FUTURE TRENDS IN INDIAN MOBILITY
MARKETSANDMARKETS KNOWLEDGE PAPER
NOTE FROM CONFERENCE CHAIRMAN

Dear Readers,

The National Mission on Electric Mobility was unveiled in 2013 to promote electric mobility in the country. Since then, the Department of Heavy Industries has introduced the Faster Adoption and Manufacturing of Hybrid & Electric Vehicles in India (FAME-India) scheme, which has moved into phase-II this year. Through the mission, the government hopes to have a cumulative fuel saving of 9,500 million litres by extending support to the hybrid/electric vehicles market development.

It is heartening to see that the Government of India is enthusiastic about promoting clean automobile technology in the country. While phase-I of FAME was focused upon creating a place for electric vehicles in the Indian automobile space, FAME-II lays emphasis on giving an impetus to electric vehicles in public transport, encourage greater adoption of EVs, create charging infrastructure, and push for R&D in technologies. Since the inception of the scheme, the government has given financial support to about 2,61,507 electric/hybrid vehicles. In October 2017, electric buses were added to the scheme as part of modernising the public transport system, and, so far, DHI has sanctioned 455 electric buses for 9 cities.

The knowledge paper - Future Trends in India Mobility, prepared by MarketsandMarkets, offers in-depth analysis of how India's automobile industry is recreating itself as per the existing government policies and the current market dynamics. It studies India's EV market scenario and future outlook, with a special focus on the key government policies, including FAME. The paper goes on to explore the future trends in public transportation, including aspects such as intelligent transportation systems, alternative fuels in public transport, effective traffic management and safety, future mobility trends, etc.

MarketsandMarkets is a leading global revenue impact company that helps its clients identify new high-growth and niche revenue opportunities. Our partnership presents new opportunities for both organisations to share best practices and industry experiences, and we hope that this association and the resultant knowledge paper will be not only appreciated by the industry, but also recognised for its value content.

PREM BEHL
Chairman
Exhibitions India Group
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The Indian automotive industry is the 4th largest industry in the world with production increasing to 5.17 million units in 2018, inclusive of passenger cars and commercial vehicles. The country is also a prominent auto exporter and has growth expectations for the future. The automobile exports grew 15.54% during FY2018.

In FY2018–2019, overall automobile exports grew by 14.50% with passenger car exports registering a decline of (-) 9.64% while commercial vehicles, three- and two-wheelers registering a growth of 3.17%, 49.00%, and 16.55% respectively.

### ADVANTAGE INDIA

#### GROWING DEMAND
- Rise in middle class income and young population may result in strong growth

#### OPPORTUNITIES
- India is expected to become a leader in shared mobility by 2030, providing opportunities for electric and autonomous vehicles
- Shifting focus towards electric cars can also provide opportunities in the sector

#### POLICY SUPPORT
- The government aims to develop India as a global manufacturing center. The government has also come up with reforms like GST to boost the growth in the sector.

#### RISING INVESTMENT
- FDI inflow in the automobile sector stood 19.29 billion between April 2000- June 2018.
- India also has a significant cost advantage that attracts investment in the sector.

Source: IBEF Organizations, Secondary Research, Expert Interviews, and MarketsandMarkets Analysis
India is witnessing sustainable economic growth on the backdrop of various factors such as strong economic expansion, socio-cultural transformation, strong demographic dividends, growing urbanization, etc. India is the 7th largest country by area, the second-most populous country in the world with over 1.3 billion people. Figure below portrays some of the major factors of growth of country as whole;

**FIG INDIAN ECONOMY SNAPSHOT**

- **2nd HIGHEST POPULATION**
- **~55th RANK GLOBAL COMPETITIVENESS**
- **G20 MEMBER**
- **GDP GROWTH RATE +7%**
- **550+ MILLION INTERNET USERS, 2018**
- **2nd LARGEST MARKET, FOR CONSUMING - CLASS HOUSEHOLDS**
- **~50+ PURCHASING MANAGERS’ INDEX**
- **DOUBLE DIGIT GROWTH IN EXPORT & IMPORTS**
- **GROWING EDUCATION AND HEALTHCARE**
- **NATIONAL HIGHWAYS: 115,530+ KM**
- **STATE HIGHWAYS: 176,166+ KM**
- **STRENGTHENING OF INDEX OF INDUSTRIAL PRODUCTION**
- **DOUBLE DIGIT GROWTH IN GROSS EXPENDITURE ON R&D**
- **GROSS VALUE ADDED (GVA)**
  - INDUSTRIAL SECTOR GROWTH: +5%
  - SERVICE SECTOR GROWTH: +8%**

**MARKET SIZE**

The automobile production comprising passenger cars and commercial vehicles increased from 4.78 million units in 2017 to 5.17 million units in 2018 at 8.19%. The growth is due to several initiatives by the Indian government and major automobile players in the market. Moreover, automobile sales increased from 3.67 million units in 2017 to 4.02 million units in 2018 at 9.49%.

**INVESTMENTS**

THE RECENT/PLANNED INVESTMENTS AND DEVELOPMENTS IN THE INDIAN AUTOMOTIVE INDUSTRY ARE AS FOLLOWS:

- Ashok Leyland has planned a capital expenditure of INR 1,000 crore (USD 155.20 million) to launch 20–25 new models across various commercial vehicle categories during 2018–19.
- Hyundai is planning to invest USD 1 billion in India by 2020. SAIC Motor has also announced to invest USD 310 million.
- Mercedes Benz has increased the manufacturing capacity of its Chakan plant to 20,000 units per year—highest for any luxury car manufacturing in India.
- In November 2018, Mahindra Electric Mobility opened its electric technology manufacturing hub in Bangalore with an investment of INR 100 crore (USD 14.25 million) which will increase its annual manufacturing capacity to 25,000 units.
FIG  OEMs PRESENCE AND PLANT LOCATIONS

MANUFACTURING CLUSTERS: INDIA AUTOMOTIVE INDUSTRY

Source: Secondary Research, Expert Interviews, and MarketsandMarkets Analysis
THE KEY OEMS OPERATING IN INDIA ARE:

MARUTI SUZUKI

The company was formerly known as Maruti Udyog Limited and changed its name to Maruti Suzuki India Limited in September 2007. The company was founded in 1981 and is headquartered in New Delhi. Maruti Suzuki India Limited is a subsidiary of Suzuki Motor Corporation. The company designs, manufactures, and sells a range of automotive vehicles. The company offers passenger cars, utility vehicles, SUVs, and MUVs along with related parts and accessories.

HYUNDAI MOTORS

Hyundai is a Korea-based company engaged in the manufacture and distribution of automobiles and automobile parts. The company operates through three segments, namely, vehicle, finance, and others. The company offers hybrid and electric hybrid vehicles under the vehicle segment. The original equipment manufacturer offers vehicles under brand names such as Genesis, Tucson, Equus, Veloster, Azera, Ioniq, Sonata, Elantra, and Accent.

TATA MOTORS

Tata Motors Limited was founded in 1945 and is based in Mumbai. Tata Motors designs, manufactures, and sells a range of automotive vehicles. The company offers passenger cars, utility vehicles, SUVs, LCVs comprising pickup trucks and small commercial vehicles, and medium and heavy commercial vehicles consisting of trucks, tractors, buses, tippers, multi-axle vehicles, dump trucks, tractor-trailers, mixers, and cargo vehicles along with related parts and accessories.

MAHINDRA & MAHINDRA

Mahindra Electric Mobility Limited operates as a subsidiary of Mahindra & Mahindra Limited. The company was founded in 1994 and is based in Bengaluru. Mahindra Electric Mobility Limited manufactures and markets fuel-free electric cars to customers in India and internationally. The company also offers a smartphone application that allows car users to get real-time data and updates to control a host of car features remotely. In addition, it licenses out its electric vehicle technologies.

