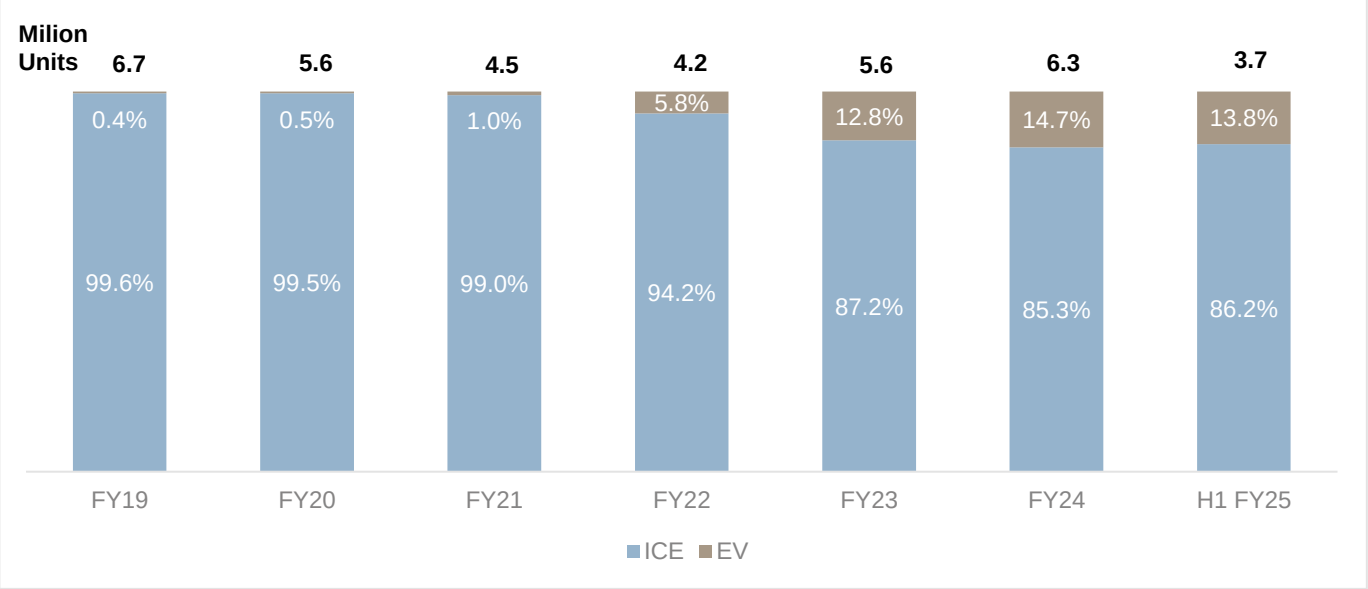
ICE vs EV split within domestic scooter sales – Fiscal 2019 to H1 Fiscal 2025



Note: High speed EVs retails from VAHAN have been considered.
Source: SIAM, VAHAN, CRISIL MI&A

On the other hand, the ICE scooter segment witnessed contraction amidst the reduced mobility, increased vehicle prices (due to BS VI emission norms compliance), higher operating costs (fuel price hike), increased interest outgo as well as increased competition from EVs. During Fiscal 2019 to Fiscal 2024 period, ICE scooter sales contracted at 4.3% CAGR.

Motorcycles

In the overall domestic sales, motorcycles have maintained their leading position in the last 5 years.

Unlike scooters, the EV penetration within motorcycles has remained inconsequential amidst lack of EV options. A few OEMs like Revolt offered EV motorcycles from Fiscal 2020. Manufacturers like Tork and Ultraviolette also introduced their e bikes/ motorcycles. However, given limited vehicle options and higher acquisitions costs for electric motorcycles, their adoption has been gradual and is yet to pick up pace. The ICE variants continued to dominate the motorcycle sales.

With OEMs like Ola and Royal Enfield announcing EV launches in the motorcycle segment, the EV subsegment is expected to grow gradually.

Mopeds

The smallest segment of mopeds witnessed a contraction during Fiscal 2019-2024, amidst the increasing adoption of scooters in the semi-urban and rural markets which are historically major markets for mopeds.

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Segmental growth within the industry in the last 5 years

Segment	FY19-FY24 CAGR	FY19 share	FY24 share
Motorcycles	**(3.0) %**	**64.1%**	**63.2%**
ICE	(3.1) %	64.1%	63.1%
EV	NM	0.0%	0.1%
Scooters	**(1.3) %**	**31.7%**	**34.2%**
ICE	(4.3) %	31.6%	29.2%
EV	101.3%	0.1%	5.0%
Mopeds	**(11.4) %**	**4.2%**	**2.6%**
Total	**(2.8) %**	**100%**	**100%**

Note: NM: Not meaningful; Figures in bracket to be read as negative (Eg. (10) to be read as minus 10), EV retail data from VAHAN has been considered. In case of EVs only high speed EVs have been considered.
Source: SIAM, CRISIL MI&A

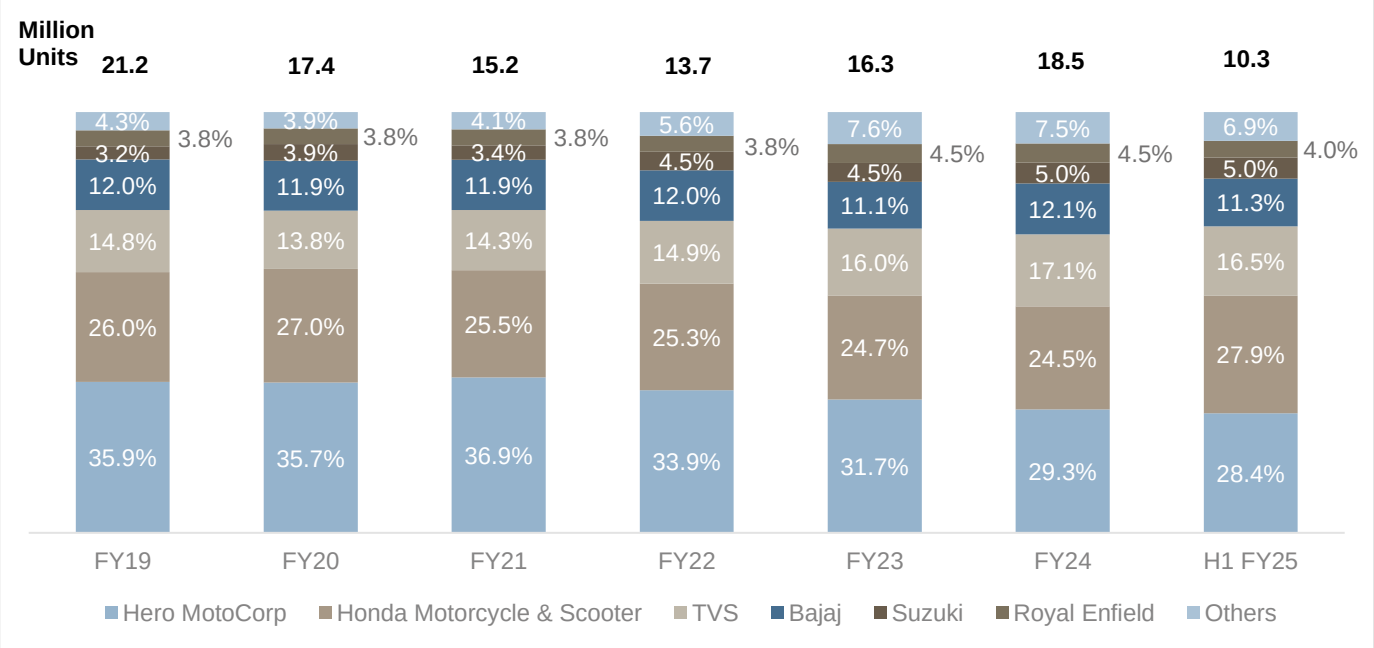
Competitive landscape of the domestic High Speed two-wheeler industry

India's Two-wheeler industry has traditionally been a market with only few major players, wherein the top 4 players have contributed to more than 80% of the annual sales. However, over the years, the competition has intensified within the industry, especially, with the entry of new age players in the electric scooter segment like Ola, Ather energy and Ampere (Greaves Electric Mobility) catering to the fast-expanding segment of EVs.

Hero MotoCorp (HMCL) continued to lead the market, with 29.3% market share in fiscal 2024 and 28.4% in H1 fiscal 2025. The increased traction for scooters including E scooters as well as premium motorcycles coupled with pressure on <=110cc motorcycles sales – where HMCL dominates – have impacted its share. The second largest contributor Honda Motorcycle & Scooter (HMSI) has also lost some ground to other players, especially the e-scooter manufacturers.

However, in H1 of fiscal 2025, HMSI share increased from 24.5% in fiscal 2024 to 27.9% in H1 fiscal 2025, while HMCL, TVS and Bajaj lost some share.

OEM wise contribution to overall High Speed two-wheeler domestic sales – Fiscal 2019 to H1 of Fiscal 2025



Note: Data includes ICE and EVs; EV retail data from VAHAN has been considered, only high speed EVs have been considered.
Source: SIAM, VAHAN, CRISIL MI&A

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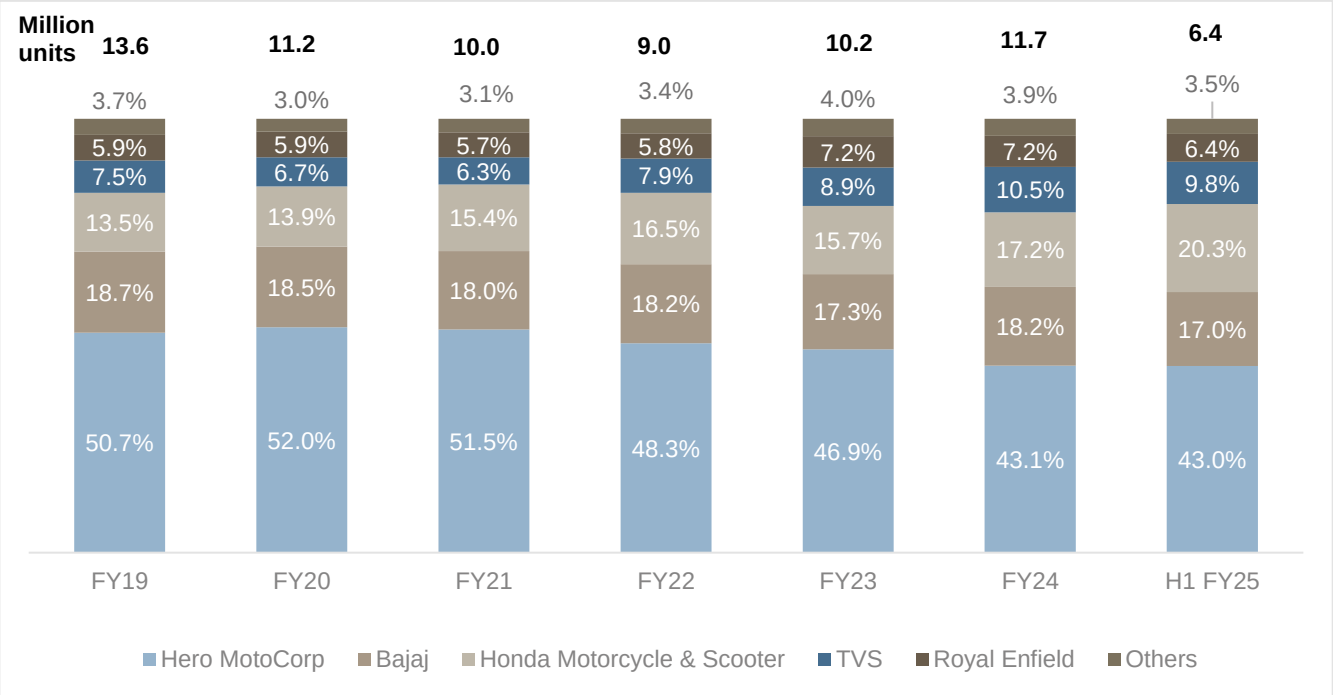
With the continued traction for its greater or equal to 125cc motorcycles and scooters- especially Jupiter coupled with rising adoption of its e-scooter model iQube, TVS has gained ground in the market during the Fiscal 2019-Fiscal 2024. Bajaj successfully maintained its 11-12% share in the last 5 years. Multiple launches in the greater or equal to 125cc motorcycles subsegments as well as increase in production & sales of its Chetak e-scooters have aided its sales. Rising sales of 125cc scooters backed Suzuki's share expansion while multitude of launches in the growing greater or equal to 125cc motorcycles segment led to share expansion for Royal Enfield.

OEM wise contribution to Domestic Motorcycles sales - Fiscal 2019 to H1 of Fiscal 2025



Note: Data includes ICE and EVs; EV retail data from VAHAN has been considered, only high speed EVs have been considered.

Source: SIAM, VAHAN, CRISIL MI&A

The overall motorcycles segment is dominated by HMCL, that is also the leader in the <=110cc motorcycles subsegment. However, given the pressure on sales of the <=110cc motorcycles subsegment and intensifying competition in greater or equal to 125cc motorcycles subsegments, HMCL has lost some ground to TVS, HMSI and Royal Enfield from an initial high base. However, increased traction for its premium models like the XPulse, Xtreme as well as demand for its recent launches like the Karizma, Harley X440 in the greater or equal to 125cc motorcycles subsegments restricted the contraction in its share. Added traction for recent launches like Xtreme 125 supported HMCL share in the current fiscal year.

Bajaj maintained its second position in the market in the last 5 years with continued traction for its motorcycles especially for its Pulsar range and increased demand for its latest launches including the Triumph vehicles. Bajaj launched Pulsar N125 in current fiscal. Bajaj also introduced the first of its kind CNG bike, Freedom 125 in first half of fiscal 2025. HMSI has expanded its presence in the motorcycles market amidst continued demand for its models like Shine 125, SP 125 coupled with its entry into the 100-cc category with Shine 100. The launch of the SP160 model also aided its share expansion during fiscal 2024.

In line with HMSI, TVS has also grabbed additional share in the motorcycles segment supported by high demand for its Raider 125 model coupled with increased push from its recent launch, the Ronin, in the greater or equal to 125cc subsegments. TVS also witnessed contraction in the <=110cc subsegment amidst the reduced demand as well as premiumization trend in the two-wheeler industry.

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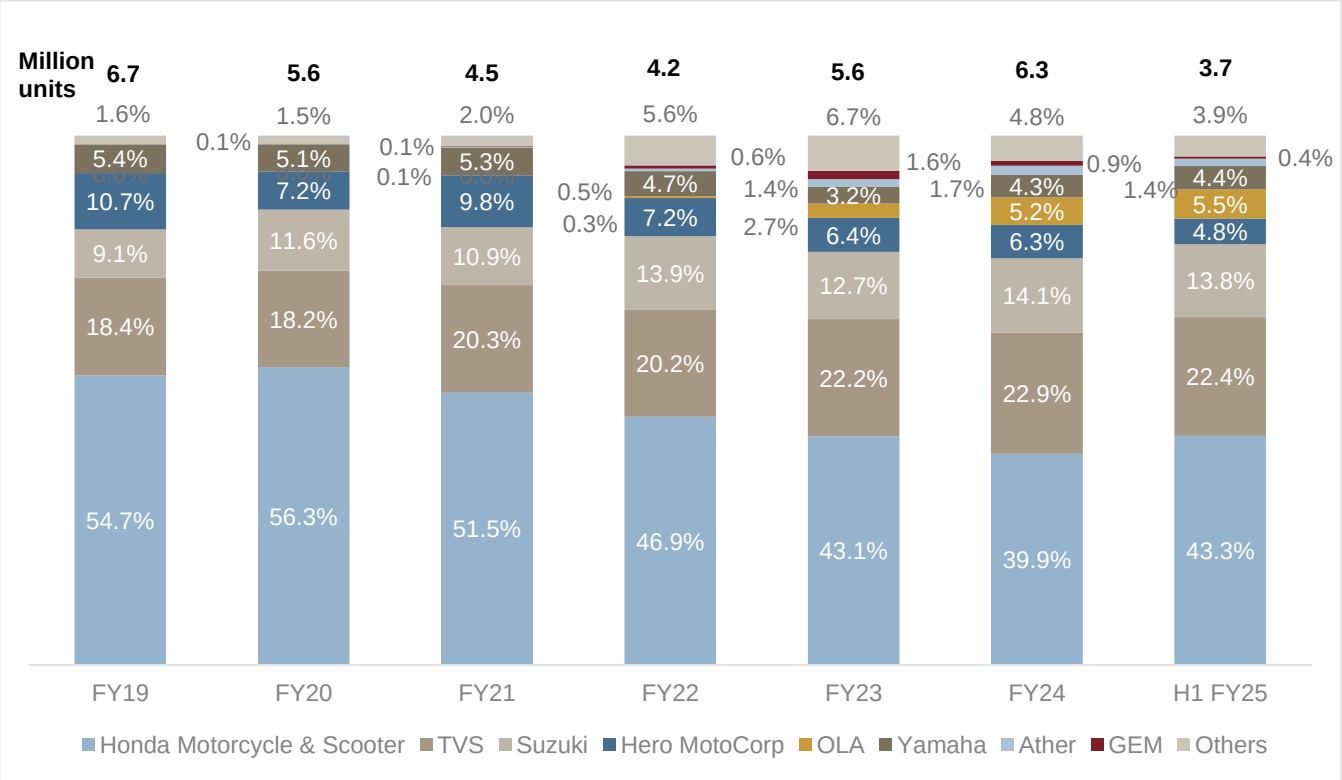
Royal Enfield, with its entire focus on the greater or equal to 125cc motorcycles segments expanded its presence further with faster growth in the premium segments. Moreover, increased support from the competitively priced model the Hunter 350 aided its growth in the last 2 years.

In H1 of Fiscal 2025, HMSI has gained share in the motorcycle industry, while Bajaj, TVS and Royal Enfield have lost share.

OEM wise contribution to Domestic Scooters sales - Fiscal 2019 to H1 of Fiscal 2025



Note: Data includes ICE and EVs; EV retail data from VAHAN has been considered, only high speed EVs have been considered.
Source: SIAM, VAHAN, CRISIL MI&A

HMSI leads the scooters segment with its Activa model. Amidst intensifying competition, the company has lost some ground. However, increased demand for the higher cc variants of its scooters - Activa 125 and Dio 125 - helped the company limit its share contraction.

Increased traction for its e-scooter iQube as well as added support from 125cc variant of its popular model Jupiter has supported TVS's share expansion within scooters segment.

Suzuki is primarily focussed on the 125cc scooters segment. Premiumization within the industry as well as healthy demand for its recent launch, the Avenis, aided Suzuki's share expansion within the scooters segment.

Amidst the electrification trend, especially within scooters, Ola and Ather have gained ground within a short span of time. With its leading contribution in the e-scooters subsegment, Ola contributed ~5% and Ather contributed ~2% to the overall scooter sales in fiscal 2024. (EV segment is covered in detail in later chapters).

In the last 5 years, Yamaha maintained its share in 3-5% range led by continued demand for its RayZR series. The recent launch of the Aerox scooter range helped Yamaha expand its presence and regain some lost ground during Fiscal 2024.

In H1 of Fiscal 2025, HMSI and Ola gained some share in scooter segment while TVS, Suzuki, HMCL and Ather lost some ground.

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For mopeds, TVS is the only OEM in the domestic market with its model, the XL100.

Review of 2W exports segment

Exports account for 15-20% of the overall two-wheeler sales in India. In the last six years, between Fiscal 2019-2024, two-wheeler industry exports rose at a moderate pace of 1% CAGR reaching volumes of 3.5 million in Fiscal 2024.

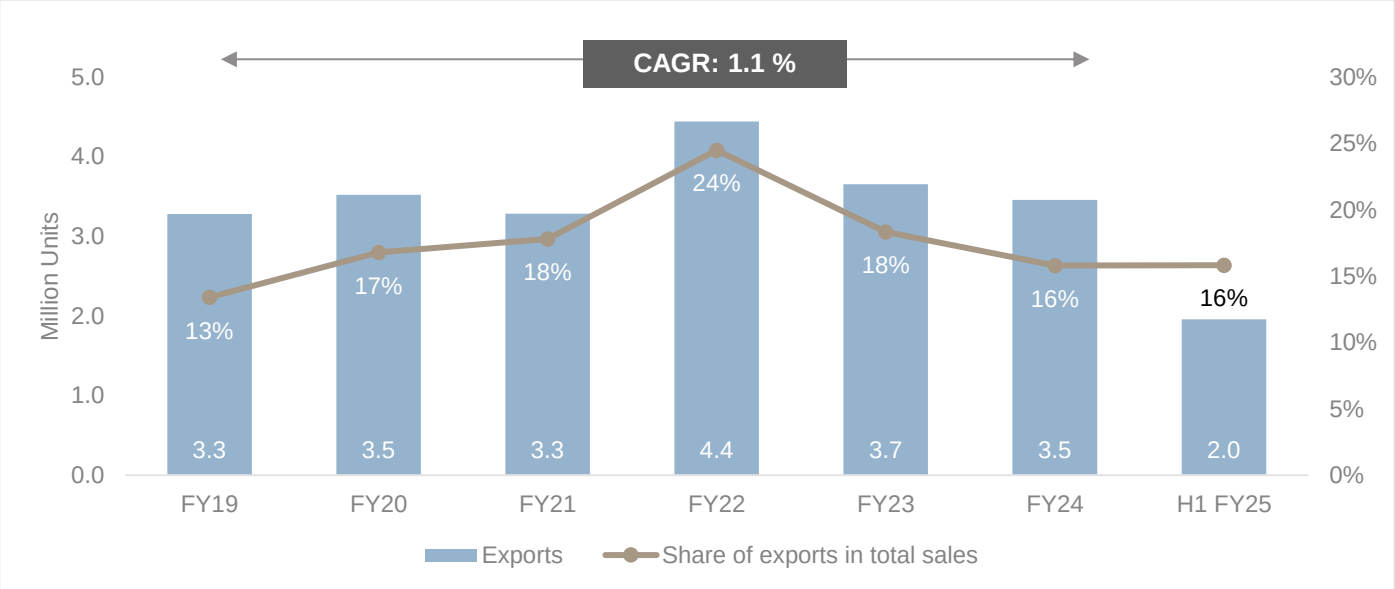
Growth in exports was led by increase in global demand as well as geographical expansion by players like Bajaj Hero and TVS. Also, joint ventures with global brands—such as KTM, Husqvarna and BMW—and catering to the global demand of these brands from India has given an additional thrust to two-wheeler exports. Additionally, OEMs have also started exporting EVs from India providing an added fillip to the exports.

However, exports from India were limited by recent global fiscal tightening measures, increased inflation levels, as well as forex unavailability. Over and above this, geopolitical conflicts have been impacting the exports demand.

In the last 6 years, exports have remained near steady at around volumes of 3.5 million with fiscal 2022 being an exceptional year for exports. Exports rose at a healthy pace in fiscal 2022 led by the increased focus of OEMs on exports amidst a slowdown in the domestic market. The export levels normalised in fiscal 2023, with increased demand from domestic markets. Its share in overall industry sales also regularized to normal 15-20% range.

During fiscal 2024, two-wheeler industry exports dropped by 5% further amidst continued focus on rising domestic market and slowdown in demand from major contributing geographies of Africa and Asia. In H1 of fiscal 2025, export clocked 2.0 million units.

Two-wheeler exports trend



Source: SIAM, CRISIL MI&A

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Two wheelers are primarily exported to developing countries from India with Africa contributing the major share. However, exports to Africa have been under pressure amidst the slowdown in their economy, sharp rise in inflation levels and unavailability of forex in Nigeria, the leading two-wheeler importer from India. Contribution of Africa has reduced from 44% in Fiscal 2023 to 40% in Fiscal 2024.

Increased exports to North American countries (6% y-o-y increase in share), primarily Mexico, has lent some support to exports during Fiscal 2024. Increase in exports to Turkey aided the share of Middle East during the year. Given the FTAs with Middle Eastern countries like Saudi Arabia and UAE, the exports to middle eastern countries have been on the rise. During Fiscal 2025, Apr-Sep, export has witnessed growth of 15% year-on-year.

During Fiscal 2025 Apr-Sep, exports to Latin American countries Mexico, Colombia and Brazil increased amidst network expansion by players like HMCL in the Latin American markets. While export in Africa has seen decline majorly due to decreased export in Nigeria.

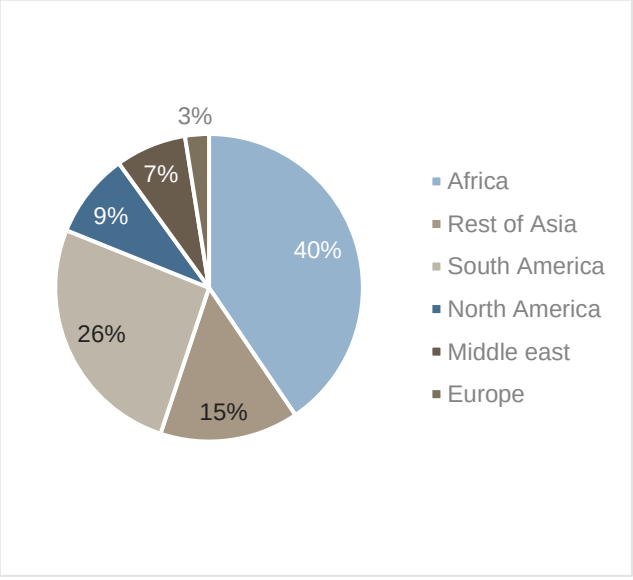
India also exports a sizeable portion to Southeast Asian countries like Philippines, Indonesia, Taiwan as well as neighbouring countries of Nepal and Bangladesh. Share of exports to neighbouring countries has also contracted in Fiscal 2024 due to the economic problems Nepal and Bangladesh. Continued exports to Indonesia have restricted the loss of share.

Scooters have witnessed higher acceptance in South Asian markets like Thailand, Malaysia, Vietnam, Indonesia and are widely favoured for their affordability, fuel efficiency, and agility in navigating congested roads. These developing nations have limited per capita incomes making passenger vehicles unaffordable for a significant customer base. Moreover, scooters are favoured for their ability as a family vehicle which can be used in urban and rural areas for the daily commute as well as to haul small luggage to and from the market.

Additionally, the respective governments are also incentivising purchase of low emission and technologically advanced vehicles which align with environmental and safety goals set by the government.

During H1 Fiscal 2025, overall exports from India increased 16% y-o-y backed by improved exports to South American countries and continued demand from Middle East and Rest of Asia. While the demand from Africa has begun to slowly recover, it has not yet reached previous levels, particularly in Nigeria.

Geographical split for Indian two-wheeler exports volumes (Fiscal 2024)



Country	Share in Fiscal 2024
Nigeria	13.8%
Mexico	8.1%
Columbia	7.9%
Guatemala	5.0%
Guinea	4.8%
Philippines	4.8%
Uganda	4.6%
Turkey	4.5%
Tanzania	4.0%
Nepal	3.7%

Note: Rest of Asia: Entire Asia except Middle East
Source: Ministry of Commerce and Industry, CRISIL MI&A

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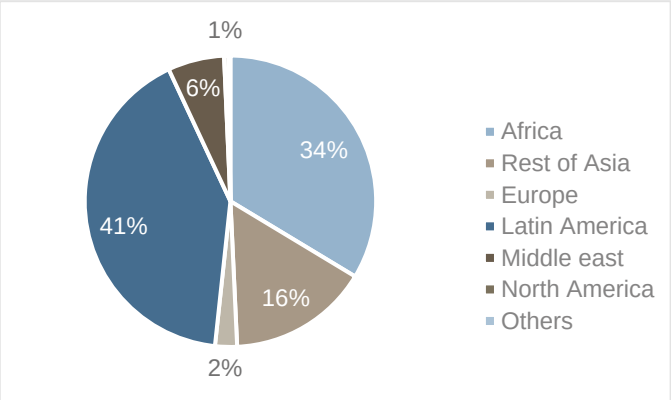
Geographical split for Indian two-wheeler exports volumes (H1 of Fiscal 2025)



Country	Share in H1 Fiscal 2025
Mexico	10.5%
Colombia	10.4%
Guinea	6.7%
Nepal	6.1%
Guatemala	5.6%
Nigeria	4.9%
Philippines	4.7%
Uganda	4.2%
Brazil	3.3%

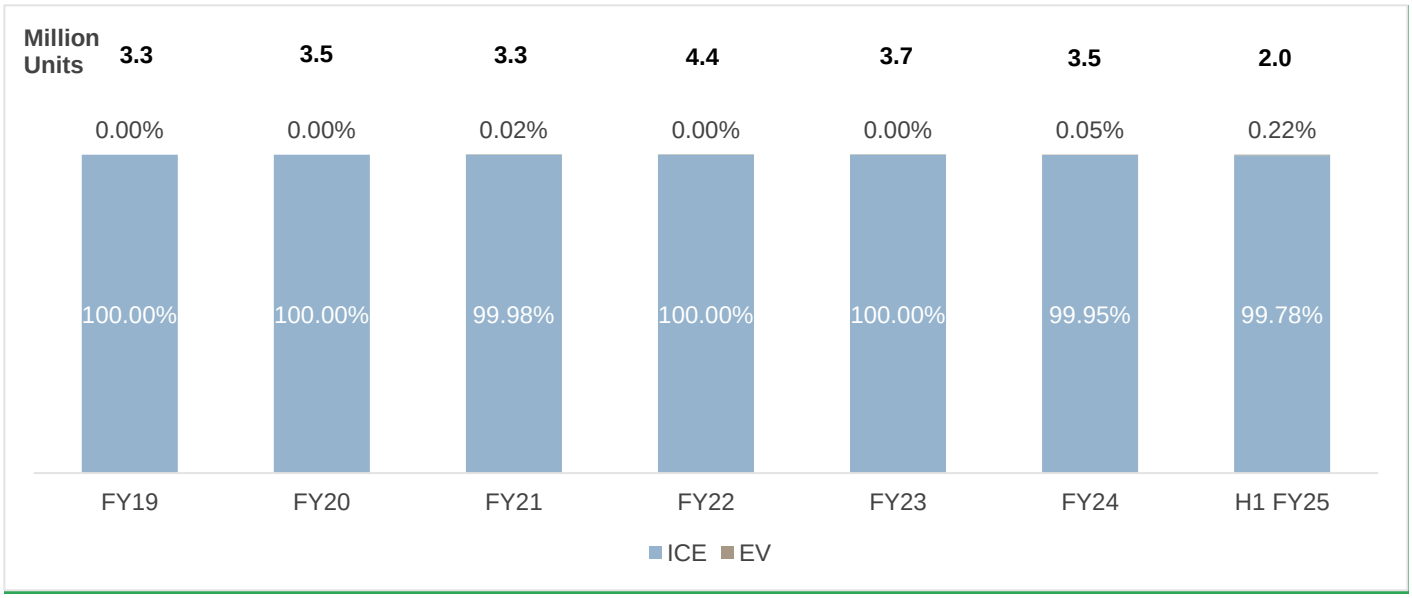
Note: Rest of Asia: Entire Asia except Middle East
Source: Ministry of Commerce and Industry, CRISIL MI&A

ICE two-wheelers completely dominate the exports. However, in line with electrification in the domestic two-wheeler market, OEMs have started exporting EVs from India in the last 3 years. In fact, in Fiscal 2024, EV exports rose 19x compared to EV exports in Fiscal 2023.

As of Fiscal 2024, TVS, Ola and Ather are primarily exporting EVs from India. The EV exports are currently at a nascent stage, however, are expected to grow going ahead.

In H1 of Fiscal 2025, TVS contributed majorly to the export of EVs from India, helping increase the share of EVs from 0.05% in Fiscal 2024 to 0.22% in H1 of Fiscal 2025.

Powertrain Split within two-wheeler exports



Note: EV exports data does not include Ola exports as SIAM does not report Ola numbers.
Source: SIAM, CRISIL MI&A

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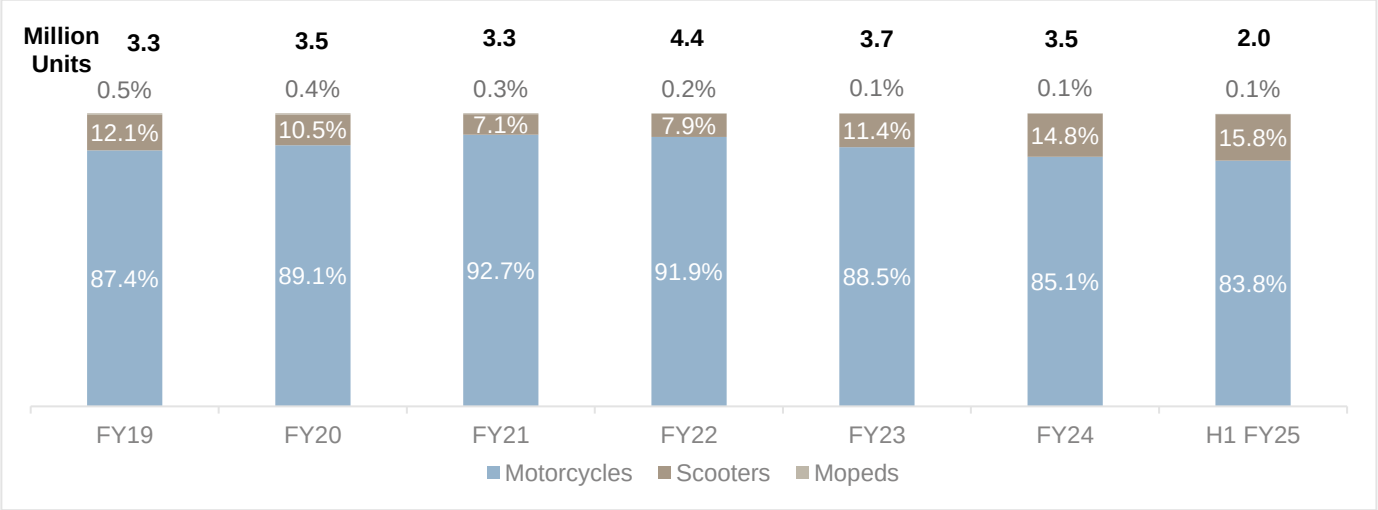
Segment-wise Exports Trend

Motorcycles dominate the exports segment as well with more than 85% share in overall exports.

Segmental split within exports

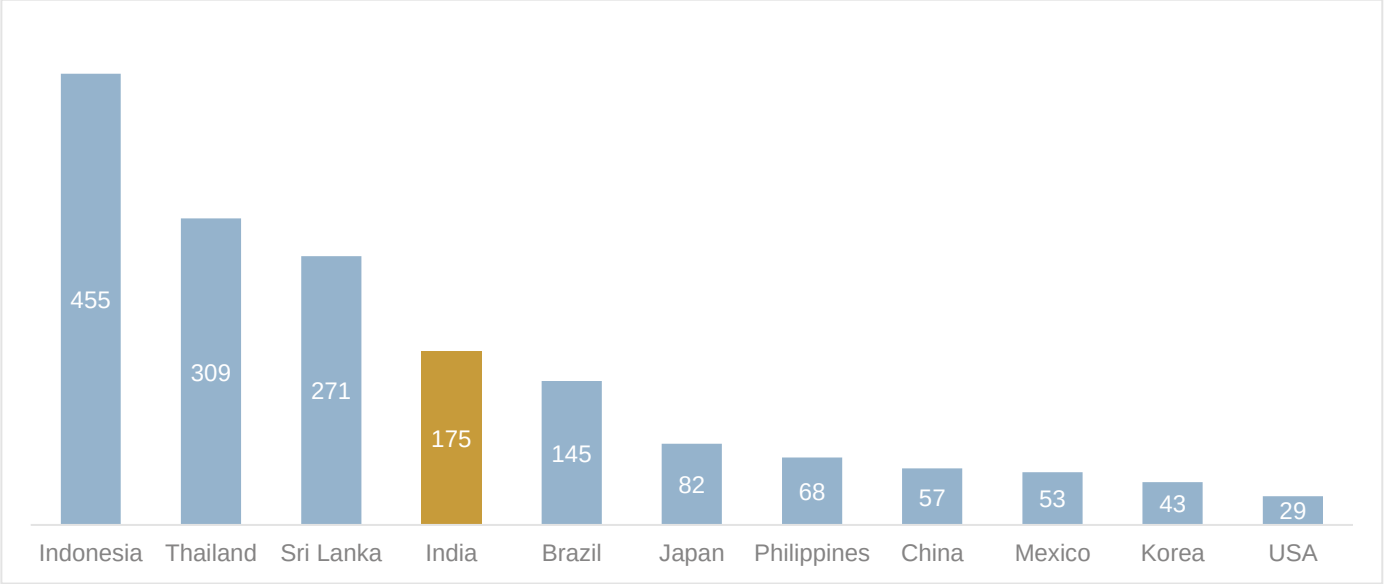


Source: SIAM, CRISIL MI&A

Demand drivers and trends in the domestic two-wheeler market

The performance of the Indian 2W industry is dependent on numerous social and economic factors, including demographic trends and preferences, income levels, affordability of 2W vehicle customers, changes in government policies, overall economic conditions as well as availability of finance and interest rates. Certain factors, such as general macroeconomic and consumer trends, have a direct impact on demand for 2W vehicles.

Two-wheeler penetration (per 1000 people)



Note: Data for 2022, India data is for 2020
Source: International Road Federation- World Road Statistics 2024

This provides a sizeable headroom for the two-wheeler industry to grow going forward.

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Rise of Urbanization

According to United Nations Population Division (World Urbanization Prospects: 2018 Revision) urban population constituted 36% of the total population in India, which had increased by 13% in the previous 10 years. The urban population accounted approx. 508 million people in CY2022, already the second largest urban community in the world. India's urban population is projected to be 675 million in 2035, which will be approximately 43% of the overall Indian population. In the interim, the urban population is expected to be approximately 542 million in 2025 and 607 million in 2030.

Managing urban growth will play a key role in India becoming a developed nation by 2047. Since nearly 70-80% of the urban infrastructure needed by 2047 is yet to be built, sizeable investments will be required in housing, commercial spaces, and public infrastructure. By 2036, India will need to invest USD 840 billion in infrastructure. This infrastructure growth will have to be supported by enhanced public services, improved access to healthcare, efficient public transportation, steady water security and public safety. The increase in urbanization will also increase the need for improving air & water quality, which will in turn give impetus to clean / green / renewable energy initiatives and clean transportation. Today urbanization is not only confined to mega-cities but is also altering the landscape of Tier 2 and Tier 3 cities.

With the rapid rise in urbanization, the demand for personal mobility is growing and demands cleaner public transport solutions. India's transportation sector is undergoing a significant change, spurred by the government's strong push towards clean energy and zero emission vehicles. This is drawing government attention towards electric vehicles, hybrid vehicles and other non-emission technologies. Hence, there is a growing adoption of electric vehicles in the public sector, which is backed by the establishment of a comprehensive charging infrastructure to ensure smooth transition towards electric mobility. Further government is incentivising adoption of e-buses through various schemes offered to state governments and State Transport Undertaking (STUs). In August 2023, the Central Government unveiled the PM e-Bus Sewa Scheme, dedicating $2.4 billion to facilitate the deployment and operation of 10,000 electric buses in 169 eligible cities. The initiative aims to complete these deployments by 2026.

Metro Rail systems are also crucial in addressing the challenges in urban mobility as they support in mass transit aiding the public transport system. India has made notable strides, with 17 metro systems operating in 17 cities as of March 2024. The Delhi Metro stands out as the largest, with an extensive network covering 902.4 kilometres and connecting major urban areas. These projects are growing globally, driven by the need for sustainable urban transportation.

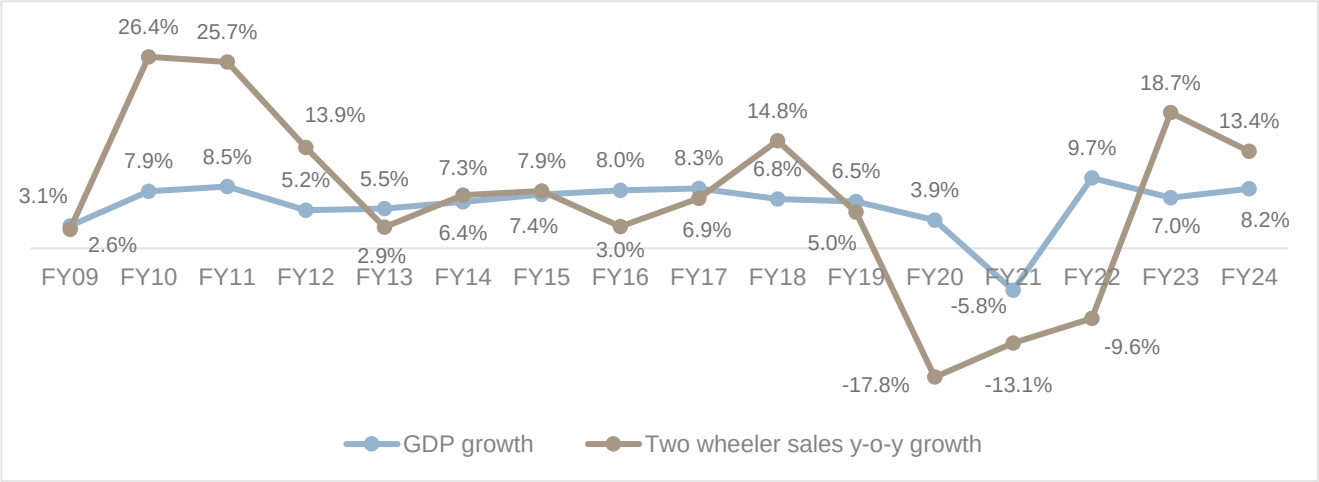
Macroeconomic support

The primary demand drivers for the two-wheeler industry are improving affordability and lower cost of acquisition and ownership. Macroeconomic factors primarily determine the disposable income and affordability for customers.

During the Fiscal 2009 -2019 decade, India’s GDP grew at a healthy pace of 7% CAGR aiding the affordability of the customer base. The private final consumption expenditure also expanded in tandem with the GDP growth during the same time.

This improvement in income levels translated into a healthy growth for the domestic two-wheeler industry at 11% CAGR. Industry achieved this growth despite a few hurdles including the demonetisation, implementation of the Goods and Services Tax, as well as the implementation of BS IV norms which pushed the vehicle prices up during Fiscal 2018.

GDP vs two-wheeler industry growth trend



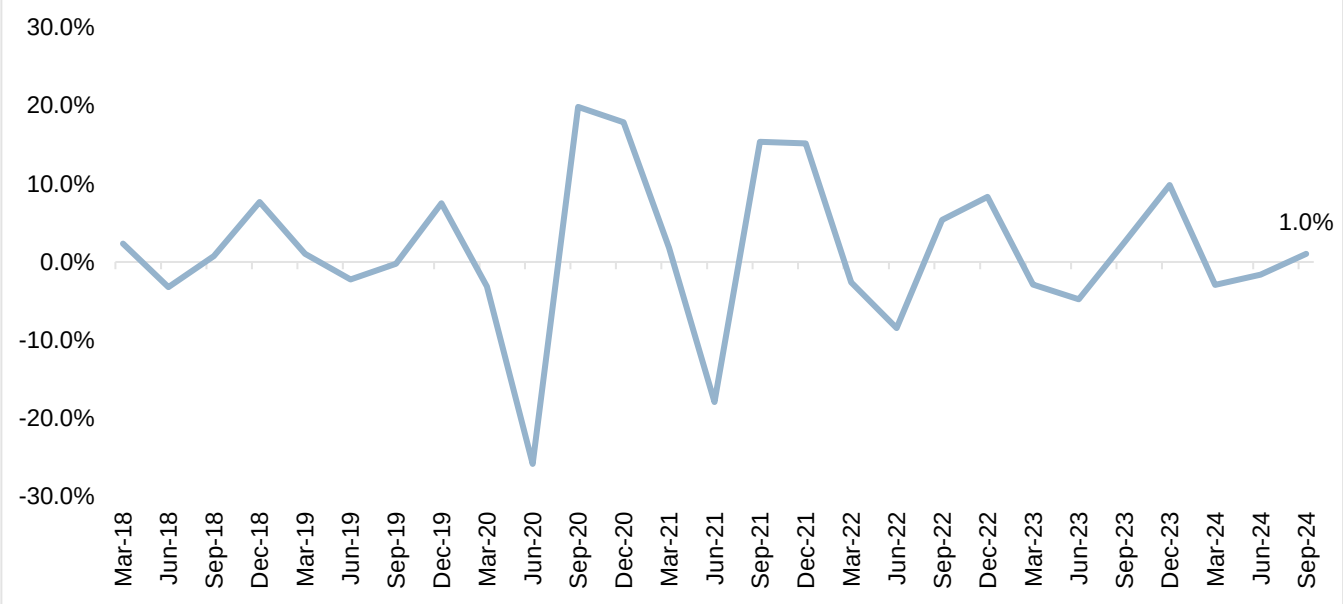
Source: MoSPI, SIAM, VAHAN, CRISIL MI&A

Going ahead, CRISIL expects India's GDP to clock a healthy growth at 6.5-7.5% CAGR (till Fiscal 2031) aiding the growth of domestic two-wheeler industry sales over the long-term horizon.

