



# EVCONNECT

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NEWSLETTER

## INSIDE THE ISSUE

### Power Talk

Conversation with Mr. Ajay Kumar Bhalla, Secretary (Power), Ministry of Power, Government of India

### Updates from the World

- Electric cars: New-build homes could be fitted with charge points
- Carlos Ghosn: Why carmakers must adapt - or die
- Work begins on sustainable and recyclable concept EV
- China to buy 60% of world's electric vehicles in 2035, says study
- How electric vehicles reduce the cost of doing business
- China weighs further cuts in electric-car subsidies
- China's cobalt dominance meets blockchain-backed resistance
- Electric buses have lower emissions regardless of electricity source, study says.

### Updates from India

- Mahindra partners with Zoomcar to introduce electric cars for rentals
- India's fixation with cheap cars is stalling its electric vehicles dream
- Electric vehicles are the future of India, Vivek Wadhwa is 99% sure of this
- India sees slower shift to EVs in blow to Green Vehicles Goal
- Maruti WagonR, Swift electric variants will get made in India
- lithium-ion batteries
- ISRO's lithium technology is a game changer for electric vehicles: How satellite tech will help car manufacturers
- Tata Motors supplies Tigor Electric Vehicles to Cognizant
- NITI Aayog to organize India's first Global Mobility Summit

### EV Feature

The future of mobility in India's passenger-vehicle market (from McKinsey & Company July 2018 issue)

## FROM THE CEO'S DESK

Dear Friends,

It gives me immense pleasure to present you with the second issue of WRI India's electric mobility newsletter, **EV Connect**.

Through numerous policies, India is making a transformative push for electric vehicles. With international success stories, the integration of renewable energy sources into the grid, increased demand for shared mobility and rising concerns about emissions, the focus on electric vehicles is apt at this time. However, to ensure a smooth transition to electric vehicles, growth of the electric mobility ecosystem is essential. Some of the most critical parameters include charging infrastructure, improved battery technologies, more awareness about electric vehicles amongst consumers, and other supporting policies. In addition, more and more innovations are coming up to combine electric mobility with the circular economy.

New developments are taking place at a rapid pace and reported through multiple media channels, making it difficult to track. This newsletter seeks to curate several of these developments into one document. We hope that over time, this curated and compiled content will come in handy to those who are seeking the latest updates on electric mobility.

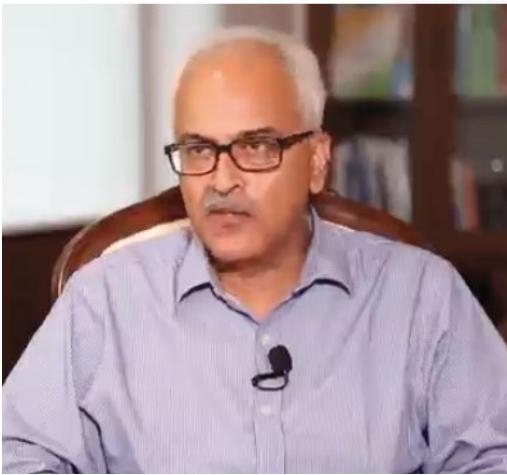
This edition of the newsletter includes a conversation with Mr. Ajay Kumar Bhalla, Secretary, Ministry of Power, Government of India, on the issues related to charging infrastructure and the way forward. It also features insights from McKinsey on the future of mobility in India's passenger-vehicle market.

We hope you find the second edition of the newsletter useful and share your suggestions to improve this newsletter.

Sincerely,



**Dr. OP Agarwal**  
CEO, WRI India



# POWER TALK

**IN CONVERSATION WITH MR. AJAY KUMAR BHALLA**

**SECRETARY (POWER), MINISTRY OF POWER, GOVERNMENT OF INDIA**

*Interview taken by Amit Bhatt, Director, Integrated Transport, WRI India.*

" Recently, the Power Ministry made a pilot scheme on adopting electric vehicles for office use. The goal was to popularize electric vehicles and build confidence in people for traveling significant distances between Delhi and Gurugram and Noida, with chargers available along the way. We aggregated the demand and tendered it out to procure 10,000 electric cars for office use."



## WATCH

the full interview [here](#)

**Interviewer:** Thanks a lot for talking to us. Let me start by asking, given there is a strong push for electric mobility in India, what plans does the Ministry of Power (MOP) have to address it?