TOYOTA MOTOR CORPORATION

Toyota Motor Corporation is an automotive manufacturer established in 1937 and headquartered in Aichi, Japan. Toyota operates in various segments such as automotive and financial services. The company’s automotive segment engages in the design, manufacture, assembly, and sale of passenger vehicles, minivans, and commercial vehicles.
GOVERNMENT INITIATIVES AND FOREIGN INVESTMENTS

The Government of India encourages foreign investments in the automobile sector and allows 100% FDI under the automatic route. The recent initiatives taken are:

- The government aims to develop India as a global manufacturing center and an R&D hub.
- Under NATRIP, the Government of India is planning to set up R&D centers at a total cost of USD 388.5 million to enable the industry to be at par with global standards.
- The Ministry of Heavy Industries has shortlisted 11 cities in the country for introduction of electric vehicles (EVs) in their public transport systems under the FAME [Faster Adoption and Manufacturing of (Hybrid) and Electric Vehicles in India] scheme. The government will also set up incubation centers for startups working in electric vehicles space.
- In February 2019, the Government of India approved the FAME-II scheme with a fund requirement of INR 10,000 crore (USD 1.39 billion) for FY’2020–22.

Source: IBEF Organizations, Secondary Research, Expert Interviews, and MarketsandMarkets Analysis

Indian automobile industry is 4th largest in the world, and is witnessing impressive growth in adopting connectivity and other advanced technologies in mobility. However, India lags significantly in adoption of electric vehicles and an efficiently integrated public transport system, which needs a cohesive effort from all stakeholders of mobility ecosystem.

- SRINATH MANDA,
  Associate Director – Automotive at MarketsandMarkets
GLOBAL EV MARKET

In 2018, the global EV sales, which include BEVs, PHEVs, and FCEVs, crossed 2 million units to reach a final figure of 2,218,490 units. The increasing popularity of EVs highlights significant efforts made jointly by various governments and automotive industry associations. However, more than 70% of EV sales worldwide in 2018 were in the US, Japan, and China.

Increasing pollution and threat of global warming have accentuated the need to replace petroleum-fueled vehicles with emission-free substitutes. After decades of R&D, the industry has found EVs to be the best suitable substitute for traditionally fueled vehicles, which has resulted in the emergence of electric vehicles.

EV promotion efforts are increasing with continuous support from many governments, automotive OEMs, and other government & non-government agencies that are not only promoting the sales of zero-emission vehicles but also taking steps toward a favorable regulatory framework, charging infrastructure, and financial support. Ambitious EV targets and policy support from governments have resulted in lowering of EV costs. In addition, factors such as extended vehicle range and improvement in charging infrastructure have fueled the demand for EVs globally.

Led by China, Asia Pacific has the highest sales of EVs. China is focusing on EVs to deal with rising vehicle emissions in the country. The Chinese government provides subsidies for the electrification of vehicles, which, in turn, have increased the sales of EVs in China. The subsidies are offered for both pure EVs and HEVs. For instance, the government subsidy includes passenger car purchasing incentives of RMB 55,000 for BEVs and RMB 30,000 for PHEVs. Over the years, the cost of batteries has reduced, which would again have a positive impact on the Chinese EV market.

The Electric Vehicles Initiative (EVI)—a multi-government policy forum dedicated to accelerating the introduction and adoption of electric vehicles worldwide—has set a target of reaching an electric car fleet of 20 million by 2020, globally. The Paris Declaration on Electro Mobility and Climate Change has also set a similar global deployment target of 100 million electric cars by 2030.

The growth of the EV market is driven by government funding, subsidies, and incentives, growing demand for EVs, increasing concerns over environmental pollution, and huge investments from automakers in EVs. However, factors such as high cost, smaller distance covered by EVs, and lack of standardization can restrain the market growth.
BYD Auto Co., Ltd. (China), Nissan Motor Company Ltd. (Japan), Tesla Motors (US), and Volkswagen (Germany) are some of the leading players in the EV market. These companies have launched EVs in different segments to cater to the increased demand. Tesla Model S, Nissan Leaf, and BYD Tang are some of the most successful models that have attracted customers toward EVs. Panasonic Corporation (Japan), Automotive Energy Supply Corporation (Japan), BYD Auto Co., Ltd. (China), and Samsung SDI (South Korea) are some of the largest battery manufacturers that cater to the global demand for EV batteries.

**ELECTRIC CARS**

This vehicle segment is the most promising market for EVs as it is the largest segment in the automotive industry. The passenger car segment of the EV market is growing at a significant rate in emerging economies of the Asia Pacific region. The market growth in the region can be attributed to a rise in the GDP and population, improvement in lifestyle, increased purchasing power of consumers, and development of infrastructure.

Passenger cars account for the largest share of the EV market. The demand for passenger cars has increased due to increase in demand for EVs. Countries such as China have a low waiting period for EVs as compared to ICE vehicles. Due to the growing stringency in emission norms, European countries such as Germany plan to have one million EVs on the road by 2020. China dominates the market for passenger electric cars, followed by the US.

**FIG  GLOBAL ELECTRIC VEHICLE MARKET OVERVIEW**

<table>
<thead>
<tr>
<th>2019</th>
<th>2025</th>
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<tbody>
<tr>
<td>3.15 Million Units</td>
<td>12.03 Million Units</td>
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- The electric vehicles market is estimated to increase from 3.15 million units in 2019 to 12.03 million units by 2025.
- It has been expected that China, US, Germany, Norway will be front runners in terms of EV adaptability.
- Government funding, subsidies, and incentives; growing demand for electric vehicles; increasing concern of environmental pollution, and huge investments by automakers in electric vehicles are driving the growth of the electric vehicles market.
- The development of fast charging stations is also driving the growth of the electric vehicles market.

**DEVELOPMENTS TOWARD ELECTRIFICATION**

Currently, EVs constitute less than 1% of all the vehicles sold in India. There are more than 400,000 units of electric two-wheelers and only a few thousand electric cars on Indian roads. According to the Society of Manufacturers of Electric Vehicles (SMEV), more than 95% of electric vehicles in India are low-speed electric scooters (25 km/h), which do not require registration and licenses. The manufacturers are waiting for the government to clear regulatory hurdles and come up with a clear stance on infrastructure development for EVs. In December 2017, the government announced an investment of USD 64.1 million in its FAME initiative for launching electric buses, taxis, and three-wheelers in 11 Indian cities. This initiative will boost the rate of EV adoption in India in the coming years. Moreover, in January 2019, under the FAME II mission, the Indian government allocated INR 350 crore for investments in research and innovation of 3 major components:
In India, no OEM is ready to make huge investments in EVs like Tesla does in the US. A Tesla-like ecosystem needs to be created in India by Indian manufacturers. The government needs to entertain OEMs and component manufacturers to create an ecosystem to make products for India. The government should provide subsidies for OEMs to create extensive charging infrastructure across India. This will encourage more consumers to buy an EV.

The government should also create alternate ways to generate electricity for fueling EVs since electricity for vehicles is only as clean as the fuel that was used to produce it. The US produces 66% of the electricity from fossil fuel, Germany 50%, and India almost 60%. We cannot use thermal or fossil fuel to produce electricity to power EVs. It can cause more damage to the environment. Electricity for EVs should be generated using renewable sources like bio gas, solar power, etc. The government should take initiatives for creating more renewable energy sources across the country.

In India, R&D of EVs is quite low because of fewer resources with knowledge on EV concepts. Governments of various states in India should create courses on EVs in colleges. These resources can be used for R&D in manufacturing units, which will boost the EV R&D in India.
FUTURE TRENDS IN INDIAN MOBILITY

OEM’S TRANSITION TOWARDS CLEAN VEHICLES IN INDIA

LIST OF AUTOMOTIVE MANUFACTURERS IN INDIA

MAJOR PLAYERS TRANSITIONING TOWARDS CLEAN ENERGY VEHICLES (2018)

LAUNCHES BY MAJOR AUTOMOTIVE MANUFACTURERS FOR (2020) AND BEYOND

MAJOR EV MARKETS

CHINA

China is considered a global leader in the sales of EVs. In China, electric vehicles are known as New Energy Vehicles. BAIC EC-Series and Zhidou D2 EV were the top-selling EVs in China. BYD is a market leader in China, in terms of sales, followed by BAIC.