Private consumption

Private final consumption expenditure (PFCE) reflects the overall consumption patterns and spending capacity of households within an economy. When PFCE increases it often translates to increased demand for various goods and services.

PFCE Quarterly Trend for India



Note: Mar refers Q4, June refers to Q1, Sep refers for Q2, Dec refers to Q3
Source: Industry, CRISIL MI&A

At the macroeconomic level, the rise in per capita income implies that as incomes increase, the proportion of expenditure allocated to discretionary items such as consumer durables and automobiles will increase. This will

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lead to a qualitative enhancement in consumption patterns, characterized by a growing demand for discretionary goods. The rise in per capita income and discretionary spending are expected to lead to a corresponding increase in demand for premium products and experiences,

The improvement in per capita income over the years has helped 2W penetration to expand. According to the National Family Health Survey 2019-21 the share of households owning a 2W reached 49.7%. This was an improvement over 37.7% which was recorded in 2015-16 survey.

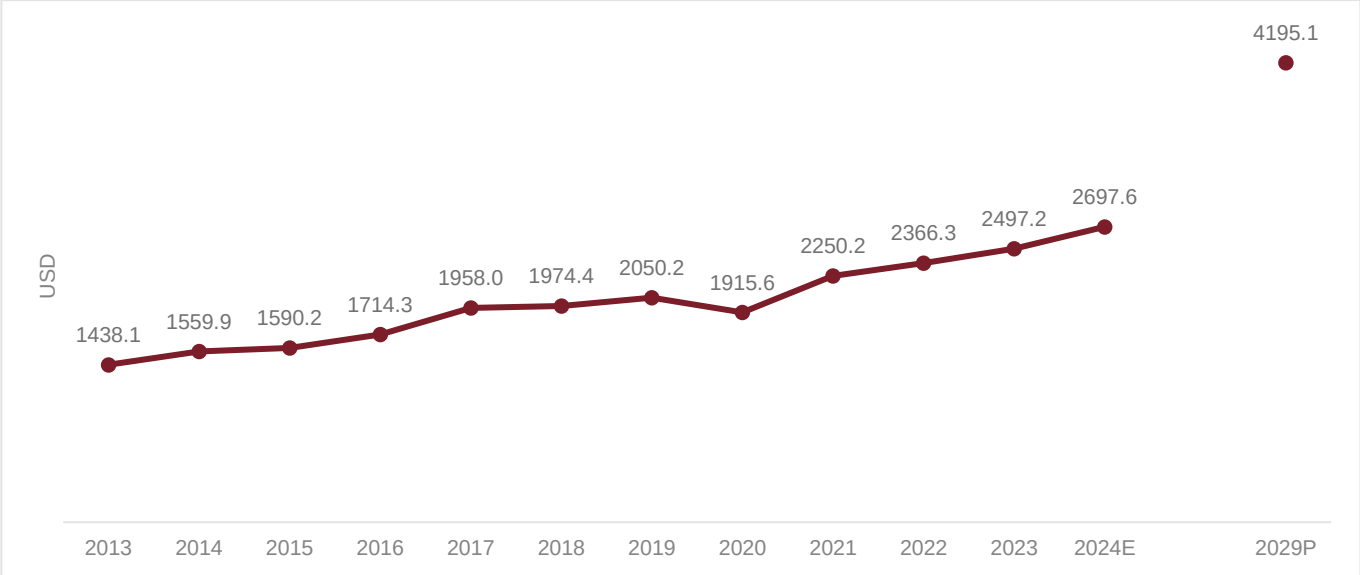
Further improvement in the per capita income will expand the 2W penetration going ahead.

Per Capita Income

Per capita income shows the increase in income thereby indicating economic well-being and average living standard of population in a country.

According to the International Monetary Fund (IMF), India had a GDP per capita of USD 2,497.19 in 2023 compared to USD 1,438.06 in 2013. It has increased at a CAGR of 5.7% in the last 10 years. In 2020, the GDP per capita decreased by 6.6% owing to the pandemic and nationwide lockdown which impacted the manufacturing and service sector. However, in 2021 these sectors returned to normalcy and GDP per capita increased by 17.0% to reach USD 2,250.18.

GDP per capita in USD from CY2013-2024



Source: IMF October 2024 Database, CRISIL MI&A

Going ahead, IMF expects the GDP per capita to grow at a faster rate of 9.23% and reach USD 4,195.09 by 2029. Continued improvement in GDP per capita to aid two-wheeler segment growth over the long-term horizon.

Inflation

High inflation levels have a negative impact on the overall disposable incomes and affordability of the customer base. Further improvement in inflation levels is expected in the shorter term which will support the growth of two-wheeler industry going ahead.

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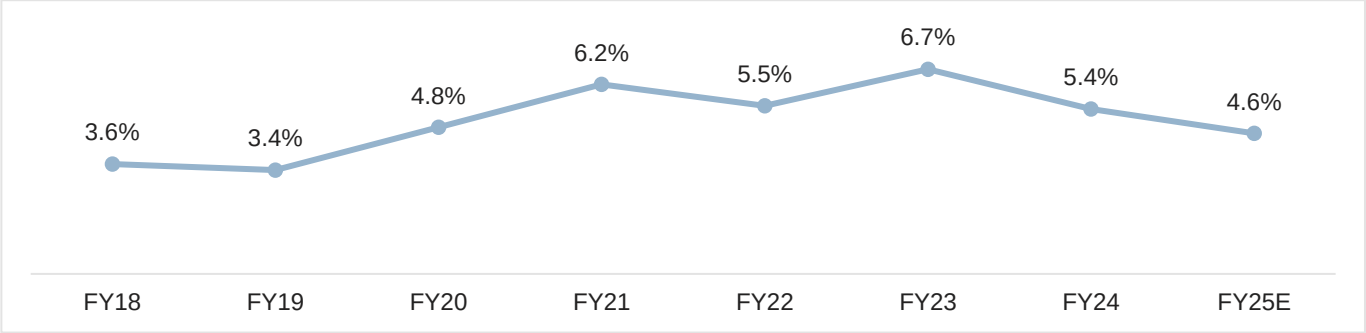
CPI trendline



Source: Ministry of Statistics and Programme Implementation (MOSPI), CRISIL MI&A Research

Agricultural incomes

Rural income growth is an important determinant of two-wheeler demand in India. Rural sales contribute nearly 55-60% of the domestic sales in India.

Within two-wheelers, although motorcycles are the preferred choice for rural customers, improvement in rural infrastructure and road connectivity has helped scooters to make inroads in rural areas. With rising electrification, a significant portion of EV demand is also coming from tier 3 and rural areas. So, the rural incomes have a direct bearing on the two-wheeler industry sales.

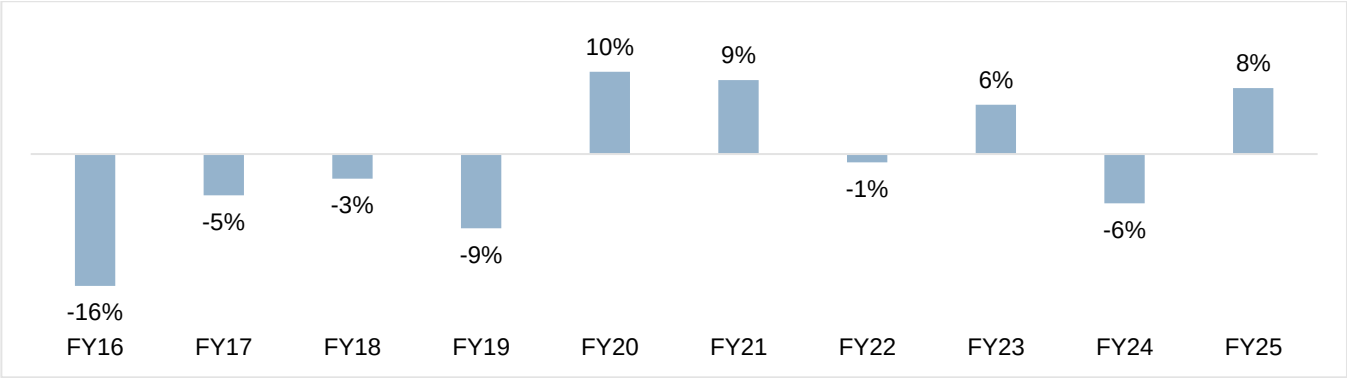
Rural India is still primarily agrarian and with 86% of land holdings, small and marginal farmers dominate the Indian agricultural landscape. These farmers rely on monsoon for irrigation; hence, its timely arrival and adequacy are needed for a good crop.

Monsoon has been favorable over the past few years with deviation in the acceptable range. Rabi output was favorable last Fiscal, supporting farmer income during the early months of Fiscal 2024. In Fiscal 2024, kharif sowing was initially delayed owing to delay in monsoon. However, sowing has picked up in recent months. Moreover, higher minimum support price (MSP) this Fiscal and good price in the mandis have maintained on-ground positivity. In Fiscal 2024 as per IMD monsoon deviation was -6%.

During the current year Fiscal 2025, India received favourable rains with 8% higher rainfall than its long period average (108% of the LPA) in the June to September 2024 period.

The expected improvement in rural incomes, subdued inflation levels as well as the possibility of a rate cut will aid the two-wheeler industry growth.

Rainfall Deviation Trend



Note: When the rainfall averaged over the country is within ±19% from its long period average (LPA).
Source: IMD, CRISIL MI&A

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Rural Infrastructure

Rural infrastructure also has a pronounced impact on rural incomes and, in turn, two-wheeler sales. Under the Pradhan Mantri Gram Sadak Yojana (PMGSY), launched in 2000, the government aims to build all-weather roads in rural India to improve connectivity as well as support the rural economy.

Over the years government has successfully executed major portion of the PMGSY annual target set for the year. Even during Fiscal 2024, government achieved 89% of the target with an addition of 26 thousand km of rural roads constructed against the target of 38 thousand km.

Expansion of the rural road network not only improves connectivity but also aids the rural economy. Improvement of rural infrastructure impacts 2W demand in two ways - directly, by generating employment in the rural economy during the construction of roads, thereby increasing wages and overall income, and indirectly by enabling mobility and accessibility.

Thus, the continued expansion in rural infrastructure is expected to back two-wheeler demand growth over the long-term horizon.

PMGSY execution

Source: NHAI, MoRTH, CRISIL MI&A

Financing support

Finance support plays an important role in the overall demand growth of the two-wheeler industry given the relatively lower income profile of customers as well as smaller ticket size of the industry.

Over the years, amidst the intensifying competition, financial institutions have expanded their reach to gain further market share within the auto finance industry. Moreover, the entry of NBFCs which focus primarily on non-metros, expanded the reach of the financing system further as banks primarily catered to the urban and salaried customers.

Going forward, CRISIL MI&A expects the finance penetration to improve further and support the growth of two-wheeler industry.

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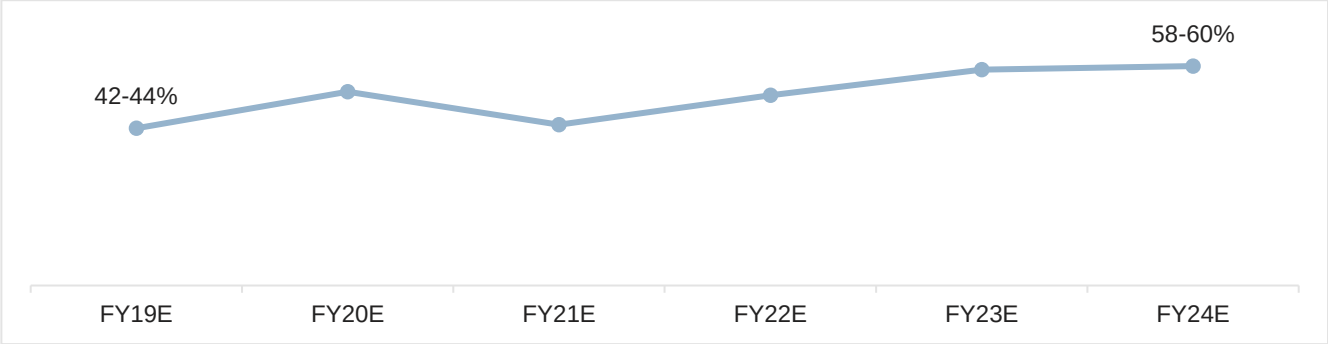
Two-wheeler finance penetration trend



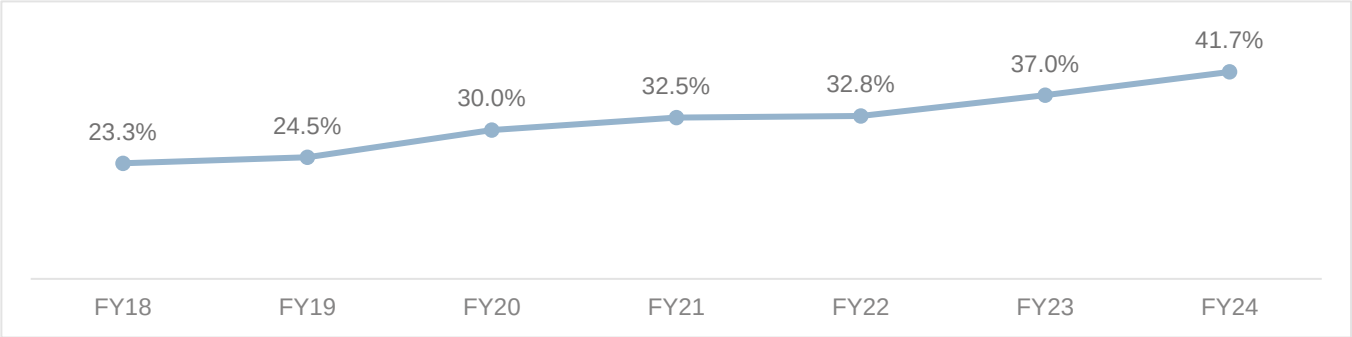
Source: CRISIL MI&A

Women participation in the workforce

Increasing female/ women participation in the Indian workforce has provided an additional boost to the two-wheeler, especially scooter sales. Given the added comfort in terms of ease of seating, lower vehicle weight, easy manoeuvrability and baggage space, scooters are amongst the preferred vehicle choices for working women.

There has also been a greater focus on increasing women participation by the corporates. This has led to improvement in the female participation in the workforce and has boosted the demand for scooters in India. The female participation in the work force has also aided the overall household incomes, boosting the two-wheeler sales as well.

Female labour force participation rate trend



Source: CRISIL MI&A

Growing Gig Economy

The gig economy is a significant contributor to the two-wheeler industry demand due to last mile delivery vehicle requirement.

According to NITI Aayog, there were nearly 6.8 million gig workers engaged in the gig economy including food, grocery, electronics, and e commerce last mile delivery work during Fiscal 2020. The gig workforce is expected to expand to 23.5 million by Fiscal 2030 backed by the expected rise in underlying industries of e-commerce and food delivery services.

The industry has managed to attract not only consumers but also investors across the world and has grown more than three-fold between Fiscals 2018 and 2023 on the back of rising internet penetration, increasing awareness of online shopping, and lucrative deals and discounts offered by well-established players and start-ups.

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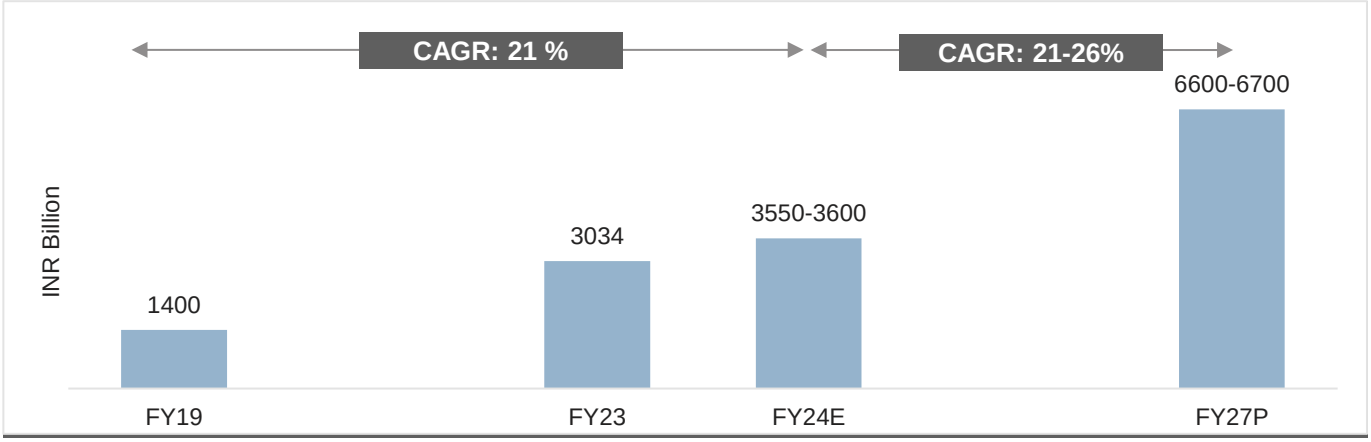
E-commerce Industry Outlook



Source: CRISIL MI&A

Premiumization in the 2W Industry

There is a clear shift towards premium vehicles being witnessed within the two-wheeler industry. Customers are looking to upgrade to the next premium vehicle segment within motorcycles as well as scooters. Younger profile of the buyers, feature rich new vehicle launches at competitive rates and financing support has aided this premiumization trend within the two-wheeler industry. In the last 5 years, as per CRISIL MI&A's estimates, the share of >=125cc motorcycles increased from approximately 38% in Fiscal 2019 to approximately 52% in Fiscal 2024. While for scooters, the share of >=125cc scooters is estimated to have risen from approximately 20% in Fiscal 2019 to approximately 47% in Fiscal 2024.

Thus, this growth of premium products – premiumization trend – has taken over multiple industries including the two-wheeler industry. Over the long-term horizon, CRISIL MI&A expects the premiumization trend to drive the overall sales in the 2W industry.

Electrification in the 2W industry

EVs are gaining global interest amidst the need to curb pollution. In India, too, EVs are gaining popularity, as the government is extending support via PM E-DRIVE and tax rate cuts to encourage EV adoption. Further, growing awareness and concerns about environmental issues are likely to drive electrification in India.

EV sales have grown, especially post pandemic aided by the rising awareness, government support and expanding EV portfolio of the industry. The entry of the new age non-traditional OEMs like Ola, Ather, and Ampere (Greaves Electric Mobility) provided an additional boost to the EV segment in India.

Going ahead, the rise in electrification is estimated to contribute significantly to the industry growth over the long term. (EVs have been covered in detail in the next chapter)

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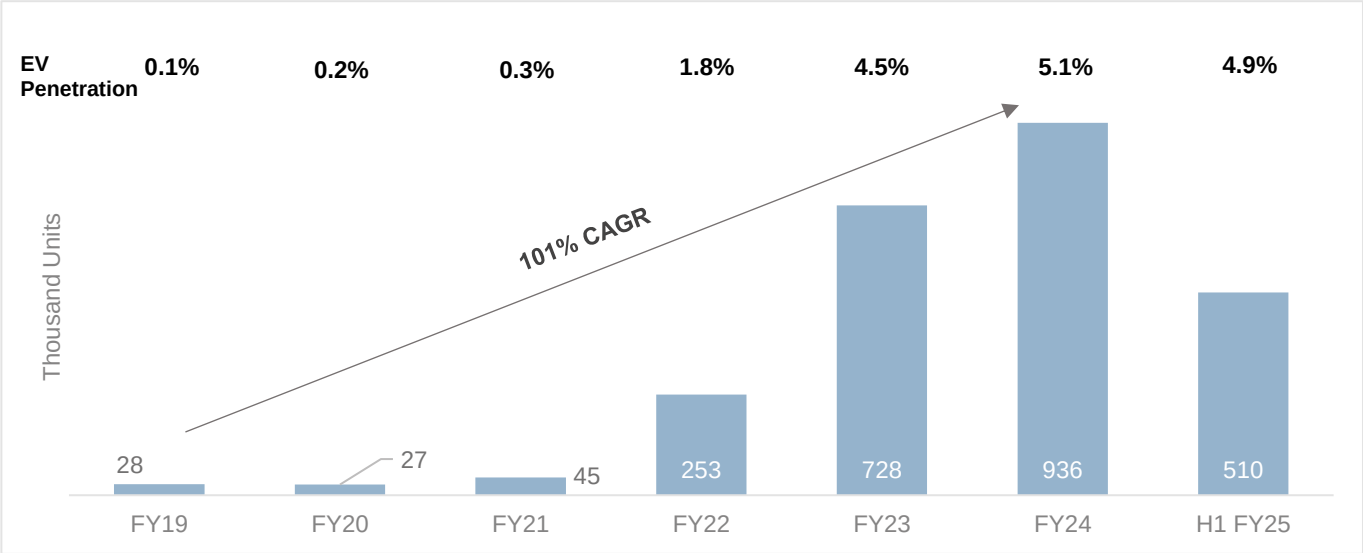
E-2W High speed retail sales trend in India



Note: VAHAN data does not include Telangana & Lakshadweep retails, only high speed EVs have been considered.
Source: VAHAN, CRISIL MI&A

Shrinking replacement cycles

The vehicle replacement cycles have been shrinking amidst the expanding vehicle portfolios by OEMs, entry of newer players into the industry - global & non- traditional, increasing number of attractive, feature rich and competitively priced vehicle launches, shortening duration of new vehicle launches by OEMs, continuous technological advancement in vehicles, younger buyer demographic, expanding financing coverage and rising awareness. The increasing share of scooters with a relatively lower ownership holding period is another factor contributing to the shortening of the replacement cycle in the overall 2W industry. Rising premiumization as well as electrification is also aiding this trend as growing number of customers make their switch from ICE to EV or to products with premium features.

From an average 10-12 years replacement cycle a decade ago, the replacement cycles have come down to 7-8 years. The shortened replacement cycle for the average customer is an added boost for the two-wheeler industry sales.

R&D support

The customer base of the two-wheeler industry today are tech savvy gen Z customers who appreciate and prefer the latest advanced features, connected technology as well as hi tech accessories for their new vehicles. Moreover, the replacement cycles have also shortened. Therefore, intermittent new vehicle launches are a must to ensure continued demand.

Thus, two-wheeler OEMs typically spend 1-2% of their revenues on Research and Development (R&D) for the latest tech, design, and features for their upcoming vehicles. R&D has also become a necessity to enhance the safety of the two-wheeler riders.

Advancement in Vehicle Technology

Over the years, there has been a significant advancement in vehicle technology as well as addition of latest features in ICE as well as EVs, making the vehicles more appealing to the customers, especially the younger buyers. EV segment has revolutionised the industry in terms of latest technological designs as well as offerings, and ICE vehicles are following with notable advancements. The latest new age vehicles offer a wide range of

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features and innovations to cater to different consumer needs offering more efficient and environmentally friendly transportation.

In recent two-wheelers, features such as digital instrument cluster (around 2010), navigation (around 2017), USB charging port (2017), Bluetooth connectivity (2018), cruise control have been added over the years. Over and above these basic features, premium vehicles including EVs offer much advanced features like full colour TFT displays, gear shift indicators, real time mileage, fuel efficiency metrics, music, calls on vehicle display, riding modes, traction control, keyless ignition, smart helmets with built in communication, etc.

As technology continues to advance, two-wheeler industry will witness more innovations in the coming years, making the ride safer and more enjoyable for the customer, thereby supporting the growth of industry over the long-term horizon.

Accessories lending further support to OEM topline and the bottom line

Over the years, traditional ICE 2W OEMs have expanded their consumer offerings with company branded accessories and merchandise like side mirrors, vehicle covers, seat covers, handlebar pads, engine guard, backrest, helmets, apparels, gloves etc. Such branded accessories form an integral part of the two-wheeler industry. For the premium models / brands, merchandising has also been actively promoted as a means to drive brand image and build long term loyalty by developing a sense of community (for example Royal Enfield). The revenues from sales of accessories & merchandise, along with those from sale of parts and spares, typically contribute approximately 10-15% of the overall revenues for the traditional ICE 2W OEMs.

In line with the ICE 2W players, the new age EV players have also entered the accessories and merchandise space and are providing some of the traditional accessories like vehicle cover, seat covers, floor mats, sidestep, t-shirts and helmets. However, they have also started to offer technologically advanced accessories for their customers including smart helmets, portable chargers, fast chargers, electronic tyre inflators, pressure monitors etc. These advanced accessories are sold at a premium over the general accessories as they have technology integrations that cater specifically to the E-2W customer. Going forward, the demand for such accessories is expected to rise along with the growth of the overall E-2W industry.

These accessories and merchandise products are high gross margin (25-30%) products for the OEMs which not only promote the brand but also provide an added support to the company top line as well as bottom line.

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2.2 Review of the E-2W industry in India

India is a signatory to the Paris Agreement under the United Nations Framework Convention on Climate Change. The country is also part of the EV30@30 campaign, targeting 30% sales share for EVs by 2030. The country is the largest two-wheeler market by volumes globally. Two-wheelers also comprise 75% of India's total automobiles sales volume today. Thus, a sizeable contribution to electrification is expected to come from the two-wheeler segment.

In India, the EV two-wheelers (E-2W) are gaining popularity enabled by the government's support via Faster Adoption and Manufacturing of Hybrid and Electric vehicles (FAME II), the EMPS subsidy, the latest PM E-DRIVE subsidy, state subsidies and tax rate cuts coupled with growing awareness and concern for environmental issues. Additionally, the E-2W portfolio is expanding with technology-rich vehicles that are being launched at competitive rates, which is driving consumer interest and growth of E-2Ws in India. Significant strides in product evolution are one of the primary reasons for the sharp growth witnessed in the E-2W segment in India.

Evolution of E-2W offerings

Electrification in the two-wheelers industry started with low-speed electric two-wheelers. These low-speed electric vehicles had a much smaller battery and a speed limit of about 25 kmph. They were primarily used for a short commute and did not warrant a registration. The market for low-speed electric two-wheelers remained unorganised with Indian manufacturers primarily assembling imported parts from China.

The real push to electrification in the two-wheelers industry came from the launch of high-speed electric two-wheelers (speed >25kmph). These electric vehicles were comparable to their ICE counterparts in terms of power as well as speed. The organised nature of the high-speed electric two-wheelers industry also provided authenticity and trust to the E-2W segment. Further, in 2018 Ather Energy launched the country's first smart electric scooter with features like touchscreen dashboard, connectivity features via 3G sim card and onboard navigation.

Since then, E-2Ws have witnessed noteworthy advancements in terms of technology as well as features, thereby incentivising the shift from ICE towards EVs.

For a typical E-2W, battery forms the consequential 35-40% of the vehicles manufacturing costs, followed by 15-20% contribution each from the chassis/platform and the Motor & Motor controller. The rest 20-25% is contributed by other mechanical and electrical parts.

In the last 6 years, battery technology has also witnessed significant advancements with the LFP (Lithium-iron Phosphate) batteries, NMC (Lithium Nickle Manganese Cobalt) & NCA (Lithium nickel cobalt aluminium oxide) batteries. These latest batteries offer much better energy density, thermal tolerance and in turn higher range and life.

The two most common versions of lithium-ion batteries that have proven to be the most suitable and viable for India are LFP and NMC. In the NMC chemistry, the cathode material is made of lithium, nickel, manganese, cobalt, and oxide. LFP cathode includes three materials – lithium, iron and phosphate. The phosphate material has high decomposition temperature (>400°eC), giving it a strong safety advantage in case of elevated temperature operations. LFP cells have cycle life and power capability comparable to NMC cells. However, their energy density is relatively lower. However, LFP batteries have a lower material cost compared to NMC since LFP batteries require less rare earth minerals in their construction. Also, iron is abundant in India, hence is not dependent on imports or impacted by price fluctuations due to global supply shocks.

These technological advancements have helped EV OEMs address one of the primary concerns regarding the usage of EVs- the range anxiety. In fact, the high-speed electric vehicles launched around Fiscal 2018 had a relatively limited range of about 60-75km per charge. In the next 6 years, the range has nearly doubled to 100-150km per charge.

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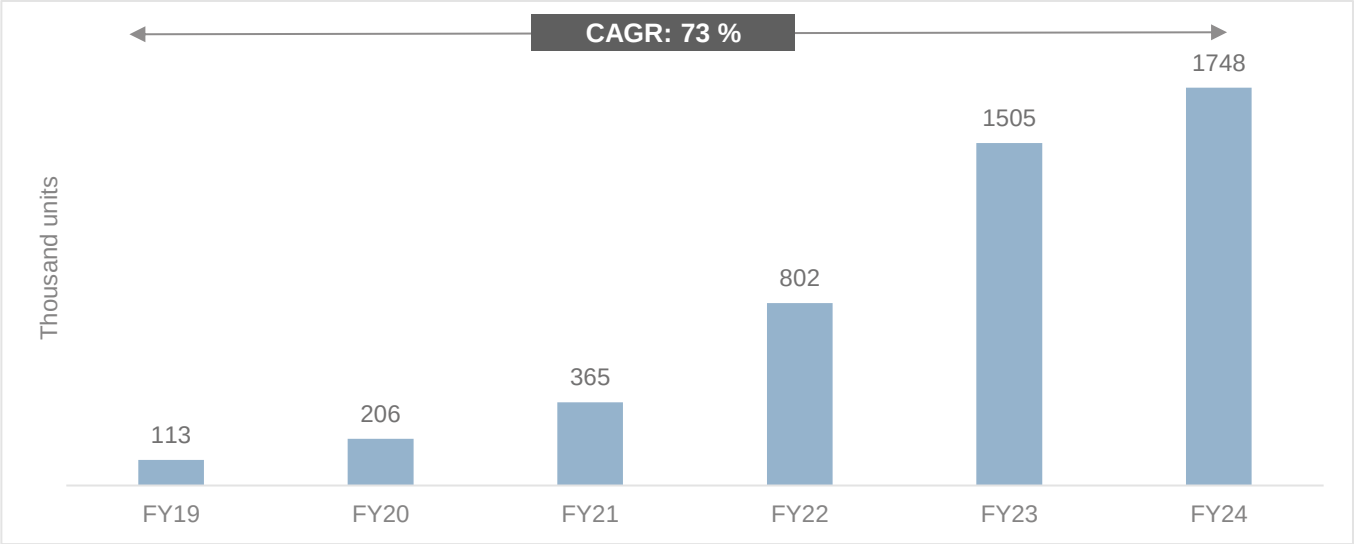
Moreover, battery safety has also enhanced in India with AIS 156 regulations and improvements in battery chemistry like LFP which offer better life and thermal tolerance compared to the old lead acid batteries. In June 2024, Bureau of Indian Standards (BIS) introduced two new standards for EVs, IS 18590: 2024 and IS 18606: 2024, focussing on increasing safety of critical component- powertrain ensuring safety of the vehicle as well as the rider.

Moreover, number of product offerings have expanded significantly in the last few years further propelling the industry growth. EV OEMs have expanded their offerings across multiple price brackets and battery capacities, in order to cater to various customer requirements.

Additionally, over the years, OEMs have also introduced high performance e-scooters which offer maximum speed of more than 80 km/hr to cater to customers who value power and performance.

E-2W Retails (high and low speed) trend – Fiscals 2019 to 2024



Note: Volume include both high speed and low speed EVs.
Source: VAHAN, Mordor, CRISIL MI&A

The continued improvements in offerings coupled with rising awareness about EVs as well as government support aided the overall e two-wheeler sales in the last 5 years. The E-2W retails rose at a sharp 73% CAGR between Fiscal 2019-2024 period.

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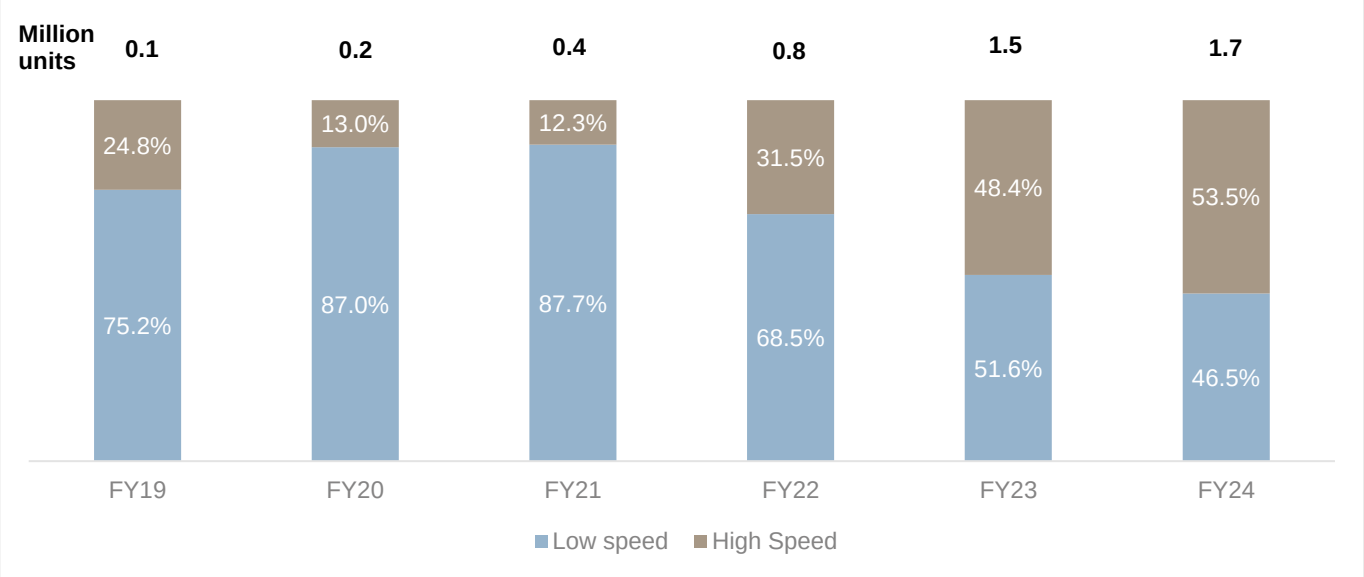
Segment wise split trend – Fiscal 2019 to 2024



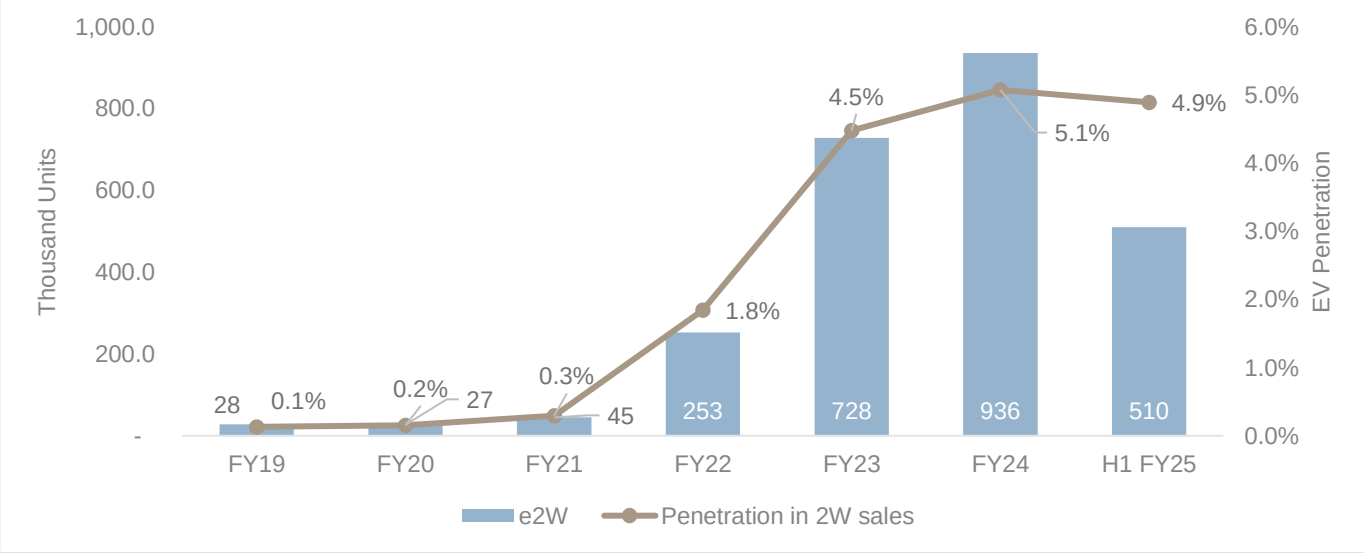
Source: VAHAN, Mordor, CRISIL MI&A

The spectacular rise of high speed E-2Ws at 102% CAGR provided the real thrust to the overall E-2W segment growth. Entry of new players, expansion in product offerings, competitively priced feature rich vehicle launches backed the sharp growth of high speed E-2Ws. In turn, their share more than doubled from approximately 25% in Fiscal 2019 to more than 50% by Fiscal 2024.

Although, low speed E-2Ws lost sizeable ground from a high base of Fiscal 2019, the segment witnessed a healthy growth at 57% CAGR during Fiscal 2019-2024 period.

High Speed E-2W Segment

E-2W Retails (high speed) and Penetration trend – Fiscal 2019 to H1 Fiscal 2025



Note: Only high-speed electric two-wheelers have been considered for the analysis
Source: SIAM, SMEV, VAHAN, CRISIL MI&A

High speed E-2W retails were growing only at a moderate pace till Fiscal 2022 due to limited vehicle portfolio, lower awareness, customer concerns regarding the range, charging infrastructure etc; despite the ₹ 10,000 per kWh government incentive under the FAME scheme. In June 2021, demand incentive for E-2Ws was increased to ₹

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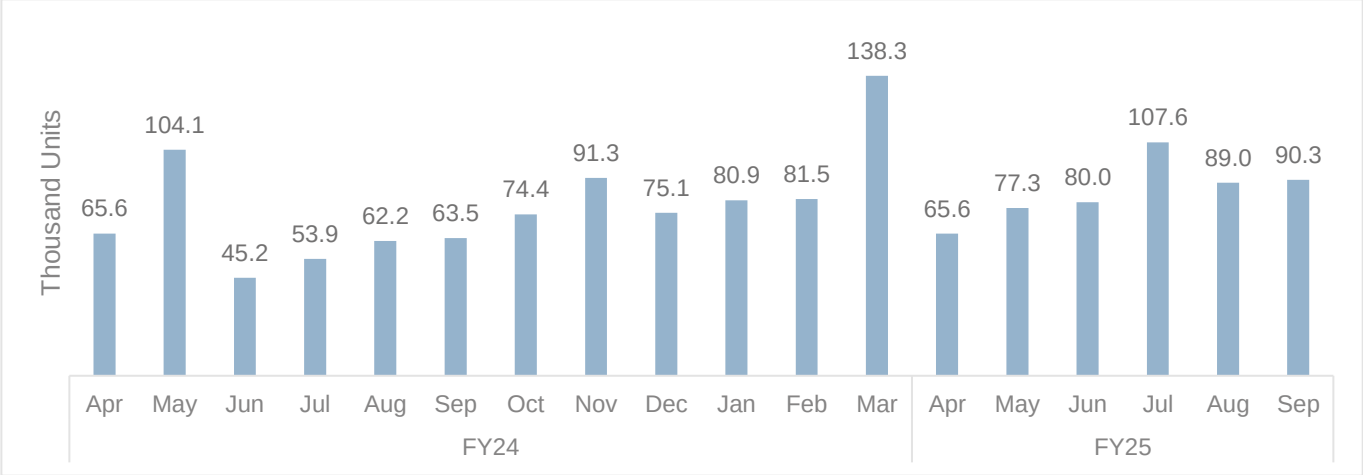
15,000/ kWh from ₹ 10,000/kWh incentive given earlier. This heightened FAME incentive coupled with expansion in vehicle portfolio by players as well as entry of Ola provided an additional thrust to the E-2W retails in Fiscal 2022.

Additionally, ICE vehicles witnessed a steep rise in prices in Fiscal 2021 due to the BS VI implementation and a further hike during Fiscal 2022 amidst the hike in raw material prices. This price hike was much higher than the normal 3-4% annual hike undertaken by the industry. The surge in vehicle acquisition costs, coupled with the steep rise in petrol prices—crossing the ₹ 100 mark—acted as a strong catalyst for customers to transition from ICE vehicles to electric two-wheelers (E-2Ws). Additionally, in Fiscal 2022, the impact of the severe second wave of COVID-19, which strained incomes and drove up medical expenses, led many consumers to prioritize essential spending.

Thus, the increased subsidy on E-2W, vehicle portfolio expansion coupled with increased acquisition and operating costs of ICE 2Ws led to the sharp growth in E-2W retails during Fiscal 2022. E-2W retails rose 5.6x from 45k in Fiscal 2021 to approximately 253 k in Fiscal 2022.

Growth momentum continued for the high speed E-2W segment in Fiscal 2023. During the year, sharp push from new age EV players supported the growth in E-2W. The legacy OEMs also scaled up their EV production, providing an added push to the EV retails during the year.

E-2W (High Speed) Retails trend for Fiscal 2024 & H1 Fiscal 2025



Note: Only high speed EVs have been considered.
Source: VAHAN, CRISIL MI&A

At the start of Fiscal 2025 in April, retail sales were initially lower due to pre-buying in March 2024, prompted by the discontinuation of the FAME 2 subsidy. However, retail sales reached 107.6k units in July as pre-buying happened in anticipation of the EMPS program ending on July 31, which was then extended to September 30, 2024. The EMPS was subsequently replaced by the PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) subsidy starting on October 1, 2024.

For Fiscal 2025 initially, the government introduced Electric Mobility Promotion Scheme 2024 (EMPS 2024). The scheme which ended on 30th September 2024, offered support of up to ₹ 10,000 per two-wheeler for about 333 thousand two-wheelers, which continue to aid E-2W demand, at least in the short term.

New PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) Scheme for promotion of electric mobility in the country has been implemented from Oct 1, 2024, to Mar 31, 2026. The scheme has an outlay of ₹ 109 billion over a period of two years. The scheme aims to incentivize approximately 2480 thousand electric two-wheelers (E-2Ws). Only E-2Ws equipped with advanced batteries are eligible for this incentive. Both commercially registered and privately owned E-2Ws can benefit from the scheme.

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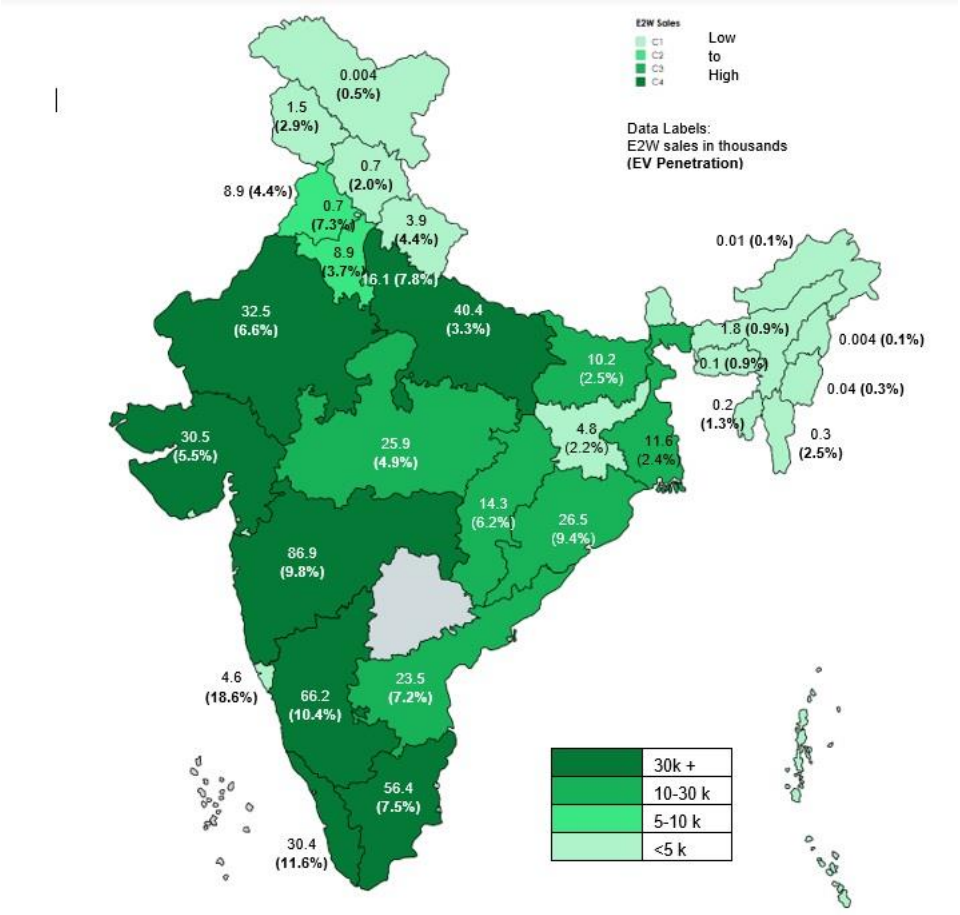
The demand incentive is proposed at ₹ 5,000 per kWh for E-2Ws registered in FY 2024-25 with maximum cap of ₹ 10,000 and ₹ 2,500 per kWh for FY 2025-26 with a maximum cap of ₹ 5,000. Incentives will be capped per vehicle or at 15% of the ex-factory price, whichever is lower.