**Secretary:** The government wants to give a very big push to the electric mobility sector. One thing is that we want to reduce our dependence on fossil fuels. So, NITI Aayog is coordinating a policy in this regard. As far as MOP is concerned, we have a role in installing the charging infrastructure and on the policy relating to the power sector vis-a-vis electric mobility. We have already clarified in April this year that you do not need a license for setting up a charging station, it is a service sector. It is not a licensed activity, so anybody can establish a charging station.

Further, through the Central Electricity Authority (CEA), we have put into place safety regulations for charging stations. What needs to be established when a charging station is made, what kind of connectivity and high tension line and similar concerns have been clarified. At MOP the Charging Station Policy is being made at present, which lays down how the charging station will be established. Our goal is to make it a free system, such that anybody can establish a charging station. We are in the stage of finalization, and we will bring out this policy shortly. The difficulty is how we begin the whole exercise.

**Interviewer:** So, what are the barriers that you see in electric mobility, and what are policy changes that you envision to remove these barriers?

**Secretary:** The first barrier is the mental barrier. If I am driving a car, I must be able to charge it wherever I take it. In the case of a big (electric) bus travelling on a highway, there must be charging stations just like petrol stations. The question is what comes first - electric vehicles or charging stations. Unless you have a sufficient number of charging stations, people will not buy electric cars, because they will be apprehensive. To address this concern, we, in our policy, are trying to bring out certain minimum density of chargers. We are even suggesting a subsidy in the form of a Viability Gap Funding (VGF). Already, the Department of Heavy Industries (DHI) is looking at that model for a subsidy scheme for chargers, under the FAME 2 scheme.

**Interviewer:** In this regard, from what we see, electric mobility requires close interaction between the automobile industry and the power sector. How do you think this can be strengthened?

**Secretary:** We need to lay down very clear policy lines, a road map, that illuminates what exactly we are looking at. Automobile makers will change their assembly line accordingly. Today, we have a lot of people asking questions - whether hybrid model will come, whether 100% pure electric will be there, if zero emission vehicles will be available and other related queries. So, this whole road map has to be laid down very clearly on what exactly we want to achieve in the medium and long-term future.

I don't see any hurdle except that we need to be clear on where we want to go by 2030 and have clarity thereafter on which parts of the transport sector we would focus upon - 2 and 3 wheelers to begin with, small cars or larger transportation vehicles and buses also. Once all these points are accommodated in a roadmap, it would give clarity to the automakers and they would come forward with their innovations.

**Interviewer:** Regarding the roadmap, as the Secretary of Power, where do you see electric mobility in medium to long-term?

**Secretary:** We feel the reception is really good. Recently, the Power Ministry made a pilot scheme on adopting electric vehicles for office use. The goal was to popularize electric vehicles and build confidence in people for traveling significant distances between Delhi and Gurugram and Noida, with chargers available along the way. We aggregated the demand and tendered it out to procure 10,000 electric cars for office use. Some of these cars are now being used by Joint Secretaries in my department, Public Sector Undertakings (PSU), the New Delhi Municipal Corporation (NDMC) and the South Delhi Municipal Corporation (SDMC) have also procured some. Many offices are using it. But in reality, the most important thing is that we have to be very confident that EVs are a good thing.

What I see as a challenge is the battery cost and deployment of fast charging systems. People are used to getting petrol filled by going to the petrol pump, in 3 to 5 minutes. They would look for a public charging station of that very nature. Of course, these vehicles can also be charged at residences, offices and shopping places also. So, ensuring that consumers conveniently find charging stations and can charge their vehicles in a time-efficient way would be part of our Charging Station Policy.

I feel research on batteries is an area of concern. What I understand is that Lithium-ion batteries that are being used have been designed to be charged at a certain temperature, compatible with climatic conditions in European countries. However, we need to look at batteries compatible with the high temperatures that the Indian landscape faces. This is because at high temperatures, the effectiveness of charging goes down.

**Interviewer:** What do you think is the role of research organisations like WRI in helping to accelerate EV adoption in India?

**Secretary:** Yes definitely. WRI is already doing a lot of good work. We expect and look forward to seeing WRI contributing, as many more electric vehicles are on Indian roads, which we are going to see by 2030 in India.

There are many areas where we can do a lot of research. One is this whole system of charging and batteries - can we modify whatever is available and make it suitable to Indian climatic conditions? The other area is how to bring down costs of the battery. Third, will be replacing the lithium ion battery and exploring other battery technologies that are coming up. Today, primarily we are using Lithium-ion, which brings up the question on its recyclability, and whether we can establish more manufacturing capacity without remaining dependent on its import. Besides that, a question is how effectively these batteries can be used. The other part is how shared mobility can be tied in with electric mobility. More education is needed on how shared mobility can be much better with electrification in an area.