In a short span of time, China has emerged as a powerhouse in the EV market. Attracted by government subsidies on EVs, more than 200 companies plan to manufacture and sell electric cars in China. According to Fitch, a leading rating agency, EV subsidies offered in China are the second best in the world after Norway. Another initiative, known as preferential vehicle licensing system, helps EV buyers in China get license plates for free and without a waiting period. Moreover, the country’s national grid is increasing investments in EV charging station infrastructure and is expected to spend approximately USD 2.4 billion by 2020 to further improve the EV charging station infrastructure. Favorable business environmental policies, such as “Made in China 2025,” are also helping startups to enter the Chinese EV market. For instance, in December 2017, Iconiq, a Chinese EV startup, announced that the company would start the production of its 7-seater SUV electric car—Iconiq 7—in 2019. Another startup, NIO, backed by Tencent, Baidu, and Xiaomi, launched its 7-seater EV “ES8” in December 2017. The price of the vehicle is about half of Tesla’s Model X.

The MPV and SUV category witnessed the maximum growth rate in China registering a Y-o-Y growth of 597% and 479% respectively in 2018. The growth is expected to continue for next 3-4 years because of upcoming newer models in this segment.

- SWATI GUPTA,
Sr. Analyst – Automotive at MarketsandMarkets
FUTURE TRENDS IN INDIAN MOBILITY

SUBSIDIES AND TAX RebATES CHINA, 2018

Initiatives to promote the adoption of EVs include passenger car purchasing incentives of RMB 55,000 for BEVs, depending on the battery range of the vehicle, and RMB 30,000 for PHEVs. This subsidy is set to end by 2020.

The subsidies are not granted to end-consumers directly but are forwarded to automakers, who then pass on these benefits to the consumers.

Source: Government Organizations, Secondary Research, Expert Interviews, and MarketsandMarkets Analysis

US

The US is estimated to hold the largest share in the North American EV market. The US automotive industry is inclined toward innovation, technology, and development of safe and comfortable automobiles. The increasing production of EVs such as BEVs, PHEVs, and HEVs is expected to drive the market for EV infrastructure in the country.

EV manufacturing companies such as Tesla, GM, and Nissan have major presence in the country. Additionally, major providers of EV charging infrastructure such as Car Charging Group and ChargePoint have significant presence in the country as well. Battery manufacturers also plan to expand their presence in the US.

The EV charging stations market in the US is growing steadily. The increasing investment by automotive manufacturers and support from government bodies have led to the development of EV charging station infrastructure in the US. Government agencies and automotive manufacturing companies are working together to increase the adoption of EVs in the US to reduce the emissions of greenhouse gases.

FIG ELECTRIC VEHICLE ECOSYSTEM
LEADING GLOBAL EV OEMS

**TESLA**

Tesla was founded in 2003 and is headquartered in California, US. The company had about 37,543 employees across the world in 2017. Tesla manufactures premium EVs. Tesla Roadster was the first EV launched in 2008, followed by the Model S and many other. While the company has presence in almost every part of the world, the major part of the revenue is generated from the US. The company inaugurated its Gigafactory at Nevada, US, in 2016, to accelerate growth by producing batteries as per requirement. Tesla plans to launch four more EVs, including BEVs and PHEVs by 2021.

**NISSAN MOTOR**

Nissan Motor is headquartered in Yokohama, Japan. It is a leading manufacturer of vehicles under the Nissan, Infiniti, and Datsun brands worldwide. It was founded in 1933. The company offers vehicle and vehicle parts, engines, manual transmission, specially equipped vehicles, industrial equipment engines, and so on. In addition, the company also manufactures EVs.

**BYD AUTO**

BYD Auto is one of the few companies that specializes in the manufacturing of commercial EVs. It was established in 1995 and is headquartered in Shenzhen, China. The company operates in three core business segments—automobiles, handset and assembly services, and rechargeable battery and photovoltaic. BYD specializes in the manufacture, design, and assembly of a wide range of products. The company has presence in several regions, including China, the US, Europe, and India.

**BMW**

BMW, a global automobile manufacturing group, is headquartered in Munich, Germany, and was founded in 1916. The company is a leading manufacturer of luxury cars. The group comprises brands such as BMW (Germany), MINI (UK), and Rolls-Royce (UK). The company operates through four business segments, namely, automotive, financial services, motorcycles, and other entities. Under the automotive segment, the company offers sedans and SUVs. The company also offers PHEVs like BMW i3 and BMW i8. It has a strong presence in Europe, Asia Pacific, and North America.

**VOLKSWAGEN**

Volkswagen is a well-established automotive manufacturer founded in 1937 and is headquartered in Wolfsburg, Germany. The company produces cars under 12 different brands, including Volkswagen passenger cars, Audi, SEAT, Škoda, Bentley, Bugatti, Lamborghini, Porsche, Ducati, Volkswagen commercial vehicles, Scania, and MAN. The company sells sedans, minicars, SUVs, luxury cars, super cars, and commercial vehicles. In addition, the company also manufactures EVs. The company’s bestselling EVs are e-Golf and e-Up.
ONGOING FAVORABLE GOVERNMENT POLICIES AND GRANTS/INCENTIVES FOR EVS

Stringent emission norms have forced automotive OEMs to introduce new and advanced EVs. In the recent past, the number of EVs has increased tremendously, accentuating the need to make rules and regulations for a smooth transition. With increasing concerns over environmental degradation like global warming, countries around the world such as the US, Canada, and European countries have started adhering to strict emission norms to help cut emissions of CO2 and NOx. Regulations on CO2 emissions are being tightened around the world, forcing many automakers to increase the production of EVs. In addition, several governments are providing incentives and tax exemptions to promote EVs. Apart from North America and Europe, Asian countries such as China and Japan are also promoting the use of EVs. While EVs are emission-free, the battery has a limited life. Also, these batteries are hazardous to the environment. Therefore, keeping environmental factors in mind, governments are enforcing strict regulations to tackle this issue. North American and European countries plan to introduce an incentive structure for used vehicle batteries.

MARKET DYNAMICS - GLOBAL EV MARKET

This part explains the various drivers, restraints, opportunities, and challenges of the global EV market. Favorable government policies and subsidies will boost the EV market. However, stringent rules for the installation of charging stations and the high cost of EVs pose a challenge to the growth of the market.

ELECTRIC VEHICLE MARKET: MARKET DYNAMICS

<table>
<thead>
<tr>
<th>DRIVERS</th>
<th>Favorable government policies and subsidies</th>
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<tr>
<td></td>
<td>Heavy investments by automakers in EV technology</td>
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<tr>
<td></td>
<td>Growing concerns about environmental pollution</td>
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<td></td>
<td>Increased vehicle range per charge</td>
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<tr>
<td>RERAINTS</td>
<td>Lack of standardization of Charging standard</td>
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<td></td>
<td>Growing concern over the disposal of drained EV batteries</td>
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<tr>
<td>OPPORTUNITIES</td>
<td>Use of vehicle-to-grid (V2G) EV charging stations for electric vehicles</td>
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<td></td>
<td>EV charging stations powered by solar panels</td>
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<tr>
<td></td>
<td>Fuel cell vehicles</td>
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<tr>
<td>CHALLENGES</td>
<td>High cost of EVs compared to ICE vehicles</td>
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<tr>
<td></td>
<td>Stringent rules for the installation of charging stations</td>
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<tr>
<td></td>
<td>Limited distance covered by EVs</td>
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<td></td>
<td>High battery cost</td>
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Source: Secondary Research and MarketsandMarkets Analysis
Stringent CO2 emission norms have increased the demand for EVs. Governments of several countries are providing incentives and subsidies to encourage EV sales. The Chinese government provides incentives of up to USD 8,633 for BEVs. Such incentives from various governments are also encouraging automakers to develop an increasing number of EVs.