State wise electric two-wheeler sales and EV penetration for H1 of Fiscal 2025

The below graph showcases e2W penetration and e2W sales by states. Few large states like Maharashtra, Tamil Nadu, Karnataka, Gujarat have high EV penetration despite the significant overall two-wheeler sales.

Eastern states including the seven sisters, West Bengal and Jharkhand have very low EV penetration between 0-3%. Northern states like Punjab, Himachal Pradesh, Uttarakhand, and Jammu Kashmir also have low EV penetration in the range of 2-5%.



Note: Data as of H1 of Fiscal 2025, Does not include Telangana EV retails, Only High Speed EVs have been considered.
Source: VAHAN

Competitive landscape of the high speed electric 2W industry

The high speed E-2W segment has been highly concentrated with a few players primarily catering to the entire segment. During Fiscal 2019, a few OEMs like Hero Electric and Okinawa completely dominated the market with more than 80% of the market share. Over the years, with the entry of new players, EV launches from legacy ICE OEMs as well as expansion in EV portfolio of players, competition intensified within the EV space.

High speed vehicles offered initially by Hero Electric, Okinawa and Greaves Electric Mobility-GEM (Ampere) offered relatively lower speed and acceleration compared to the ICE counterparts. Ather Energy entered the market in Fiscal 2019 with its 450 model which offered comparable power and acceleration as an ICE vehicle. This helped Ather Energy achieve approximately 11% market share in Fiscal 2020 and they have managed to maintain that

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share through multiple updates and had a 11.5% market share in Fiscal 2024. Amidst the intensified competition, Ather energy has lost share in H1 of Fiscal 2025 to 9.9%.

Ola Electric (Ola) entered the EV market in Fiscal 2022 and expanded its presence at a very fast pace and became the leading contributor to EV retails in India. Expansion in product portfolio and distribution network thrusted the contribution of Ola in E-2W market. As of Fiscal 2024, Ola has the market leadership in E-2W sales with a share of 35.1%. In H1 of Fiscal 2025 Ola share increased to 39.7%.

The legacy OEMs have also entered the EV space. TVS introduced the iQube model in Fiscal 2020 and has gradually increased its supply over the years. It's model iQube received healthy traction helping them clock second highest retails during Fiscal 2024. It has remained second largest in H1 of Fiscal 2025 but has lost some share during the period.

Bajaj's Chetak EV was introduced in Q4 of Fiscal 2019. The company gradually expanded its presence across the country in the next few years. With increased company focus, coverage expansion and higher production, the company's share increased to nearly 11% in Fiscal 2024 and the share expanded to 15.6% in H1 of Fiscal 2025.

Greaves Electric Mobility (GEM) is one of the players having vehicles across all segments of the E-2W market which are low speed, and high speed for both B2B and B2C markets. With its brand, Ampere- which was there in the low-speed EV segment since 2008, entered the high-speed market in Fiscal 2020 and gradually expanded its presence in the high speed E-2W space. In Fiscal 2023, company's market share reached 12% levels. However, amidst the increased competition, the company lost some ground during Fiscal 2024 to 5.7% and to 3.2% in H1 of Fiscal 2025.

HMCL entered the EV segment with VIDA in Fiscal 2023. Company's contribution increased to approximately 2% by Fiscal 2024 amongst intensified competition in the E-2W industry.

In late November 2024, HMSI entered the electric scooter market with the launch of the Activa e model featuring swappable batteries, and the QC1 model equipped with a fixed battery system. Deliveries for the same will start in February 2025. This move is expected to further boost the electric vehicle market.

Erstwhile leading contributors in the E-2W industry, Hero Electric and Okinawa faced stiff competition from newer entrants and increased focus from other legacy two-wheeler manufacturers. From a high base, their share contracted in the next 3 years.

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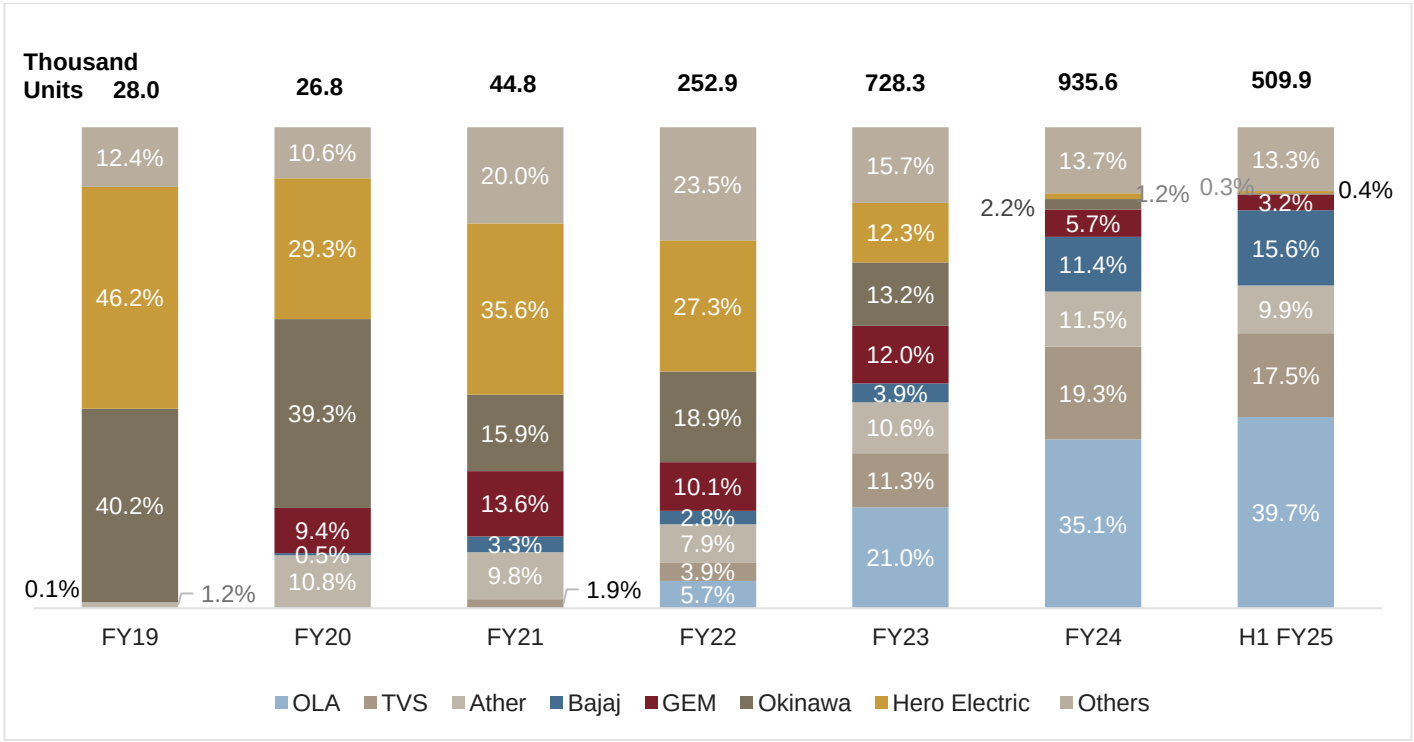
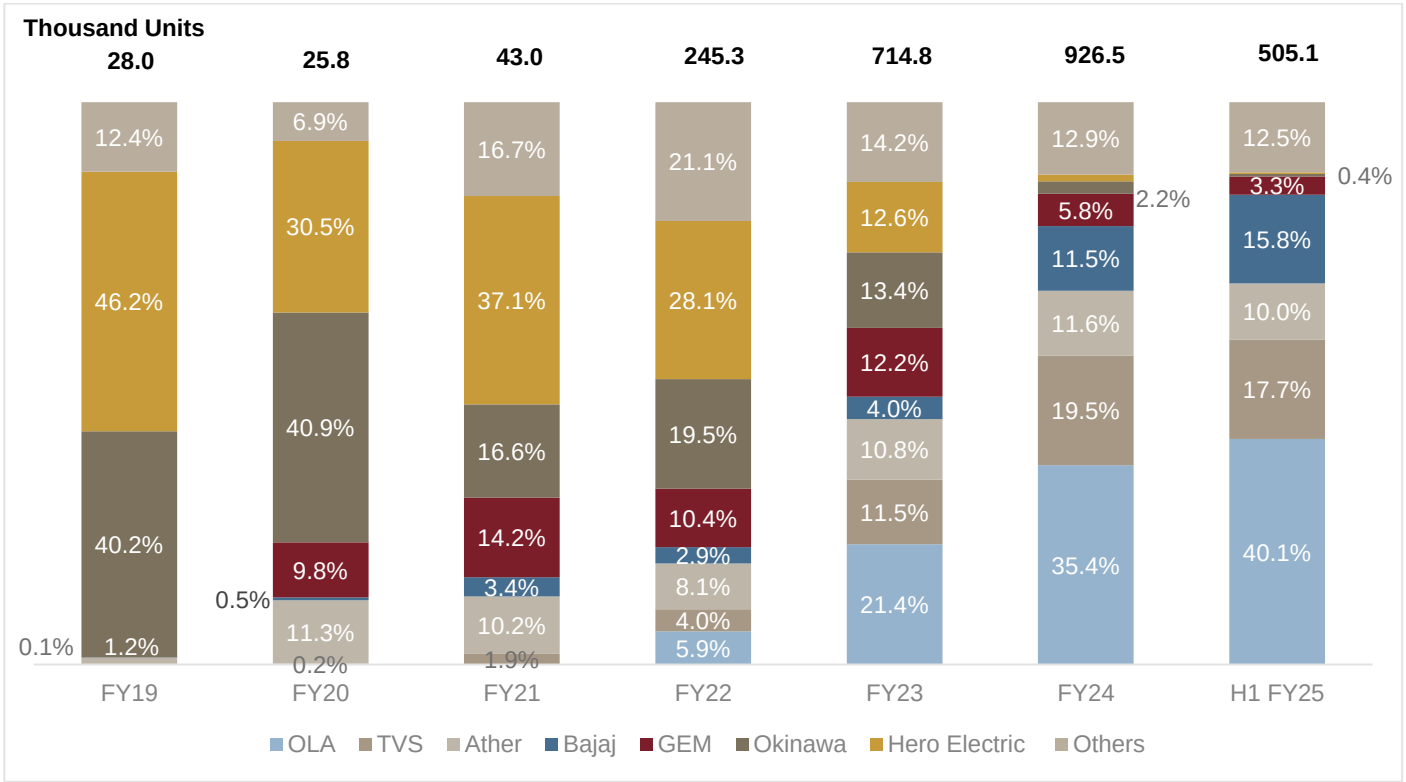
OEM wise contribution to E-2W retails (High Speed)



Note: Only High Speed EVs have been considered
Source: VAHAN, CRISIL MI&A

OEM wise contribution to High speed EV scooter retails



Note: Only High Speed EVs have been considered
Source: VAHAN, CRISIL MI&A

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OEM wise contribution to state wise High speed E-2W retails for H1 Fiscal 2025

State	Share in India Sales	Ola	TVS	Ather	Bajaj	GEM	Others
Andaman & Nicobar Island	**0.0%**	0.0%	33.3%	20.8%	0.0%	0.0%	45.8%
Andhra Pradesh	**4.6%**	53.4%	13.0%	9.1%	12.3%	1.5%	10.7%
Arunachal Pradesh	**0.0%**	28.6%	0.0%	71.4%	0.0%	0.0%	0.0%
Assam	**0.3%**	60.7%	3.7%	11.2%	7.7%	4.0%	12.7%
Bihar	**2.0%**	49.0%	8.7%	2.9%	4.6%	10.1%	24.6%
Chhattisgarh	**2.8%**	30.4%	35.1%	3.3%	16.1%	4.0%	11.1%
Chandigarh	**0.1%**	36.7%	20.1%	1.3%	13.0%	15.4%	13.5%
Delhi	**3.1%**	44.0%	14.2%	7.8%	8.0%	1.7%	24.3%
DNH&DD	**0.0%**	50.0%	8.6%	15.0%	9.3%	0.7%	16.4%
Goa	**0.9%**	50.5%	6.5%	14.9%	22.1%	0.4%	5.6%
Gujarat	**6.0%**	44.5%	18.0%	9.7%	16.9%	1.7%	9.3%
Himachal Pradesh	**0.1%**	54.7%	0.9%	0.4%	21.0%	3.1%	19.8%
Haryana	**1.7%**	73.5%	8.4%	2.7%	3.3%	2.5%	9.6%
Jharkhand	**0.9%**	43.6%	18.4%	8.8%	5.4%	5.8%	18.0%
Jammu & Kashmir	**0.3%**	61.4%	1.8%	14.6%	8.3%	1.4%	13.1%
Karnataka	**13.0%**	32.1%	18.4%	21.6%	8.2%	2.1%	17.6%
Kerala	**6.0%**	29.6%	14.5%	22.6%	24.4%	1.2%	7.8%
Ladakh	**0.0%**	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Maharashtra	**17.0%**	26.8%	16.1%	7.7%	34.6%	2.0%	12.8%
Meghalaya	**0.0%**	84.6%	0.0%	1.9%	4.8%	0.0%	8.7%
Manipur	**0.0%**	41.0%	0.0%	2.6%	0.0%	0.0%	56.4%
Mizoram	**0.1%**	1.4%	13.4%	84.8%	0.4%	0.0%	0.0%
Madhya Pradesh	**5.1%**	38.6%	28.3%	4.4%	16.5%	1.9%	10.3%
Nagaland	**0.0%**	25.0%	0.0%	50.0%	0.0%	0.0%	25.0%
Odisha	**5.2%**	47.2%	17.7%	4.4%	11.1%	4.7%	15.0%
Punjab	**1.8%**	47.7%	24.6%	4.2%	14.0%	3.2%	8.0%
Puducherry	**0.4%**	34.0%	31.7%	8.2%	12.5%	3.0%	10.6%
Rajasthan	**6.4%**	43.8%	22.9%	5.3%	9.3%	1.7%	17.0%
Sikkim	**0.0%**	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tamil Nadu	**11.1%**	36.0%	17.9%	12.0%	8.9%	9.5%	15.7%
Tripura	**0.0%**	81.0%	2.4%	0.4%	7.3%	2.0%	6.9%
Uttarakhand	**0.8%**	53.0%	10.0%	9.0%	5.8%	5.3%	16.8%
Uttar Pradesh	**7.9%**	51.8%	16.3%	3.4%	10.4%	1.9%	16.3%
West Bengal	**2.3%**	65.2%	2.6%	5.4%	10.9%	1.9%	14.0%

Note: Represents contribution within high speed E-2Ws
Source: VAHAN, CRISIL MI&A

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Low Speed E-2W Segment

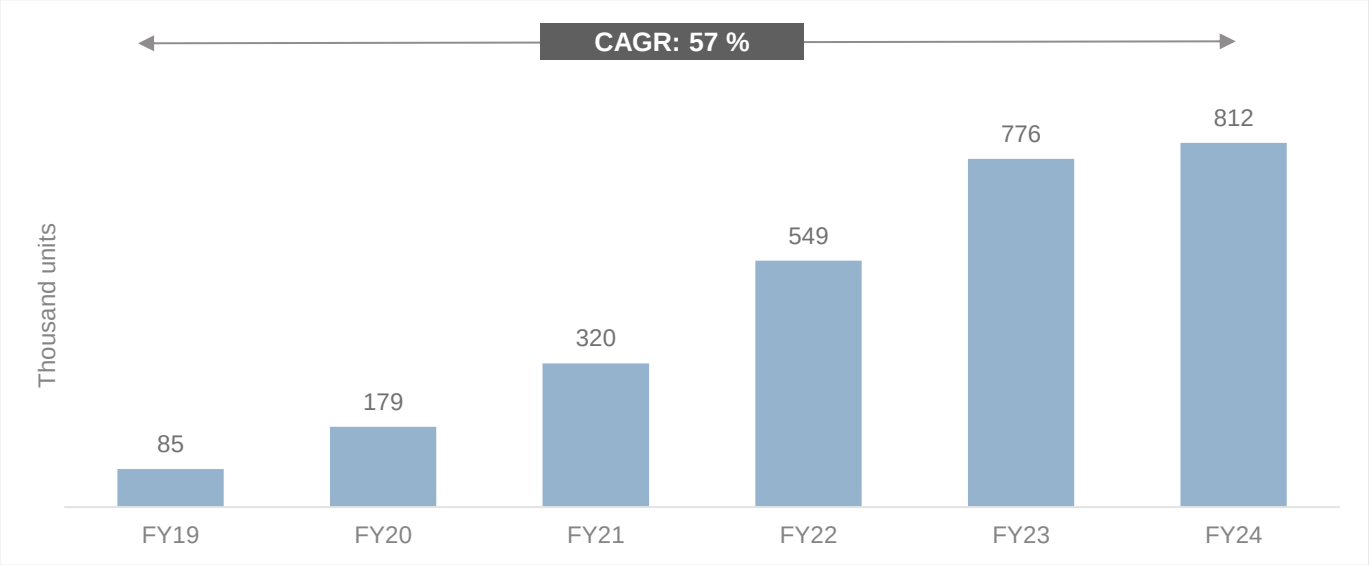
India is one of the largest markets for low-speed electric two-wheelers, primarily driven by their widespread use in e-commerce and online food delivery services. These low-speed electric vehicles are equipped with smaller batteries and have a speed limit of roughly 25 km/hr.

During the last 5 years, the low speed E-2W segment witnessed a healthy growth at 57% CAGR primarily supported by growing demand from the e commerce and last mile delivery segment. There has also been upgradation happening from bicycles towards the low speed E-2W segment by price sensitive customer base. This B2C demand has also aided the growth of low speed E-2W segment.

In Fiscal 2024, approximately 0.8 million low-speed electric two-wheelers were sold across the country. According to Mordor, notable models in this category include the GEM Reo, Detel Easy Plus, Avon E Plus, Hero Electric Flash E2, and Lohia Oma Star Li electric scosoter.

In recent years, companies like Zomato have collaborated with two-wheeler manufacturers to introduce low-speed electric two-wheeler fleets for last-mile delivery operations.

E-2W Retails (low speed) – Fiscal 2019 to 2024



Source: Mordor

Competitive landscape of the low speed electric 2W industry

The low-speed electric two-wheeler (E-2W) segment has seen considerable fragmentation over the past five years, with numerous new players entering the market.

Amidst the intensifying competition within the segment coupled with increasing focus towards the high-speed segment, the share of relatively larger players contracted over the years.

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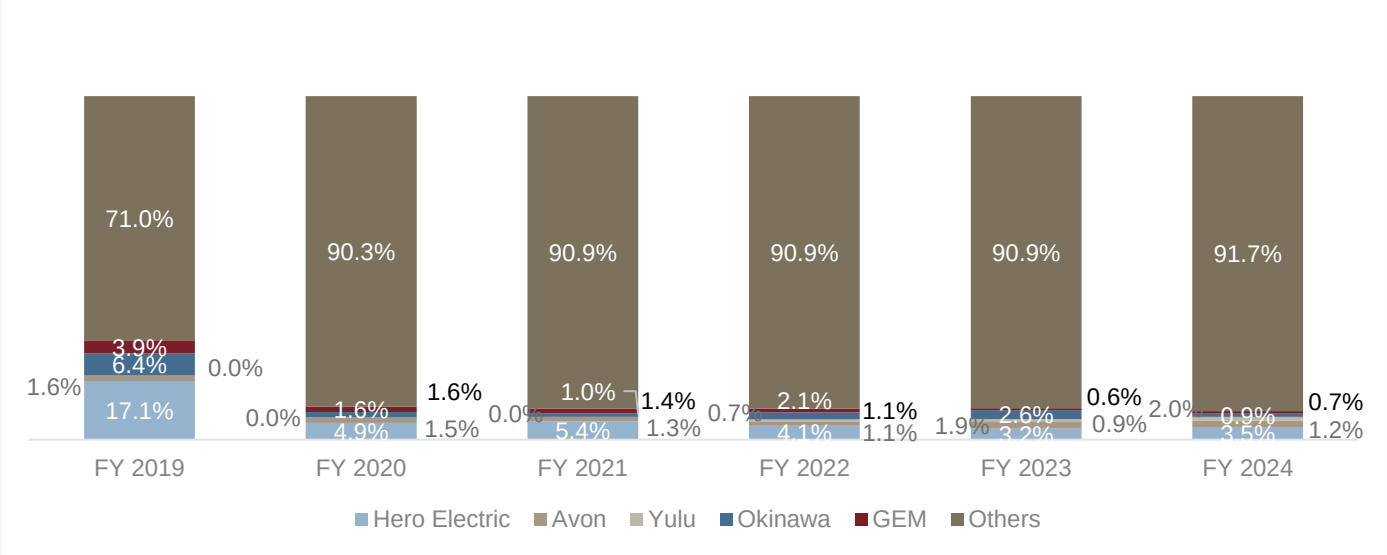
OEM wise contribution to E-2W retails (low Speed)



Source: Mordor

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Key Growth Drivers for Two-wheeler Electrification

Over and above the growth of drivers of electrification mentioned in the previous section, below are few key drivers of electrification within the two-wheeler industry.

Cost of Ownership Comparison - EV vs ICE

For the Total cost of ownership (TCO) calculation, an annual running of 8000 km is considered, i.e., 25 km per day for 325 days of operation per year. A 7-year holding period is considered, assuming no battery replacement happens during the ownership period.

As of fiscal 2025, the total cost of ownership (TCO) of an e2W, with subsidy till fiscal 2026, was 52% lower than that of an ICE 2W for an annual running of 8,000 km.

Going ahead, by Fiscal 2030, for an annual running of 8,000 km, the E-2W TCO is projected to be 51% lower than its petrol counterpart even without the subsidy. Total cost of ownership for an E-2W is decreasing over the years amidst the lowering global battery prices, economies of scale and improving technology resulting in higher manufacturing efficiency of the electric vehicles.

However, despite the favorable TCO, the acquisition cost (ex-showroom price without subsidy) for an E-2W was about 54% higher than its ICE counterpart during Fiscal 2025. Going ahead, this price gap between the two is expected to narrow down considering the expected decline in battery prices and improving economies of scale, despite standard inflation impact.

E-2Ws currently offer more advanced technological features such as touch screen displays, map based navigation, Bluetooth and LTE connectivity.

TCO for seven-year ownership with subsidy till Fiscal 2026

Year/Annual Running	3,000 km	6,000 km	8,000 km	10,000 km	12,000 km
Fiscal 2025E	30% lower cost than petrol	46% lower cost than petrol	52% lower cost than petrol	57% lower cost than petrol	60% lower cost than petrol
Fiscal 2030P	30% lower cost than petrol	45% lower cost than petrol	51% lower cost than petrol	55% lower cost than petrol	59% lower cost than petrol

Note:

- *Analysis done for Delhi*
- *Subsidy scenario till Fiscal 2026 includes Central subsidy and State Subsidy, no subsidy is considered post Fiscal 2026.*
- *GST and road tax structure have been assumed to be constant as per current structure.*
- *Above analysis is done without considering battery replacement*

Source: CRISIL MI&A

Charging Infrastructure for 2Ws

Charging infrastructure plays a significant role in growth of EV adoption.

For E-2Ws, the number of public chargers in Fiscal 2024 was 18,326 and is expected to grow at a CAGR of 35-38% from Fiscal 2024 to Fiscal 2031. The connector types for E-2Ws considered as per BEE India are Bharat AC-001, Bharat AC-001, Light EV AC Charge point, Light EV DC Charge point, and Light EV Combined Charging standard (LECCS).

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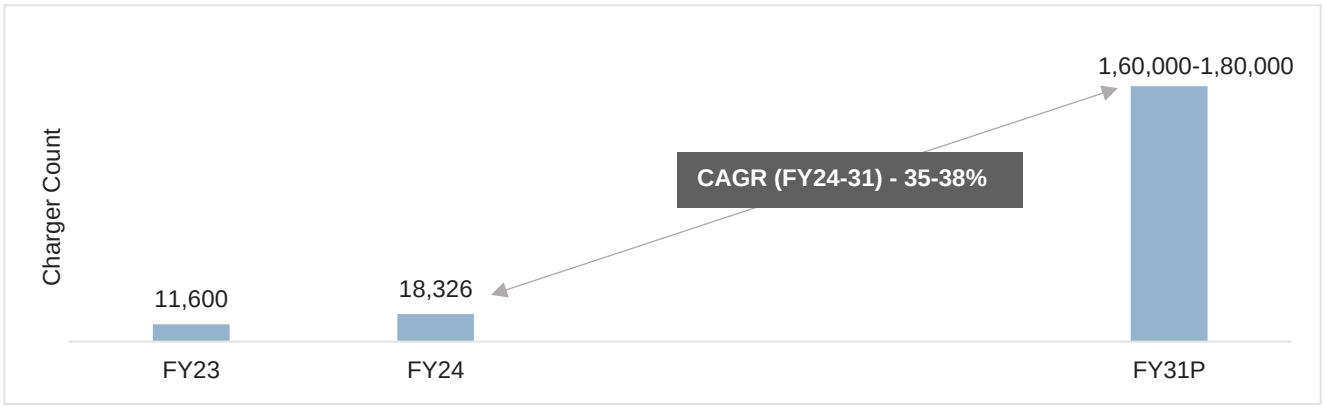
Two wheeler public Charging infrastructure outlook



Source: BEE India, Crisil MI&A
Note: P=Projected

The chargers depicted in the chart above represent public charging stations as per BEE standards. However, it's important to note that for every electric two-wheeler (E-2W) sold, a home charger is provided which can be plugged into a standard 6A / 5A socket.

Scale Expansion

Amidst the fast-rising electrification within the two-wheeler industry, new age players as well as legacy players have planned capacity expansion over the medium to long term horizon. Large players in the EV space like Ola and Ather energy have aggressive expansion plans. Ather energy has planned to double its capacity in the next 3 years to approx. 1.4 mn. Ola has planned to expand its capacity to 10 mn through multiple sequential additions to its current capacity of approximately 2mn. The EV Megasite of GEM also has expandable capacity which can be ramped up to 1 million units.

This increased production capacity is expected to provide the required support for further electrification. Additionally, the increased production levels are expected to bring in economies of scale going ahead, helping the industry keep the vehicle prices competitive over the long-term horizon.

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2.3 Outlook on the 2W Industry

Domestic High Speed Two-Wheeler Industry Outlook

The industry is expected to continue its growth momentum over the long-term horizon led by the positive microeconomic and macroeconomic environment, favourable rural demand, premiumization, intermittent launches, shrinking replacement cycle and continued support from financers. Moreover, continued R&D investments by the OEMs and the technological advancement in the industry is expected to provide an added support to the growth of the industry over the long-term horizon.

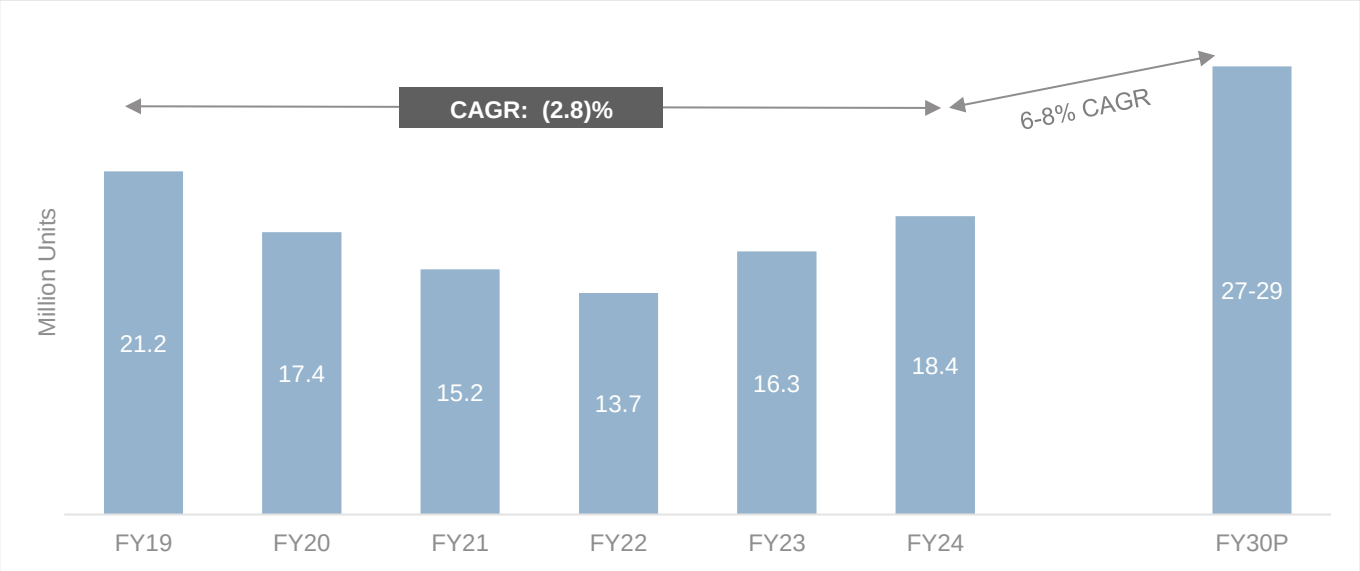
Additionally, the fast-rising EV segment, with EV portfolio expansion by legacy players, capacity expansion by new age players will accelerate the industry growth.

Introduction of CNG powertrain motorcycle by Bajaj, which will offer lower operating costs compared to petrol variants, will push the two-wheeler industry growth further.

Led by these positive industry drivers, the two-wheeler industry sales are projected to grow at 6-8% CAGR and reach volumes of 27-29 million by Fiscal 2030. Of this, the E-2W segment is projected to clock a healthy CAGR of 40-45% during the period and the ICE 2W vehicle segment is expected to grow at a moderate pace of 1-3% CAGR.

With the growth in E-2Ws, the EV penetration is expected to reach 28-32% of overall 2W industry sales by Fiscal 2030. (EV subsegment outlook is covered in detail in the later section)

Domestic High Speed two-wheeler industry outlook



Note: Overall numbers include EVs, In case of EVs only High speed EVs have been considered
Source: SIAM, VAHAN, CRISIL MI&A

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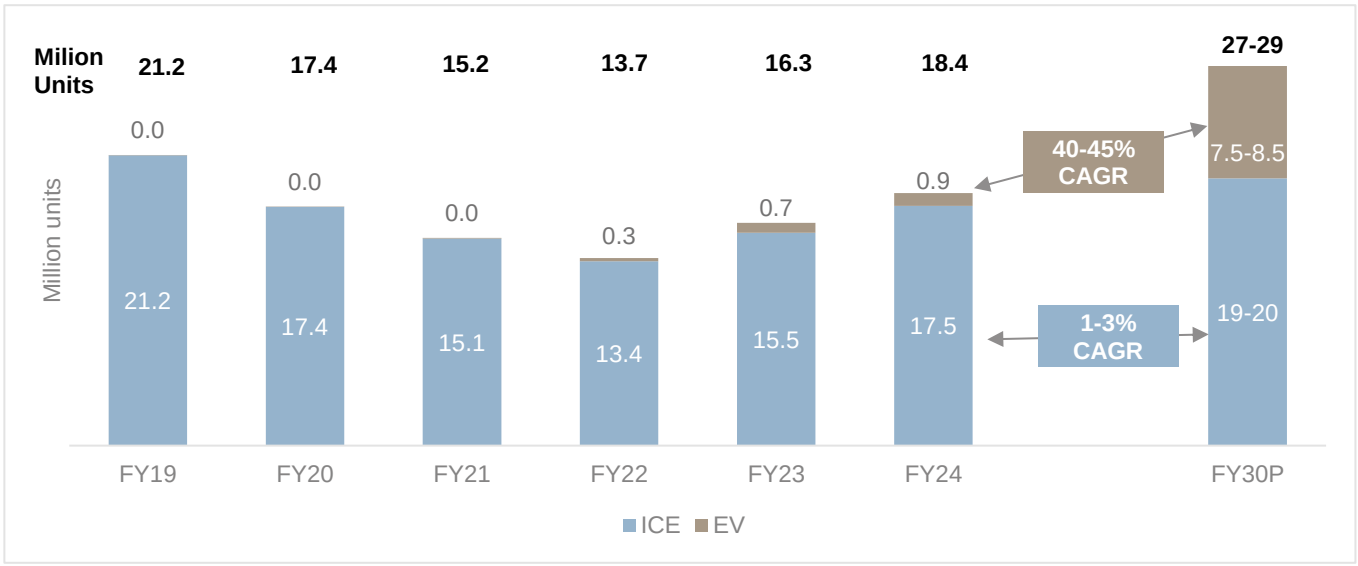
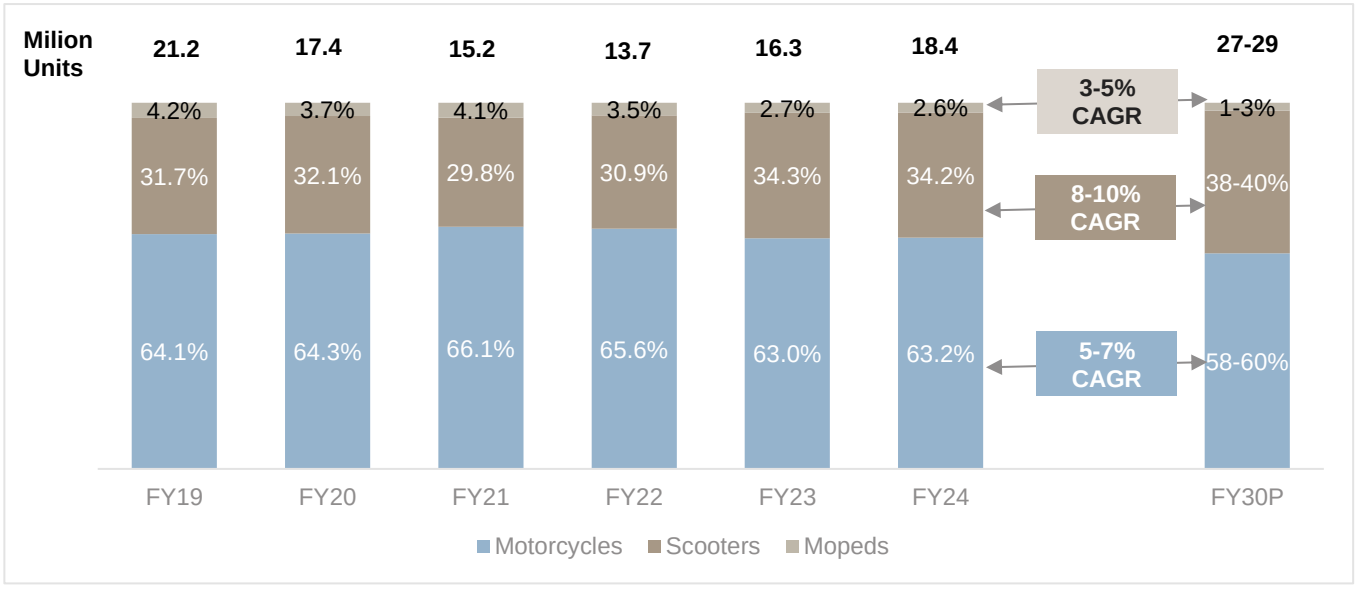
Domestic High speed two-wheeler industry powertrain wise outlook



Note: Figures above the graph showcase the total sales, In case of EVs only high speed EVs have been considered.
Source: SIAM, VAHAN, CRISIL MI&A

Going ahead, over the long-term horizon, CRISIL MI&A expects the scooter segment to grow at a much faster pace off the relatively lower base, backed by expected sharp rise in e-scooter demand, ubiquitous usage of scooters, rising share of women in workforce, projected growth of e commerce segment coupled with continued focus of OEMs on the scooters segment. The strong launch pipeline, especially for e-scooters and faster replacement cycles of the scooters segment will also back the faster growth of the scooters segment. Further, the improvement in supporting charging infrastructure is expected to provide added impetus to the segment's growth.

Segmental Split Outlook



Source: SIAM, VAHAN, CRISIL MI&A

Motorcycles, on the other hand, are projected to grow at a slower pace over the long-term horizon- till Fiscal 2030. The primary contributor to motorcycle sales, the ICE motorcycles are expected to grow at a slower rate. The >=125cc subsegments are expected to continue to provide the thrust to the motorcycles segment going ahead while the <=110cc subsegment is projected to grow at only a moderate pace. Premiumization and upgradation will limit the growth of <=110cc motorcycles subsegment

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Mopeds are expected to grow almost in line with the overall industry growth led by the electrification in the price sensitive segment. CRISIL MI&A expects the relatively financially weak, bottom of the pyramid customer base of mopeds segment to opt for EV mopeds which have relatively lower acquisition costs.

There is only one model, the recently launched E luna, currently present in the mopeds segment, however, launch of more models are expected in the short term which will revive the growth of this contracting segment.

Electrification Outlook for Indian Two-wheeler Industry

High speed E-2W Outlook

The high-speed electric two-wheeler retails rose at a sharp growth pace of 101% CAGR in the last 6 years, albeit off the small base of Fiscal 2019. Going ahead the growth momentum in the industry is expected to continue over the long-term horizon led by rising awareness, improving TCO for electric vehicles, bridging acquisition cost gap between EV and ICE counterparts, larger vehicle portfolio, expanding charging infrastructure, furthering financing support, increasing EV manufacturing capacity, and continued government support.

Additionally, the investments in electric vehicles are gaining momentum as both established automakers and new players focus on expanding their EV portfolios. This surge is driven by increased funding for research and development, alongside strategic collaborations to enhance battery technology and charging infrastructure. With supportive government policies and growing consumer demand for cleaner transportation, companies are channeling substantial resources into developing efficient and cost-effective electric vehicles, which is expected to significantly boost EV penetration in the years ahead.

Upcoming launches in E-2W segment

OEM	Vehicle	Segment	Tentative Launch
HMSI	PCX Electric	Scooter	2025
TVS	iQube update	Scooter	2024
	Creon	Scooter	2025
Suzuki	Burgman Street Electric	Scooter	Dec 2024
HMCL	eMaestro	Scooter	2025
Bajaj Chetak	Vector	Scooter	NA
Yamaha	Neo’s	Scooter	2025
Vespa	Electtrica	Scooter	2025
Ola	Adventure	Motorcycle	2025
	Cruiser	Motorcycle	2025
	Diamond Head	Motorcycle	2026
	Roadster	Motorcycle	2025
GEM	Nexus (New variants)	Scooter	2025
	Magnus Update	Scooter	Jan 2025
	Reo Update	Scooter	Jan 2025
LML	Star	Scooter	Dec 2024
Tork	Electric Scooter	Scooter	Dec 2024
Hero Electric	AE8	Scooter	2025

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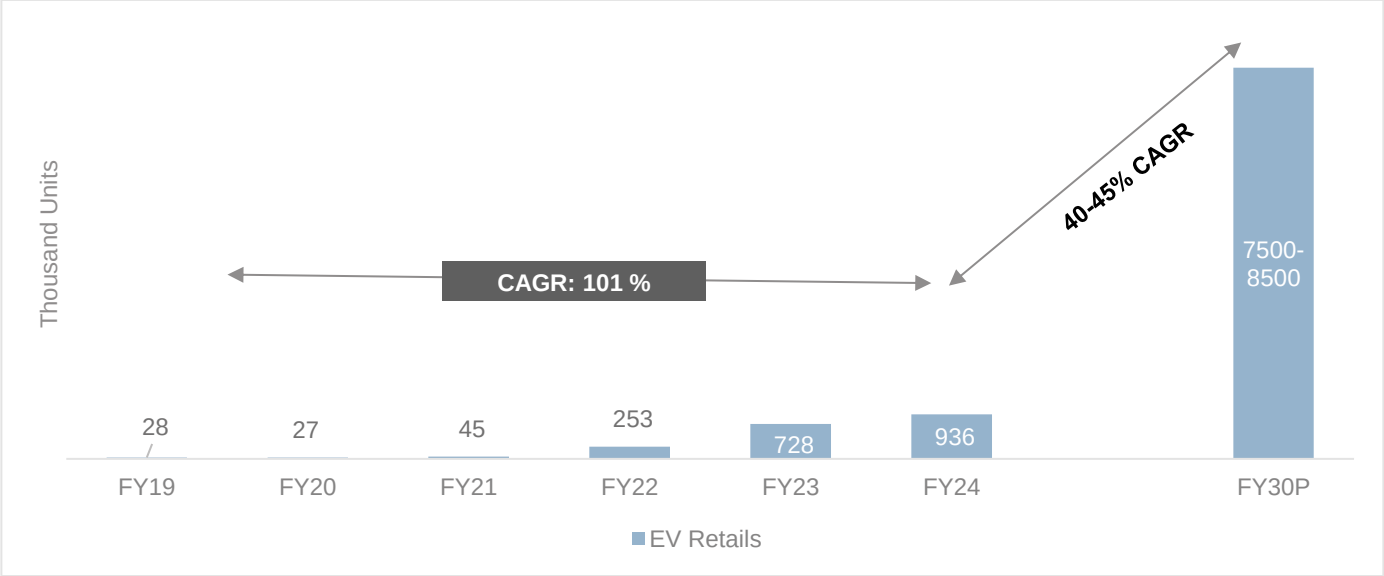
Note: Based on information in secondary sources
Source: Industry, News Reports

With the increase in EV launches, favourable government support, continuation of incentives / benefits, faster momentum in infrastructure development, further lowering of battery prices (due to easing supply chain constraints or due to better and cheaper battery chemistries) and improving local value chain will enable a faster shift towards electrification.

Additionally, with EV portfolio expansion by legacy players, capacity expansion by new age players will accelerate the segment growth. Entry of HMSI, another legacy player in the EV space will provide further thrust to the segment growth. Another large player, Suzuki is also expected to enter the EV space in the short term.

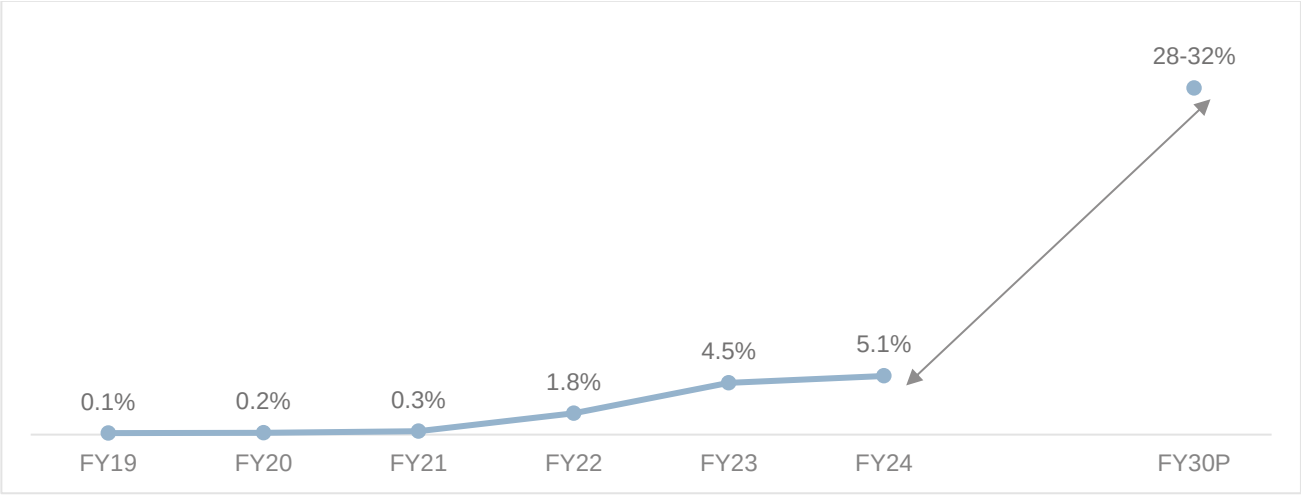
CRISIL MI&A expects the EV retails to rise at a healthy pace of 40-45% CAGR and reach volumes of 7.5-8.5 million in Fiscal 2030. And the EV penetration to reach 28-32% by Fiscal 2030. Such expansion will make E-2Ws one of the fastest growing segments in the automotive industry in India.