Several governments are providing various kinds of incentives such as low or zero registration fee and exemption in import tax, purchase tax, road tax, etc. Apart from providing subsidies, governments are also making favorable policies for the development of charging infrastructure. The US government recently invested USD 5 billion for promoting EV charging infrastructure. The same trend can be observed in European countries. Countries such as Norway and Germany are investing heavily in promoting EV sales. Thus, owing to the high amount of incentives and subsidies in Europe, a high growth rate in EV sales can be observed.

Heavy investments from automakers are expected to cater to the growing demand for EVs and play a major role in the evolution of the EV market. Tesla, Volkswagen, Mahindra & Mahindra, Ford, Nissan, BMW, and General Motors have huge R&D budgets for the development of EVs. OEMs offer EVs in different segments that include small hatchbacks such as Leaf as well as high-end sedans like Tesla Model 3. The wide product offering is attracting many consumers and resulting in an increased market for EVs. For instance, in January 2018, Ford announced an increase in planned investments in EVs to USD 11 billion by 2022. The company plans to lineup 40 EVs by 2022, out of which 16 would be fully electric and 24 would be PHEVs.

In November 2017, Volkswagen, along with its Chinese partner, JAC Motors, announced an investment of USD 12 billion with a tenure of 7 years for the production of electric cars in China. The company will produce 40 new hybrid and EVs locally. This investment is a part of a wider investment (USD 25 billion), made in September 2017, for the electrification of 300 models of Volkswagen AG holdings by 2030. Daimler, Toyota, Ford, Renault–Nissan Alliance, GM, and BMW have also announced JVs in China to produce EVs.

Factors such as the growth of the EV market and variation in charging loads have accentuated the need for standardization of EV charging technology. Certain EV charging stations may only be compatible with a certain type of voltage. For instance, AC charging stations provide a voltage of 120 VAC through Level 1 charging stations and 208/240 VAC through Level 2 charging stations. On the other hand, DC charging stations provide fast charging through 480 VAC.

Governments need to standardize charging infrastructure for the development of a favorable ecosystem and increasing sales of EVs. Different countries use their own standard for fast charging. Japan uses CHAdeMO; Europe, US, and Korea use CCS; and China uses GB/T. Further, US-based electric car maker Tesla uses its high-performance superchargers, which are unique to Tesla and cannot be used for other EVs. The lack of standardization across countries may impact the installation of charging stations.
Vehicle-to-grid (V2G) EV charging describes a system that has a bi-directional electrical energy flow between plug-in EVs and the power grid. V2G technology enables EVs to store unused power and discharge it to the grid. V2G technology can improve the electrical component's performance and add value for EV owners.

**EV CHARGING STATIONS POWERED BY SOLAR PANELS**

EVs can be charged at an electric charging station or using a solar panels. The use of renewable energy to power EV charging stations is one of the key opportunities for players in the EV charging market. Due to the decreasing price and easy installation of solar panels, solar-powered charging stations have become ideal for homeowners or commercial buildings. These charging stations can be installed at residential buildings, shopping malls, theater complexes, convention centers, parks, and other facilities. 10 solar panels can provide the electricity required to power an EV that can drive approximately 21,000 km each year. Due to the rapidly advancing solar panel innovations and designs, companies have started developing solar-powered charging stations to reduce the dependence on fossil fuels.

**CHALLENGES**

**HIGH COST OF EVS IN COMPARISON TO ICE VEHICLES**

The cost related to technology and infrastructure in EV implementation is high. EVs are costlier than gasoline-powered vehicles. The battery is considered the most important part of an EV as it provides power to the vehicle. The battery of an EV needs frequent charging, which calls for additional equipment such as electric chargers. Hence, the cost of battery, charger, and installation gets added to the cost of an EV. All these factors make an EV costlier than traditional ICE vehicles. Hence, the high cost of EVs is the biggest challenge faced by EV manufacturers.

**STRINGENT RULES FOR INSTALLATION OF CHARGING STATIONS**

A service provider must follow a certain set of instructions while installing a charging station. Service providers need approval from plot owners (when the installation is done on private properties), local governments for regulatory mandates, and utility providers for energy transfer. For instance, homeowners or contractors need to submit a plot plan, electrical load calculations, electrical plans, installation instructions, and charger specifications to the local permitting office for obtaining a permit for a typical installation of a residential EV charging station. The installation of EV charging stations is more complex in commercial locations than residential locations. The commercial installation requires permits, community or design guidelines, electrical source or metering, parking and signage requirements, zoning requirements, and inspection fees. Thus, installation of a charging station is complex as many stages are involved in the value chain.
DECREASING BATTERY PRICES

Advancements in technology would help decrease the cost of EVs. The cost of EVs varies with the cost of the battery in these vehicles. In recent times, the battery cost has reduced significantly. In 2010, the battery cost was approximately USD 1,000 per kWh, which has now come down to about USD 450 per kWh. This reduction in battery cost is likely to drive the mass production of EVs in the near future. Regions such as North America and Europe have witnessed similar trends with respect to vehicle battery cost, owing to similar regulations imposed by the respective governments. Additionally, OEMs are also launching similar models in Europe and North America.

**EV BATTERY (PER KW), IN USD**

![Graph showing the reduction in EV battery price over time]

Source: Secondary Research, Expert Interviews, and MarketsandMarkets Analysis
BEST PRACTICES FOR EV GROWTH EMPLOYED BY MAJOR MARKETS

The major markets for EVs include China, the US, and Japan. The US is estimated to hold the largest share in the North American region. Battery manufacturers also plan to expand their presence in the country. Thus, the best practices employed are government incentives for both EVs and charging infrastructures, which will uplift the market for EVs in the near future.

ENABLING FACTORS INCLUDING CHARGING INFRASTRUCTURE

The growing demand for EVs in various parts of the world is expected to increase the demand for charging stations. As a result, various governments are funding the development of charging station infrastructure and subsidizing the EV charging infrastructure. Significant advances in financial support from governments in the form of tax rebates, subsidies, and regulations to promote ecofriendly vehicles have increased the adoption of EVs. In addition, the growing sensitivity of various governments toward a cleaner environment has increased the demand for zero-emission vehicles. These vehicles require installation of efficient charging infrastructure.

GOVERNMENT POLICIES

INDIA

The National Mission for Electric Mobility (NCEM) has launched the National Electric Mobility Mission Plan (NEMMP)-2020 with an aim to invest INR 140 billion in the next 8 years for the development of electric infrastructure.

EXISTING SUBSIDIES AND TAX STRUCTURE, INDIA

- A new circular regarding the charging infrastructure has been announced by the Indian government, in December 2018, which stated that was a de-licensed activity to set up a charging station and the electricity received from any company would be free of cost.
- Private charging stations are permitted at residential places, and any charging station can get electric power from any company through open access protocols.

GLOBAL KEY DEVELOPMENTS

- In March 2019, Tesla unveiled V3 Supercharging, the next step in the growth of Tesla’s Supercharger network. V3, which is born from Tesla’s experience of building the world’s largest grid-connected batteries, enables its vehicles to charge faster than any other EV in the market today.
- In July 2018, BYD (Build Your Dreams), the world’s largest battery electric bus manufacturer and EV company, joined the Charging Interface Initiative (CharIN e.V.), as it works to establish global standards for charging BEVs.
- In April 2018, Schneider Electric, one of the leading global manufacturers of EV chargers, released wall mounted chargers suitable for homes and businesses. The Schneider Electric EVlink Smart Wallbox comes in various ratings of electrical wattage output—from 3.4 kW to 22 kW—and can work on a single-phase or three-phase electrical supply, offering significant advantages in recharging capacity compared to general power outlets.
- In April 2018, ABB launched its newest EV charging solution, Terra HP, the first 350 kW product in the market. Charging time for a range of 200 km is just 8 minutes. Ideally suited for use at highway rest stops and petrol stations, Terra HP’s ultra-high current has the capacity to charge both 400 V and 800 V cars at full power.
- In December 2018, Efacec developed a super charger which set the new record in recharging EV batteries. It increased the range of a Porsche Taycan by 100 km in just 3 minutes.
The market of EVs in India is expected to show rapid growth in the long term. The e-mobility industry in India is developing at pace with support from the government and manufacturers such as Mahindra & Mahindra and Tata. The government of India is supporting the development of electric infrastructure with various plans. For instance, the National Electric Mobility Mission Plan (NEMMP)-2020 aims to invest INR 140 billion in the next 8 years for the development of electric infrastructure. Government incentives and subsidies and initiatives from OEMs would help reduce the cost of EVs, which, in turn, would drive the demand for EVs in the Indian market. In September 2017, the Indian government decided to buy 10,000 electric cars from Tata Motors to replace old petrol and diesel cars used by government agencies.