High Speed E-2W Retails and Outlook



Note: Only high-speed electric two-wheelers have been considered for the analysis
Source: SIAM, SMEV, VAHAN, CRISIL MI&A

Outlook for EV Penetration in 2W segment



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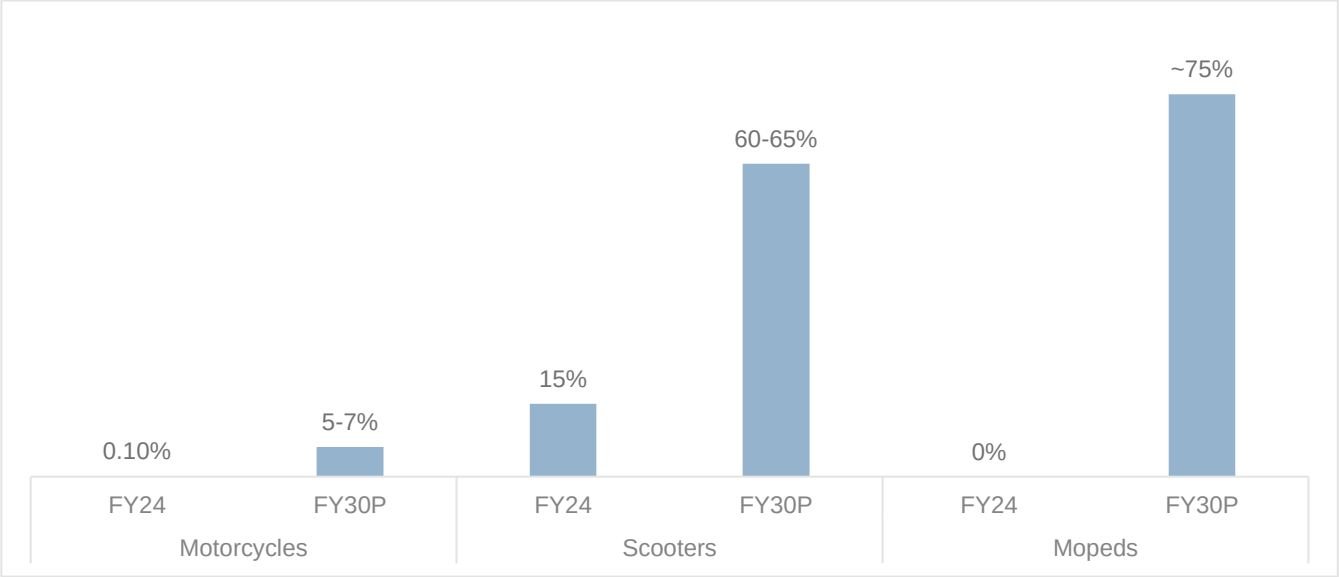
Note: Only high-speed electric two-wheelers have been considered for the analysis.
Source: SIAM, VAHAN, CRISIL MI&A

For the industry electrification, scooters are expected to lead the charge going ahead as well. EV penetration within scooters is currently significant (approximately 15%) as of Fiscal 2024. Due to the fast-expanding e scooter portfolio, OEM focus, highly tech-enabled e-scooter offerings, lowering TCO and reduction in acquisition cost difference vs ICE counterparts, the customer preference is expected to shift from ICE scooters to e scooters leading to a sharp rise in e-scooter penetration going forward and reach 60-65% of scooter sales by Fiscal 2030.

Segment wise electrification outlook



Source: SIAM, VAHAN, CRISIL MI&A

Electrification within motorcycles segment has remained limited amidst restricted offerings as well as longer distance usage of motorcycles compared to scooters. However, amidst the projected launch of e bikes/ motorcycles from OEMs including Revolt, Ola, Tork and Ather energy will back electrification within motorcycles as well. Increased adoption from the gig worker community is also expected to provide further impetus to the EV penetration within motorcycles and reach 5-7% of sales by Fiscal 2030.

Mopeds is another segment which is projected to see sharp electrification going ahead. The price sensitive nature of the moped customer base, lower operating costs of EV, lowering the acquisition price gap between EVs and ICE equivalents will propel the EV sales within the moped segment. The launch of mopeds by Kinetic Green and expected offering from TVS will aid the E-moped demand over the long-term horizon.

CRISIL MI&A projects the overall EV penetration in 2Ws to reach 28-32% by Fiscal 2030.

Low speed E-2W Outlook

According to Mordor Intelligence, from the high base of Fiscal 2024, the low-speed electric two-wheeler market in India is expected to grow at a modest CAGR of 0-2% between Fiscal 2024 and Fiscal 2030. This growth is driven by rising urbanization and increasing traffic congestion, which are encouraging commuters to explore alternative modes of transportation.

In the past five Fiscal years (2019-2024), the low-speed electric two-wheeler segment recorded strong growth at a CAGR of 57%, largely driven by rising demand from the e-commerce and last-mile delivery sectors.

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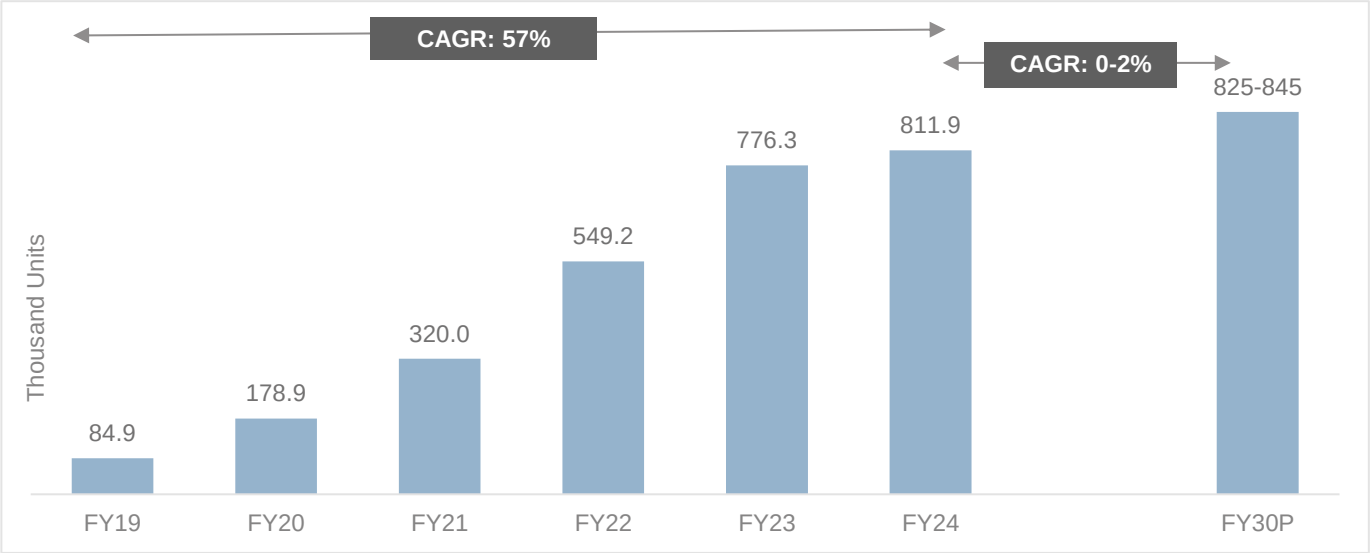
Low speed E-2W growth outlook



Source: Mordor

Recognizing this shift, several companies are investing in research and development to enhance their offerings in this segment. For example, in September 2024, Kinetic E-Bikes launched new low-speed electric models in Assam, aiming to promote sustainable travel across the Northeast region. These scooters, designed for short-distance commuting, deliver a range of 65-120 km per charge, making them ideal for everyday use. Similarly, in October 2024, Zelio E-bikes introduced an upgraded version of their Eeva ZX+ model. With a top speed of 25 km/h, it can cover up to 100 km on a single charge, catering to the needs of urban commuters looking for efficient and eco-friendly transport options.

According to Mordor, moving forward, tighter regulations, such as those outlined in the Central Motor Vehicles Rules and the Climate Change Action Plan, are expected to enforce stricter speed limits on low-speed electric two-wheelers. These measures will ensure that manufacturers comply with safety standards while promoting greener transport solutions. The fact that these scooters do not require a driving license makes them even more accessible, broadening their appeal among a wide range of consumers, including students and senior citizens.

Exports Outlook

Two-wheeler exports from India grew at a moderate pace of 1.1% CAGR during Fiscal 2019 to Fiscal 2024. Going ahead, CRISIL MI&A expects the industry exports to grow at a faster pace of 3-5% CAGR to reach 4-4.5 million levels by Fiscal 2030.

This growth will be propelled by continued improvement in macro-economic environment in exports destinations, expansion in geographical coverage by the OEMs as well as the expansion in vehicle portfolio for exports. Moreover, going ahead, the fast-growing EV segment is expected to contribute meaningfully to exports as well amidst the capacity expansion by the players, increasing focus on exports market, and sharp rise in EV portfolio.

India being one of the largest two-wheeler domestic markets globally, has a unique opportunity to leverage its domestic market scale and manufacturing competitiveness to produce electric two-wheelers not just for the domestic market but also for the exports markets. Further, policies including PLI are offering a momentum to domestic OEMs for manufacturing and exporting EVs from India. The government offers incentives through PLI for entire EV ecosystem including automobiles, auto components and ACC batteries.

Additionally, the growing demand for eco-friendly and sustainable transportation options globally is expected to provide the fillip to e-two-wheelers demand going forward. Countries like Nepal, which have a strong dependence on India for their two-wheeler imports, have declared high electrification targets of 90% EV penetration in all private passenger vehicles sales (including 2W) by 2030. They have also reduced import duties on EVs, ranging from 25%

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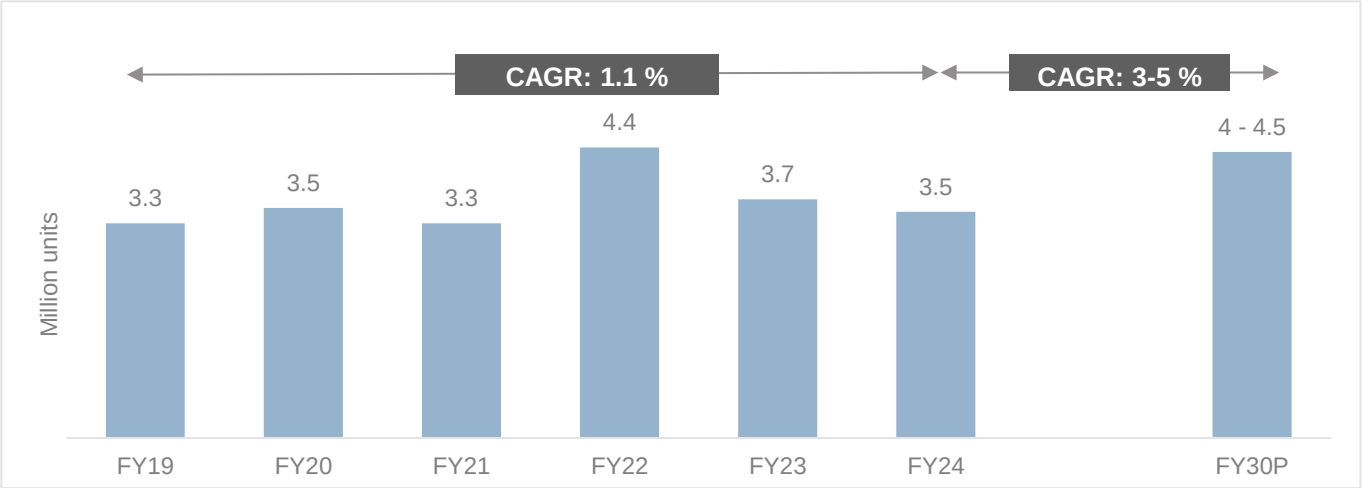
to 90% (import duties for gas and diesel fueled vehicles are 276% and 329%). Such initiatives will aid the Indian E-2W exports demand going ahead. The rise in E-2W exports will also support the overall two-wheeler industry exports over the long-term horizon.

India's economic relations with global economies through different trade agreements would enable Indian OEMs to enhance the exports of automobiles and related components from the country. Recently India has established FTA with several nations including the UAE and Australia. India is also negotiating with the UK and the EU on establishing FTA. FTA agreements will offer immense potential to Indian OEMs, enabling them to tap into a broader customer base and establish India as a key player in the global automotive industry.

Exports Outlook



Note: Only high-speed electric two-wheelers have been considered for the analysis
Source: SIAM, CRISIL MI&A

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3. Review of the Indian Three-Wheeler Industry

3.1 Review of the Indian Three-wheeler Industry

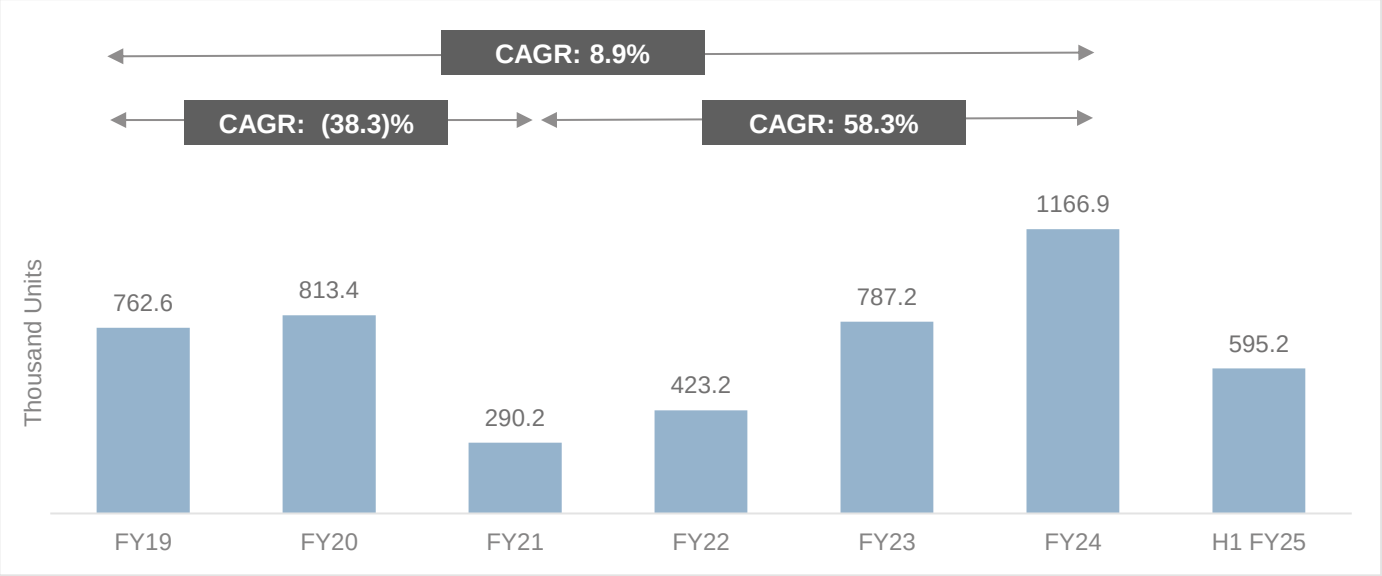
The Indian three-wheeler Industry- L5 and L3 segment included - witnessed significant upheaval in the last five years between Fiscal 2019 to Fiscal 2024. From a high of 813 thousand units in Fiscal 2020, the annual sales plunged in Fiscal 2021 to reach a low of approximately 290 thousand units.

Within the automobile sector, three-wheeler industry was one of the worst hit segments during the Covid period. Drastic fall in last mile transport requirement, fear of infection from shared mobility and in turn increased preference for personal mobility, inherent financing problems, increased vehicle prices for BS VI vehicles derailed the industry sales during the pandemic years.

Amidst the nation-wide lockdown and in turn, the reduced requirement for mobility impacted the three-wheeler industry, especially the larger passenger segment significantly and the industry sales plunged 64% y-o-y in Fiscal 2021.

From this very low base, industry sales picked up with gradual resumption in economic activities and increase in mobility amidst reopening of schools/colleges, offices as well as increase in tourism. From Fiscal 2021 to Fiscal 2024 period, industry sales rose at a sharp pace of approximately 58% CAGR to reach 1167-thousand-unit levels in Fiscal 2024. Industry crossed the pre Covid sales high during the year.

Three-wheeler industry (L5 + L3) retails trend



Note: Includes L5 as well as L3 subsegment sales data, Retail sales data from VAHAN has been considered for the analysis. VAHAN data does not include retails for Telangana state
Source: VAHAN

Within the three-wheeler industry retails, larger, more powerful yet relatively costlier L5 segment witnessed a sharper fall during the pandemic. On the other hand, the relatively affordable L3 segment, saw restricted fall during the period.

Recovery in sales was also relatively faster for the economical L3 segment- post the financial losses suffered by the client base amidst the pandemic, while the recovery was relatively gradual for the L5 segment.

During the overall Fiscal 2019-2024 period, L5 segment retails contracted at 0.4% CAGR from a high base while the L3 segment witnessed a healthy growth at 36% CAGR from a very low base of Fiscal 2019. (L5 & L3 segments are covered in detail in the subsequent part)

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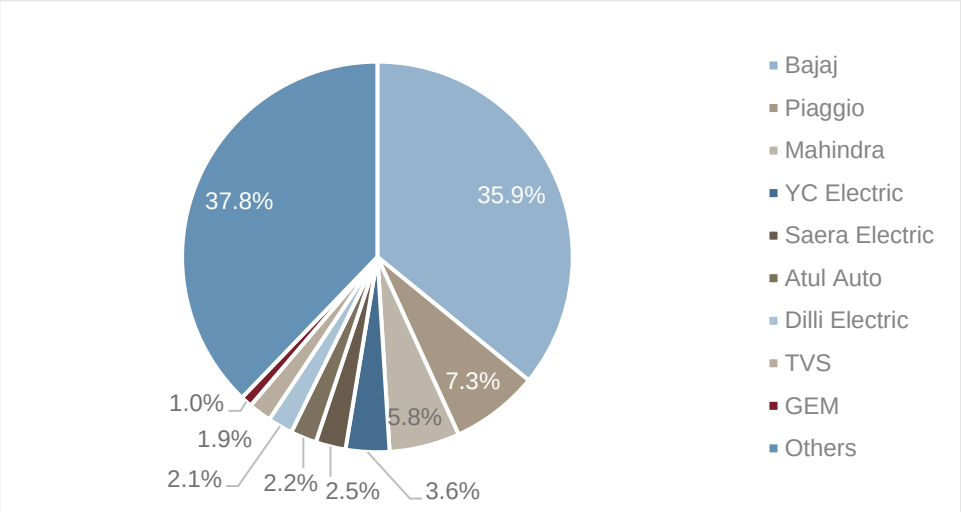
Player wise split in three-wheeler industry (L5+L3) retails H1 Fiscal 2025



Note: Includes L5 as well as L3 subsegment sales data, Retail sales data from VAHAN has been considered for the analysis. VAHAN data does not include retails for Telangana state, MLR Auto retails have been considered as L5 retails of Greaves Electric Mobility, while retails of Best way Agencies have been considered L3 retails of Greaves Electric Mobility.
Source: VAHAN

Overall, three-wheeler industry is relatively fragmented with few large players like Bajaj, Piaggio dominating the L5 segment, while players like Mahindra, Atul Auto and GEM have offerings across L5 and L3 category. The L3 segment is much more fragmented with some large players like YC Electric, Saera Electric, Dilli Electric having a notable share in the L3 subsegment.

During H1 Fiscal 2025, these relatively large players contributed to approximately 63% of the industry retails with Bajaj leading the entire industry with 36% share.

3.2 Review of the L5 segment

During the Fiscal 2019 to Fiscal 2024 period, the L5 segment retails dropped at 0.4% CAGR, dropping from 647 thousand units in Fiscal 2019 to 636 thousand units by Fiscal 2024.

From a high of 671 thousand units reached in Fiscal 2020, L5 segment retails dropped 70% during Fiscal 2021 amidst the reduced mobility requirement during the Covid period. Nationwide lockdowns, closure of schools and colleges/offices, ban on tourism and travel impacted the requirement of last mile mobility during the pandemic.

The impact of the reduced mobility was much more pronounced on the larger passenger segment, while the goods segment witnessed a limited loss amidst continued demand for the last mile delivery segment.

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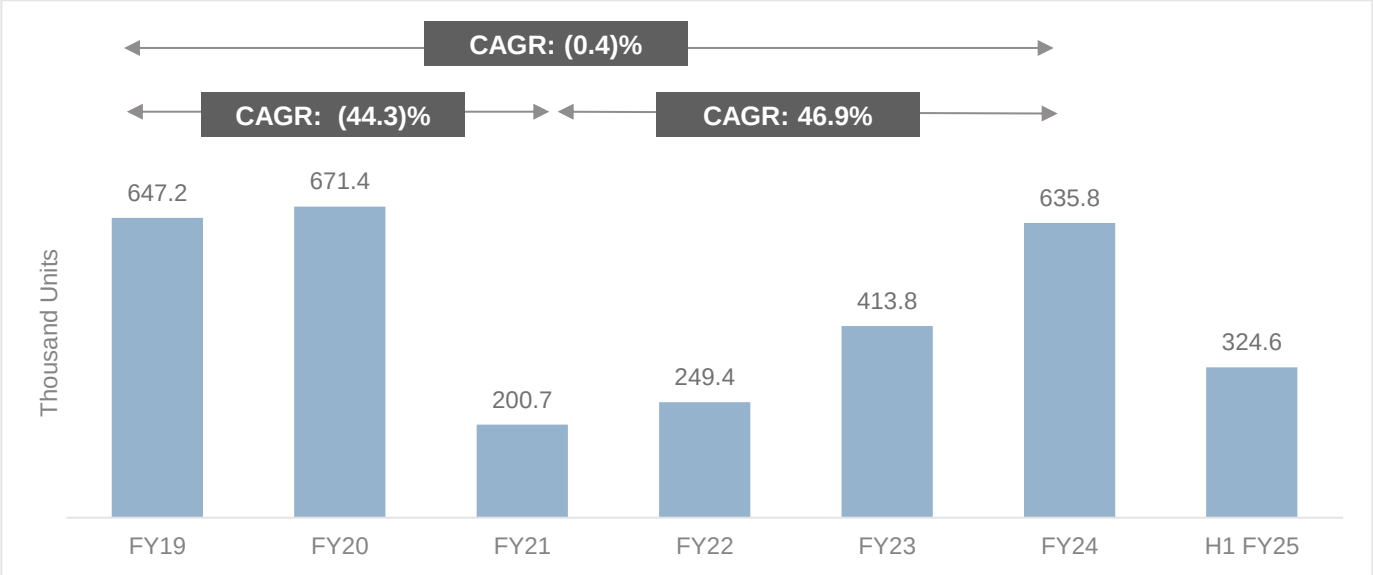
Three-wheeler L5 segment retails trend



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data; Retail sales data from VAHAN has been considered for the analysis.
Source: VAHAN

The gradual normalisation of economy, reopening of offices, colleges/schools revived the demand for the L5 three-wheeler segment. And industry rebounded at a healthy pace of approximately 47% CAGR during Fiscal 2021-2024 period. The sharp rise in industry sales during Fiscal 2021 to 2024 period was led by the healthy improvement in passenger segment sales which clocked a sharp 65% CAGR during the same period.

Indian three-wheeler industry is dominated by the passenger segment typically contributing above 75% of the L5 segment sales. The share of passenger segment dropped during the pandemic years due to the sharp drop in mobility requirements and in turn the reduced ridership and the significant drop in segment sales.

During the pandemic, the nation-wide lockdown, closure of schools, colleges and offices, coupled with ban on intracity, intercity travel impacted the requirement of mobility, especially the shared mobility during Fiscal 2021. This sharp drop in ridership requirement impacted the sales of passenger three wheelers. Sales of three-wheeler passenger segment dropped 75% during the year. On the other hand, the drop in goods segment was relatively limited given the continued need for the last mile delivery even during the pandemic. In fact, the higher traction for e commerce during the epidemic restricted the fall in goods segment sales.

Thus, the share of goods segment increased from 19% in Fiscal 2020 to 33% in Fiscal 2021 while the share of larger passenger segment dropped from 81% to 67% during the same period.

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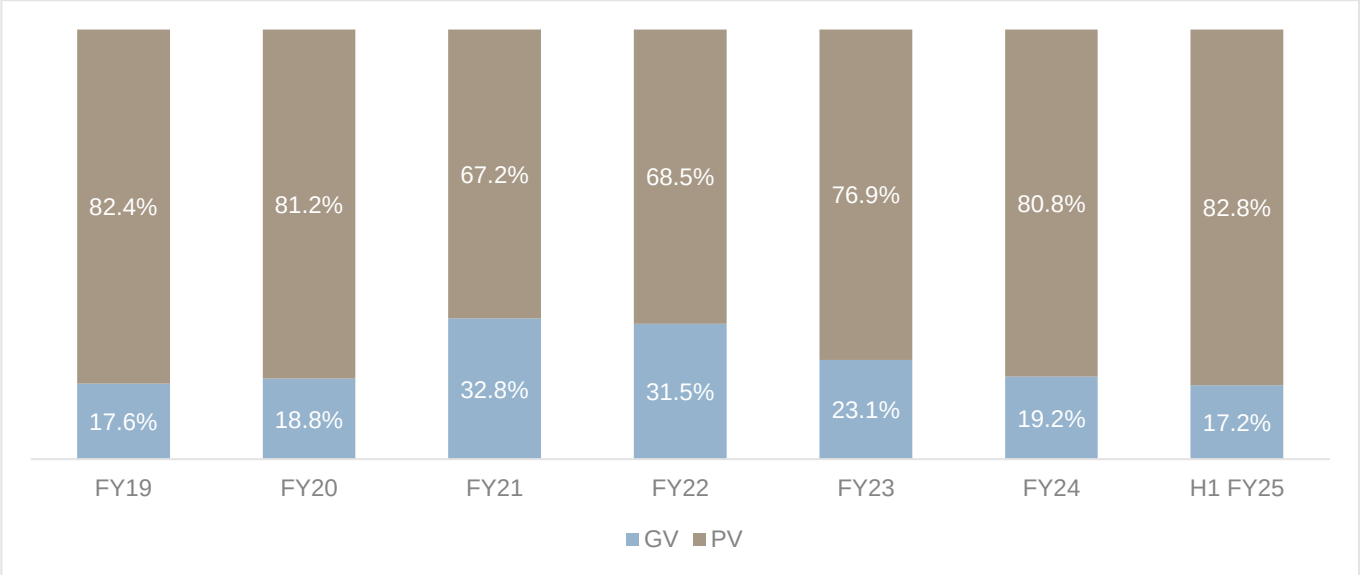
Segment wise share within the three-wheeler L5 segment retails

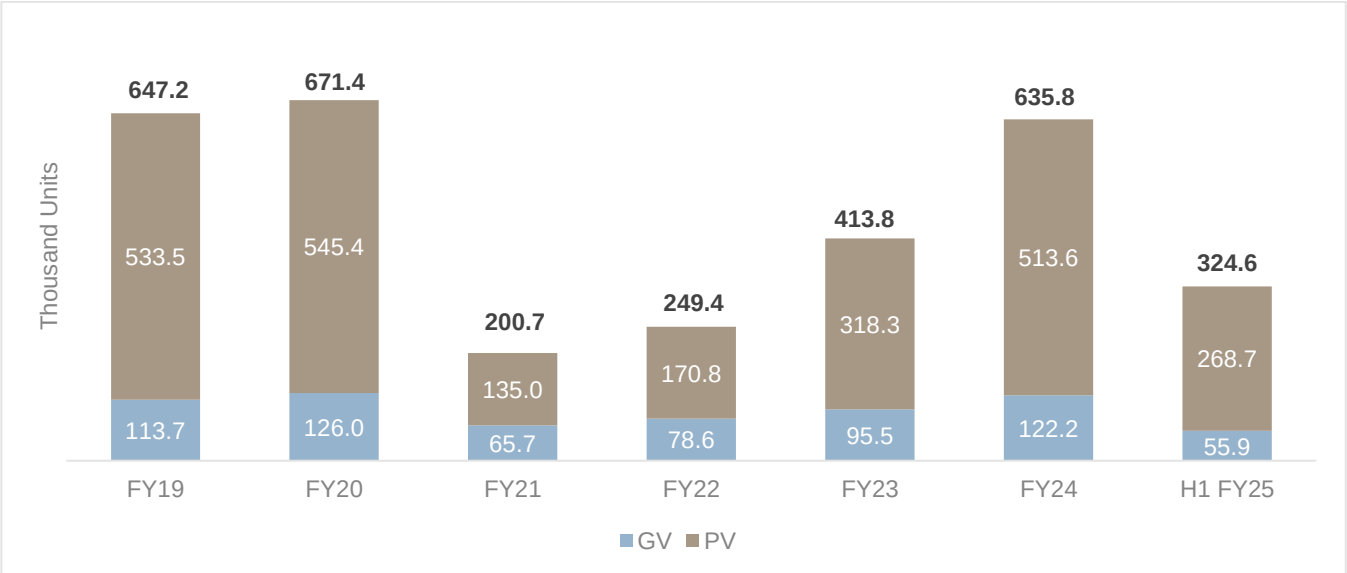


Note: GV: Goods Vehicles/ Cargo vehicles, PV: Passenger Vehicles; Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data. Retail sales data from VAHAN has been considered for the analysis.
Source: VAHAN

Gradual reopening of economy and rise in mobility, reopening of schools and colleges, rise in tourism and in turn, the need for last mile connectivity aided the demand for passenger segment from Fiscal 2022. From a very low base of Fiscal 2021, the passenger segment clocked a sharp growth at 55% CAGR till Fiscal 2024.

The three-wheeler goods segment, which suffered a relatively lesser impact (48% drop in Fiscal 2021) of the pandemic continued its growth at a relatively moderate pace post pandemic backed by the improvement in macro-economic scenario, rise in investments, increased construction activity, continued healthy rise in e retail and the last mile delivery. The goods segment witnessed growth at 23% CAGR between Fiscal 2021 to Fiscal 2024 period.

Segment wise split within the three-wheeler L5 segment retails



Note: GV: Goods Vehicles/ Cargo vehicles, PV: Passenger Vehicles; Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data. Retail sales data from VAHAN has been considered for the analysis.
Source: VAHAN

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This relatively faster growth witnessed by the passenger segment expanded its share post pandemic and the passenger segment sales reached the pre pandemic levels of 80%+ during Fiscal 2024.

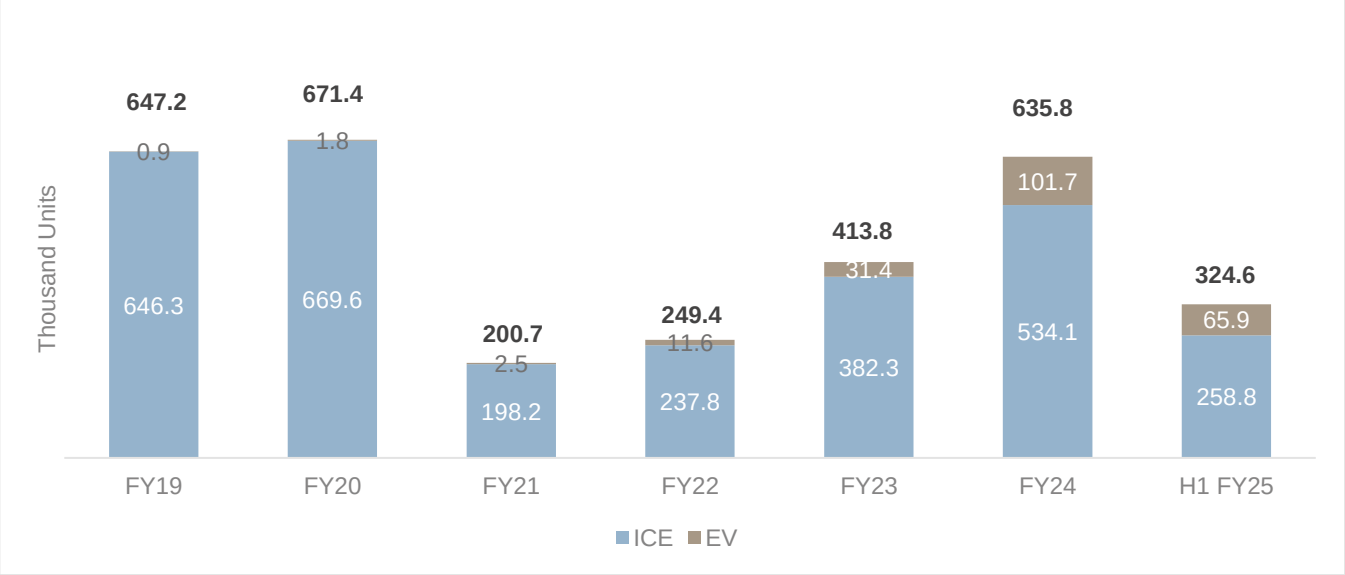
The passenger three-wheeler segment also received thrust from increased traction for the EV (E Autos L5) segment. The EV passenger segment witnessed a 250% CAGR growth between Fiscal 2021 to Fiscal 2024 period.

Increasing acceptance of EVs, launch of EV models, government incentives, expanding charging infrastructure coupled with lower operating costs aided the growth of EV segment within the three-wheeler industry. Additionally, unlike the L5 ICE vehicles which require permits to drive in most states, the EV segment does not require a permit.

EV sales were insignificant during the pre-pandemic era and reached 2.5k (1% penetration) by Fiscal 2021. Off this insignificant base, EV sales grew at a sharp pace of 244% CAGR and reach 100K+ levels by Fiscal 2024.

(EV segment is covered in detail in the subsequent section)

Electrification within the three-wheeler industry



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data. Retail sales data from VAHAN has been considered for the analysis.
Source: VAHAN

Support from government in the form of incentives, entry of legacy players in the EV subsegment, improvement in the EV supply led the growth of EVs within the three-wheeler industry. The shift of customer base from ICE segment to EVs for the low operating costs and no permit requirements provided an additional kicker to the EV demand post pandemic.

In turn the EV penetration within the three-wheeler industry increased from an insignificant 0.1% in Fiscal 2019 to a sizeable 16% by Fiscal 2024. In fact, it increased to approximately 20% during H1FY25.

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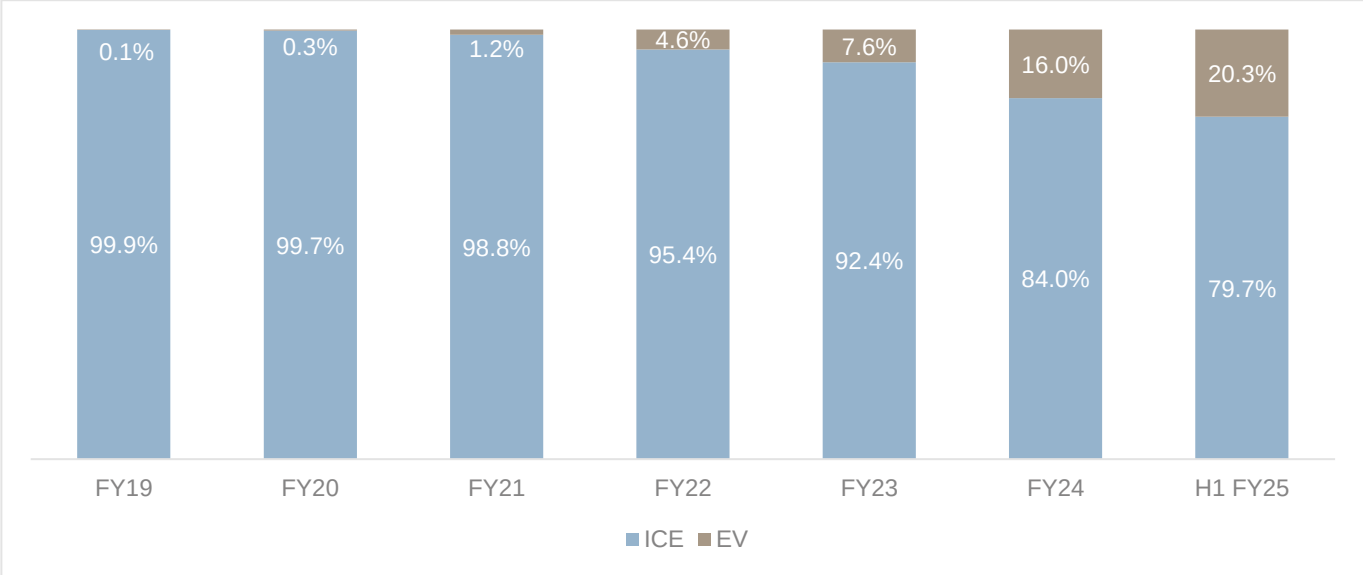
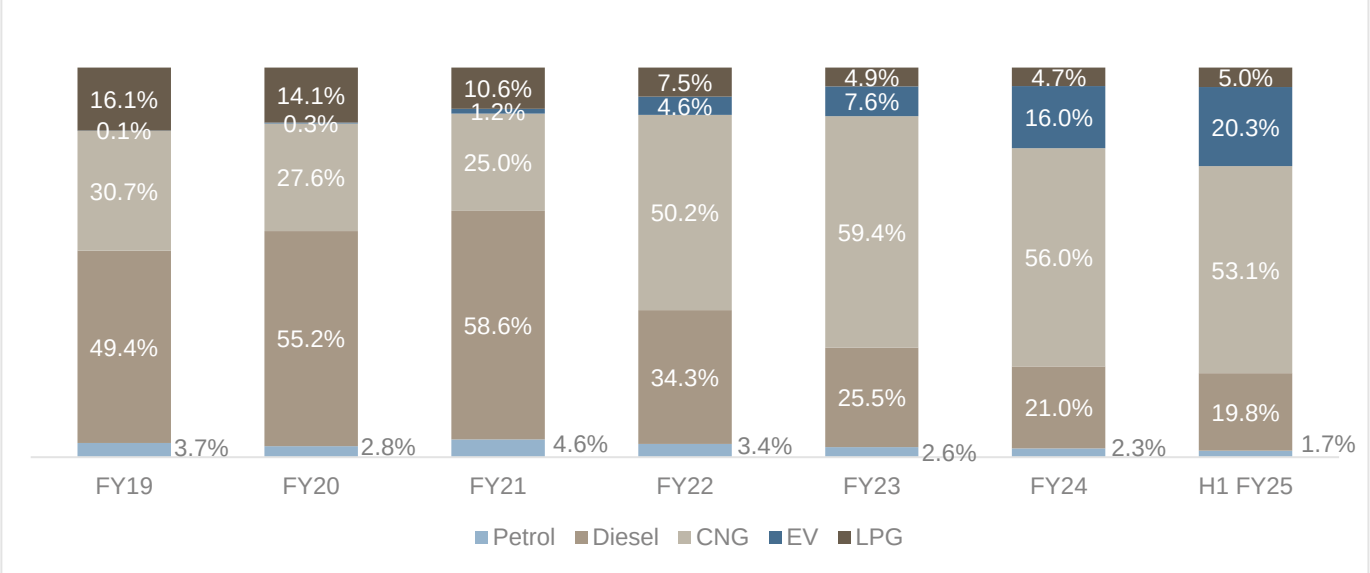
Electrification within the three-wheeler L5 segment retails



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data. Retail sales data from VAHAN has been considered for the analysis.
Source: VAHAN

Like EVs, CNG powertrain share has also increased significantly during Fiscal 2019- 2024 period. Increased focus of OEM, portfolio addition, CNG infrastructure expansion, ban on diesel vehicle usage aided the growth of CNG segment within the L5 three-wheeler segment retails.

Powertrain wise split within the three-wheeler L5 segment retails



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data. Retail sales data from VAHAN has been considered for the analysis. CNG powertrain numbers include CNG + petrol/CNG vehicle retails while LPG powertrain numbers include LPG+ Petrol/LPG numbers
Source: VAHAN

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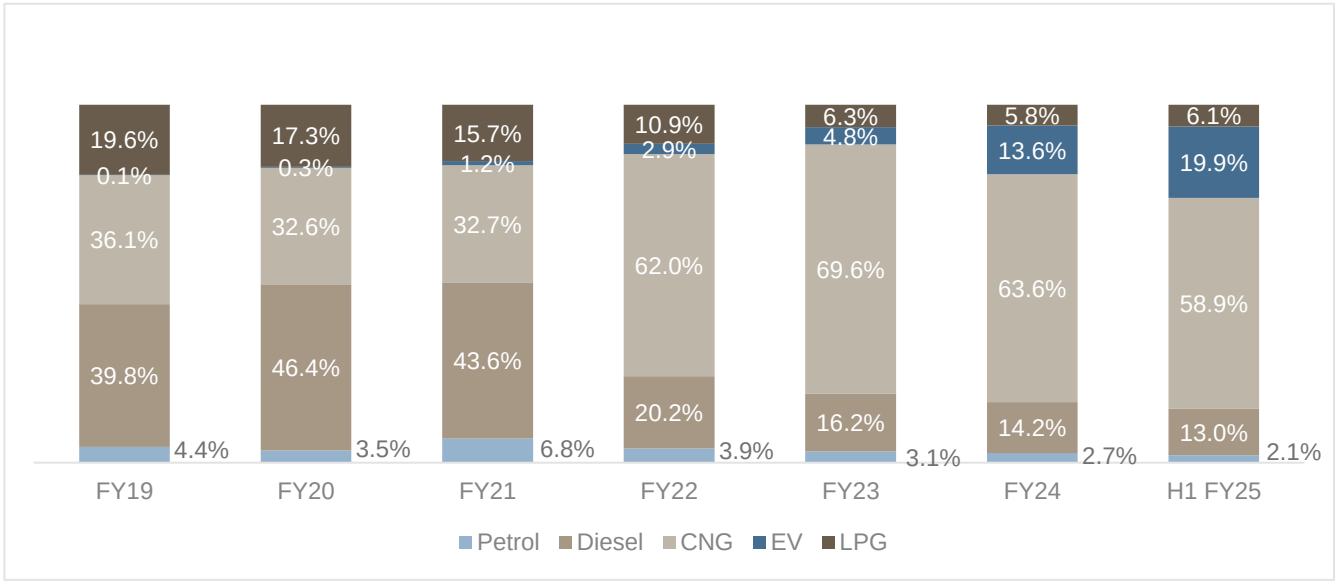
The share of CNG segment is much more pronounced in the larger passenger segment where its share increased from 36% in Fiscal 2019 to approximately 64% by Fiscal 2024.

Powertrain wise split within the three-wheeler L5 passenger segment retails

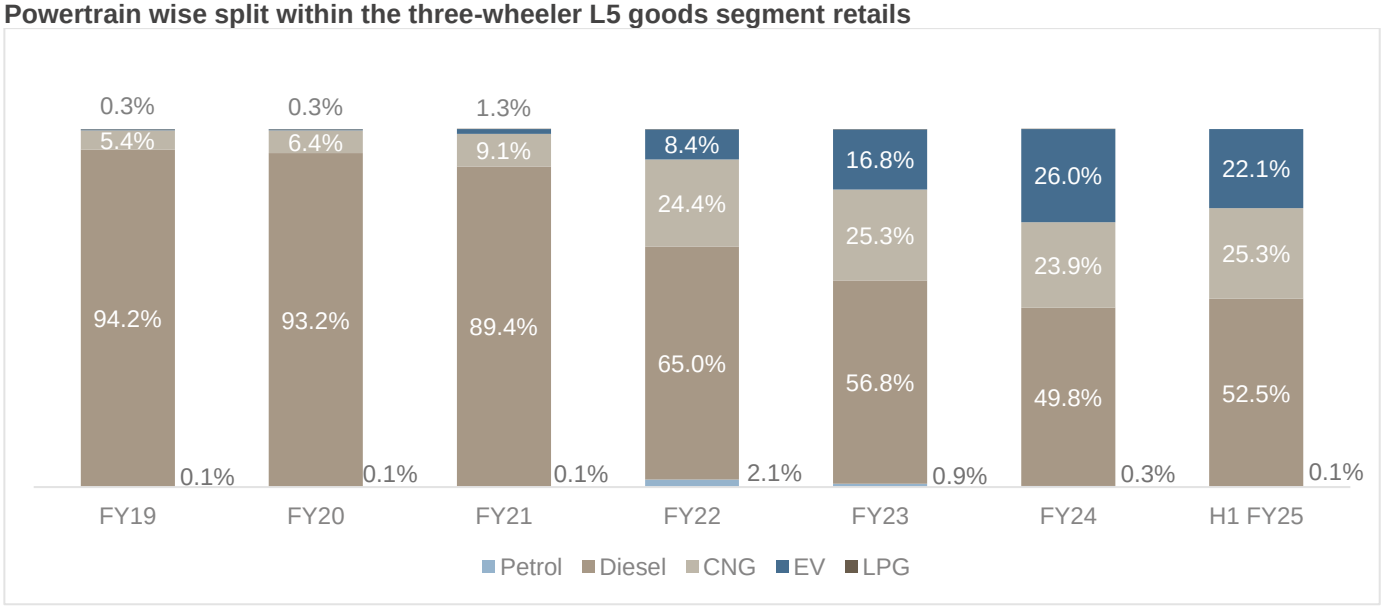


Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data. Retail sales data from VAHAN has been considered for the analysis. CNG powertrain numbers include CNG + petrol/CNG vehicle retails while LPG powertrain numbers include LPG+ Petrol/LPG numbers

Source: VAHAN

Additionally, the goods segment, which was dominated by diesel powertrain, contributing more than 90% of the retails in Fiscal 2019 also witnessed some shift towards the cleaner fuels CNG and EV, contracting the share of diesel to approximately 50% as of Fiscal 2024.