KEY DEVELOPMENTS DRIVING EVS

- In September 2017, Maruti Suzuki announced a JV with Denso and Toshiba for establishing a Lithium-Ion battery manufacturing plant in Gujrat with a total investment of INR 1,700 crore.
- In early 2018, Maruti Suzuki announced that they have entered into a partnership with Toyota for the development of electric cars. Together, they aim to produce as many as 35,000 electric cars annually in India during 2020–21. The company also announced in May 2018 that they would invest about USD 14.5 billion in R&D—its highest ever spend toward the EV program.
- Suzuki Motorcycle India, the local two-wheeler subsidiary of Japanese automaker Suzuki Motor Corp., is planning to bring in electric two-wheelers to the Indian market by 2020. Suzuki has set up a project team of 5 people and engaged KPMG to help devise EV solutions.
- In 2018, Hyundai announced that it would launch the globally successful Kona SUV electric version in to the Indian automotive market in 2019. The company also said that it was exploring if it can manufacture compact SUVs and sedan EVs in India.
- In 2018, Renault India announced that it had placed orders for electric motors and transmission with Rico Auto Industries and was working on developing EVs at their Chennai plant.
CURRENT LEVEL OF PENETRATION AND SALES

In FY2019, the total EV sales reached a total of 759,600 units, which includes electric two-wheelers (126,000), electric three-wheelers (630,000), and electric passenger vehicles (3,600). The electric two-wheeler market witnessed a growth of 130% (YoY). The growth is due to the government announcement of the FAME-II (Faster Adoption and Manufacturing of Electric Vehicles) policy.

<table>
<thead>
<tr>
<th>SEGMENT</th>
<th>FY 2019</th>
<th>FY 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELECTRIC TWO-WHEELERS</td>
<td>126,000</td>
<td>54,800</td>
</tr>
<tr>
<td>ELECTRIC THREE-WHEELERS</td>
<td>630,000</td>
<td>NA</td>
</tr>
<tr>
<td>ELECTRIC PASSENGER CARS</td>
<td>3,600</td>
<td>1,200</td>
</tr>
</tbody>
</table>

Source: Secondary Sources and MarketsandMarkets Analysis

- Supporting govt policy details
  - FAME I and II
  - Other supporting policies (if any)

**FAME-I:** is an incentive scheme for the promotion of electric and hybrid vehicles in India. The objective of the scheme is to promote electric mobility. It also provides financial incentives for attractive EV production and creation of electric transportation infrastructure. FAME-I started in 2015 and was completed in March 2019.

**FAME-II:** The Indian government rolled out FAME-II scheme for clean mobility. Under this scheme, 100,000 registered electric two-wheelers with a maximum ex-factory price will be eligible to avail incentive of INR 20,000 each. The scheme is proposed to get implemented over a period of 3 years effective from April 1, 2019, to encourage adoption of electric and hybrid vehicles.

**FAME-II** scheme will offer an incentive of INR 150,000 each to 35,000 electric four-wheelers with an ex-factory price of up to INR 1,500,000 and incentive of INR 13,000 each to 20,000 strong hybrid four-wheelers with ex-factory price of up to INR 1,500,000.

**OTHER SUPPORTING POLICIES**

**DELHI ELECTRIC VEHICLE POLICY:** Delhi EV Policy 2018 is notified by the GNCTD (Government of the National Capital Territory of Delhi). It will remain valid for 5 years from the date of notification. This is a new approach required to kick-start EV adoption in Delhi. The primary objective of the Delhi EV Policy 2018 is to improve Delhi’s air quality by lowering emissions from automotive and transportation sectors. Thus, this policy will seek to drive rapid adoption of BEVs. It is expected that these vehicles will contribute to 25% of all new vehicle registrations by 2023.
EMERGING EV CHARGING ECOSYSTEM

The EV market has witnessed rapid evolution with the ongoing developments in charging infrastructure and technology. Technological advancements in EV charging and enhanced range of distance covered by EVs are some of the major factors driving the growth of the EV market. In addition, the growing sensitivity of various governments toward a cleaner environment has increased the demand for zero-emission vehicles. These vehicles require installation of efficient charging infrastructure. Public and private charging stations play a significant role in this scenario. A public charging station can charge up to 8x faster than a regular residential outlet, which means an EV can be charged 100% in just 1–4 hours depending on battery capacity.

FIG ELECTRIC VEHICLE CHARGING STATIONS MARKET OVERVIEW

The use of renewable energy to power EV charging stations is one of the key opportunities for players in the EV charging market. Because of the decreasing price and easy installation of solar panels, solar powered charging stations have become ideal for homeowners and commercial buildings. These charging stations can be installed at residential buildings, shopping malls, theater complexes, convention centers, parks, and other facilities. 10 solar panels can provide the electricity required to power an EV that can drive approximately 21,000 km each year. With rapid advancements in solar panel innovations and designs, companies have started developing solar-powered charging stations to reduce dependency on fossil fuels.
SOLAR POWERED CHARGING STATIONS

Increased EV sales has increased the demand for charging infrastructure to recharge EVs. This has prompted EV manufacturers to integrate solar panels to charging stations to improve the efficiency of electric supply. The growing demand for EVs has paved the way for automakers to integrate solar technology into EVs and make use of renewable energy in the transportation business. The solar powered charging station volume is projected to reach 38,782 units by 2020 and 387,542 units by 2030, at a CAGR of 17.1%. The growth can be attributed to the availability of solar energy in subcontinental countries and various initiatives taken by the governmental agencies to promote clean mobility solutions.

FIG  SOLAR POWERED CHARGING STATION MARKET, BY REGION, 2022 VS. 2030 (UNITS)

<table>
<thead>
<tr>
<th>Region</th>
<th>2022-p</th>
<th>2030-p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia Pacific</td>
<td>55,743</td>
<td>217,024</td>
</tr>
<tr>
<td>Europe</td>
<td>31,697</td>
<td>116,263</td>
</tr>
<tr>
<td>North America</td>
<td>21,860</td>
<td>54,256</td>
</tr>
</tbody>
</table>

p: Projected
Source: MarketsandMarkets Analysis.

RECENT DEVELOPMENTS

- In January 2019, Sono Motors partnered with Bosch to provide the Sion’s central control unit and a software-based solution for its intelligent networking. The electric car with solar integration, the first ever to go into series production, is designed with maximum efficiency for the user, offering car, ride, and power sharing.

- In November 2018, Hanergy’s US-based subsidiary, Global Solar Energy Inc. (Hanergy GSE) inked a cooperation agreement with TAM-Europe Company, a subsidiary of China Hi-Tech Group Corporation. The two parties collaborated to develop solar car roof system solutions and manufacture solar vehicles in the future, which rely solely on solar energy.

- In March 2017, The Japanese version of Toyota Prius Prime was integrated with solar panels over the roof by Panasonic. With this development, Panasonic’s new setup is capable of generating up to 180 W. Toyota claimed that the solar roof could provide the Toyota Prius Prime PHEV with about 6 km of range a day when parked outside. Notably, the panel did not change the shape of the Prius Prime’s roof, while the contours and drag coefficient also remained the same.
INDIA RIDE HAILING/SHARING MARKET

Ride sharing offers a convenient and cost-effective means of personal mobility with the help of a transportation network system. It helps reduce travel costs and eliminates the need for individuals to drive to a location on their own. As more people use a single vehicle, ride sharing results in a lesser number of vehicles on the road and thus reduces emissions and overall impact on the environment. Ride sharing reduces travel expenses as commuters do not need to own a car and bear the expenses related to its maintenance. In addition, ride sharing facilitates ‘first mile last mile’ travel as people can choose from multiple options such as car and bike to move from one location to another. Traditional taxicabs are a conventional example of mobility on demand service.