Powertrain wise split within the three-wheeler L5 goods segment retails



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data. Retail sales data from VAHAN has been considered for the analysis. CNG powertrain numbers include CNG + petrol/CNG vehicle retails while LPG powertrain numbers include LPG+ Petrol/LPG numbers

Source: VAHAN

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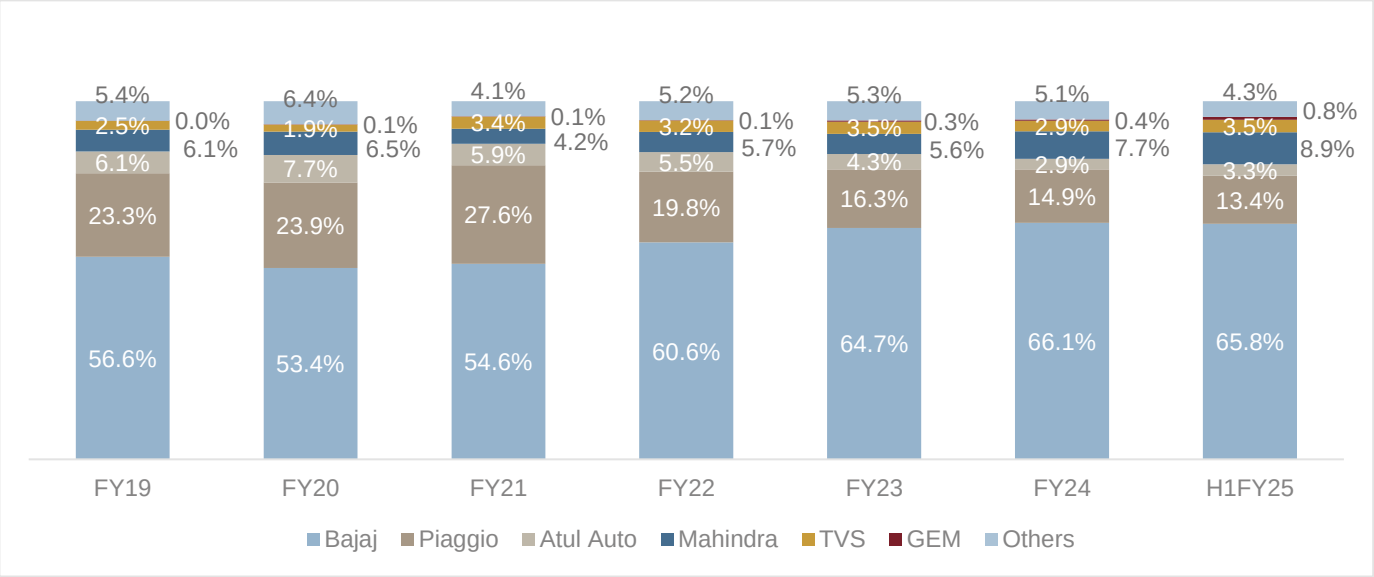
Competitive Landscape within the L5 three-wheeler industry

The three-wheeler industry is dominated by few large players who contribute to more than 90% of the industry demand. The top players Bajaj, Piaggio, Mahindra, Atul Auto lead the industry primarily contributing to the industry demand. These players contributed nearly 92% of the industry sales during Fiscal 2024.

Relatively smaller players like TVS and the recent entrants GEM have been increasing their share gradually in the industry.

Player wise contribution within the L5 three-wheeler industry



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data, Retails of MLR Auto is considered for calculating share of Greaves Electric Mobility. Retail sales data from VAHAN has been considered for the analysis.
Source: VAHAN

Bajaj leads the three-wheeler industry with more than 50% share. In the last 5 years, Bajaj has, in fact, expanded its presence further in the industry and commanded approximately 66% share during Fiscal 2024 and H1 of Fiscal 2025. Presence of Bajaj is dominant in the larger Passenger segment where its contribution has been above 60% throughout the last 5 years. Supported by increased presence in the E Auto segment, Bajaj extended its share further in the passenger segment to approximately 73% by Fiscal 2024. This increased presence in the passenger segment boosted Bajaj's share in the overall two-wheeler industry to approximately 66% in Fiscal 2024. Over and above the dominance in the passenger segment, the increased presence in the goods segment also aided Bajaj's share in the overall industry.

The second largest player Piaggio dominated the Goods segment with more than 40% share within the subsegment. However, it has been losing ground to Bajaj. The company has relatively lower share in the passenger segment. Amidst the intense competition, its share has dropped from 20% in Fiscal 2019 to 13% by Fiscal 2024 in the larger passenger segment. While in goods segment, from a high base of approximately 41% in Fiscal 2019 its share dropped to 23% in Fiscal 2024.

Another large player, Mahindra has been gaining ground in the industry led by its increasing presence in the passenger segment. The rising share of EVs within the industry coupled with company's higher presence in the E Auto segment is supporting this growth. Additionally, Mahindra managed to retain its presence in the goods segment backing the expansion in the overall three-wheeler industry.

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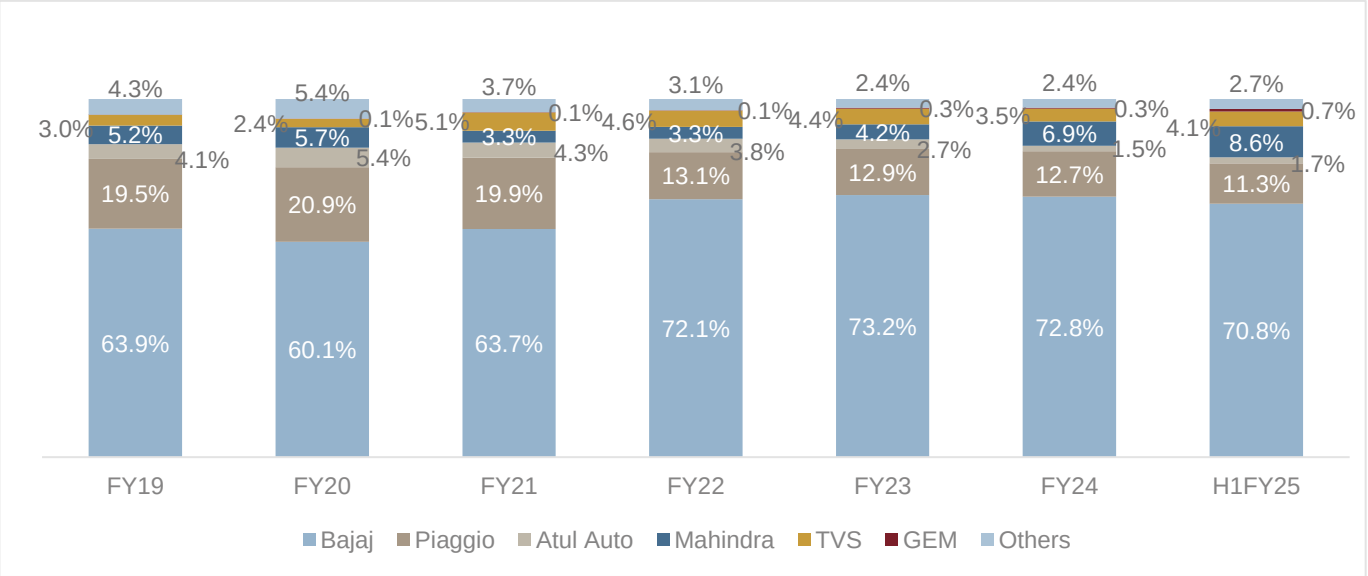
Relatively smaller player, TVS, which is predominantly present in the passenger subsegment, has also maintained its presence in the 2-4% range. Company has been gradually increasing its presence in the goods subsegment. On the other hand, Atul Auto has been losing ground to other larger players in the last 5 years.

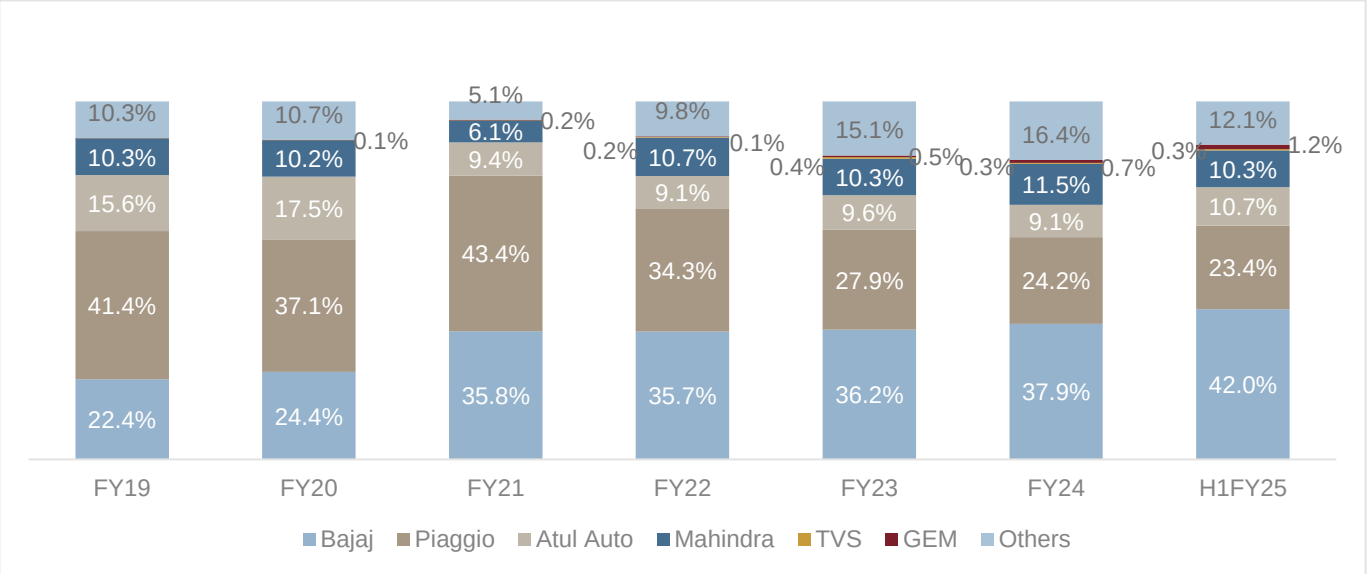
Another player GEM has been gradually increasing its presence in the market and grabbed approximately 1% of the market by H1 of Fiscal 2025. Its presence is relatively higher in the goods segment at 1.2% during H1 of Fiscal 2025.

Player wise contribution within the L5 Passenger segment of three-wheeler industry



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data, Retails of MLR Auto are considered for calculating share of Greaves Electric Mobility. Retail sales data from VAHAN has been considered for E Auto segment.
Source: VAHAN

Player wise contribution within the L5 Goods segment of three-wheeler industry



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data, Retails of MLR Auto are considered for calculating share of Greaves Electric Mobility. Retail sales data from VAHAN has been considered for E Auto segment.
Source: VAHAN

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Powertrain wise Competitive Landscape within the L5 three-wheeler industry

During Fiscal 2019 to Fiscal 2024 period, CNG has emerged as the largest powertrain within the L5 three-wheeler industry. Its share grew from approximately 31% in Fiscal 2019 to approximately 56% by Fiscal 2024 led by government push towards cleaner fuels, expanding CNG infrastructure, launch of CNG variant by manufacturers.

Within the CNG vehicle retails, Bajaj dominates the segment with more than 85% share and has continued to lead the CNG segment during Fiscal 2019-2024 period. Bajaj has also expanded its presence in the second largest powertrain diesel (as of Fiscal 2024).

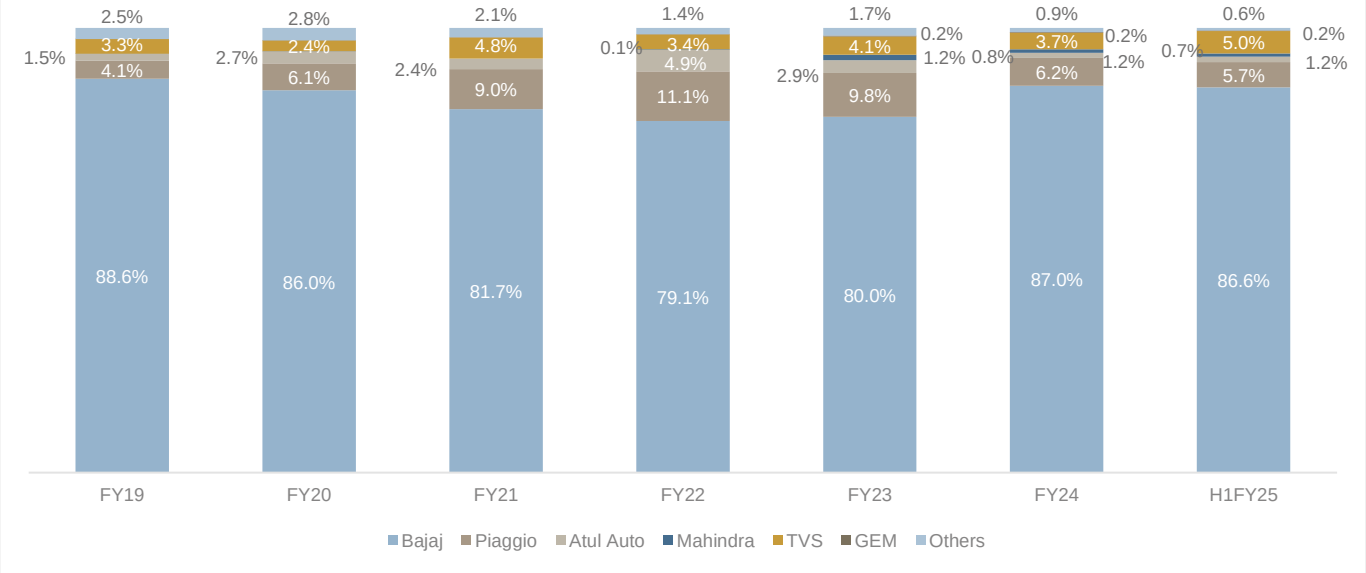
Launch of CNG variants aided the share of Piaggio (one of the leading players in the diesel segment) in the CNG segment. Its share increased from approximately 4% in Fiscal 2019 to around 6% by Fiscal 2024. However, from a high base, Piaggio has lost some ground in the diesel segment to other players, especially Bajaj.

TVS which has insignificant share in the diesel segment has gained some ground in the CNG segment.

One of the relatively smaller players, GEM has gained sizeable ground in the diesel segment, contributing 3.5% of the retails during H1 Fiscal 2025.

(EV powertrain has been covered in detail in the later section.)

Player wise contribution within the CNG vehicle retails of L5 three-wheeler industry



CNG	FY19	FY20	FY21	FY22	FY23	FY24	H1FY25
Bajaj	88.6%	86.0%	81.7%	79.1%	80.0%	87.0%	86.6%
Piaggio	4.1%	6.1%	9.0%	11.1%	9.8%	6.2%	5.7%
Atul Auto	1.5%	2.7%	2.4%	4.9%	2.9%	1.2%	1.2%
Mahindra	0.0%	0.0%	0.0%	0.1%	1.2%	0.8%	0.7%
TVS	3.3%	2.4%	4.8%	3.4%	4.1%	3.7%	5.0%
GEM	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%
Others	2.5%	2.8%	2.1%	1.4%	1.7%	0.9%	0.6%

Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data, Retails of MLR Auto are considered for calculating share of Greaves Electric Mobility. Retail sales data from VAHAN has been considered for E Auto segment.
Source: VAHAN

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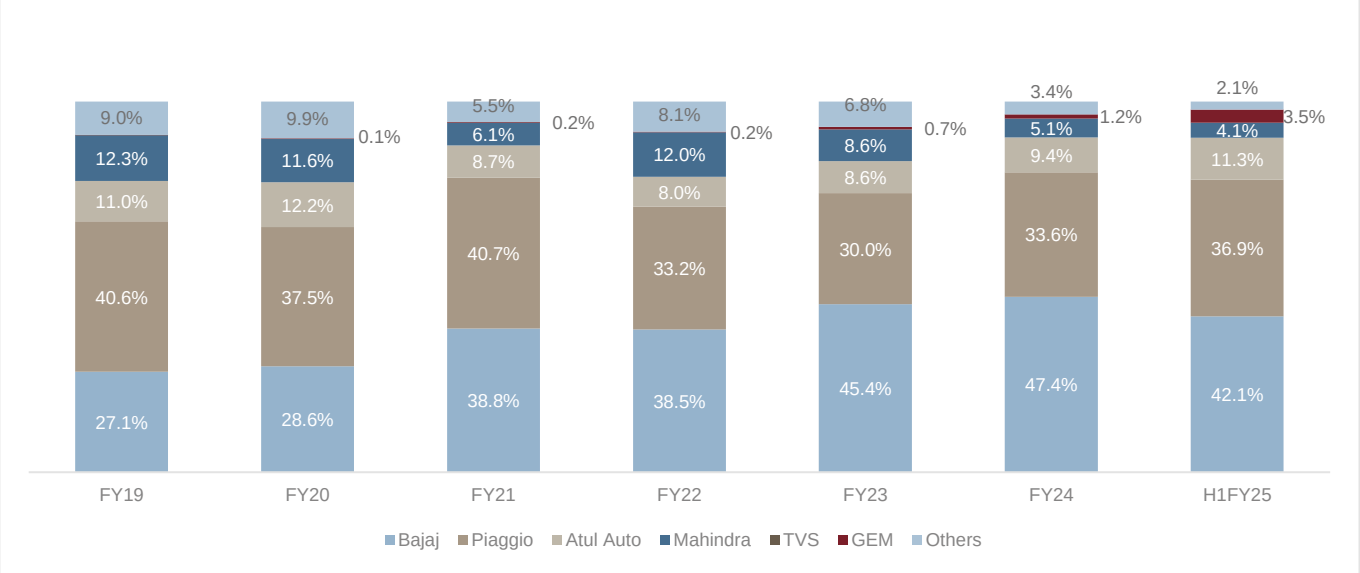
Player wise contribution within the Diesel vehicle retails of L5 three-wheeler industry



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data, Retails of MLR Auto are considered for calculating share of Greaves Electric Mobility. Retail sales data from VAHAN has been considered for E Auto segment.
Source: VAHAN

Demand drivers

Easier availability of finance

Given the relatively humble financial profile of a typical three-wheeler buyer, finance availability plays a significant role in the three-wheeler industry sales. In fact, within the automobile segments, finance penetration levels for the three-wheeler segment are one of the highest at approximately 95%.

Over the years, continued availability of finance as well as accommodative stance of the financiers has aided the growth of three-wheeler segment. Additionally, sales growth in the 3W industry was accelerated by financial incentives, such as subsidies, interest on subvention on loans, and hire-purchase schemes, along with the offering of the permit-exchange system at no additional cost, easier availability of finance, positive LTV (Loan to value) ratio, competitive interest rates, and higher funding provided by various banks and NBFCs.

Moreover, financers have been expanding their presence. The entry of NBFCs targeting the markets, banks had exited, with focus largely on non-metros, have fuelled the expansion. Additionally, entry of new financers, especially focussing on EV financing, have been aiding the three-finance sector.

Going forward, the continued support from financers is expected to aid the growth of three-wheeler industry in the long-term horizon.

Stable agricultural output

Rural economy plays a significant part in the three-wheeler segment with more than 50% of the demand coming from the rural areas.

Rural India is still primarily agrarian and with 86% of land holdings, small and marginal farmers dominate the Indian agricultural landscape. These farmers rely on monsoon for irrigation; hence, its timely arrival and adequacy are needed for a good crop. Any negative impact on crop supply due to low rainfall has a cascading effect on the rural economy, as it leads to reduced earnings and subsequently lower spending.

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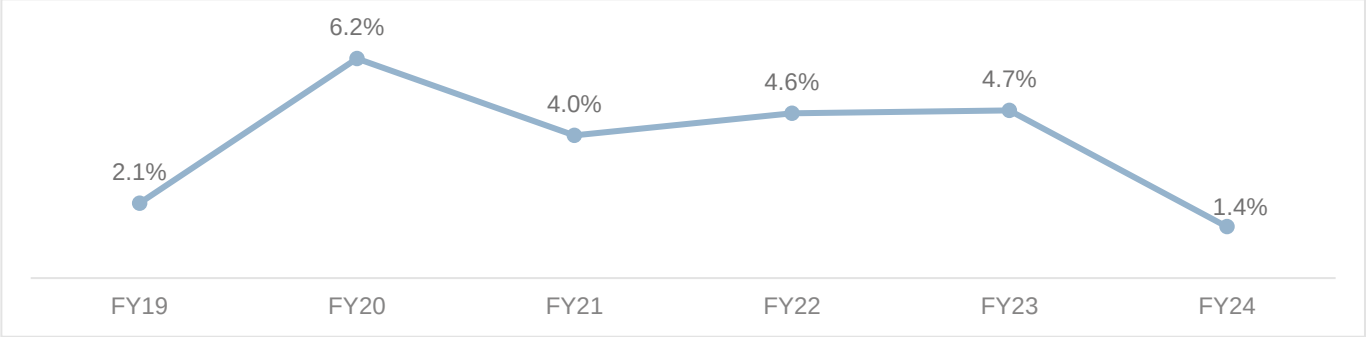
Monsoon has been favorable over the past few years with deviation in the acceptable range. In the last 5 years, the performance of the agriculture sector has been encouraging. In fact, the Agri Gross Value Added (GVA) grew at a healthy growth pace of 4.2% CAGR during Fiscal 2019-2024 period. This 4.2% growth is despite a slowdown witnessed in Fiscal 2024 (1.4% growth) due to the unfavourable monsoon.

Agri GVA growth trend



Source: MOSPI

Fiscal 2024 witnessed an uneven spread of rainfall and overall monsoon levels were 6% deficient than the long-period average.

During the current year Fiscal 2025, India received favourable rains with 8% higher rainfall than its long period average (108% of the LPA) in the June to September 2024 period. From a region-wise perspective, the rainfall distribution turned more equitable with the deficit in the north-west region somewhat reversing, excess in the southern peninsula easing and the deficit in the north-east region moderating in the current year.

This year, the healthy, timely and well-distributed rainfall is expected to lift agriculture income by bolstering crop output, which was impacted in the past Fiscal and is currently showing signs of revival. The healthy rainfall in the current year, also aided the reservoir levels which are expected to support the Rabi crop in the second half of the current year aiding the rural economy.

Thus, Agri GVA is expected to grow at a healthy pace of 3.5% in Fiscal 2025.

Additionally, robust crop output is expected to help restrict food inflation, which has been high in the last 2/3 years. Combating food inflation, with non-food inflation already being low, can also provide policy room for interest rate cuts.

The expected improvement in rural incomes, subdued inflation levels as well as the possibility of a rate cut will aid the three-wheeler industry growth.

Steady growth in industrial and Services GVA

The industry sector holds a prominent position in the Indian economy, constituting 30% of total GVA. During Fiscal 2019-2024 period, Industry GVA clocked a healthy growth at 4.3% CAGR. Industry GVA is expected to grow at faster pace of 6% during Fiscal 2025 aided by expected improvement in manufacturing as well as construction activities.

Services GVA (approximately 55% share in total GVA) clocked a relatively faster growth at 4.8% CAGR in Fiscal 2019-2024 period. In 2024, the services GVA witnessed a healthy 7.6% growth. Even going ahead, the services sector is poised to grow at a healthy pace of approximately 8% in Fiscal 2025.

The projected improvement in Industry & Services sector GVA is expected to aid the three-wheeler industry demand going ahead.

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Growth in Gig worker Economy and e-commerce Industry

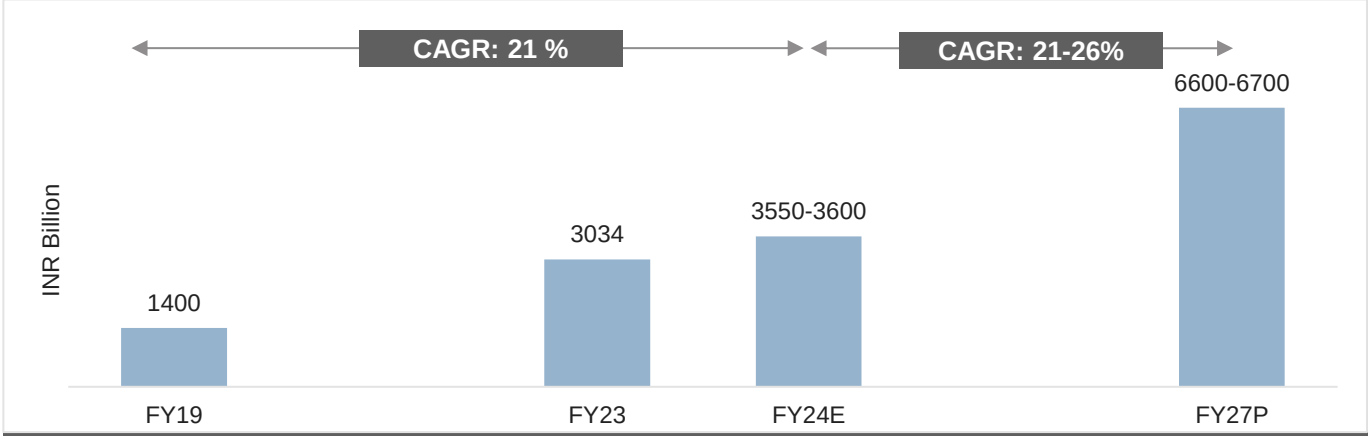
The gig worker and e commerce economy are significant contributors to the industry demand due to last mile delivery vehicle requirement.

According to NITI Aayog, there were nearly 6.8 million gig workers engaged in the gig economy including food, grocery, electronics, and e commerce last mile delivery work during Fiscal 2020. The gig workforce is expected to expand to 23.5 million by Fiscal 2030 backed by the expected rise in underlying industries of e-commerce and food delivery services.

The Indian e-commerce industry, estimated at approximately ₹ 3,000 billion in Fiscal 2023, has had a phenomenal run over the past few years. The industry has managed to attract not only consumers but also investors across the world and has grown more than three-fold between Fiscals 2018 and 2023 on the back of rising internet penetration, increasing awareness of online shopping, and lucrative deals and discounts offered by well-established players and start-ups. However, growth moderated a bit, albeit remained healthy in Fiscal 2023.

During Fiscal 2024, E commerce industry is estimated to have witnessed a further 17-19% growth reaching ₹ 3550-3600 billion levels.

E-commerce Industry Outlook



Source: CRISIL MI&A

Even going ahead, demand is expected to improve by 20-22%, in Fiscal 2025 to reach ₹ 4300-4400 billion levels led by improving consumer sentiment and moderating inflation.

CRISIL MI&A projects the e-commerce industry to cross ₹ 6.6 trillion by Fiscal 2027, logging a CAGR of 21-26% between fiscal 2024 and fiscal 2027.

This provides a vast mobility-solution opportunity for three-wheeler industry using EVs in the middle- and last-mile connectivity. Electric 3Ws provide an essential element of this supply chain.

E Autos subsegment

With the emphasis on reducing the carbon footprint, electric vehicles (EVs) are gaining importance globally. India is also a signatory to the Paris Agreement under the United Nations Framework Convention on Climate Change. The country is also part of the EV30@30 campaign, targeting a 30% sales share for EVs by 2030.

The Indian government has been extending its support via Faster Adoption and Manufacturing of Hybrid and Electric vehicles (FAME), EMPS, PM E-DRIVE schemes coupled with tax-rate cuts to boost EV adoption. Furthermore, growing awareness, concern for environmental issues, and keener focus from automotive companies are driving electrification in India. The EV segment received a real thrust in the past two years with model launches, increasing awareness, elevated fuel prices, and improvement in infrastructure support.

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A sharp rise in fuel costs in the past few years provided an added incentive to the price-sensitive customers of three-wheelers. Moreover, vehicle launches from the industry backed the growth in adoption, especially from Fiscal 2023.

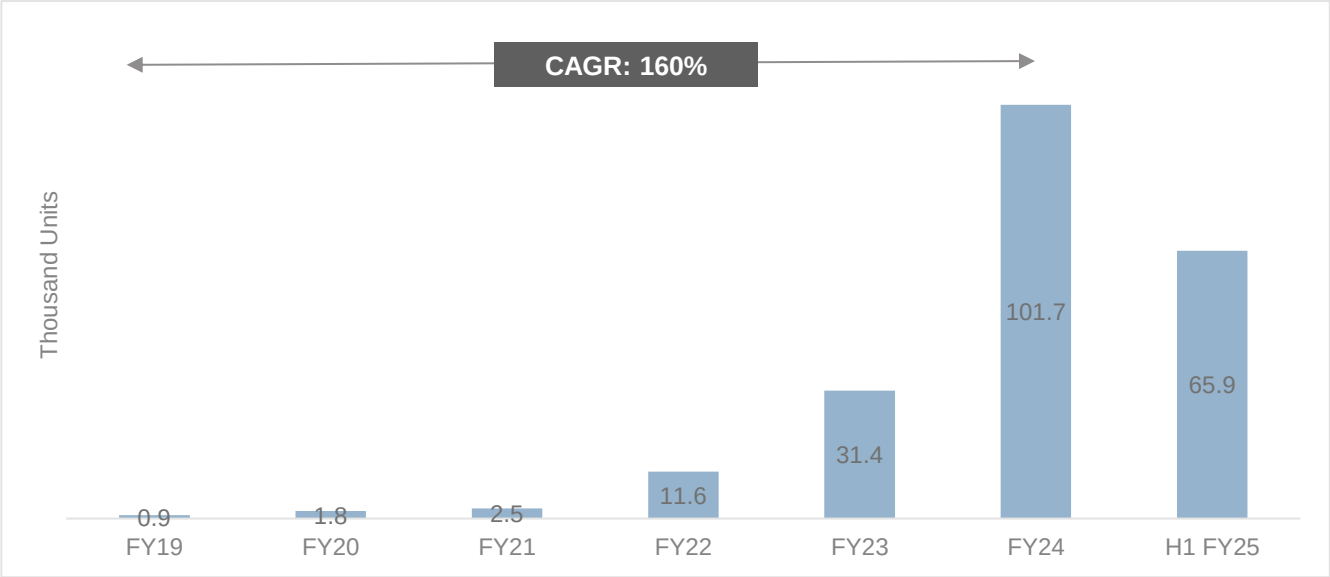
From a very low base of Fiscal 2019, the E Autos subsegment sales have skyrocketed in the last five years crossing 100 thousand retails mark during Fiscal 2024.

Increasing offerings from OEMs, improving EV supply, rising EV awareness, expanding charging infrastructure, lower operating costs, relatively lower range anxiety, ability to charge at home aided the growth of E Autos in the last 5 years. Additionally, expanding E commerce segment and preference of large E commerce players for the EV three-wheeler segment provided an added boost to the EV sales. This category of usage requires vehicles with higher ranges and reliability, with better operating efficiencies that support income generation.

In turn, the E Auto retails have grown at a stupendous pace of 160% CAGR during Fiscal 2019- Fiscal 2024 period.

Conversely, the sales of ICE vehicles have contracted at approximately 4% during the same period, supporting the sharp growth in the E Auto penetration from an insignificant 0.1% in Fiscal 2019 to 16% by Fiscal 2024. In fact, the E Auto penetration crossed 20% mark during the first half of Fiscal 2025.

E Auto Retail sales trend



Retail sales data from VAHAN has been considered for E Auto segment.
Source: VAHAN

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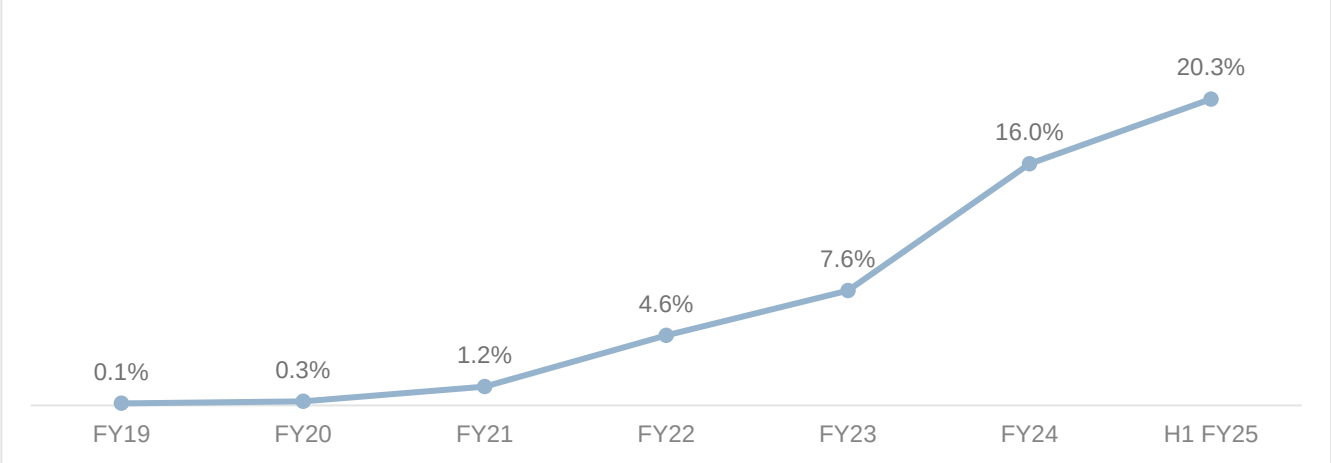
EV penetration within the L5 three-wheeler industry



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data, Retail sales data from VAHAN has been considered for the analysis.
Source: VAHAN

In line with the ICE three-wheeler segment, passenger subsegment dominates the E Auto subsegment as well. However, its contribution took a hit during the pandemic period amidst the reduced mobility requirement due to the lockdowns and closure of offices, schools/colleges as well as reduced tourism.

Normalising economic activity, reopening of offices, schools/colleges as well as increased tourism boosted the demand for passenger segment. In turn, the share of passenger subsegment within E Autos bounced back and reached approximately 69% in Fiscal 2024. In fact, in the first half of Fiscal 2025, the share of passenger E Autos rose to 81%.

Conversely, the goods segment received a boost during the pandemic years led by the increased need for the last mile delivery from E commerce players. This increased requirement boosted the share of goods segment during the pandemic years. However, the rebounding of the larger passenger segment post pandemic restricted the share of goods segment in the later years.

Although the share of E Auto goods segment dropped in the last 5 years, the E Auto goods retails grew at a sharp pace of 154% CAGR.

The E Auto Passenger segment witnessed a revival post pandemic, and their retails grew at a relatively faster rate of 163% CAGR during Fiscal 2019-2024 period expanding its presence in the E Auto subsegment.

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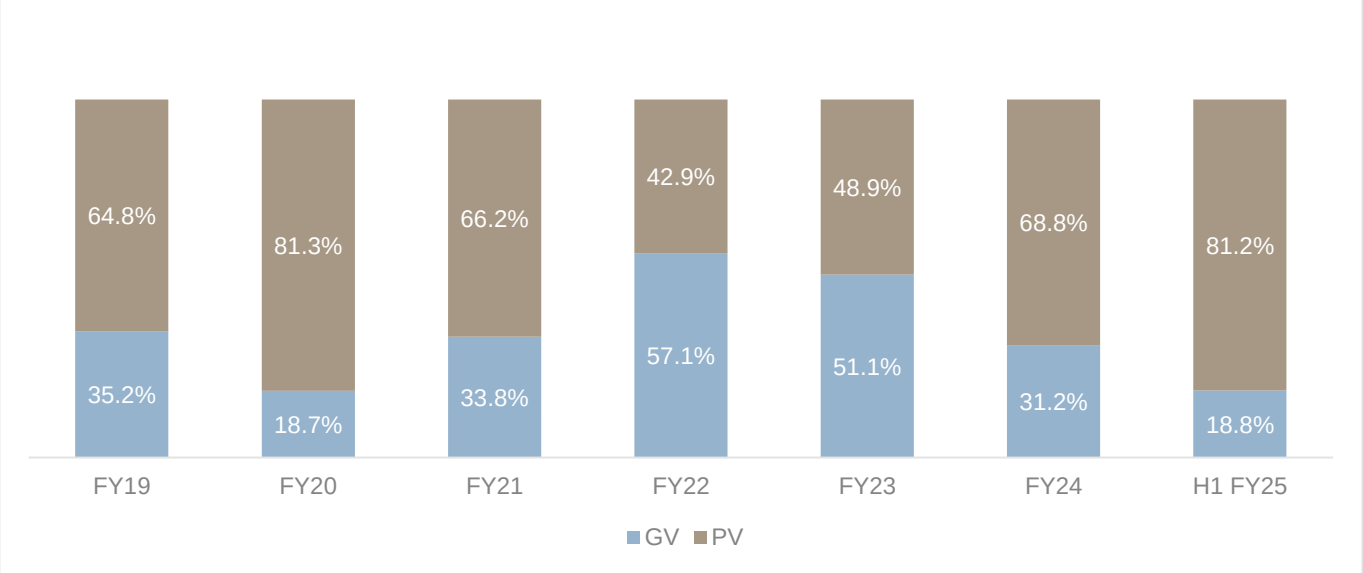
Segment wise split within the E Auto Industry



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data, Retail sales data from VAHAN has been considered for E Auto segment.
Source: VAHAN

Competitive Landscape within the E Auto subsegment

The E Auto segment was relatively fragmented especially during the pre-covid period. Amongst the larger players in the three-wheeler industry, Mahindra & Atul Auto had a sizeable share.

Share of large players increased in the last 5 years with increased product launches, improvement in vehicle supply as well as expansion in the reach.

M&M continued to dominate the E Auto space in the last 5 years. Its share increased from 4% in Fiscal 2019 to approximately 39% by Fiscal 2024. Company dominance is more in the larger passenger segment aiding its share in the overall E Auto subsegment.

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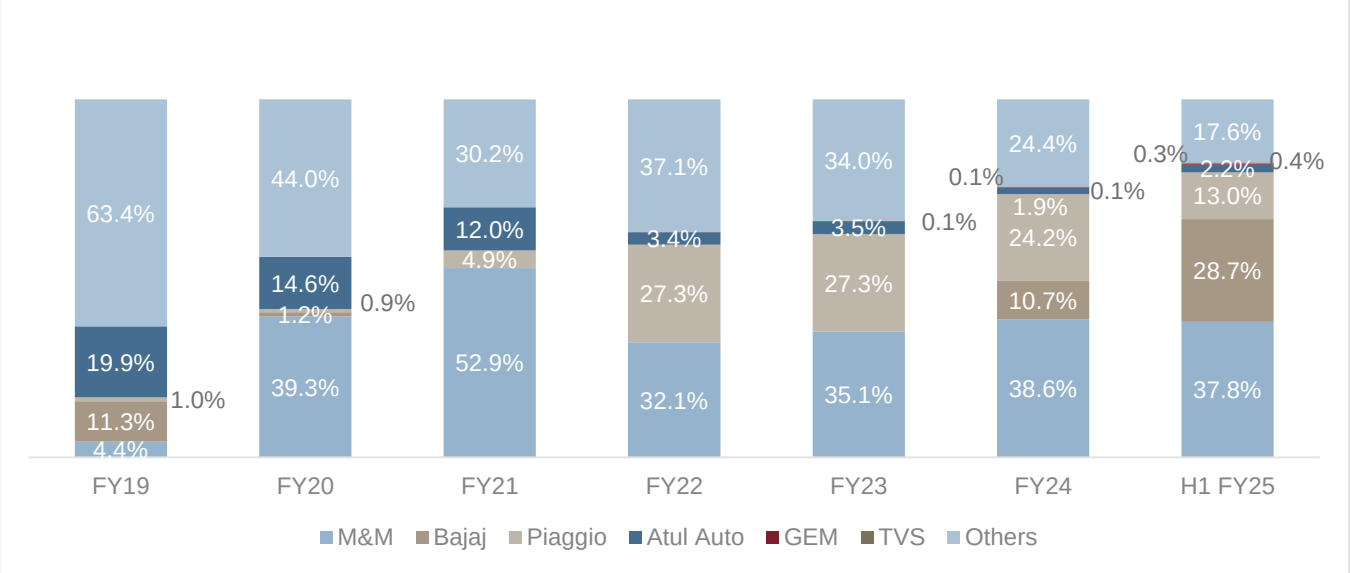
Player wise contribution within the E Auto segment



	FY19	FY20	FY21	FY22	FY23	FY24	H1 FY25
M&M	4.4%	39.3%	52.9%	32.1%	35.1%	38.6%	37.8%
Bajaj	11.3%	1.2%	0.0%	0.0%	0.0%	10.7%	28.7%
Piaggio	1.0%	0.9%	4.9%	27.3%	27.3%	24.2%	13.0%
Atul Auto	19.9%	14.6%	12.0%	3.4%	3.5%	1.9%	2.2%
GEM	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.3%
TVS	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.4%
Others	63.4%	44.0%	30.2%	37.1%	34.0%	24.4%	17.6%

Note: Includes E Auto (L5) subsegment sales data, does not include E Rickshaw (L3) subsegment data, Retail sales data from VAHAN has been considered for E Auto segment. Retails of MLR Auto are considered for calculating share of Greaves Electric Mobility GEM.
Source: VAHAN

Within E Auto passenger segment, Bajaj has gained a sizeable ground in the last two years aided by the improved supply as well as reach of its E Auto models. Even within the E Auto Goods segment Bajaj has extended its presence in the last 2 years.

Piaggio has also expanded its presence in the E Auto space with increased offerings in the last few years. In turn its share rose from 1% in Fiscal 2019 to approximately 24% by Fiscal 2024. However, it lost some ground to Bajaj in the first half of Fiscal 2025.

One of the early contributors, Atul Auto has been losing ground to other large players amidst the intensified competition within the E Auto segment.

Recent entrant Greaves Electric Mobility GEM has gradually expanded its presence in the subsegment in the last two years. Its share reached approximately 0.3% during first half of Fiscal 2025.