GLOBAL LATEST DEVELOPMENTS

- In December 2018, New York City planned to install 50 mobile solar powered EV charging stations with integrated energy storage.
- In June 2018, India’s first solar powered EV charging station was installed in Mumbai.
- In March 2017, the Japanese version of Toyota Prius Prime was integrated with over the roof solar panels by Panasonic. With this development, Panasonic’s new setup is capable of generating up to 180 W.
- In December 2017, Nissan partnered with solar installers to promote solar energy with new EV purchases. The company has a strong reputation among solar installers being the pioneer in EVs integrated with solar panels.

Currently, penetration of shared mobility in India is low. As India is one of the most populous countries in the world, it has an opportunity to redefine personal mobility. The transportation sector in India accounts for 18% of commercial energy consumption and is highly dependent on oil imports. Moreover, private vehicle mobility has significant implications on land requirements for parking. For instance, in Delhi, parking accounts for 8–10% of the available land pool.
The shared mobility concept leads to better fleet utilization. India has the potential to reduce vehicle kilometer demand by nearly 35%, accounting to 2,000 billion kilometers by 2035. Further, when combined with more efficient vehicle technologies, it can cumulatively save above 1 gigatonne of CO2 through 2030. The latest entrant in the shared mobility space in India is Mahindra with the launch of Glyd, a premium app-based taxi service available on select routes in Mumbai.

LATEST DEVELOPMENTS

- In September 2018, Ola launched the project ‘Guardian,’ a real-time monitoring system, to strengthen ride safety of its customers on the platform further. Launched as a pilot in Bengaluru, Mumbai, and Pune, the project is a part of Ola’s national programme on safety, ‘Street Safe,’ and is also a first for the ride-sharing industry. In September 2018, the company also announced its plans to launch bikes on its platform in Agra.
- In August 2018, Ola announced the launch of first-of-its-kind policy research and social innovation unit—Ola Mobility Institute. The specialized think tank has been set up to develop knowledge frameworks that will focus on the intersection of mobility and public goodwill. The institute will focus on leveraging “disruptive” potential of mobility as a growth and innovation engine for India’s economy.

RIDE SHARING: AN OVERALL ECOSYSTEM

“In present situation, Mobility Service providers have to shed ~60% share to drivers, and most of the remaining amount is again spent on backend services. However, with an introduction of autonomous cars and robotaxis, the driver cost can be used by service providers and benefits can possibly be transferred to the users. Additionally, OEMs would be playing a key role - not just as a vehicle manufacturers but also as service providers, where the OEMs would not only be contributing towards the development of autonomous cars, but can also be promoting station-based mobility services.”

AMEY AMANAJI,
Associate Manager – Automotive at MarketsandMarkets
In India, more than 30% of the total population lives in urban areas and contributes more than 60% of the total GDP of the country. By 2030, the total population in urban areas is estimated to reach nearly 40% of, contributing 75% to the total GDP of India. Therefore, there is a need to develop physical, institutional, social, and economic infrastructure of the country. Hence, the government is taking required steps to develop smart cities, which is going to be a key initiative toward the development of smart mobility infrastructure in India.

MARKET SIZE AND KEY PLAYERS

The Indian ride sharing market is projected to grow at a CAGR of 33.86%, by value, from an estimated USD 552.0 million in 2018 to USD 4,251.7 million by 2025. The e-hailing segment is estimated to be the largest, by value. It is projected to reach USD 3,358.9 million by 2025 from an estimated USD 427.5 million in 2018, at a CAGR of 34.24%. The car rental segment is estimated to be the second largest and is expected to grow from an estimated USD 97.8 million in 2018 to USD 488.9 million by 2025, at a CAGR of 25.84%.

FIG RIDE SHARING MARKET OVERVIEW

CAGR 19.9%

- The ride sharing market is estimated to reach USD 218.0 billion by 2025 from USD 61.3 billion in 2018, at a CAGR of 19.9%.
- The major drivers of this market are growing need for personal mobility in the wake of growing urbanization and decline in car ownership.
- Maintaining a proper sustainability and profitability model is one of the critical challenges experienced by ride sharing service providers.
- Asia Oceania leads the ride sharing market owing to high population and increasing urbanization. Also, less vehicle ownership among people also drives the ride sharing market in the region.

UBER

Uber is a leading provider of ride-sharing services. It offers services through mobile application (app) and website. Uber was founded in 2009 and is headquartered in San Francisco, California. According to Uber, it has 75 million riders and 3 million drivers, worldwide. It completes 15 million trips each day and completed 4 billion trips worldwide in 2017.

OLA

Ola is a provider of on-demand ride-hailing services. The company provides cab rental services and allows customers to book a ride through phone, online, or a mobile application. Ola was founded in 2011 and is headquartered in Bengaluru, India. It is the largest ride-sharing service provider in India. India is amongst the most targeted markets for providing ride-sharing services.
CONNECTED CAR MARKET IN INDIA

A connected car is defined as a vehicle that can communicate with external entities such as traffic stop signals towers, satellite, roadside antennas, pedestrians, other vehicles, and the cloud.

The connected car technology helps improve the overall driving experience, while simultaneously enhancing vehicle and pedestrian safety. It is now becoming an integral part of modern automobiles and is being adopted in passenger cars as well as commercial vehicles.

The connected car market in India is at a nascent stage. The whole value chain consists of Tier I suppliers of hardware & software, cloud infrastructure providers, cybersecurity players, automobile manufacturers, aftermarket players, fleet business owners, government regulatory bodies, insurance companies, startups, and end users. Startups are playing a major role in the Indian connected car market. They are emerging with advanced and innovative engineering ideas that can be a turning point for the automobile industry. As Indian startups are capable of providing the same connected solutions at an optimized cost, OEMs have started to invest in emerging companies to make the connected technology suitable for the Indian scenario.

FIG  CONNECTED TECHNOLOGY EVOLUTION

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>General Motors launched the connected car service through OnStar</td>
</tr>
<tr>
<td>2001</td>
<td>OEMs began integrating Bluetooth in its new cars</td>
</tr>
<tr>
<td>2003</td>
<td>Turn by turn navigation system was implemented in connected cars with cellular networks</td>
</tr>
<tr>
<td>2007</td>
<td>Ford introduced its infotainment &amp; telematics service with Ford Sync</td>
</tr>
<tr>
<td>2009</td>
<td>OEMs began integrating software and data driven mobility services</td>
</tr>
<tr>
<td>2010</td>
<td>All major OEMs deployed infotainment systems such as Toyota Entune and Hyundai BlueLink</td>
</tr>
<tr>
<td>2014</td>
<td>Launch of Apple CarPlay and Google Android Auto infotainment systems</td>
</tr>
<tr>
<td>2017</td>
<td>General Motors Cadillac and Mercedes-Benz rolled out V2V equipped vehicles</td>
</tr>
</tbody>
</table>

Source: Expert Interviews and MarketsandMarkets Analysis

The Indian connected car market is estimated to be 1.6 million units in 2018 and projected to grow at a CAGR of 16% to reach 4.5 million units by 2025. This growth can be attributed to the automobile manufacturers who are offering vehicles equipped with connected car services.

KEY DEVELOPMENTS

- In 2018, Maruti Suzuki launched a telematics solution called Suzuki Connect for customers of their premium vehicle models. Suzuki Connect includes features like emergency alerts, preventive assistance, vehicle tracking, live vehicle status, driving behaviour analysis and convenience alerts.

- In 2019, Hyundai also launched Hyundai BlueLink Connected Car Technology for the Indian market. The BlueLink technology has been developed in-house and is already in use in the global markets for the last 10 years. Hyundai has integrated 10 India-specific features for the Indian market, starting with the AI based voice assist system which understand the India-accented English.