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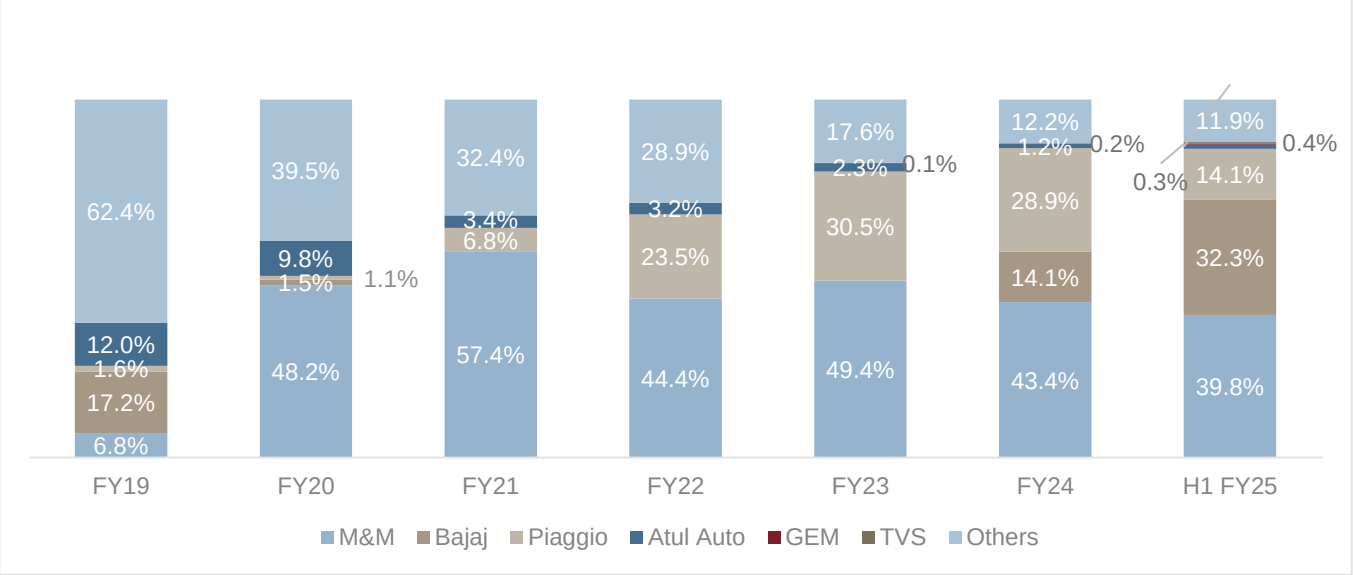
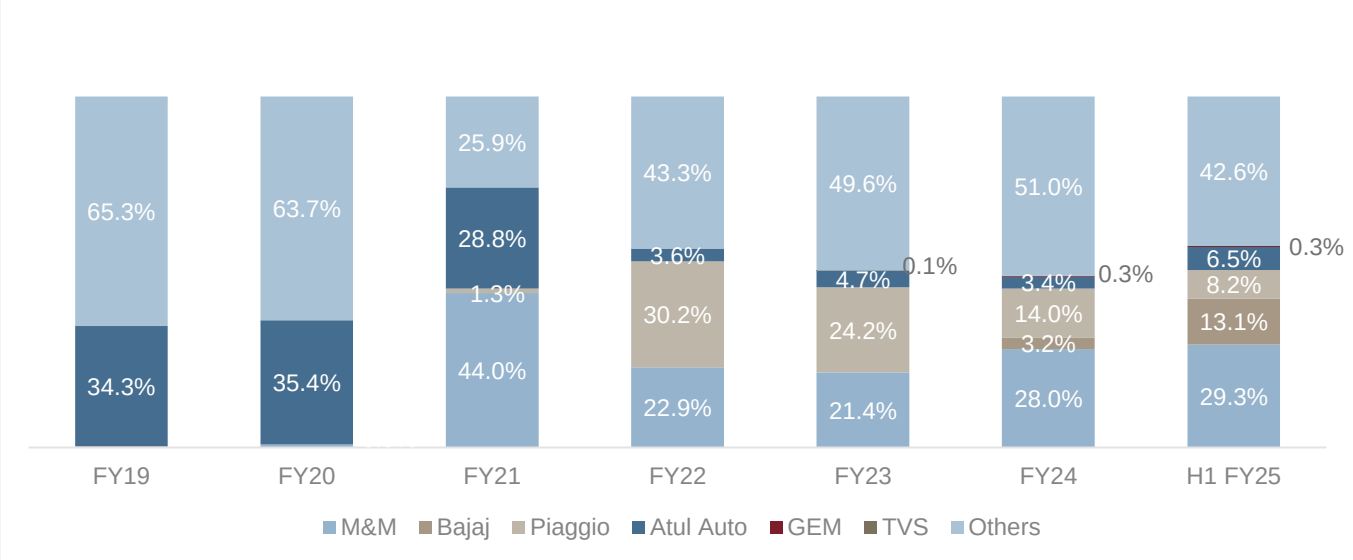
Player wise contribution within the E Auto Passenger subsegment



Note: Includes E Auto (L5) subsegment sales data, does not include E Rickshaw (L3) subsegment data, Retail sales data from VAHAN has been considered for E Auto segment. Retails of MLR Auto are considered for calculating share of Greaves Electric Mobility GEM.
Source: VAHAN

Player wise contribution within the E Auto Cargo subsegment



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Source: VAHAN

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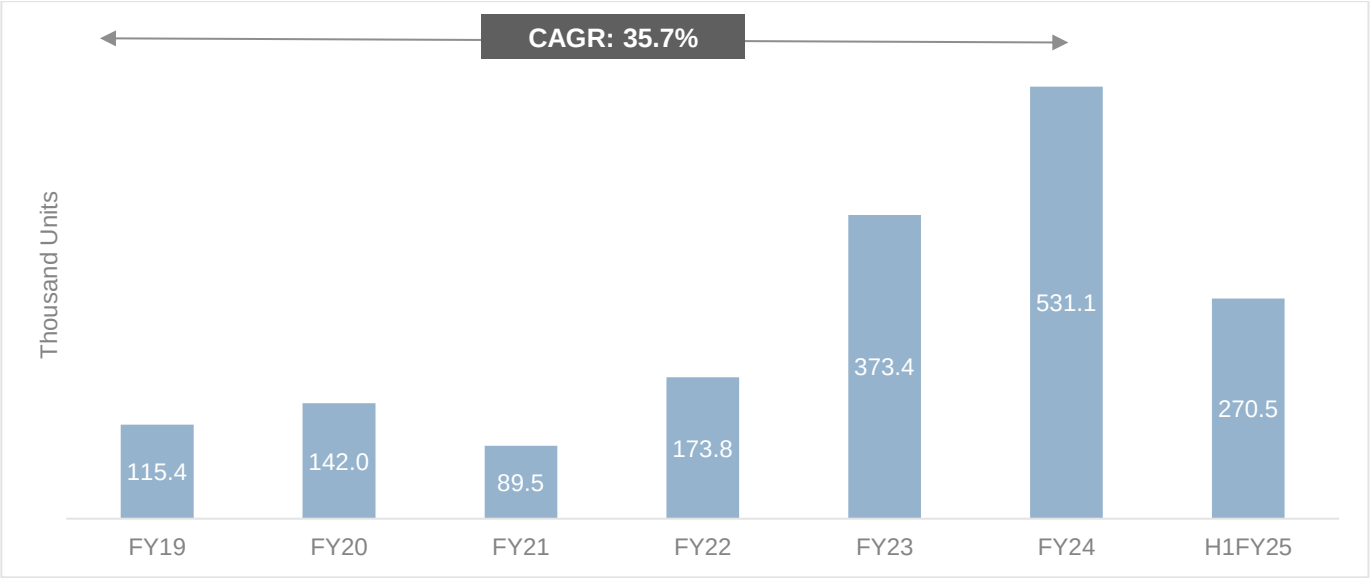
3.3 Review of the E Rickshaw (L3) segment

The E Rickshaw segment witnessed a healthy growth during last 5 years led by rising acceptance of EV, continued requirement for last mile connectivity, increased mobility post pandemic as well as the rise in requirement from the e commerce subsegment.

The segment retails clocked a healthy 36% CAGR during Fiscal 2019- 2024 period, despite a sharp drop seen during the pandemic period. The E Rickshaw segment, which is dominated by the passenger subsegment, saw a sharp 37% drop in retails during Fiscal 2021 amidst the sudden drop in mobility requirement due to the pandemic.

E Rickshaw Retail sales trend



Note: Includes E Rickshaw (L3) subsegment sales data, does not include E Auto (L5) subsegment data, Retail sales data from VAHAN has been considered.
Source: VAHAN

The passenger E Rickshaw segment is typically used for a short distance connectivity and in the form of shared mobility from bus/train/metro stations, commercial centres. The lockdowns, closure of schools/colleges and offices during the pandemic impacted the requirement for the last mile connectivity and in turn the passenger E Rickshaws sales. The passenger E Rickshaw segment dropped 42% during Fiscal 2021.

On the other hand, the goods E Rickshaw segment witnessed a healthy growth, from a low base, during the same year led by the increased need for last mile delivery for e commerce segments. Thus, the share of goods E Rickshaw segment rose during the year to 11%.

Post pandemic, in the next three years, the goods E Rickshaw segment increased at a healthy pace of 58% led by the continued demand for last mile delivery while the larger passenger segment grew at a much faster pace of 82% CAGR from the reduced base of Fiscal 2021 backed by improvement in the overall mobility, resumption of schools/colleges and offices. The revamped tourist demand also aided the passenger segment growth.

In turn, the share of passenger segment expanded to 92% by Fiscal 2024.

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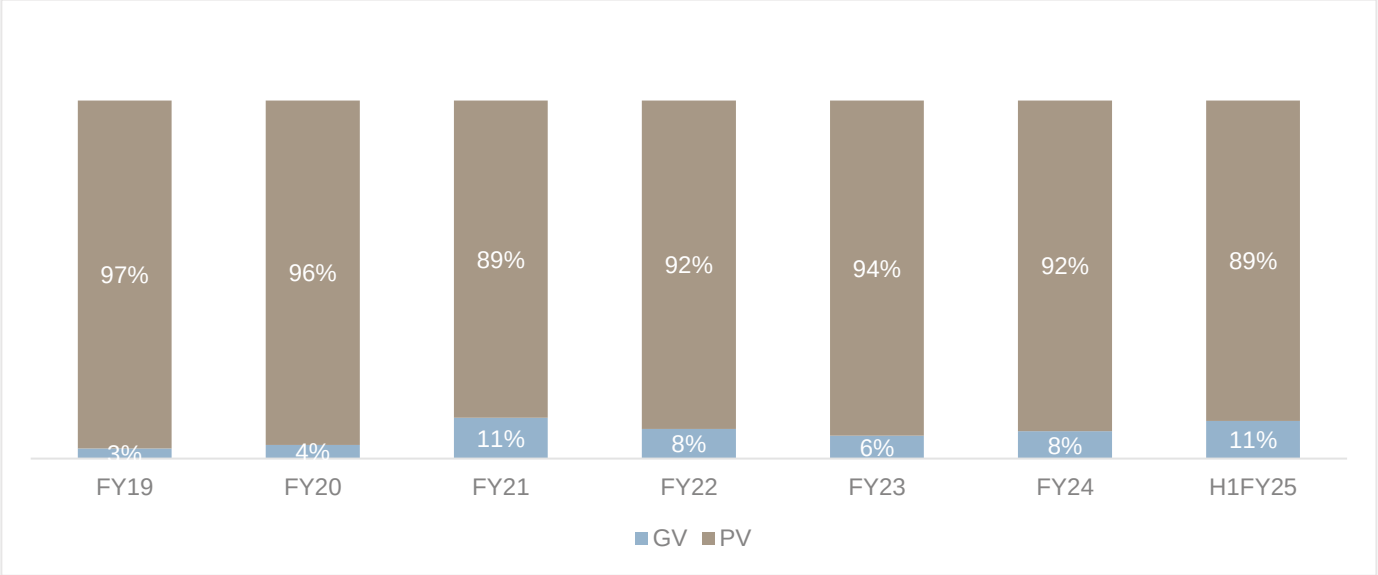
Segment wise split within the E Rickshaw segment



Note: Includes E Rickshaw (L3) subsegment sales data, does not include E Auto (L5) subsegment data, Retail sales data from VAHAN has been considered.

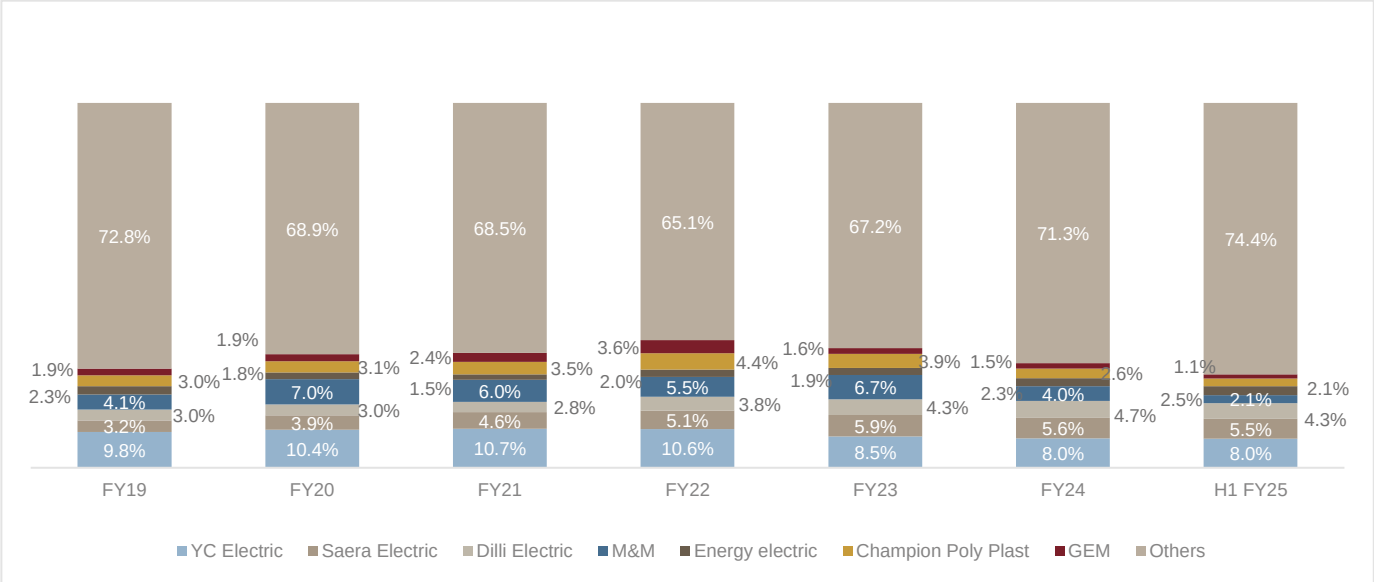
Source: VAHAN

Competitive Landscape within the E Rickshaw subsegment

Unlike the E Auto segment, the E Rickshaw subsegment is highly fragmented and dominated by small unorganised players. Few large players like YC electric, Saera Electric, Dilli Electric, M&M, GEM contribute 25-30% retails of the market. The rest 70-75% is contributed by numerous small unorganised players.

Within the large players, YC Electric leads the E Rickshaw subsegment with around 8-10% share, followed by Saera Electric contributing 4-6% and Dilli Electric at 3-5%.

Player wise contribution within E Rickshaw subsegment



Note: Includes E Rickshaw (L3) subsegment sales data, does not include E Auto (L5) subsegment data, Retail sales data from VAHAN has been considered. Best way Agency retails have been considered for GEM contribution.

Source: VAHAN

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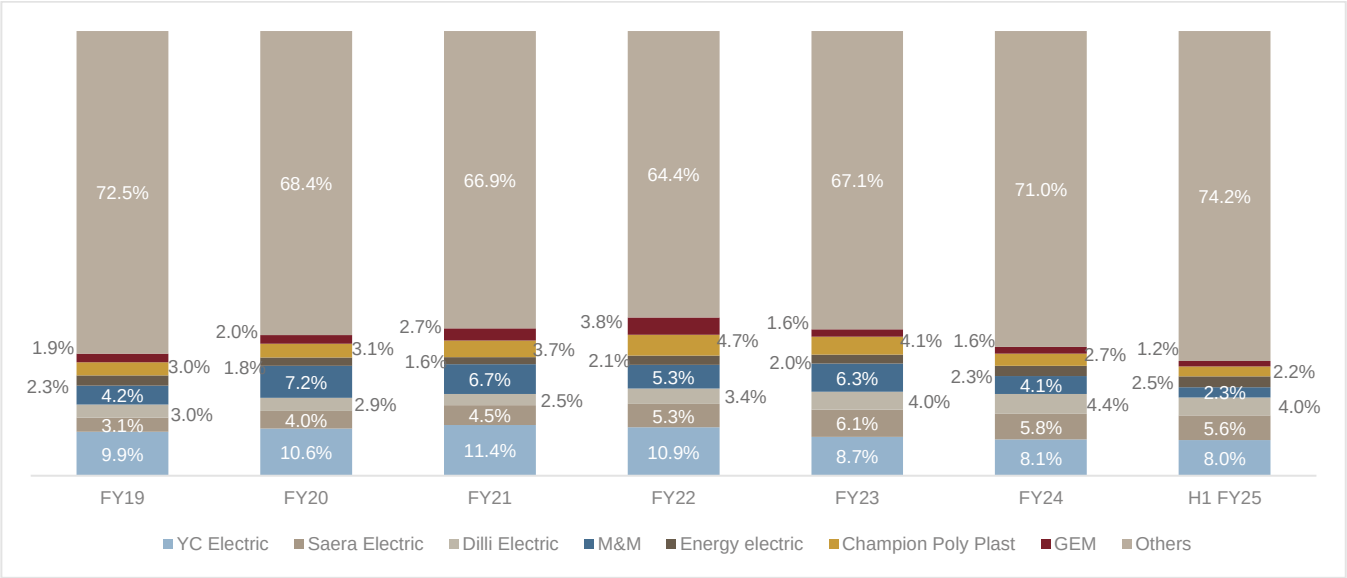
M&M, Atul Auto which have notable presence in the ICE and E Auto segments, have offerings in the E Rickshaw segment as well. Although their share in the overall E Rickshaw market is limited. Greaves Electric Mobility GEM which has recently introduced products in the E Auto space also commands 1-2% share in the E Rickshaw subsegment.

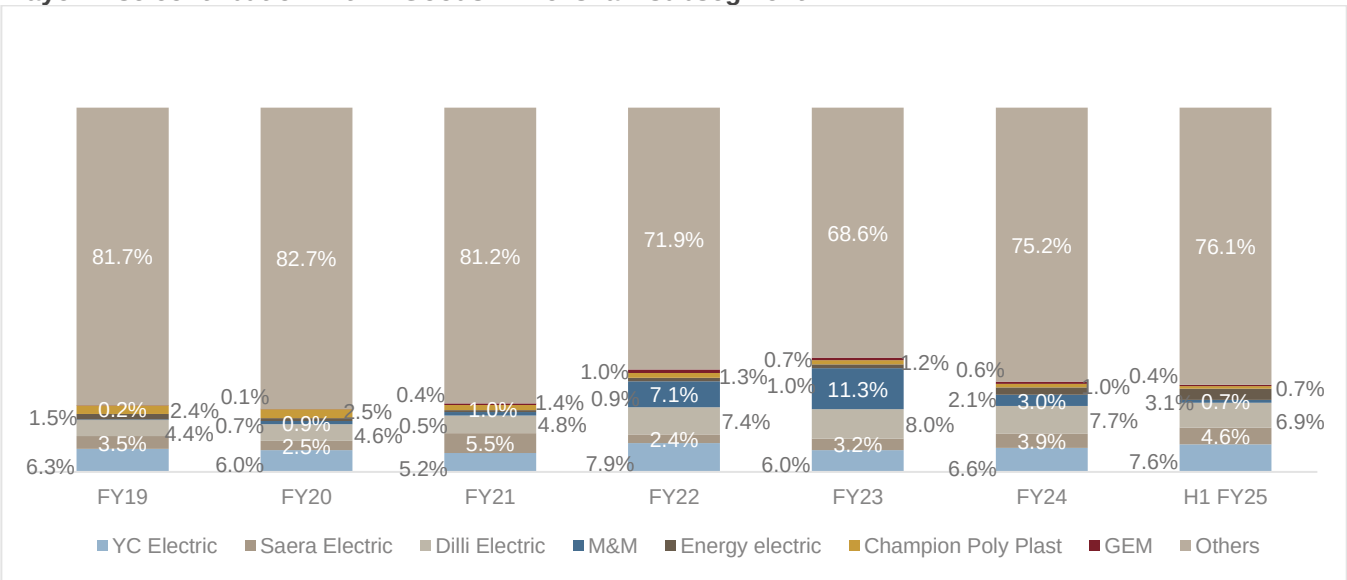
Player wise contribution within Passenger E Rickshaw subsegment



Note: Includes E Rickshaw (L3) subsegment sales data, does not include E Auto (L5) subsegment data, Retail sales data from VAHAN has been considered. Best way Agency retails have been considered for GEM contribution.

Source: VAHAN

Player wise contribution within Goods E Rickshaw subsegment



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Note: Includes E Rickshaw (L3) subsegment sales data, does not include E Auto (L5) subsegment data, Retail sales data from VAHAN has been considered. Best way Agency retails have been considered for GEM contribution.
Source: VAHAN

Drivers for Three wheeler industry electrification

Total cost of ownership (TCO) for L5 segment

The TCO for an electric 3W is 49% lower than that of a petrol 3W and 30% lower than that of a CNG 3W for 30,000km in Fiscal 2025. These lower operating costs are considering the subsidy provided by the government.

Going ahead, even if the subsidy is discontinued, the expected reduction in battery prices, increasing efficiency will help keep the operating costs for EVs lower than their ICE counterparts highlighting the viability of electric 3Ws for a typical commercial application over the long-term horizon.

Thus, the lowered cost of ownership is expected to provide a boost to 3W electrification in the long-term horizon. Additionally, unlike ICE vehicles, E-3W passenger vehicles do not fall under the ambit of the permit system, leading to a shift in the customer preference towards E-3Ws.

TCO for L5 3Ws in FY25 for four-year ownership

Annual running	30,000 km	35,000 km	40,000 km
Petrol-equivalent 3W EV	49% lower cost than petrol	53% lower cost than petrol	56% lower cost than petrol
CNG-equivalent 3W EV	30% lower cost than CNG	34% lower cost than CNG	37% lower cost than CNG

TCO for 3W in FY30 for a four-year ownership

Annual running	30,000 km	35,000 km	40,000 km
Petrol-equivalent 3W EV	50% lower cost than petrol	54% lower cost than petrol	57% lower cost than petrol
CNG-equivalent 3W EV	32% lower cost than CNG	36% lower cost than CNG	40% lower cost than CNG

Note: Total cost of ownership analysis framework takes into consideration down payment/ initial payment, Incentive/subsidies, EMI, fuel cost, maintenance cost over the ownership period adjusted for the resale value, Inclusive of PM E-DRIVE subsidy and State subsidy for Delhi, E Autos have been considered for the calculation. No subsidy is considered for fiscal 2030. Fuel costs have been considered consistent across the time period.
Source: Industry, CRISIL MI&A

Technological advancements

The continued technological advancements, especially in the battery technology have made the recent vehicle offerings more efficient providing longer range and higher battery life thus making the vehicles more attractive for the buyers.

Even going ahead, the further technological advancements are expected to make vehicles more appealing for the customer base and aid the demand in the long-term horizon.

Replacement opportunity in three-wheelers

Demand for 3Ws has improved after the pandemic as customers are upgrading and replacing old fleet for higher uptime and cleaner vehicles. The replacement market for 3Ws has expanded. Pent-up demand from Fiscal 2021 (when vehicular moment was restricted) has helped the segment clock healthy growth post the Covid period.

Further, demand in the replacement market is expected to grow owing to deeper penetration of electric three-wheelers. Additionally, central and state subsidies have lowered the capital cost. Also, some of the states have either reduced or waived of registration fees, road tax and permit requirement for electric three-wheelers.

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Moreover, these vehicles have inherently lower running cost. Overall, their cost of ownership is much lower than conventional diesel or CNG three-wheelers, rendering shift to electric 3Ws attractive.

Other factors driving growth

- Favourable cost economics, strong charging infrastructure, easy availability of finance should drive the growth of e-autos
- E-commerce delivery is an important segment in E-3W sales. An improving economy amid low-to-moderate inflation is expected to drive consumer spending in propelling retail-industry growth driving the sales of E-3W even further.
- A stronger infrastructure network (metro lines and road connectivity) and the need for zero-emission 3Ws for last-mile connectivity to also support electrification in the longer run.

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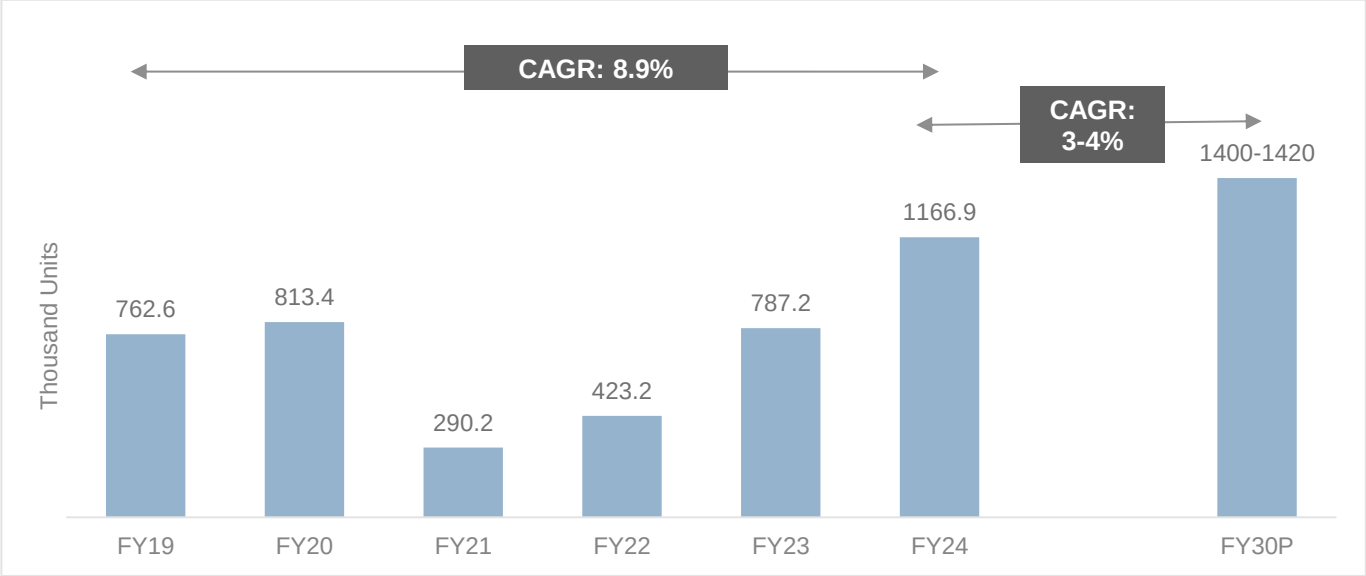
3.4 Outlook on the three-wheeler industry

The overall three-wheeler (L5+L3) industry grew at a healthy pace of approximately 9% CAGR during Fiscal 2019-2024 period and reached a high of approximately 1.2 million levels by Fiscal 2024.

Going ahead, from the high base of Fiscal 2024, the industry is expected to continue its growth, albeit at a moderated pace of 3-4% CAGR during Fiscal 2024-2030 period.

This growth will be led by the premium L5 segment, which is projected to grow at a relatively faster rate of 4-5% CAGR. On the other hand, the L3 segment is expected to grow at a moderate pace of 1-3% CAGR on a very high base of Fiscal 2024.

Three-wheeler industry (L5 + L3) outlook



Note: Includes L5 as well as L3 subsegment sales data, Retail sales data from VAHAN has been considered for the analysis. VAHAN data does not include retails for Telangana state
Source: CRISIL MI&A, VAHAN

The larger L5 segment, which contracted at 0.4% CAGR during Fiscal 2019-2024 period, is expected to clock a healthy growth at 4-5% CAGR till Fiscal 2030.

The growth for the L5 segment will be primarily aided by the expected demand from the EV subsegment. Increasing Portfolio expansion, government support, technological enhancements, expansion in charging infrastructure to provide the thrust to the electrification within the industry.

The EV sales are projected to grow at a healthy pace of 19-21% CAGR while the ICE segment sales are projected to remain near steady.

In turn, the EV penetration within the segment, is projected to increase from 16% in Fiscal 2024 to 35-40% by Fiscal 2030. In the last 5 years, EV penetration within the L5 segment, grew from insignificant levels in Fiscal 2019 to 16% by Fiscal 2024.

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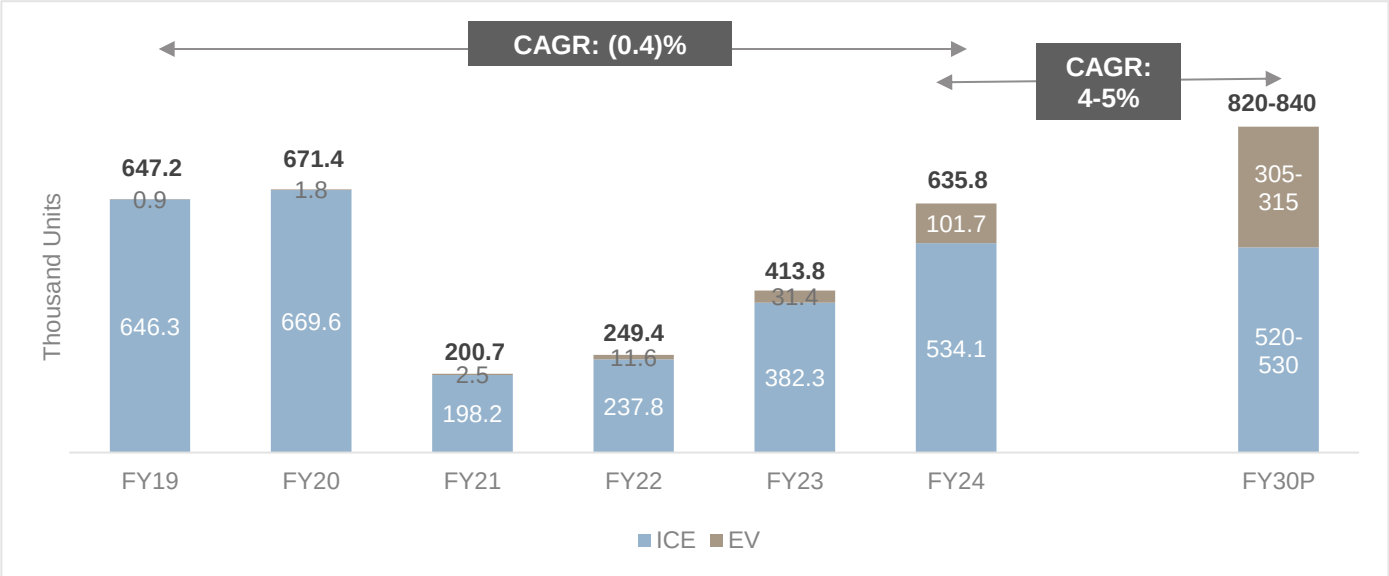
Three-wheeler industry L5 segment outlook

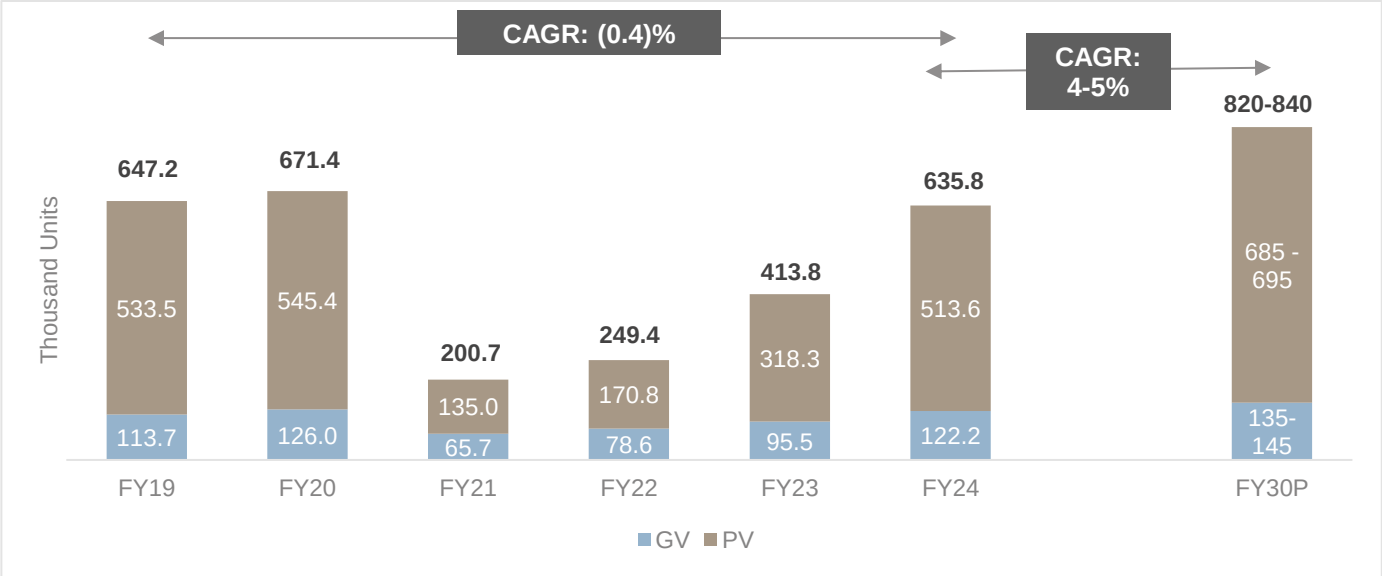


Note: Includes L5 as well as L3 subsegment sales data, Retail sales data from VAHAN has been considered for the analysis. VAHAN data does not include retails for Telangana state
Source: CRISIL MI&A, VAHAN

Within the L5 segment, the goods subsegment which witnessed growth at 1.5% CAGR during Fiscal 2019-2024 period is projected to clock a faster growth of 2-3% led by the continued demand for last mile delivery, e commerce and FMCG sectors.

The larger passenger subsegment witnessed a sizeable hit during the pandemic and its sales contracted at approximately 1% during the last 5 years. The subsegment retails have not reached the pre covid levels as of Fiscal 2024. On this lowered base, the passenger subsegment is projected to witness growth at a relatively faster pace of 4.5-5.5% CAGR amidst the continued demand for the last mile mobility.

Three-wheeler industry L5 segment outlook



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data; Retail sales data from VAHAN has been considered for the analysis. Source: CRISIL MI&A, VAHAN

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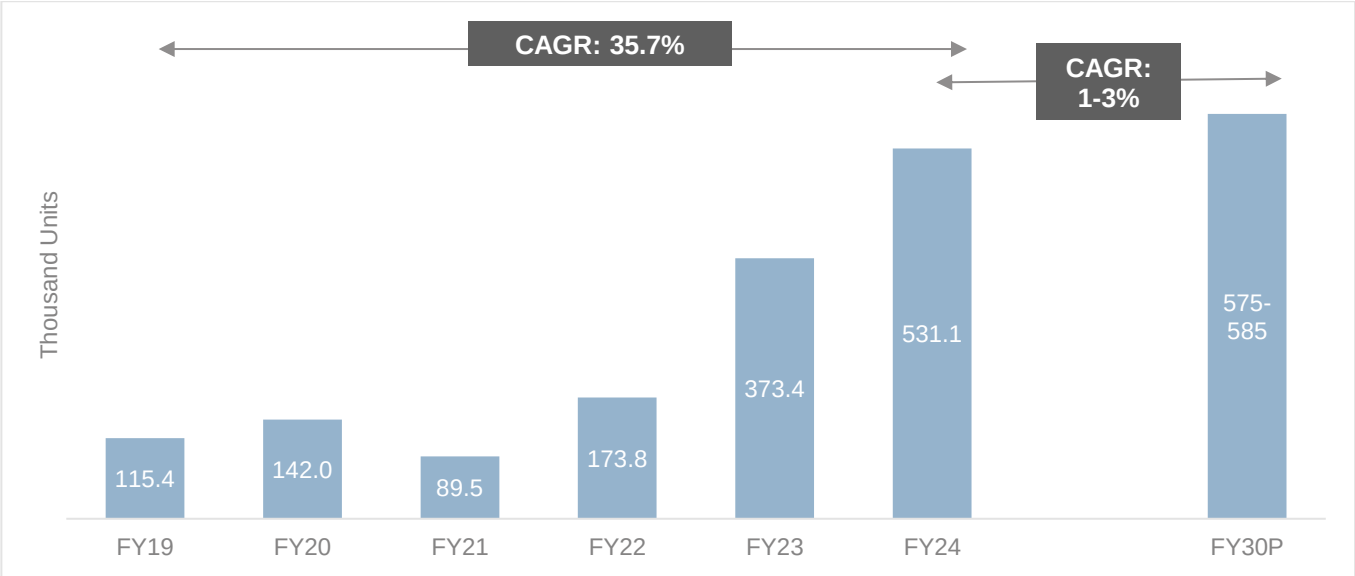
The smaller L3 subsegment witnessed growth at a healthy pace of 35.7% CAGR during Fiscal 2019-2024 period and reached a high of approximately 530 thousand units in Fiscal 2024. From this high base, the subsegment is expected to continue its growth albeit at a moderate pace of 1-3% CAGR till Fiscal 2030.

Continued demand for the last mile mobility is expected to back the demand growth for the L3 segment going ahead. However, some shift towards the premium L5 subsegment to restrict the growth of the L3 segment.

Three-wheeler industry L3 segment outlook



Note: Includes E Rickshaw (L3) subsegment sales data, does not include E Auto (L5) subsegment data, Retail sales data from VAHAN has been considered.
Source: VAHAN

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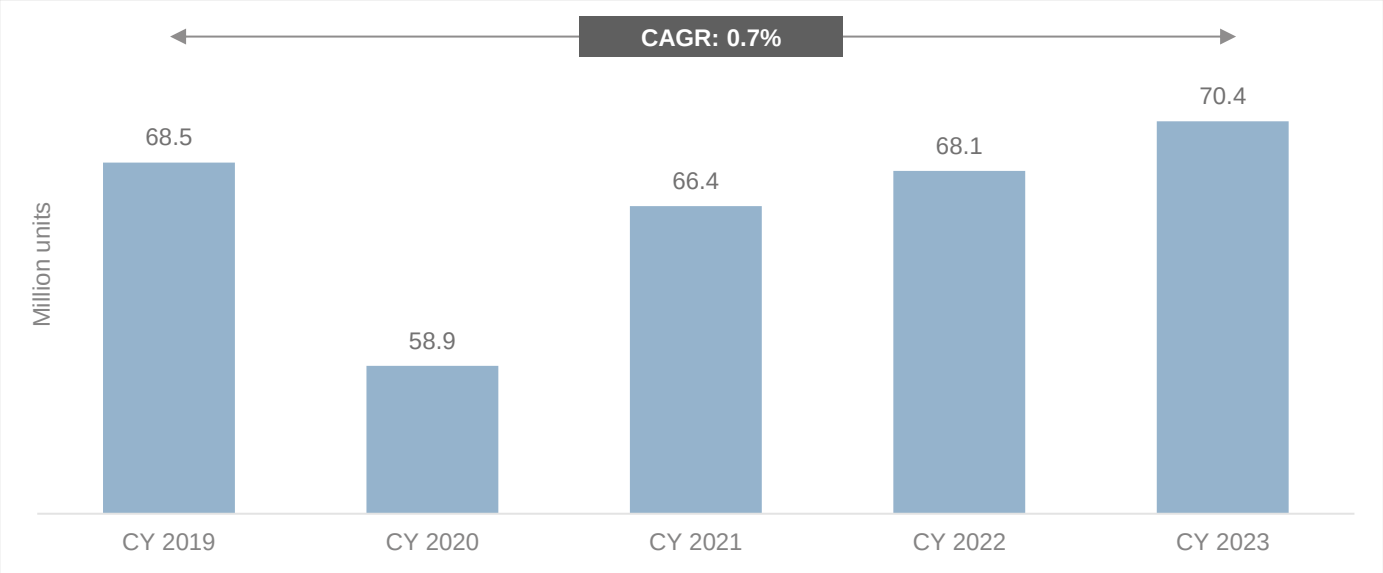
4. Global Industry

4.1 Review of the global two-wheeler Industry (High Speed + Low speed EVs)

Global two-wheeler sales (including the high speed two wheelers as well as low speed EVs), have grown from approximately 69 million units in CY2019 to approximately 70 million units in CY2023 at 0.7% CAGR. Global two-wheeler sales got impacted during the pandemic amidst the restricted mobility and the sales dropped 14% in CY2020.

With the gradual reopening of the economies and normalised mobility, two-wheeler sales bounced back and rose at a healthy 6% CAGR post pandemic and reached approximately 70 million levels by CY2023. The improvement in demand post pandemic in major contributors like Asia Pacific region, Latin America supported the overall growth in global two-wheeler sales.

Global two-wheeler sales volumes trend (High Speed + low speed EVs)



Source: MORDOR data

Within the overall global two-wheeler sales, Asia Pacific Region dominates the global market, with leading contributors India and China coupled with other large two-wheeler markets Indonesia, Thailand, Vietnam, Philippines, Malaysia, Singapore, Myanmar, and Cambodia. This region grew at a healthy pace post pandemic supporting the growth in overall global two-wheeler sales. Latin America, Africa, Europe and North America hold a relatively minor share in the global market. Growth in sales in these markets provided an added support to the global sales.

Additionally, faster growth in the smaller low speed EV segment aided the overall sales growth during CY2019-2023 period.

During CY2019-2023, High-speed two wheelers' sales contracted at 0.1% CAGR while the low-speed EV segment witnessed a healthy approximately 54 % growth. In turn, the share of low-speed EV increased from 0.8% in CY2019 to 3.9% in CY2023.

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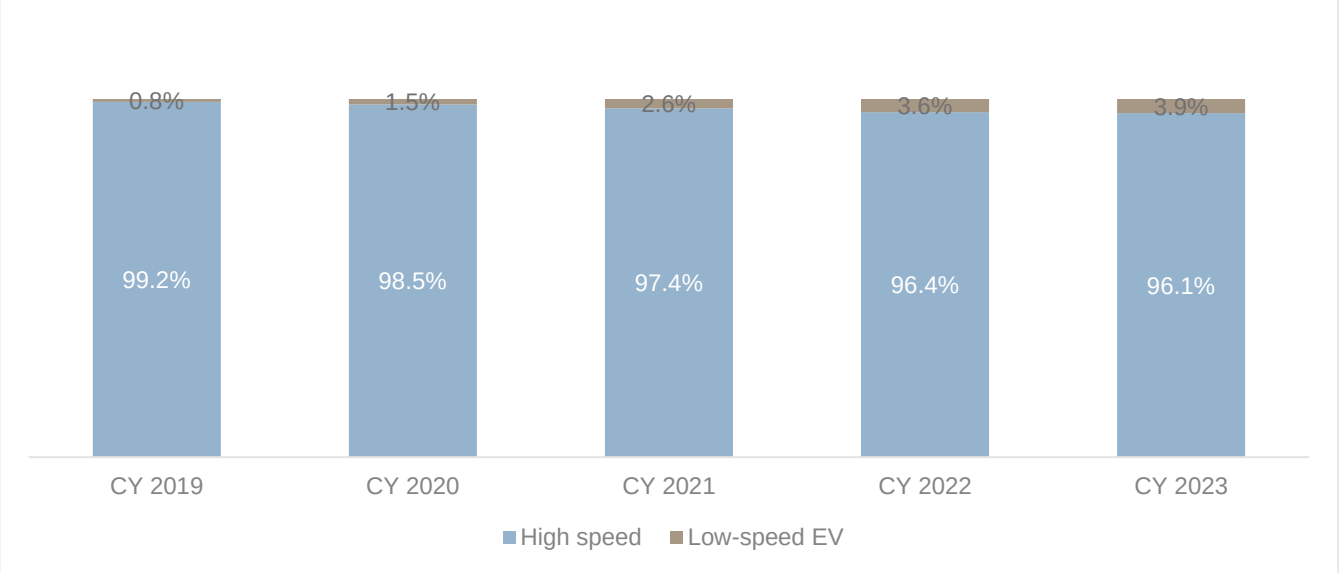
Split between High speed two wheelers and low speed EVs within the global two wheeler sales



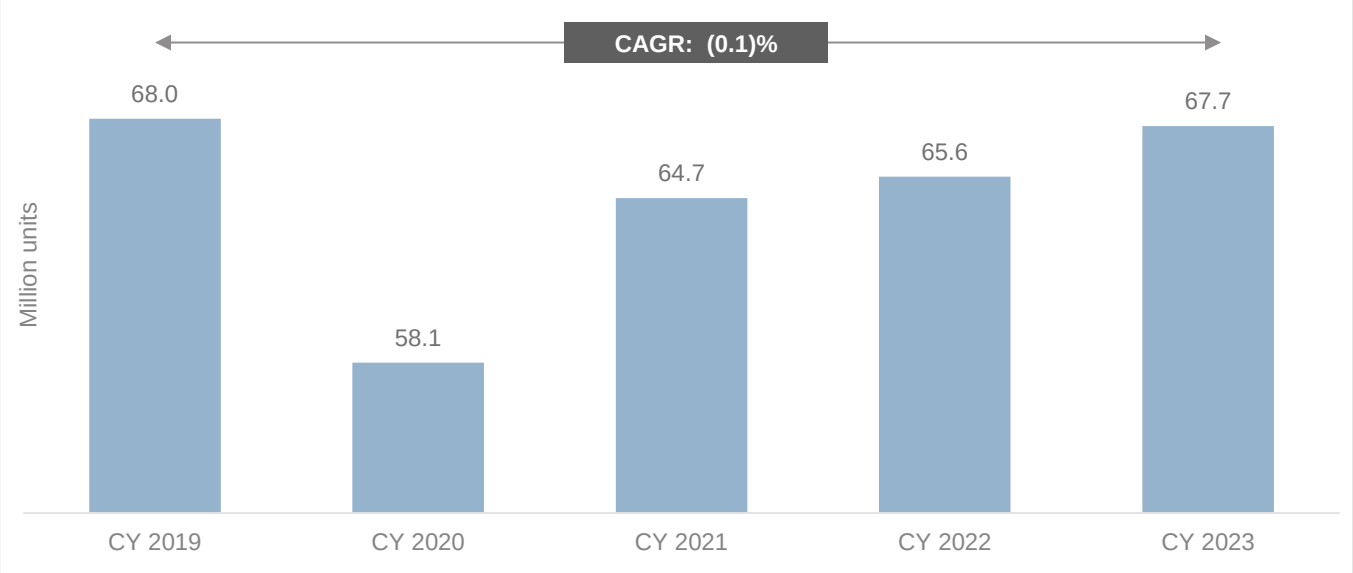
Note: Low speed EV definition varies for some geographies to <45kmph
Source: MORDOR data

The global High-speed two-wheeler market, which dominates the two-wheeler industry, contracted at 0.1% CAGR during CY2019 to CY2023 period. The industry witnessed a sharp contraction during the pandemic period and clocked a healthy 5.2% CAGR growth in the next 3 years to reach approximately 68 million levels in CY2023. Reopening of economy, normalized mobility, increased electrification, helped industry clock a healthy growth post pandemic.

During CY2019-2023 period, motorcycles witnessed a 0.5% CAGR growth while scooters sales dropped at 0.9% CAGR. The drop in scooter growth was primarily due to the sharp 19.5% contraction witnessed during the pandemic.

In fact, scooters have grown at a faster pace of 6.2% CAGR between 2020-2023 albeit from a lowered pandemic base. On the other hand, motorcycles witnessed a slower growth at 4.6% CAGR during the post pandemic period.

Global High-Speed two-wheeler sales volumes trend



Source: MORDOR data

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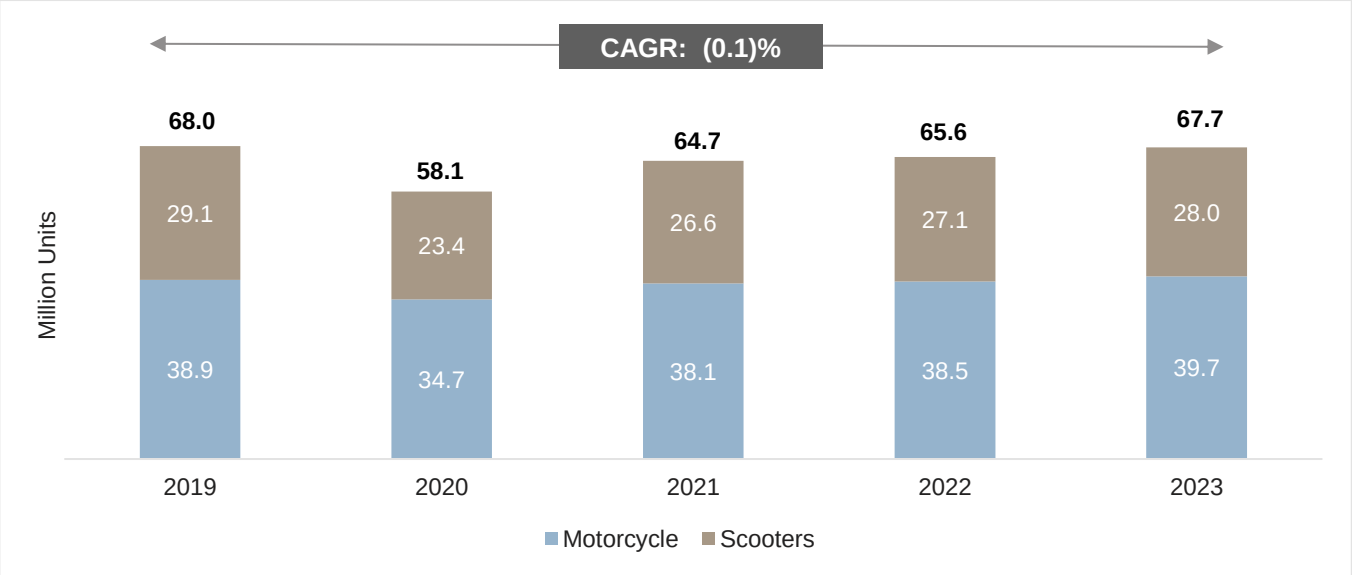
Within the High-speed two wheelers, ICE segment dominates the entire segment with more than 90% contribution. However, the share of High Speed EVs has been on the rise led by increasing awareness, governmental support, expanding vehicle portfolio and improving EV infrastructure.

Global High-Speed two-wheeler sales volumes trend

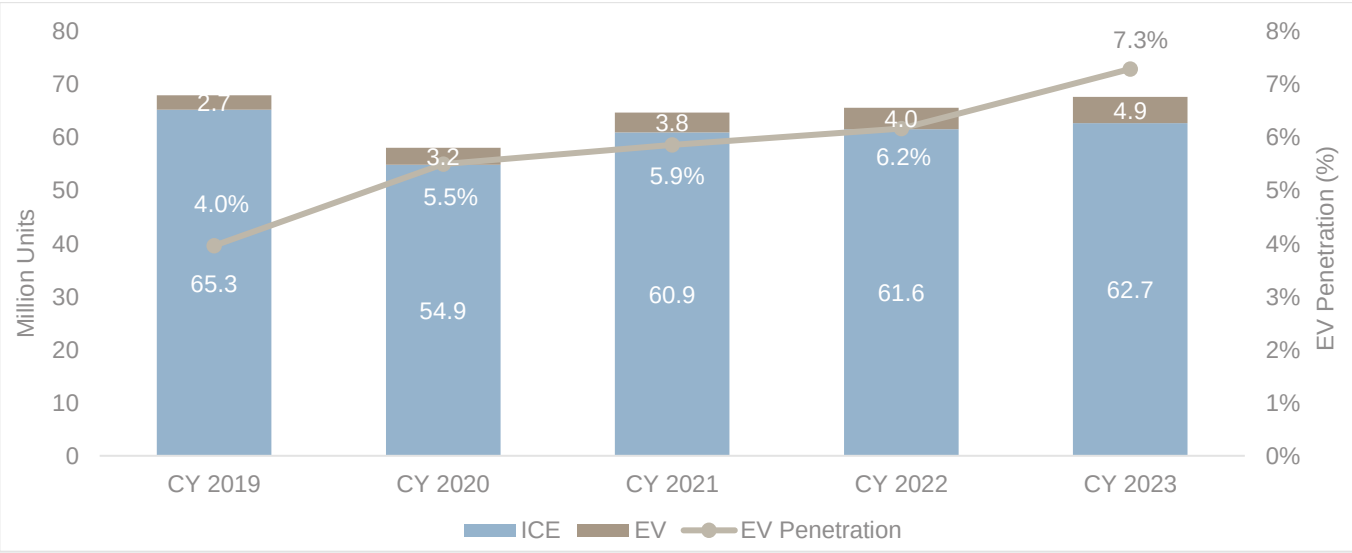


Source: MORDOR data

In the last 5 years, EV sales have grown at a healthy pace of 16% CAGR while ICE vehicle sales have contracted at 1% CAGR. In turn the EV penetration within the High-speed two-wheeler industry has increased from 4% in CY2019 to 7.3% by CY2023.

EV penetration is more prominent in scooters segment, where it increased from approximately 8% in CY2019 to approximately 15% by CY2023 while within motorcycles, EV penetration has remained moderate between approximately 1% in CY2019 to approximately 2% in CY2023.

Global High Speed two-wheeler sales powertrain split



Source: MORDOR data

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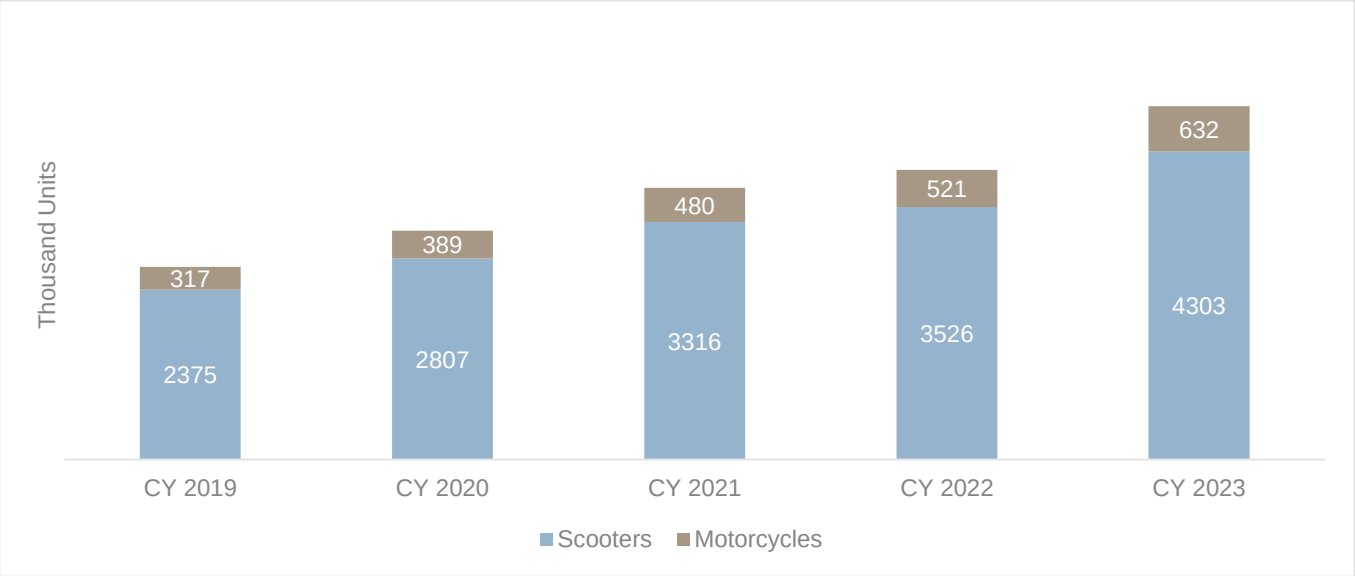
The EV sales grew consistently every year from 2.7 million units in CY2019 to 4.9 million units in CY2023 at a healthy growth rate of 16% CAGR. This highlights a strong shift in consumer preference and industry focus towards EVs.

This continued increase was supported by government policies pushing towards EV adoption, improvements in EV charging infrastructure, rise in environmental awareness, advancements in battery technology as well as expansion in EV portfolio.

Global High Speed EV segmental split



Source: MORDOR data

EV sales increased at a healthy pace in APAC region especially in countries such as India, China as well as ASEAN countries including Indonesia, Thailand, Vietnam, Malaysia.

Even in developed regions like US & Europe, EV sales increased led by government initiatives, technological advancements and shift in consumer preferences. EV penetration within the Africa two-wheeler sales is currently insignificant amidst the low affordability, poor electricity access as well as low electricity reliability. However, EV sales have witnessed some improvement off the very low base in the last few years.

The EV penetration is relatively lower in Latin American countries. Although EVs have clocked a faster growth from a very low base, the penetration levels remained much lower than other regions like APAC, ASEAN and Europe.

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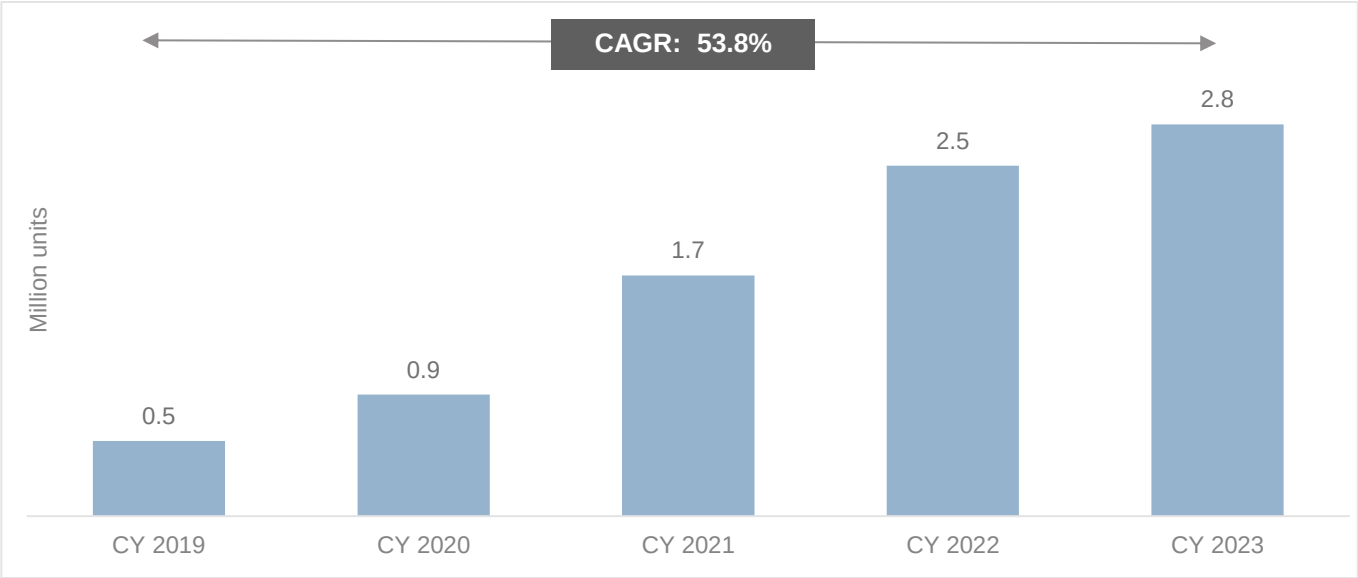
Low-speed electric two-wheeler market

The low-speed electric two-wheeler sales have increased at a healthy pace of approximately 54% CAGR off the very low base of CY2019. Rise in demand from the last mile delivery requirements aided this affordable, low maintenance and clean energy segment.

Additionally, the increased demand from urban commuters amidst rising congestion also supported the demand growth of this segment.

Global low-speed electric two-wheeler market sales trend



Source: MORDOR data

The Asia-Pacific region dominates the market for low-speed electric two-wheelers. Low-speed electric two-wheelers are widely utilized in Asia-Pacific's last-mile delivery services sector. The penetration of online food delivery services and e-commerce adoption in the region contributed to the surging growth of this market segment.

India is also one of the leading countries in the Asia-Pacific region with increasing low speed EV sales. In recent years, various companies such as Zomato have partnered with two-wheeler manufacturers to deploy low-speed electric two-wheeler fleets as part of their last-mile delivery services.

4.2 Review of the global three-wheeler industry

The global three-wheeler market witnessed a healthy growth at 5.3% CAGR, increasing from 3.9 million units in CY2019 to 4.5 million units in 2023. The pandemic impacted the global three-wheeler market during CY2020 contracting the sales by 10% during the year.

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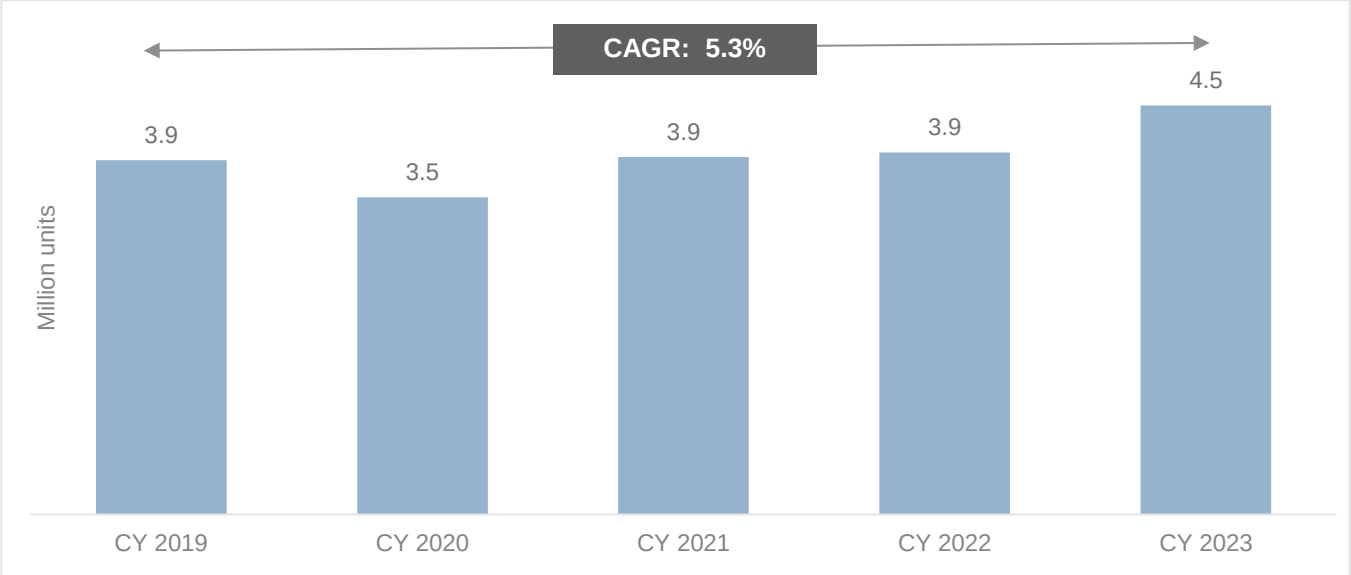
Global three-wheeler market sales (L5+L3)



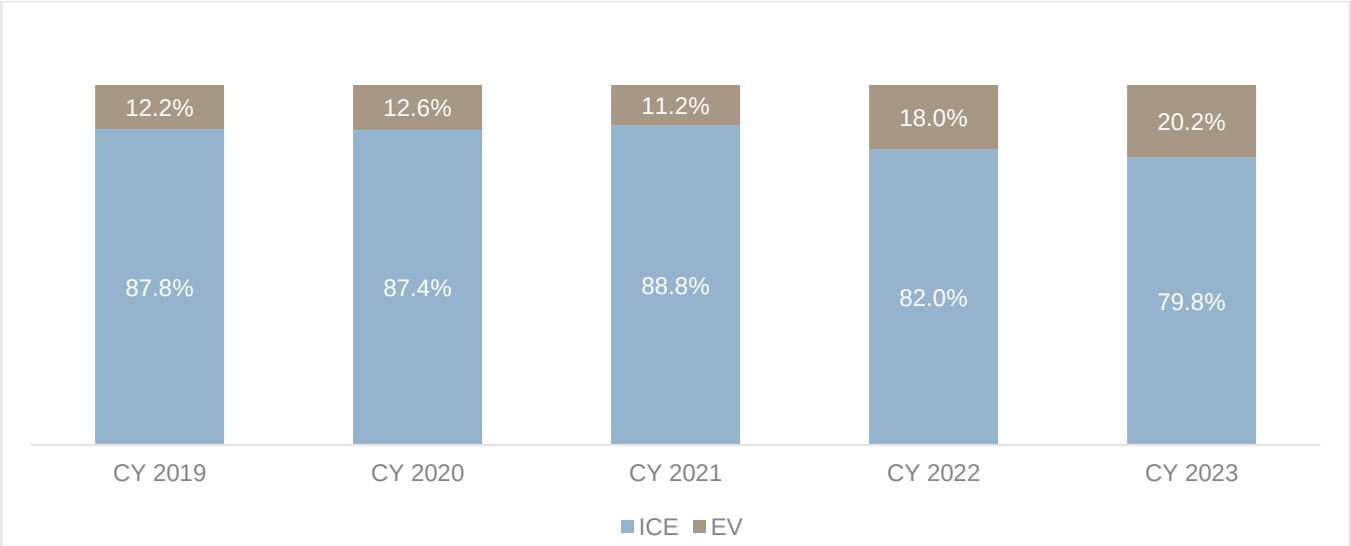
Note: Numbers include L5 & L3 category sales
Source: MORDOR data

Amidst the normalization in the economic activity and continued demand from the last mile delivery segment, the global three-wheeler sales picked up pace post pandemic and grew at a healthy pace of approximately 9% in the next three years reaching 4.5 million units by CY2023.

The resurgence in demand from Asia Pacific market- which dominates the three-wheeler industry, aided the growth of this segment.

Additionally, the healthy growth witnessed by the EV subsegment provided the thrust to the global three-wheeler sales. The smaller segment of EVs witnessed a healthy approximately 18% growth during CY2019-CY2023 period while the larger ICE segment grew at a relatively slower pace of 1.2% CAGR during the same period. In turn, the share of EVs grew from approximately 12% in CY2019 to approximately 20% by CY2023.

Global three-wheeler market powertrain split



Note: Numbers include L5 & L3 category sales
Source: MORDOR data

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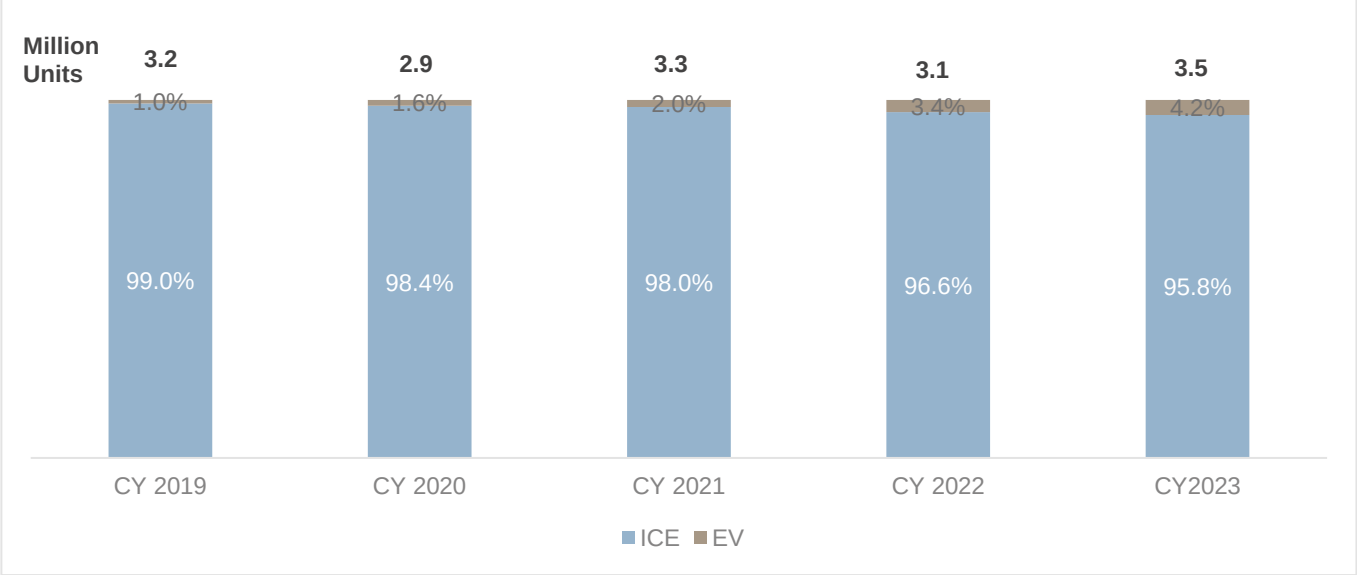
The healthy growth in EV segment was aided by the government's support, expansion in charging infrastructure, player focus as well as growth of e-commerce. Additionally, various players made partnerships with e-commerce players to boost the use of EVs in their last-mile delivery supporting the faster growth of EVs.

Global three-wheeler L5 segment sales trend

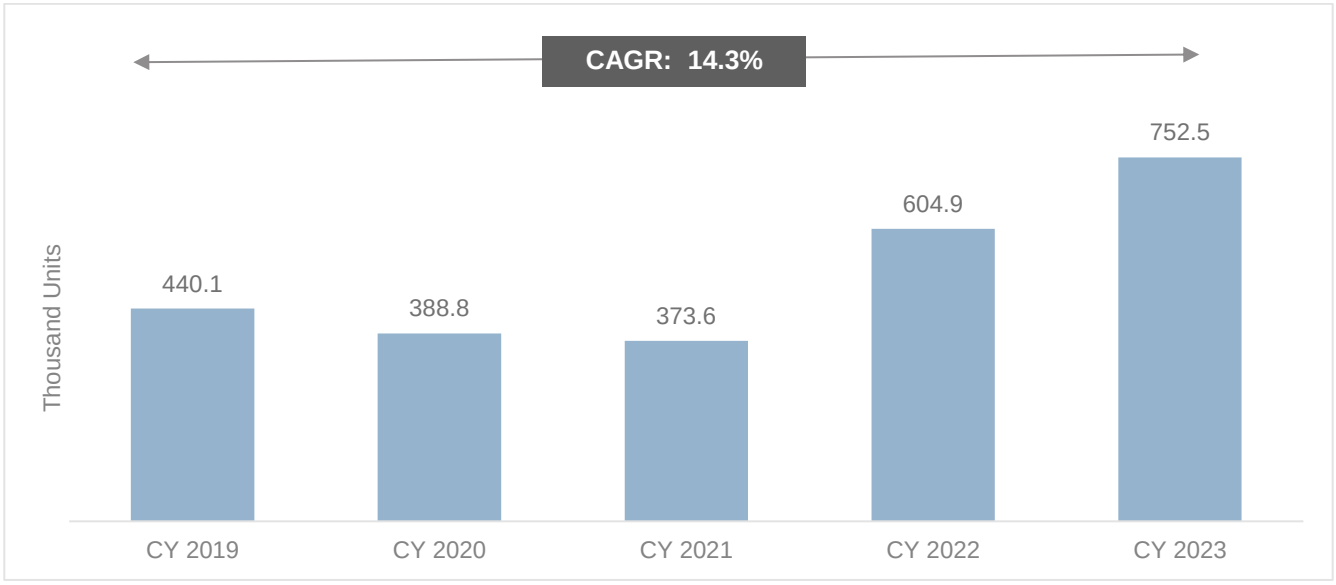


Source: MORDOR data

Moreover, the increase in internet penetration and hence the ride-hailing services has further increased the demand for three-wheelers, E-3W in particular. Various manufacturers have also extended their product portfolios to cater to the growing demand supporting the growth of EVs.

Within the EV segment of three-wheelers, L3 segment witnessed a healthy growth at approximately 14% CAGR during Fiscal 2019-2023 period. Higher affordability, requirement for the last mile mobility supported this healthy growth of EV L3 subsegment.

EV L3 global sales trend



Source: MORDOR data

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4.3 Regulatory Support for EV adoption

Amidst the increased need to reduce emissions and to moderate the use of fossil fuels, governments across the globe have set up net zero emission targets and are incentivizing long term sustainable mobility solutions.

Governments are introducing various incentives and subsidies to promote the adoption of EVs across vehicle segments. These incentives include subsidies, tax credits, rebates etc. By providing these financial benefits, governments aim to accelerate the transition toward cleaner and more sustainable transportation options. These measures help lower the initial costs associated with owning electric vehicles and make them more accessible to a broader range of consumers. Additionally, governments have been encouraging manufacturers to support the EV adoption through increased aid for vehicles and EV component manufacturing as well as are actively supporting the charging infrastructure expansion efforts.

For example, India has been offering incentives through PM E-DRIVE, Electric Mobility Promotion Scheme, PLI – Auto components, chemistry cells, Phased Manufacturing Policy, Battery recycling and Charging infrastructure policy. China is promoting EV adoption with tax breaks, research funding, subsidies and New Energy Vehicle (NEV) mandates for OEMs. South Korean government is implementing regulations and incentives to encourage EV adoption as well as to increase the availability of charging infrastructure.

Thailand has authorized the second phase of their EV package- EV3.5 for 2024-2027 period. It has also reduced excise duty on EV batteries and announced a THB 24 billion subsidy for battery manufacturing.

The proposed incentives in Vietnamese Ministry of Transport EV policy include no import tax, reduced VAT for EV buyers. Indonesia has allocated USD 455 million to subsidize the sale of 1 million electric motorcycles in the country. Indonesia has also extended its localization deadline, providing more time for manufacturers to establish their facilities. Malaysia is offering income tax rebates to local manufacturers of EV charging equipment.

These ASEAN countries have tall EV targets with Thailand targeting 30% EVs by 2030, Vietnam targeting 10% of new vehicle sales as EVs by 2030 and a complete transition to EVs by 2050, Malaysia earmarking 15% EVs and 125,000 EV charging stations by 2030, Indonesia targeting 20% EV share in new vehicle sales by 2025 as well as 0.6 million EV vehicle production by 2030. In line with these targets, the respective governments are expected to continue to support the EV growth going ahead aiding EV sales in the long run.

Even in developed regions like North America and Europe, governments have been supporting EV adoption. For instance, Canada has introduced a 25% rebate for battery-powered motorcycles. In Europe, Austria is providing grants to support the adoption of electric two-wheelers and three-wheelers. Japan and South Korea have set subsidy programs targeting 100% adoption of electric two-wheelers, with 100,000 such vehicles on the road by 2025. Japan also aims for 622,000 electric two-wheelers by 2025 and plans to raise this number to 8.75 million by 2035.

Within the African market, the Nigerian Automotive Industry Development Plan (NAIDP) has paved the way for vehicle manufacturers to set up manufacturing plants in the country. In Morocco, the government is targeting 250,000 electric two-wheelers and three-wheelers on the road by 2030.

Such government initiatives have supported EV adoption in the last few years and is expected to provide further impetus going ahead as well.

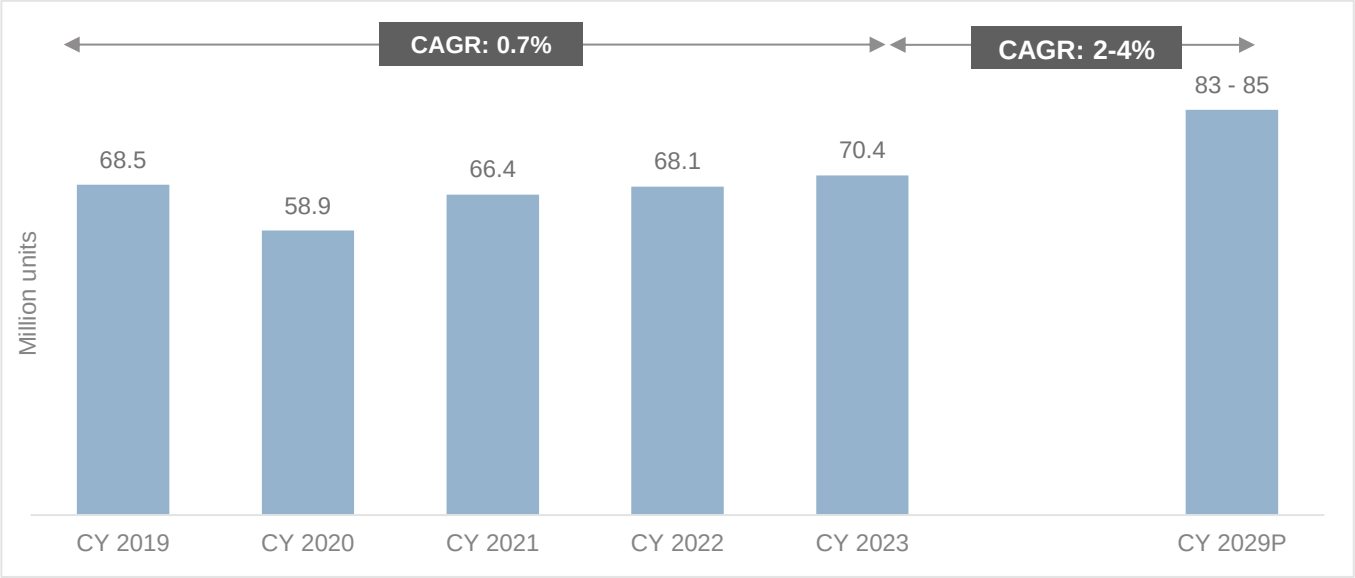
4.4 Global Outlook

Global 2-wheeler outlook (High-speed + low-speed EVs)

According to Mordor Intelligence projections, the global 2W sales are expected to grow at an increased pace of 2-4% CAGR during CY2024-CY2029. The industry is expected to reach 83-85 million units' sales by CY2029.

This increased pace will be led by the expected faster growth in the high-speed two-wheelers at 2.5-3.5% CAGR compared to low-speed electric 2Ws which are projected to grow at a relatively slower place of 1-2% CAGR from an elevated base of CY2023.

Global two-wheeler sales outlook



Source: MORDOR data

The global High-speed two-wheeler industry sales are expected to grow at an accelerated pace of 2.5-3.5% CAGR till CY2029 compared to a 0.1% CAGR contraction witnessed during CY2019-2023 period. Improvement in economic conditions, rising demand from underlying segments like e commerce, ride hailing coupled with increased traction for EVs is projected to support this demand growth. Shift from ICE segment towards the EVs amidst expansion in portfolio, technological advancements, expansion in EV support infrastructure to aid the rising EV adoption by personal buyers.

Sales volumes are projected to reach 80-82 million levels by CY2029.

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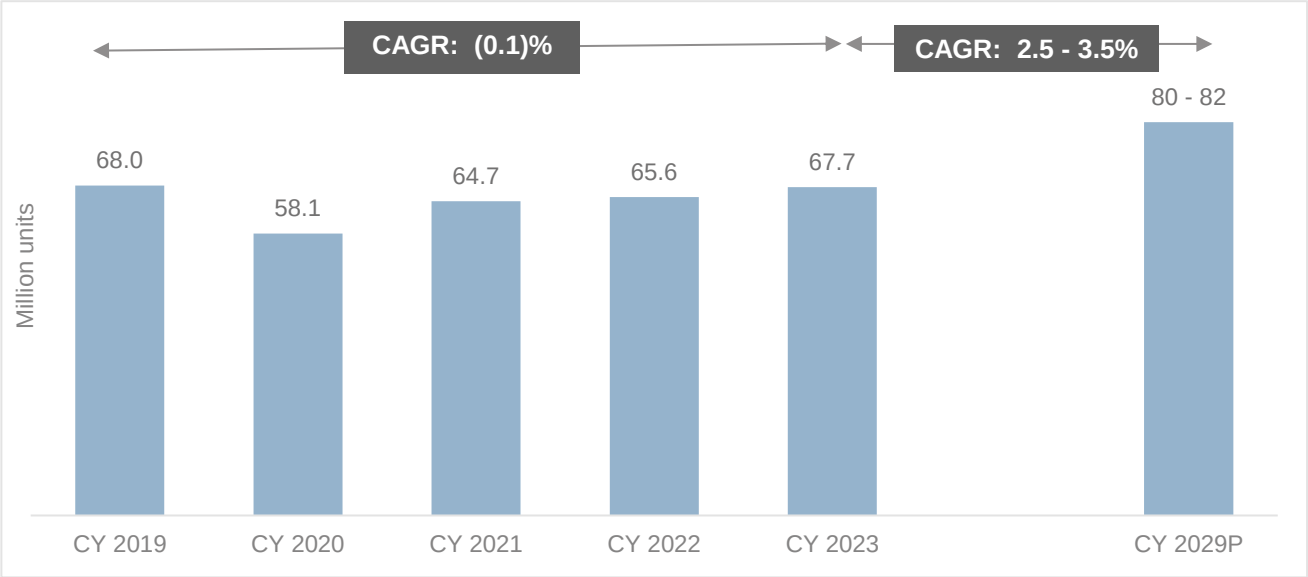
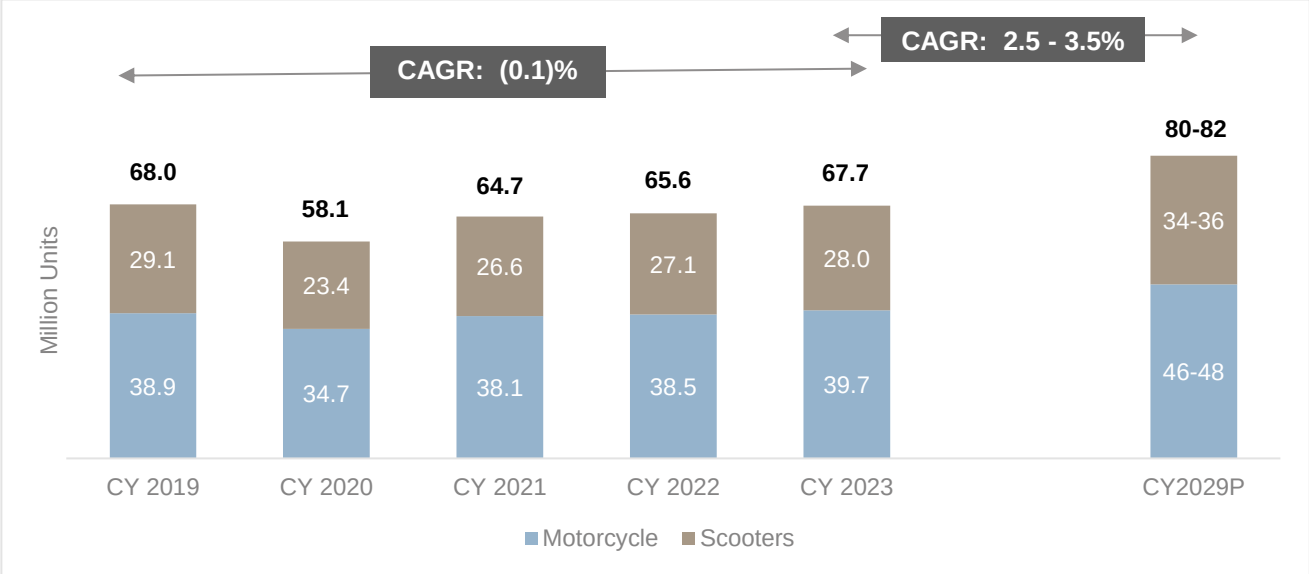
Global High speed two-wheeler sales volume outlook



Source: MORDOR data

Global High speed two-wheeler sales volume outlook



Source: MORDOR data

Additionally, the continued push from governments, increasing awareness, expanding vehicle portfolio is expected to provide a boost to electrification growth going forward. Globally, the EV penetration within the High-speed two-wheeler segment is expected to reach 15-16% levels by CY2029 from the current 7.3% levels.

The EV penetration within scooters is expected to reach 27-29% by CY2029 from approximately 15% levels as of CY2023 while for motorcycles, the EV penetration is projected to reach 6-8% levels by CY2029 from the current approximately 1.5% level.

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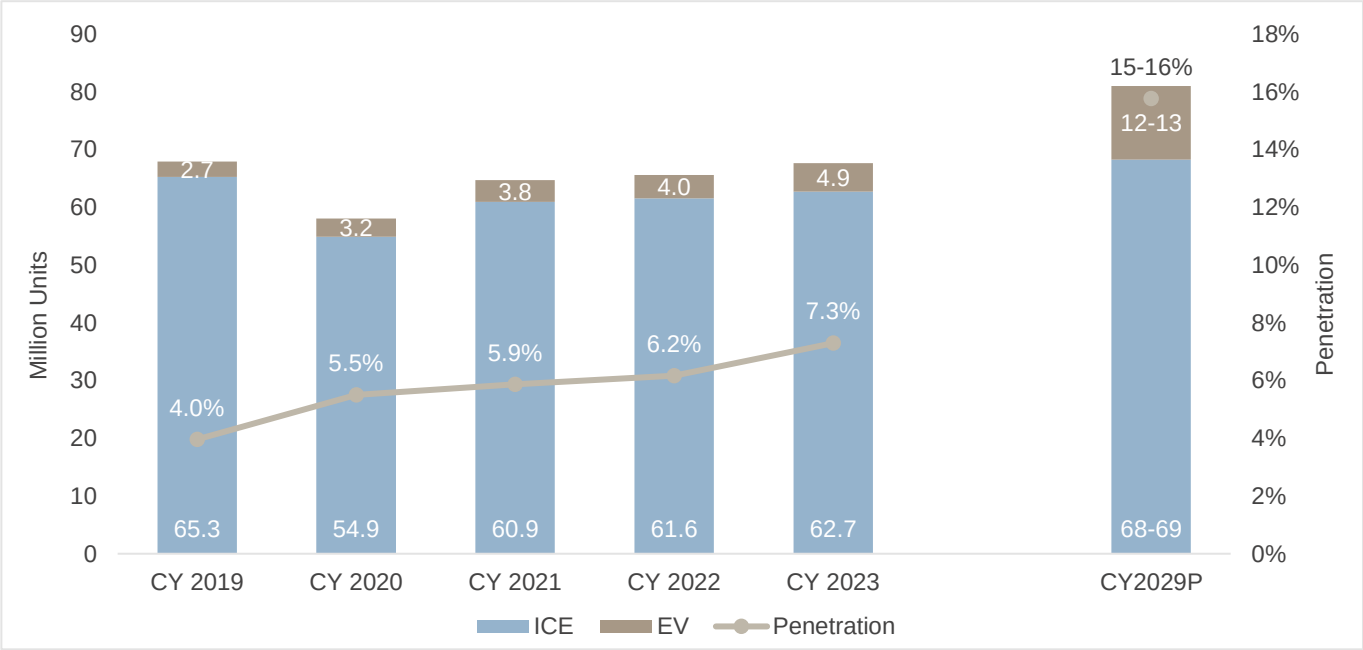
Global High Speed two-wheeler sales powertrain split outlook

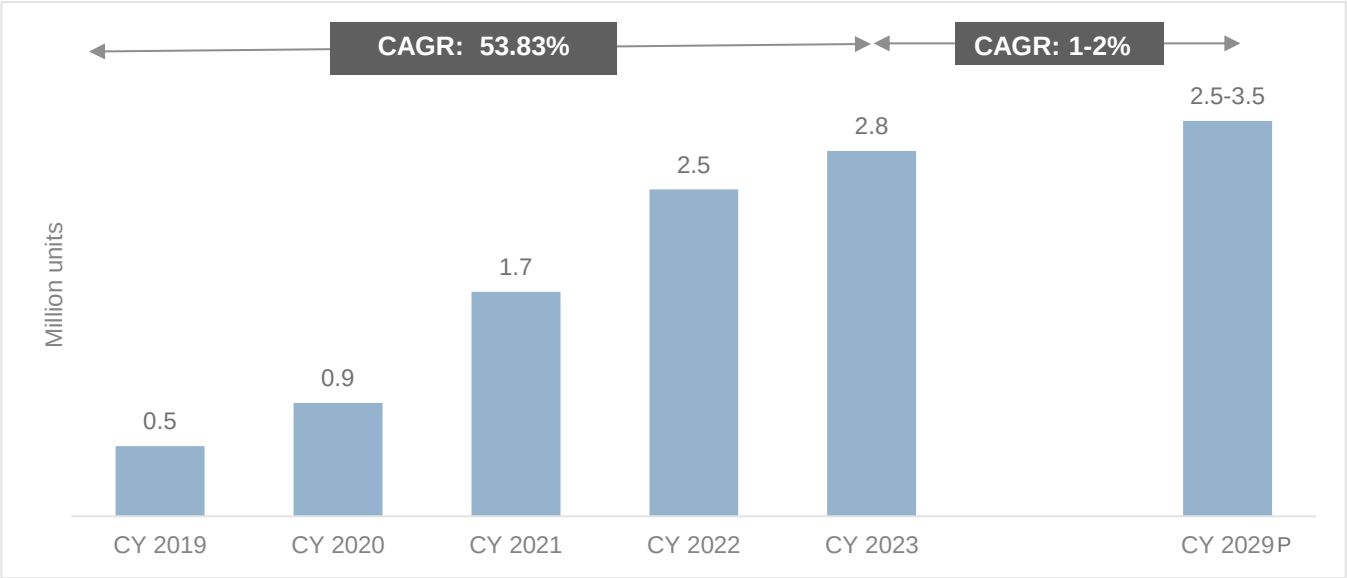


Source: MORDOR data

The smaller low speed segment is projected to grow at a relatively moderate pace of 1-2% CAGR, according to Mordor Intelligence projections. However, this growth is expected to be on an elevated base of CY2023 and some moderation in growth pace is expected going further.

The growth in the low-speed two-wheeler EVs will be led by the continued demand from the last mile delivery, continued portfolio expansion. However, shift towards high performance high speed EVs as well as concerns about the rider safety in low speed EVs are expected to restrict the growth in low speed EVs.