- Tata Motors and Microsoft partnered to build connected cars for India. The company also showcased “Tamo Racemo,” India’s first connected sports car, at the Geneva International Motor Show, 2017.
The roll out of 4G connectivity and government plans for 100 smart cities are the other major drivers for the growth of the connected car market in India.

In 2016, Toyota launched its cloud-based telematics services for India under the brand name “Toyota Connect.”

At the end of 2016, South Korean automaker Hyundai announced that it had accelerated the development of advanced ccOS (connected car Operating System), the core platform technology for its future connected cars. The company also announced that the first ccOS-installed vehicles are set to be available by 2020 under the concept of Hyper-Connected Intelligent Car.

INDIA CONNECTED CAR: MARKET DYNAMICS

DRIVERS

The passenger cars in India has shifted largely from using mechanical components and devices to using technology driven by embedded software. Today, a car is equipped with 80 different computers along with millions of lines of software codes controlling different functions in the vehicle. The major automobile manufacturers such as Maruti Suzuki, Hyundai, Mahindra & Mahindra, Honda, Tata, Toyota, Renault, Ford, Nissan, and Volkswagen have started to implement connected technologies either in an embedded or integrated form. These manufacturers have perceived the increase in consumer demand for embedded infotainment systems in mid- and low-end models. Infotainment systems have become a mandatory part of every model of vehicles. Many OEMs have started to provide connected features in infotainment systems through offerings such as AndroidAuto, Apple CarPlay, and MirrorLink. According to MarketsandMarkets analysis, total penetration of connected cars in India was approximately 30% as of 2018.

ECONOMY CAR MANUFACTURERS ATTEMPTING TO PROVIDE LUXURY FEATURES

Government initiatives for implementing connected car technology

Automobile manufacturers modify their offerings according to the mandates by government regulatory bodies. Various connected services such as vehicle tracker, remote diagnostics, predictive maintenance, and vehicle park navigation are now available in some vehicles. The Indian government has mandated the connected feature for public transport vehicles under Automotive Research Association of India (ARAI) standards—AIS-140—for equipping Intelligent Transportation Systems (ITS), which is going to be implemented for passenger cars too in the coming years. ITS are a major part of the smart city plan. The government financially supports new research projects and implementation, hoping to build and run smart cities in the future. The major focus of India’s Smart City initiative is on smart transportation. The infrastructure and support services accomplished by the Smart City initiative shall suffice the needs of the connected car market.

Source: Expert Interviews and MarketsandMarkets Analysis

OPPORTUNITIES

EMERGING PROFIT POOL FOR THE AUTOMOTIVE INDUSTRY

Today, passenger cars are being developed with new generation connected technologies. The number of connected cars is increasing. The ecosystem of connected cars is emerging, and customers are showing interest in connected services, triggering a significant redistribution of revenue among the players in the value chain. The profit pool of the automotive industry is changing with emerging technologies and customer preferences. For instance, financing field possessed the highest average return on sales (RoS), followed by aftermarket in 2017. By 2035, the highest average RoS for the automotive industry is expected to be generated by data & connectivity, followed by financing.
FUTURE TRENDS IN INDIAN MOBILITY

FIG  PROFIT POOLS FOR AUTOMOTIVE INDUSTRY (2017 VS. 2035)

Source: Secondary Sources and MarketsandMarkets Analysis

EVOLUTION OF NEW VALUE CHAIN ECOSYSTEM OF AUTOMOTIVE INDUSTRY

In the current scenario, many non-automotive companies from various industries such as IT, software, telecom, and cybersecurity are partnering with automobile manufacturers to provide connected services for automobiles. Hence, a vast amount of data will be exchanged, increasing digital services for vehicles in future. The automotive industry will witness a change in the traditional value chain ecosystem and redesign its customer engagement process and aftersales services. Automakers are striving to implement non-automotive functions such as digital services in connected cars. Therefore, major IT and telecom companies are playing a crucial role in the value chain of the connected car ecosystem, and hence, the Indian connected car market is open with huge opportunities for non-automotive players.

CHALLENGES

THREAT OF DATA BREACH AND CYBERSECURITY FOR CONNECTED VEHICLES

The rise in car connectivity is exposing vehicles to risks. The products are getting complex with the increased use of ECUs and software with 30–40 million lines of codes. The fragmented supply chain of OEMs is proving to be a major difficulty in providing cybersecurity and data privacy to connected vehicles. Thus, the risk of hacks and data theft is high in connected vehicles. Majority of the new cars rolled out by 2020 are expected to be connected to networks. Hence, many OEMs and security solution providers are taking various countermeasures for cybersecurity threats. However, any secured design would not guarantee full security over a period. There must be consistent implementation of updated security codes in connected vehicles. Accordingly, OEMs should minimize the chances of security lags and make software patches more secured. For instance, there were more than 40 million data breaches recorded in India as per 2017 reports.

INCREASE IN PRICE OF VEHICLES WITH CONNECTED SERVICES

The cost of developing connected cars is huge, including cost of electronics, software platform, hardware devices, connected gateway, and cellular usage. For instance, the cost of electronics alone has risen to approximately 45–50% of the total vehicle cost. The high cost involved in connected services such as over-the-air updates may also increase the overall cost of the vehicle. The cost incurred will increase the price of the car, which needs to be paid by the end user of the vehicle. As per research, up to 30% of the customers are willing to pay for connected services. As connected cars will have a dynamic ecosystem of the value chain, companies which provide electronics, software platforms, and
hardware devices, etc., will want to generate revenue from them, and, thus, cost optimization of vehicles comes to the fore. Many automobile manufacturers have started optimizing the manufacturing cost of vehicles by managing the cost of interior and exterior parts. For example, BMW used to provide high quality leather seats in its earlier premium models but now in upgraded vehicles of the same models, high quality leather seats as optional, for which the customer needs to pay separately.

According to MarketsandMarkets, more than 70% of the total vehicles produced in India by 2025 will be connected. As India is the fastest growing market in the connected car space in Asia Pacific, automobile manufacturers are trying to grab the highest market share in the country. New advanced technologies and increased connectivity are shaping the end-user preferences for connected solutions in India. To track down customer preference, services in terms of features and preference in terms of form type have been considered.

REALIZING FIRST AND LAST MILE CONNECTIVITY THROUGH CONNECTED AND SHARED MOBILITY

In India, ‘first and last mile’ connectivity is an important factor when using public transport. Citizens of India want direct connectivity through public transport. Innovation, strategic planning, and collaborations are providing creative solutions for transportation choices. Innovative shared mobility programs help reduce vehicle miles traveled (VMT), auto emissions, car ownership rates, household costs, street space and parking demands, and traffic congestion. Shared mobility plans can also link to first and last mile connections by spreading convenient and cost-effective public transportation options at strategic locations. Transportation and funding are connected and incredibly important to developing solutions for low-income communities. However, there is a thick line in balancing public funding and subsidies sustainably without fiscal commitments.
INTELLIGENT TRANSPORTATION SYSTEM (ITS):

Intelligent transportation system (ITS) is a combination of information and communication technologies applied in transportation networks and infrastructure to facilitate vehicle-to-vehicle, vehicle-to-infrastructure communication and transfer of information; this helps in enhancing safety, traffic management, and environmental performance of roadways, railways, aviation, and maritime. The navigation and communication technologies, which are typically used in the ITS, are Global Positioning System (GPS), dedicated short-range communication (DSRC), and carrier access for land mobiles (CALM).

The integration of ITS systems across the transport infrastructure is expected to deliver safety benefits. These systems can connect with road users to help address various problems related to public safety. The ITS-based applications—such as real-time traffic alerts, collision avoidance systems, anti-lock braking systems, lane departure assistance, and crash notification systems—primarily focus on safety.

- Japan’s Smartway or the US’ IntelliDrive are designed to help drivers avoid road crashes. The US IntelliDrive system could potentially address 82% of vehicle crash scenarios involving unimpaired drivers.