Global low-speed electric two-wheeler market sales outlook



Source: MORDOR data

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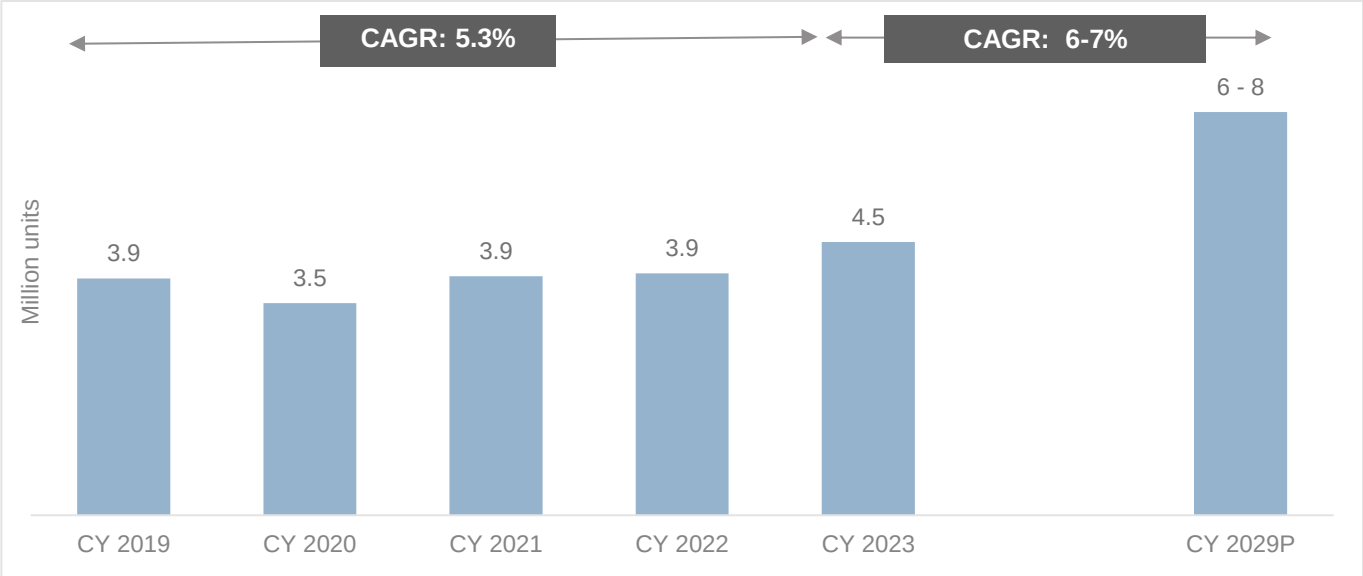
Global outlook 3W

The global three-wheeler industry sales are expected to grow at an increased pace of 6-7% CAGR till CY2029 compared to a 5.3% CAGR witnessed during CY2019-2023 period.

According to Mordor Intelligence estimates, the EV segment is projected to provide a major push and grow at a faster pace of 19-21% CAGR led by the supportive policies, technological advancements, expansion in charging infrastructure, expansion in portfolio as well as changing consumer preferences. Within EVs, the L5 segment is projected to grow at a faster pace of 31-33% while the growth for the L3 segment is projected at a relatively moderate pace of 16-18% from a high base.

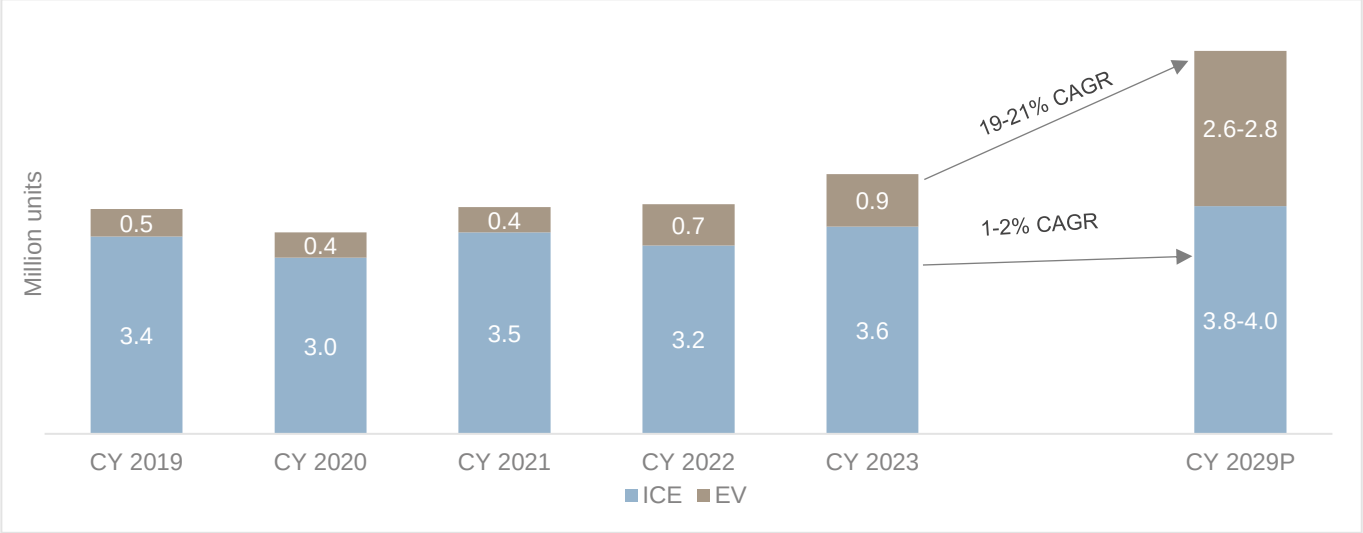
The larger ICE segment has remained relatively steady over the years, is projected to grow at a moderate pace of 1-2% CAGR. In turn the share of EVs is expected to reach 38-43% from current 20% levels.

Global three-wheeler market sales outlook



Source: MORDOR data

Global three-wheeler market powertrain split outlook



Source: MORDOR data

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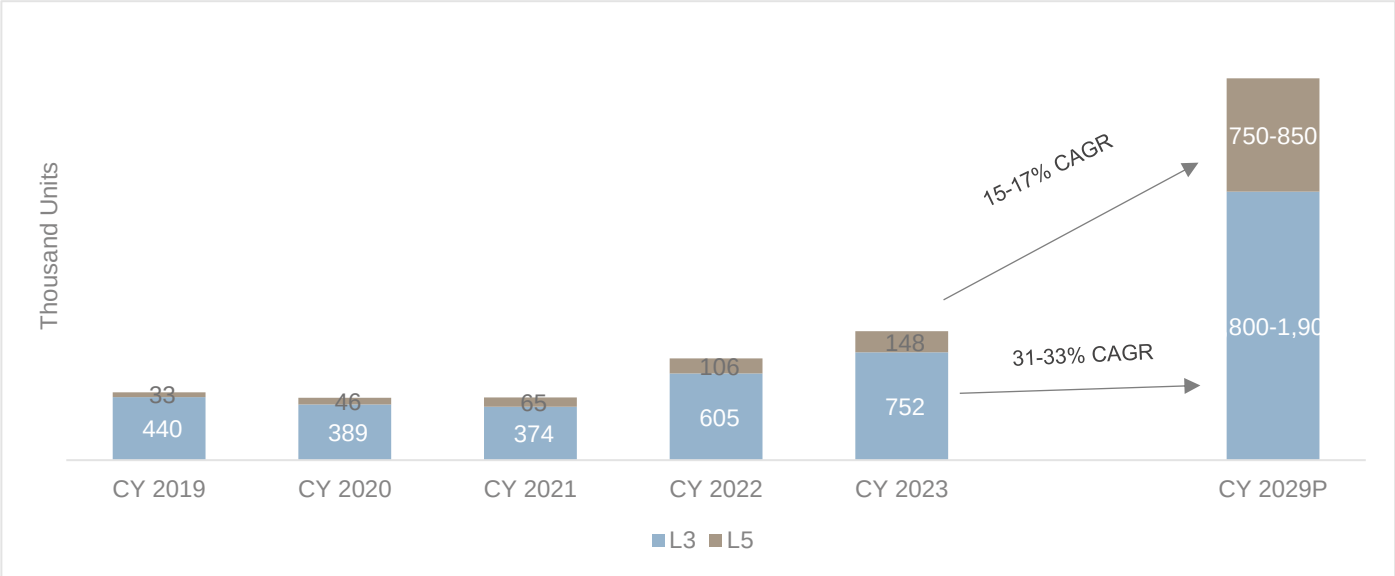
Global three-wheeler EV split outlook



Source: MORDOR data

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5. Competitive Landscape

Competition in the Indian automotive market has intensified in the last few years especially amidst the EV revolution, with new players entering the market and the legacy players expanding their portfolio.

5.1 Player-wise portfolio comparison

Segment		Ola Electric Mobility	Ather Energy	TVS Motor Company	Hero MotoCorp	Bajaj Auto	Greaves Electric Mobility	Mahindra last mile mobility	Atul Auto
2W	ICE	✗	✗	✓	✓	✓	✗	✗	✗
	2W EV - (<25 kmph max speed)	Upcoming	✗	✗	✗	✗	✓	✗	✗
	2W EV - (>25 & = <65 kmph max speed)	✗	✗	✗	✗	✓	✓	✗	✗
	2W EV - (>65 kmph max speed)	✓	✓	✓	✓	✓	✓	✗	✗
3W	Petrol/CNG 3W	✗	✗	✓	✗	✓	✓	✓	✓
	Diesel 3W	✗	✗	✗	✗	✓	✓	✓	✓
	EV L5	✗	✗	✗	✗	✓	✓	✓	✗
	EV L3	✗	✗	✗	✗	✗	✓	✓	✓

Source: OEM website

5.2 Competition Profiles

Ola Electric Mobility Limited

Ola Electric holds the largest market share in electric two-wheeler segment in India and has gone public with an Initial Public Offering (IPO) in August 2024.

They have been approved for both PLI schemes – one relating to the manufacturing of advanced automotive technology products (part of the Automobile PLI Scheme), and another relating to advanced cell chemistry batteries (the “Cell PLI Scheme”). The company is also awarded 20GWh capacity under the Cell PLI Scheme.

Manufacturing facilities

Ola built the Ola Future factory in Tamil Nadu, with an installed capacity of one million units per year as of October 31, 2023, and has commenced its operation of manufacturing EVs and EV components like battery packs, motor, and vehicle frames. In addition, Ola operates Battery Innovation Centre (BIC) in Bengaluru, India that is focused on developing cell technology and manufacturing processes for the cell manufacturing operations at Ola Gigafactory.

Ola has recently commenced manufacturing the 4680-form factor cells of 1GWh which is expandable to 20 GWh at Ola Gigafactory on March 22, 2024, and till Q1 FY25 have manufactured approximately 30000 cells ramping up month on month.

The cells from Ola's Gigafactory are expected to be used in both existing and upcoming EV models starting Q1 FY26. Phase 1 of the Ola Gigafactory was completed on May 31, 2024.

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Product Portfolio

Model	e-vehicle category	Battery capacity (in kWh)	Range (ARAI Certified)	Maximum Speed	Charging Time (100%)
S1X+	2W	3Kwh	151km	90km/h	7.4hrs
S1X	2W	2kwh	95km	85km/h	5hrs
S1X	2W	3kwh	151 km	90km/h	7.4hrs
S1X	2W	4kwh	193km	90km/h	6.5hrs
S1 Air	2W	3kwh	151km	90km/h	5hrs
S1 Pro (2nd gen)	2W	4kwh	195km	120km/h	6.5hrs
S1 Z	2W	3kwh	146km	70km/h	5 hrs
S1 Z+	2W	3kwh	146km	70km/h	5 hrs
Gig	2W	1.5 kwh	112km	25km/h	NA
Gig+	2W	1.5 kwh	157km	45km/h	NA

Source: OEM website, CRISIL MI&A

Recent launches

On August 15, 2023, Ola announced their new EV scooter model, Ola S1 X. In November 2024, company launched S1 Z range and low speed Ola Gig scooters.

Distribution network

Ola's network comprises 870 experience centers and 431 service centers (of which 429 service centres are located within experience centers) situated across India, as of September 31, 2024. Customers can discover products, reserve test drives and pre-order and purchase EV scooters through the Ola Electric website and track the status of delivery and after-sales.

Ather Energy

Ather Energy was founded in 2013 and is headquartered in Bangalore, Karnataka. It is the third largest E-2W manufacturer in India by sales volume, after Ola and TVS, as of Fiscal 2024.

Manufacturing facilities

Ather Energy's manufacturing facility is located at Hosur, Tamil Nadu. They are also planning to set up another manufacturing plant in Maharashtra state (Chhatrapati Sambhaji Nagar district), which has a high E-2W penetration and has a strong automotive supplier base.

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Product Portfolio

Model	e-Vehicle category	Battery capacity (in kWh)	Range (ARAI Certified)	Maximum Speed	Charging Time (0-80%)
RiztaS	2W	2.9kwh	123km	80km/h	6 hr 30 min
450S	2W	2.9kwh	115km	90km/h	6 hr 30 min
RiztaZ	2W	2.9kwh	123km	80km/h	6 hr 30 min
450Apex	2W	3.7kwh	157km	100km/h	5 hr 45 min
450X	2W	2.9kwh	111km	90km/h	6 hr 30 min
450X	2W	3.7kwh	150km	90km/h	4 hr 30 min
RiztaZ	2W	3.7kwh	159km	80km/h	4 hr 30 min

Source: OEM website, CRISIL MI&A

Recent launches

The company delivered its first model Ather 450 in 2018 and subsequently added Ather 450X and 450S, two new products to its portfolio. The 450X was launched in 2020, Ather 450X (3rd Generation) was launched in 2021 and Ather 450S was launched in 2023.

In 2024 Ather Energy launched a new range of 'Rizta' scooters targeting the family convenience segment.

Distribution network

The company has 226+ ECs across 166+ cities as of October 2024.

TVS Motor Company Limited

TVS Motor Company manufactures the electric scooter, TVS iQube, which was launched in 2020. TVS Electric Mobility Limited (TVSEM), is 100% subsidiary of TVS Motor. TVSEM was incorporated in December 2021 to undertake Electric Mobility business. The company has yet to commence its operations as of Fiscal 2024.

Manufacturing facilities

TVS has four manufacturing plants, three located in India (Hosur in Tamil Nadu, Mysore in Karnataka, and Nalagarh in Himachal Pradesh) and one in Indonesia at Karawang. They have increased their production capacity of electric scooter iQube to 25,000 units per month from August 2023 and plan to enhance it further in future.

Product Portfolio

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Model	e-vehicle category	Battery capacity (in kWh)	Range (ARAI Certified)	Maximum Speed	Charging Time (0-80%)
iQube	2W	2.2kwh	75km	75km/h	2hrs 45 min
iQube	2W	3.4kwh	100km	78km/h	4hrs 30 min
iQube S	2W	3.4kwh	100km	78km/h	4hrs 30 min
iQube ST	2W	3.4kwh	100km	78km/h	3hrs
iQube ST	2W	5.1kwh	150km	82km/h	4hrs 18 min
TVS X	2W	3.8kwh	140km	105km/h	4hrs 30 min

Source: OEM website, CRISIL MI&A

Recent launches

In 2023, TVS launched its premium EV TVS X. In 2024, the company launched TVS iQube ST (5.1kWh battery) and a new budget electric scooter - TVS iQube (2.2kWh battery). TVS iQube now has five variants iQube, iQube S and iQube ST model ranges.

Distribution network

TVS has 700+ EV dealer touch points across 400+ cities in India as of Fiscal 2024. Vehicle test ride, enquiry, or post sale services are available at TVS dealership through company trained sales and service team.

Strategic partnerships and investments

TVS Motor Company has acquired stake in the Swiss E-Mobility Group (SEMG). This move allows TVS Motor Company's to expand its presence in Europe with a portfolio of premium, technologically advanced brands, including Norton Motorcycles and EGO Movement, which were recently acquired. It has also acquired ION Mobility and Killwatt GmbH on 14th March 2024 and 20th March, 2024 respectively through TVS Motor (Singapore) Pte Limited.

Bajaj Auto Limited

Bajaj Auto established Chetak Technology Limited (CTL), a 100% subsidiary of Bajaj Auto formed on 4th October 2021, to focus on the development of new technologies and products in the electric two -wheeler space.

Manufacturing Facilities

CTL commenced its operation from the new manufacturing plant located at Akurdi, Pune to manufacture electric vehicles. The plant has an annual production capacity of 480,000 EVs with an investment of ₹ 4.7 billion in Fiscal 2024. Further, investment of more than ₹ 2 billion has been planned in Fiscal 2024-25 to transform the new manufacturing site into a major hub for the design, development, and expansion of electric two-wheelers.

Recently the company has received the Production Linked Incentives (PLI) certificates for Chetak from the automotive testing agency International Centre for Automotive Technology (ICAT).

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Product Portfolio

Model	e-Vehicle Category	Battery capacity (in kWh)	Range (ARAI Certified)	Maximum Speed	Charging Time (100%)
Chetak Blue 2903 Standard	2W	2.88 kWh	123km	63kmph	4 hrs
Chetak Blue 2903 TecPac	2W	2.88 kWh	123km	63kmph	4 hrs
Chetak Blue 3202 Standard	2W	3.2 kWh	137km	63kmph	3 hr 35 min
Chetak Blue 3202 TecPac	2W	3.2 kWh	137km	73kmph	3 hr 35 min
Chetak Blue 3201 Standard	2W	3.2 kWh	136km	73kmph	3 hr 35 min
Chetak Blue 3201 Special Edition	2W	3.2 kWh	136km	73kmph	3 hr 35 min
Chetak Blue 3201 TecPac	2W	3.2 kWh	136km	73kmph	3 hr 35 min
Maxima XL Cargo E-Tec 12.0	3W -Cargo	11.8kwh	183km	40kmph	5.50 hrs
RE E-Tec 9.0	3W-Passenger	8.9kwh	178km	45kmph	4.30 hrs

Source: OEM website, CRISIL MI&A

Distribution network

Chetak was launched on January 14, 2020. Initially Chetak's sales were restricted to only two cities -Pune (4 outlets) and Bengaluru (13 outlets) due to low demand. Bajaj Auto introduced a second model, the Chetak Urbane, in November 2023 and upgraded the Chetak Premium in December 2023. Currently, these two models are offered through a network of 204 dealers in over 164 cities.

Strategic partnerships and investments

Bajaj Auto has invested an additional ₹ 0.46 billion in Yulu Bikes Private Limited in February 2024, post which company's total investment in Yulu Bikes stands at ₹ 1.65 billion. With this investment, Bajaj Auto's stake in Yulu Bikes has increased to 18.8% of its paid-up equity share capital. Yulu Bikes is present in the three metros - Bangalore, Mumbai and Delhi as of Fiscal 2024 and plans to further increase its fleet size in Fiscal 2025 and expand its footprint to other cities.

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Greaves Electric Mobility

Greaves Electric Mobility Ltd (GEM) is the electric mobility business of Greaves Cotton Limited (GCL). Greaves Cotton Ltd (which was established 165 years ago) is one of the major players in single cylinder diesel engines as well as one of the prominent manufacturers of multiple powertrains including traditional as well as clean powertrain solutions.

GEM has been designing and manufacturing electric vehicles for over 16 years and has established a strong presence in electric two-wheeler segment. The company was one of the first companies in India to focus on the evolving market of electric vehicles and has been amongst the frontrunners at driving the EV adoption in the country. Its brand “Ampere” is one of the fastest growing E-2W brands in the industry.

Manufacturing facilities

In 2021 GEM (formerly Ampere Electric) announced a potential investment of ₹ 7 billion in a phased manner over a period of 10 years for e-mobility manufacturing plant in Ranipet and signed an MoU with the Government of Tamil Nadu.

Greaves Electric's three-wheeler lineup builds on the legacy of Greaves' state-of-the-art manufacturing facility in Toopran, Hyderabad. This facility produces a range of CNG and diesel three-wheelers and is now driving the production of electric three-wheelers to advance last-mile electric mobility solutions.

Company also has an e rickshaw manufacturing plant in Greater Noida.

Product Portfolio

Model	e-vehicle category	Battery capacity (in kWh)	Range (ARAI Certified)	Maximum Speed	Charging Time (100%)
Reo LA	2W	1.3kwh	70+km*	25kmph	5-6 Hrs
Reo Li plus	2W	1.3kwh	70+km*	25kmph	4-5 Hrs
Magnus EX	2W	2.3kwh	100km*	55 kmph	6-7hrs
Nexus EX	2W	3.0kwh	136km*	93kmph	3.3 hrs
Nexus ST	2W	3.0kwh	136km*	93kmph	3.3 hrs
Eltra City	3W-Passenger	10.8kwh	171km*	48kmph	5-6 hrs
Eltra PU	3W -Cargo	10.8kwh	171km*	48kmph	5-6 hrs
Eltra DV	3W -Cargo	10.8kwh	171km*	48kmph	5-6 hrs
Eltra FB	3W -Cargo	10.8kwh	171km*	48kmph	5-6 hrs
Ele 1000ss	E-rickshaw-Passenger	6.2kWh	80-90km*	25kmph	8-10 hrs
Ele 5000ss	E-rickshaw-Passenger	7.8kWh	90-100km*	25kmph	8-10 hrs

*Note: * Range travelled per full charge as mentioned on the company website*
Source: OEM website, CRISIL MI&A

Recent launches

Greaves Electric Mobility launched Hi speed E-2W Nexus in April 2024. Ampere Nexus comes in two variants (Nexus EX and Nexus ST). In November 2023, the company re-entered the low-speed scooter segment with the relaunch Reo Li Plus (max speed up to 25 kmph).

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During September 2023, Greaves Electric Mobility launched its electric cargo three-wheeler, the 'Greaves Eltra. It has recently launched its electric 3-wheeler passenger vehicle, the Greaves Eltra City E-3W in Fiscal 2024.

Dealership Network

Greaves Electric Mobility currently has 400 dealership and touchpoints across India and has plans to expand its dealership network to reach more than 300 cities pan India. Company has also access to approximately 20,000 mechanics through its sister entity *Greaves Retail* to provide service support.

Greaves Eltra, manufactured by Greaves Electric Mobility at its manufacturing location in Hyderabad, will be available throughout India via Greaves Electric Mobility's nationwide network.

Strategic partnerships and investments

In 2021, Greaves Electric Mobility acquired 100% stake in Bestway Agencies Pvt Ltd (BAPL) which sells E-Rickshaw under the brand name ELE brand. In 2020, the company announced their first intervention in Bestway with 74% stakes and added e-rickshaw as part of the portfolio offerings.

In 2021, company also acquired a strategic stake in L5 3W manufacturer MLR Auto Ltd. to expand their presence in 3-wheeler segment. GEM currently holds 51% stake in MLR Auto Ltd.

Hero MotoCorp Limited

Hero MotoCorp is the leading manufacturer of two-wheelers in India. VIDA by Hero was born in March 2022 with focus on sustainability. They entered the EV segment with VIDA in Fiscal 2023.

Manufacturing facilities

Hero MotoCorp's electric scooter manufacturing is plant located in Chittoor, Andhra Pradesh. VIDA was designed and developed at Hero's R&D hubs, the center of innovation and technology CIT in Jaipur and the Hero Tech center Germany (TCG). Hero MotoCorp launched VIDA V1 in October 2022.

Product Portfolio

Model	e-vehicle category	Battery capacity (in kWh)	Range (ARAI Certified)	Maximum Speed	Charging Time (0-80%)
V1 Plus	2W	3.44kwh	143km	80kmph	5 hr 15 mins
V1 Pro	2W	3.94kwh	165km	80kmph	5 hr 55 mins

Source: OEM website, CRISIL MI&A

Distribution network

Hero MotoCorp introduced its electric vehicle offerings VIDA V1 initially in major 3 cities Delhi, Bengaluru and Jaipur in October 2022 which later got expanded to 8 cities by December 2022. It has recently expanded its sales channel to over 100 cities and 150 dealers by leveraging Hero dealer network. It is using Hero MotoCorp's existing dealer network to rapidly scale up its operations across the country. VIDA also has Experience Centres located in Jaipur and Bengaluru.

VIDA also has the VIDA Hubs that are exclusive showrooms for VIDA portfolio, where specially trained representatives give a detailed description of the vehicle, its features and the VIDA ecosystem. Fast charging stations are also available at all the VIDA Hubs to provide complete charging experience and test ride are also available. There are total 40 VIDA hubs across India.

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Strategic partnerships and investments

Hero MotoCorp has partnered with Zero Motorcycles, a global electric motorcycles and powertrains player, for collaboration in developing a platform for electric motorcycles. They have also forged a partnership with Ather Energy to establish an interoperable fast-charging network. Through this partnership customers will have access to 2500+ fast charging points across the country.

As per Hero MotoCorp's product strategy, electric motorcycles will be added to the VIDA range from 2025-2026 onwards. The portfolio is likely to see a total of six motorcycles across price ranges.

Mahindra Last Mile Mobility Limited

Mahindra Last Mile Mobility Limited (MLMML), a subsidiary of Mahindra & Mahindra Ltd, commenced its commercial operations in September 2023. The company has secured investments from the Indian Japan Fund (IJF) alongside the International Finance Corporation (IFC).

MLMML manufactures a range of three-wheeler electric vehicles, including the Treo series, Zor Grand, and e-Alfa, catering to passenger as well as cargo segments. It offers the most extensive portfolio of last-mile mobility solutions, covering electric, petrol, CNG, and diesel three- and four-wheelers for both passenger and cargo segments. The electric lineup is further supported by the robust and fuel-efficient Alfa and Jeeto range, catering to diverse customer needs.

Manufacturing facility

MLMML's manufacturing facilities are strategically located in Bengaluru, Haridwar, and Zaheerabad. To address the growing demand for its three-wheeler EVs, the company has ramped up production capacity threefold, ensuring the ability to meet sustained market demand efficiently.

Product portfolio

Model	e-vehicle category	Battery capacity (in kWh)	Range (ARAI Certified)	Maximum Speed	Charging Time (0-80%)
Treo Plus	3W	10.24 kWh	167km	55kmph	4.30 hrs
Treo HRT	3W	7.37 kWh	141km	55kmph	3.50 hrs
Treo SFT	3W	48V	141km	55kmph	3.50 hrs
Treo Yaari HRT	3W	48V	129km	24.5kmph	2.30 hrs
Treo Yaari SFT	3W	48V	129km	24.5kmph	2.30 hrs
e-Alpha Plus	3W	150Ah	100km*	25kmph	10-12 hrs
e-Alpha Cargo	3W	140Ah	95km*	25kmph	NA
Zor Grand	3W	10.24 kWh	90km*	50kmph	4.30 hrs
Treo Zor	3W	7.37 kWh	80km*	50kmph	3.50 hrs

*Note: * Range travelled per full charge as mentioned on the company website*
Source: OEM website, CRISIL MI&A

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Dealership Network

MLMML boasts an extensive network of 1,150 touchpoints across India, along with access to over 10,000 charging stations nationwide. The trusted Mahindra brand has been instrumental in helping MLMML maintain its position as a leading EV manufacturer in the country.

Strategic partnerships and investments

On December 21, 2023, MLMML formed a strategic partnership with Attero, a global leader in lithium-ion battery recycling and e-waste management. This collaboration focuses on efficient EV battery recycling to address the environmental challenges associated with the safe disposal of electric vehicle batteries. The partnership underscores MLMML's commitment to sustainability, particularly in the recycling and reuse of lithium-ion batteries. MLMML offers a comprehensive lineup of lithium-ion electric three-wheelers, including models like Treo, Treo Plus, Treo Zor, Treo Yaari, and Zor Grand.

Further expanding its green initiatives, on July 8, 2024, MLMML announced a strategic collaboration with Ecofy, India's first green-only NBFC, backed by Eversource Capital. This partnership is designed to accelerate the adoption of electric three-wheelers in India by providing accessible financing solutions, supporting the nation's green transition.

Atul Auto Limited

Atul Auto Ltd (AAL), a Gujarat-based company established in 1986, is a prominent manufacturer of three-wheelers in both the passenger and cargo segments under the Atul brand. AAL offers a comprehensive range of three-wheelers powered by diesel, petrol, CNG, LPG, and electric drivetrains, making it an established player in the three-wheeler industry.

To expand its offerings, Atul recently introduced new models under the brand names "Gem" and "Gemini" for both passenger and cargo segments. In response to the growing EV market, Atul Greentech Pvt Ltd (AGPL) was set up as a dedicated subsidiary focusing on electric vehicles. AGPL began commercial production of specialized EV variants in Fiscal 2024, maintaining a distinct focus on the rapidly evolving e-mobility space and exploring future opportunities in the energy sector. Although AGPL's operations are still in the early stages, it is poised to drive the company's growth in the EV domain.

Manufacturing facilities

Atul Auto Ltd (AAL) operates two manufacturing plants in Gujarat, located in Rajkot and Ahmedabad, with an installed capacity of 60,000 vehicles per annum. The company has also started operations at a new facility in Bhayla, near Ahmedabad, which will add another 60,000 units to its production capacity. With these two plants, AAL now has a cumulative manufacturing capacity of 120,000 vehicles annually.

AAL serves a diverse customer base across both the cargo and passenger segments, offering vehicles with payload capacities of 350 kg and 500 kg. These vehicles are available in multiple fuel options, including diesel, petrol, CNG, LPG, and electric, catering to a wide range of customer needs.

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Product portfolio

Model	e-vehicle category	Battery capacity (in kWh)	Range (ARAI Certified)	Maximum Speed	Charging Time (0-80%)
Elite Cargo	3W	NA	80km*	25kmph	8-10 hrs
Elite e-Rikshaw	3W	NA	60-70km*	22kmph	NA
Elite+ e-Rikshaw	3W	NA	80-100km*	22kmph	NA

*Note: * Range travelled per full charge as mentioned on the company website*
Source: OEM website, CRISIL MI&A

Distribution network

Atul Auto Ltd (AAL) has a strong presence in India, operating across 21 states with more than 200 primary and 130 secondary touchpoints. The company is also expanding internationally, with a presence in 20 countries and is continuing to grow. AAL boasts 365 service centers spread across 348 cities in India. Additionally, its global sales, service, and spare parts network includes over 600 touchpoints, further solidifying its widespread reach and customer support.

Strategic partnerships and investments

Atul Auto Ltd (AAL) has significantly expanded its production capacity through a greenfield expansion in Ahmedabad, adding an additional 60,000 units per annum at an estimated capital expenditure of ₹ 2,670 million.

The company has also invested ₹ 0.30 billion in Atul Greentech, reflecting its commitment to developing high-performance and sustainable electric vehicles (EVs). The launch of the new Atul Rik is an example of the company's response to the evolving needs of both the urban and international markets.

In FY23, AAL issued preferential warrants worth ₹ 1.15 billion, which were capitalized in FY24. These funds were utilized to fully repay the company’s debt and invest in growth strategies, including further developments at Atul Greentech.

To support customers in purchasing their vehicles, AAL has established strategic partnerships with leading banks and non-banking financial companies (NBFCs) to offer retail financing options for its products.

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5.4 Key Financial KPIs

		Ola Electric				TVS Motor Company				Hero MotoCorp			
Particulars	**Units**	**H1 FY25**	**FY24**	**FY23**	**FY22**	**H1 FY25**	**FY24**	**FY23**	**FY22**	**H1 FY25**	**FY24**	**FY23**	**FY22**
Revenue from operations[1]	**₹ Millions**	28,580.00	50,098.31	26,309.27	3,734.23	217,085.40	391,447.40	319,739.90	243,553.10	206,937.20	377,886.20	341,583.80	295,512.80
Revenue YoY growth[2]	**%**	35.07%	90.42%	604.54%	43090.26%	14.33%	22.43%	31.28%	25.41%	12.56%	10.63%	15.59%	(4.55%)
Sales Volume[3]	**No. of vehicles (in thousands)**	223.82	329.62	156.25	20.95	2,315.40	4,191.00	3,682.00	3,310.00	3,055.00	5,621.00	5,329.00	4,944.00
E-2W Sales Volume[4]	**No. of vehicles (in thousands)**	223.82	329.62	156.25	20.95	NA	NA	NA	NA	NA	NA	NA	NA
3W Sales Volume [5]	**No. of vehicles (in thousands)**	NA	NA	NA	NA	69.00	146.00	169.00	172.00	NA	NA	NA	NA
E-2W Revenue from Operations[6]	**₹ Millions**	28,580.00	50,098.31	26,309.27	3,734.23	NA	NA	NA	NA	NA	NA	NA	NA
E-2W Revenue YoY growth[7]	**%**	35.07%	90.42%	604.54%	43090.26%	NA	NA	NA	NA	NA	NA	NA	NA
3W Revenue from Operations[8]	**₹ Millions**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3W Revenue YoY growth[9]	**%**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Operating Gross Profit[10]	**₹ Millions**	5,280.00	6,303.07	605.18	(1,074.77)	85,605.60	147,394.90	111,277.30	80,980.20	68,973.90	122,791.80	102,143.50	86,309.20
Operating Gross Profit Margin[11]	**%**	18.47%	12.58%	2.30%	(28.78%)	39.43%	37.65%	34.80%	33.25%	33.33%	32.49%	29.90%	29.21%
Operating EBITDA[12]	**₹ Millions**	(5,840.00)	(12,675.80)	(12,524.48)	(8,003.89)	31,072.80	55,434.10	40,673.80	27,546.30	29,973.70	53,496.30	40,937.70	34,447.70
Operating EBITDA Margin[13]	**%**	(20.43%)	(25.30%)	(47.60%)	(214.34%)	14.31%	14.16%	12.72%	11.31%	14.48%	14.16%	11.98%	11.66%
Profit/(Loss) after Tax[14]	**₹ Millions**	(8,420.00)	(15,844.00)	(14,720.79)	(7,841.50)	10,729.50	17,785.40	13,094.60	7,308.80	20,986.80	37,421.60	27,999.00	23,290.50
Profit/(Loss) after Tax Margin [15]	**%**	(27.77%)	(30.22%)	(52.90%)	(171.86%)	4.93%	4.53%	4.08%	3.00%	9.92%	9.68%	8.06%	7.74%
E-2W installed capacity[16]	**No. of vehicles (in thousands)**	NA	679.00	450.00	187.50	NA	NA	NA	NA	NA	NA	NA	NA
E-2W capacity utilization[17]	**%**	NA	49.00%	36.00%	17.00%	NA	NA	NA	NA	NA	NA	NA	NA
3W installed capacity[18]	**No. of vehicles (in thousands)**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3W capacity utilization[19]	**%**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

		Bajaj Auto				Ather Energy				Mahindra & Mahindra			
Particulars	**Units**	**H1 FY25**	**FY24**	**FY23**	**FY22**	**H1 FY25**	**FY24**	**FY23**	**FY22**	**H1 FY25**	**FY24**	**FY23**	**FY22**
Revenue from operations[1]	**₹ Millions**	251,793.50	448,704.30	364,553.80	331,447.10	NA	17,538.00	17,809.00	4,089.00	746,991.00	1,382,793.00	1,212,685.50	901,705.70
Revenue YoY growth[2]	**%**	19.05%	23.08%	9.99%	19.48%	NA	(1.52%)	335.53%	412.41%	10.36%	14.03%	34.49%	21.40%
Sales Volume[3]	**No. of vehicles (in thousands)**	2,323.56	4,350.93	3,927.86	4,308.43	NA	109.58	92.09	23.40	655.46	1,203.33	1,106.00	810.27
E-2W Sales Volume[4]	**No. of vehicles (in thousands)**	NA	115.70	36.26	8.19	NA	109.58	92.09	23.40	NA	NA	NA	NA
3W Sales Volume [5]	**No. of vehicles (in thousands)**	NA	NA	NA	NA	NA	NA	NA	NA	NA	78.11	59.08	30.52
E-2W Revenue from Operations[6]	**₹ Millions**	NA	1,727.90	845.40	NA	NA	17,538.00	17,809.00	4,089.00	NA	NA	NA	NA
E-2W Revenue YoY growth[7]	**%**	NA	104.39%	NA	NA	NA	(1.52%)	335.53%	412.41%	NA	NA	NA	NA
3W Revenue from Operations[8]	**₹ Millions**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3W Revenue YoY growth[9]	**%**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Operating Gross Profit[10]	**₹ Millions**	75,814.40	129,772.00	103,341.30	88,148.90	NA	1,220.00	1,855.00	251.00	298,551.00	546,645.50	472,809.90	383,673.80
Operating Gross Profit Margin[11]	**%**	30.11%	28.92%	28.35%	26.60%	NA	6.96%	10.42%	6.14%	39.97%	39.53%	38.99%	42.55%
Operating EBITDA[12]	**₹ Millions**	50,239.70	87,615.60	64,505.30	52,499.20	NA	(6,847.00)	(7,076.00)	(2,599.00)	143,765.20	248,919.30	203,248.30	146,828.50
Operating EBITDA Margin[13]	**%**	19.95%	19.53%	17.69%	15.84%	NA	(39.04%)	(39.73%)	(63.56%)	19.25%	18.00%	16.76%	16.28%
Profit/(Loss) after Tax[14]	**₹ Millions**	33,272.30	77,082.40	60,602.10	61,658.70	NA	(10,597.00)	(8,645.00)	(3,441.00)	69,068.40	122,698.20	113,744.80	72,530.10
Profit/(Loss) after Tax Margin [15]	**%**	12.84%	16.65%	16.10%	17.91%	NA	(59.23%)	(47.98%)	(83.16%)	9.06%	8.69%	9.28%	7.96%
E-2W installed capacity[16]	**No. of vehicles (in thousands)**	NA	480.00	120.00	NA	NA	379.80	232.48	113.70	NA	NA	NA	NA
E-2W capacity utilization[17]	**%**	NA	NA	NA	NA	NA	28.53%	40.41%	19.92%	NA	NA	NA	NA
3W installed capacity[18]	**No. of vehicles (in thousands)**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3W capacity utilization[19]	**%**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

		Atul Auto			
Particulars	**Units**	**H1 FY25**	**FY24**	**FY23**	**FY22**
Revenue from operations[1]	**₹ Millions**	3,167.30	5,272.90	5,131.20	3,153.20
Revenue YoY growth[2]	**%**	48.83%	2.76%	62.73%	6.56%
Sales Volume[3]	**No. of vehicles (in thousands)**	15.44	26.04	25.55	16.06
E-2W Sales Volume[4]	**No. of vehicles (in thousands)**	NA	NA	NA	NA
3W Sales Volume [5]	**No. of vehicles (in thousands)**	15.44	26.04	25.55	16.06
E-2W Revenue from Operations[6]	**₹ Millions**	NA	NA	NA	NA
E-2W Revenue YoY growth[7]	**%**	NA	NA	NA	NA
3W Revenue from Operations[8]	**₹ Millions**	2,926.70	4,795.50	4,658.40	2,863.70
3W Revenue YoY growth[9]	**%**	56.77%	2.94%	62.67%	-1.34%
Operating Gross Profit[10]	**₹ Millions**	928.60	1,550.70	1,436.60	749.10
Operating Gross Profit Margin[11]	**%**	29.32%	29.41%	28.00%	23.76%
Operating EBITDA[12]	**₹ Millions**	205.30	399.70	362.60	(163.90)
Operating EBITDA Margin[13]	**%**	6.48%	7.58%	7.07%	(5.20%)
Profit/(Loss) after Tax[14]	**₹ Millions**	53.30	70.70	31.30	(254.80)
Profit/(Loss) after Tax Margin [15]	**%**	1.68%	1.34%	0.61%	(8.04%)
E-2W installed capacity[16]	**No. of vehicles (in thousands)**	NA	NA	NA	NA
E-2W capacity utilization[17]	**%**	NA	NA	NA	NA
3W installed capacity[18]	**No. of vehicles (in thousands)**	NA	120.00	NA	NA
3W capacity utilization[19]	**%**	NA	NA	NA	NA

Notes:
All the financial information for the peers mentioned above is on a consolidated basis and is sourced from the respective annual reports/financial results except for Ather and Ola.
The financial information of Ola and Ather are sourced from the Red Herring Prospectus and Draft Red Herring Prospectus filings submitted to SEBI respectively and financial results.
The non-financial information of peers are sourced from the Annual reports, press releases and presentations available on their websites.
NA stands for Not available as the data is not reported in the RHP/DRHP fillings or respective annual reports, press releases and presentations as the case maybe
Revenue from operation for Fiscal 2021 of Ola is sourced from annual report available on their website for YoY growth computation
Sales volume for September 2024 of Hero, TVS, Mahindra, Bajaj are sourced from the Standalone Unaudited Q2 results from the websites of the respective companies
E2W revenue from operations of Bajaj is sourced/assumed from Chetak Technology Private Limited section of Bajaj annual report(s)
Sales volume and Revenue from operations of Ola and Ather is considered/assumed as the E-2W sales volume and E-2W revenue from operations
Effective annual capacity of Ather is considered/assumed as E-2W installed capacity

(1) Revenue from operations as per Profit and loss statement
(2) Year-over-year growth is calculated as (Relevant Year Revenue from operations minus Previous Year Revenue from operations) divided by Previous Year Revenue from operations multiplied by 100
(3) Total vehicles sold during the relevant period
(4) E-2W vehicles sold during the relevant period
(5) 3W vehicles sold during the relevant period
(6) Revenue from electric two wheeler business
(7) Year-over-year growth is calculated as (Relevant Year E-2W Revenue from Operations minus Previous Year E-2W Revenue from Operations) divided by Previous Year E-2W Revenue from Operations multiplied by 100
(8) Revenue from sale of three wheeler business
(9) Year-over-year growth is calculated as (Relevant Year 3W Revenue from Operations minus Previous Year 3W Revenue from Operations) divided by Previous Year 3W Revenue from Operations multiplied by 100
(10) Operating Gross Profit is calculated as Revenue from operations reduced by Cost of materials consumed, purchase of stock-in-trade and change in inventories of finished goods, stock-in-trade and work-in-progress
(11) Operating Gross Profit Margin is calculated as Operating Gross Profit divided by Revenue from operations
(12) Operating EBITDA is calculated as Profit / (Loss) before exceptional items, share of Profit/(loss) of equity accounted investee and tax less Other income add Finance costs and Depreciation and amortisation expenses
(13) Operating EBITDA Margin is calculated as Operating EBITDA divided by Revenue from operations
(14) Profit/(loss) after tax
(15) Profit/ (Loss) after tax Margin is calculated as Profit/ (Loss) after tax divided by Total income
(16) E-2W capacity
(17) E-2W capacity utilization is calculated as E-2W number of vehicles produced divided by E-2W capacity
(18) 3W Capacity
(19) 3W capacity utilization is calculated as 3W number of vehicles produced divided by 3W capacity
Sources: Company financial and Quarterly reports, RHP and DRHP filings

6. Challenges to the Electric Two-Wheeler (E2W) and Three-Wheeler (E3W and ICE) Industry in India

Players in the Indian two-wheeler and three-wheeler industry, such as Ather Energy, Ola Electric Mobility, TVS Motors, Bajaj Auto, Hero MotoCorp, Atul Auto, Mahindra and Mahindra and others, face a variety of challenges. These include both demand- and supply-side issues that vary based on individual strategies and market focus.

Demand-Side Challenges

- Economic Slowdowns: Moderation in GDP growth, inflation, and disruptions in rural income due to below-normal monsoons may impact purchasing decisions for 2Ws and 3Ws alike.
- Rising Acquisition Costs: Price increases due to input cost inflation, lack of economies of scale in EVs, and uncertainty around battery costs continue to affect affordability. For ICE three-wheelers, rising fuel prices pose additional challenges.
- Vehicle Financing and Resale Concerns: Limited financing options and uncertainty around resale values, especially for EVs, reduce consumer confidence.
- Limited Awareness: The benefits of EVs over ICE vehicles are not well understood by the masses, slowing adoption.
- Charging and Refueling Infrastructure: EV adoption is hampered by insufficient public charging infrastructure, while for ICE 3Ws, the availability of CNG/LPG refueling stations remains a challenge in some regions.
- Policy Uncertainty: Ad hoc changes in EV subsidies (e.g., FAME) and inconsistent state-level incentives impact sales for E2Ws and E3Ws.
- Traffic Congestion: Increasing urban congestion and the growth of public transport systems (e.g., metros, e-buses) may lead to deferred purchases of personal and commercial vehicles.

Supply-Side Challenges

- Dependence on Imports: EV players rely heavily on imported components (e.g., lithium-ion cells, semiconductors), while ICE vehicles are affected by fluctuations in commodity prices (e.g., steel, aluminum).
- Geopolitical and Supply Chain Risks: Global events like the pandemic or geopolitical tensions disrupt the supply of critical raw materials and components.
- Availability of Skilled Workforce: Rapid technological advancements in powertrains, batteries, and lightweight materials create a growing demand for skilled labor, which is currently scarce.
- Technology Obsolescence: Constant evolution in EV technology (e.g., solid-state batteries) poses a risk of investment in outdated systems.
- Localization and Regulatory Barriers: Government initiatives (e.g., PLI, Atmanirbhar Bharat) require significant upfront capital investments, which some OEMs struggle to meet.
- Increasing Competition: A surge in new entrants and portfolio expansions by legacy players intensifies competition, making customer acquisition challenging.

Challenges Specific to 3Ws (ICE + EV):

- Commercial Viability: For E3Ws, higher upfront costs and inadequate charging infrastructure deter adoption, while ICE 3Ws face rising fuel costs and stricter emission norms.
- Fleet Electrification: The transition from ICE to EV fleets is slowed by uncertainties around battery life and lack of charging depots.
- Segment Fragmentation: Electric 3W market is highly competitive and fragmented, thus challenging for companies operating in this space.

- Price Sensitive market: The 3W market, particularly in India, is highly price sensitive as it predominantly caters to small business owners, fleet operators, and individual drivers who operate on thin margins and have a humble profile. Even minor price increases in vehicle acquisition or operational costs (e.g., fuel or electricity) significantly impact purchasing decisions.

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