The deployment of ITS that provide real-time traffic statistics can help in resolving increasing traffic congestion concerns. Intelligent signal controls gather information from sensors that quantify vehicle speed, traffic signals, pre-emption alarms, and other traffic-related information.

- In Istanbul, the implementation of adaptive traffic management system has reduced travel times by 20%, decreased delays by 30%, and increased average speed by 35%. Furthermore, the introduction of smart mobility solutions such as autonomous Robo taxi in Singapore has improved its traffic scenario up to an extent.

The slow infrastructural growth due to space and cost constraints is a major hindrance for ITS to gain traction. ITSs are chiefly deployed in developed countries, such as the US, the UK, and Japan, to manage traffic effectively. These countries have efficient transport services and infrastructure. However, these ITSs are also implemented in developing countries such as India and South Korea, albeit slowly as it involves various innovations and adaptation to suit the roadways.
FUTURE TRENDS IN INDIAN MOBILITY

INTELLIGENT TRANSPORTATION MARKET OVERVIEW

- Leading countries such as France, Germany, the UK, and the US are expected to be the major markets for intelligent transportation system during the forecast period.
- Product launches, contracts, geographic expansions, and new opportunities in emerging as well as mature markets offer lucrative growth avenues for the market players during the forecast period.

EFFECTIVE TRAFFIC MANAGEMENT AND SAFETY:

Traffic management is an application of smart transportation solutions and involves planning, monitoring, and controlling the traffic. It aims to enhance the effectiveness of existing legacy infrastructure, ensure the safety of transportation operations, and smoothen the flow of traffic with the help of various traffic modeling and management systems.

Traffic management is the process of prioritizing, shaping, and routing traffic to ensure that critical transport services remain available. Traffic management provides guidance to the commuters and haulers about road congestion and suggests the best possible route. This involves the use of ICT to control and manage the flow of road traffic, intersection control, and ramp metering; enforce speed limits; detect incidents and emergencies; and implement response strategies to ensure safe and efficient use of the road network by optimizing the existing infrastructure.

- The Government of India has progressively committed significant investments in the traffic management sector. The ministry of transport plans to invest a further 30% of the USD 1 trillion earmarked for the development of transport infrastructure, under the country’s 12th Five-Year Plan (2013–2018)
- USD 423 million ITS is being developed to improve the traffic management and control systems on Hong Kong’s nationwide road network. Saudi Arabia has invested USD 140 billion in smart transportation systems with a major focus on urban traffic management.

TRAFFIC MANAGEMENT MARKET OVERVIEW

- The global traffic management market size is expected to grow from USD 26.67 billion in 2018 to USD 50.72 billion by 2023, at a CAGR of 13.7% during the forecast period.
- The rising urban population and high demographic rate are expected to drive the market growth during the forecast period.
- Emerging economies, such as India, Singapore, Malaysia and the Middle East, offered several untapped and unexplored opportunities in the traffic management market.
FUTURE TRENDS IN INDIAN MOBILITY

FUTURE MOBILITY TRENDS

ROBO TAXI:

A robo-taxi combines the benefits of an autonomous vehicle and e-cab hailing services by operating without a driver and focusing on ‘Mobility as a Service’ (MaaS). It is expected to reduce the cost of ownership and improve fleet management. It would offer a safe, convenient, and economical mode of transportation. OEMs have partnered with autonomous driving system providers and fleet managers to launch robo-taxi services. Since most developments can be seen in the field of electric vehicles, the robo-taxi market may initially feature electrically propelled vehicles.

The robo-taxi market is projected to grow from 2,024 units in 2020 to 3,830,912 units by 2030.

- Increasing developments and investments by companies in autonomous driving, connectivity, electrification, and shared mobility are expected to drive the robo-taxi market.
- Rising demand for ride-hailing services, vehicle safety, and fuel efficiency by manufacturers and government is likely to propel the market.

The robo-taxi market is likely to witness a significant increase in demand with the recent technological advancements in electric vehicles and autonomous driving systems.

Shared mobility is also a key driver for the robo-taxi market. People are comfortable sharing rides, creating a good opportunity for companies such as Uber, DiDi, and Lyft to find a new sustainable source of revenue. In addition, several OEMs are interested in the robo-taxi market, not just as a vehicle manufacturer but also as a mobility platform provider.

Aptiv and Lyft are sharing the leverage fully-integrated autonomous driving platform and network to share the profit. General Motors’ Cruise Automation has partnered with DoorDash on a food delivery service using self-driving cars in San Francisco.

HYPERLOOP:

Hyperloop is the fifth mode of passenger and freight transport after road, air, water, and rail, proposed by Elon Musk. It will drive a pod-like vehicle into a vacuum tube, enabling it to accelerate to the speed of aircraft using linear electric motors and magnetic levitation. The system is designed to run at over 750 mph, i.e., greater than the speed of airlines for the price of a bus ticket. The Hyperloop system is expected to be operational by 2022 and will be available on demand.

The most significant factor driving the market for Hyperloop technology is the increasing application of technology in the transportation industry. The implementation of Hyperloop technology has the potential to revolutionize transportation, prevent travel delays, and improve the overall travel experience with a more efficient and flexible mode of transport.

- The reduction in travel time and cost with the use of Hyperloop transportation technology is a major driving factor for the growth of this market.
- Less land area requirement and resistance to earthquakes are the key drivers for the adoption of Hyperloop technology.
- The increasing need for decongestion of cities and energy-efficient transportation are the major opportunities for this market.
- Lack of government support, relatively low response from capital investors, and possibility of passenger emergency due to power outage are the major challenges for this market.
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SRINATH MANDA

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Srinath leads the Automotive Practice at Markets & Markets, he brings 18+ years experience in Business Consulting and Industry, Market Research, Competitive Intelligence, Customer Intelligence, Project Feasibility Studies, Financial Risk Analysis, Syndicated Research, and Business Case Studies. He has vast experience in executing consulting projects for industry bodies, government entities, financial institutions and Fortune 500 firms from automotive & transportation industry such as – Daimler, Honda, Hitachi, Fiat, Karma, BorgWarner, Bosch, Continental, Faurecia, Delphi, SKF, Cummins, Panasonic, AVL, Magna, Brembo, Pioneer, Kubota, NEC, TVS Group, Aditya Birla Group, DHL, FedEx and APL among others. He has published/executed over 250 business research and consulting projects in diverse industries and geographic markets.

He holds MBA in Marketing from Jawaharlal Nehru Technological University, and B.Sc. from Osmania University. He also holds a certificate in Supply Chain Management from CII Institute of Logistics.

ATUL KUMAR

Assistant Manager - Automotive & Transportation | atul.kumar@marketsandmarkets.com

Atul Kumar has been tracking the automotive industry from more than 7 years with experience in market research, business intelligence, strategic consulting, competitive intelligence, market trend Mapping & forecast etc. He specializes in advance technologies such as electric and hybrid cars, autonomous vehicles, connected technologies among others. Being working at MarketsandMarkets as Assistant Manager, Atul manages a team of Sr. analysts and analysts in end-to-end client engagements along with syndicate report studies. He has worked with clients such as continental, Karma, Bosch, AVL, Panasonic etc.

He holds MBA in Marketing from Pune University (India), and Bachelors in business management Nalanda College (India). He also holds green belt in Six Sigma Quality certification program.

SWATI GUPTA

Sr. Analyst - Automotive & Transportation | swati.gupta@marketsandmarkets.com

Swati has 4+ years’ experience in Market Research, Business Analysis, Market Trend Mapping & Forecast, Supply Market Analysis, and Competitive Intelligence. Presently, She is associated with MarketsandMarkets as Sr. Analyst in Automotive & Transportation practice.

Prior to this, he was employed as Business Analyst with Lucintel Research. She has a vast experience in market research, business analysis & development and has managed domestic as well as international clients. She specialize in electric vehicles, autonomous cars, ADAS and other automotive advance technologies.

With MarketsandMarkets, She has published 20+ syndicate research studies.

She holds MBA degree from Swami Vivekananda Technical University, and BCA from Pt. Ravishankar Shukla University.
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