## UPDATES FROM THE WORLD

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### **Electric cars: New-build homes could be fitted with charge points** | *Policy Strategy*

The United Kingdom (UK) government has a target of reducing 80% of greenhouse gas (GHG) emissions by 2050, compared to the 1990 level. Hence, new homes in suburban England would need to be fitted with electric car charging points under a government proposal to cut emissions. The government also plans to ban the sale of petrol and diesel vehicles in UK by 2040. This however, has been met with pushback from major Original Equipment Manufacturers (OEMs) like Toyota. The proposal announced by the Transport secretary includes: (a) an assessment whether new homes and offices should be required to install charging points; (b) new street lighting columns with on-street parking to have charging points in appropriate locations, and (c) funds for creating more charging infrastructure.

*Takeaway for India:* Although India is in the early stages of EV revolution, it can certainly take the learnings to create charging infrastructure in public places, homes and offices for private electric vehicles. An early mapping of new and upcoming real estate infrastructure would help in assessing the requirement of installing charging points for electric vehicles in private sector. [Read more](#)

### **Carlos Ghosn: Why carmakers must adapt - or die** | *Technology and New Developments*

The Chairman and Chief Executive of the Alliance – a car-making giant made up of Renault, Nissan and Mitsubishi, Carol Ghosn reflects on the evolution of electric vehicles. According to Ghosn, OEMs or manufacturers who are evolving with the times, would witness a sizeable share in the electric vehicle market. Companies that have reservations with regards to the electrification of their products, may eventually vanish. Ghosn also mentioned the effect of other evolving technologies including autonomous vehicles and the effect of the internet and smartphones on vehicles.

*Takeaway for India:* This could be a wakeup call for local car manufacturers in India. India has the opportunity to pilot projects taking a cue from international efforts. The government could support accelerators or launch challenges to invite innovators and entrepreneurs to assess the feasibility of autonomous vehicles and out-of-the-box applications of early stage technologies that are a part of the EV revolution. [Read more](#)



## Work begins on sustainable and recyclable concept EV | Technology

Students of the TU Eindhoven Ecomotive Division have gone a step further and created a concept electric vehicle, Noah. The speciality of this EV is that it may be the world's first circular car. The bio composite recipe used in its previous model (Lina) has been tweaked, which means it is now made up of 90% recyclable materials. Chassis and interior panels are designed to be detachable, to make recycling or re-use easier. For the 350kg Noah, the design team claims that Noah's drivetrain has been optimized for 97% efficiency during acceleration, and 100% efficiency at cruising speeds.

*Takeaway for India:* India has embarked on the industrialization pathway relatively faster than other mature markets. The circular model of development could provide answers to some of the pressing negative externalities it possesses. As per the World Economic Forum, from the mobility point-of-view, a multi-modal and integrated transport system including strategies for repair, remanufacturing, and recycling of vehicles would notably reduce energy consumption to 32% by 2030, whilst helping to move towards mobility for all. Such innovation in vehicles would accelerate the reduction of energy consumption and therefore, assist India in achieving its climate goals as per the Paris Agreement.

[Read more](#)

## China to buy 60% of world's electric vehicles in 2035, says study | Market Trends

A recent study conducted by Tokyo-based market research specialist, Fuji Keizai, forecasts that 60% of sales of electric vehicles globally will take place in China by 2035. This number is 15 times that of electric vehicles sold in 2017. The firm also affirms that the new energy policy set to be introduced in China in 2019 would enable electric vehicles to grow substantially. In this policy, electric vehicles will be subsidized based on range. This would create a competitive ground for OEMs to conduct research on technology for electric vehicles, to have the maximum possible range. Hybrid vehicles would not be categorized in the new energy vehicles policy leading to manufacturers exploring more efficient electric vehicles and eventually phasing out hybrid vehicles. Further, hybrid vehicles would be categorized under conventional engines, which is based on taxations taking into account the carbon emissions ( $\text{CO}_2/\text{km}$ ).

*Takeaway for India:* India could gain the knowledge to subsidize electric vehicles based on range and other technical factors, as appropriate. This would not only spur innovation but would also attract global investments in EV market in India. [Read more](#)

## **How electric vehicles reduce the cost of doing business | Business / Market Trends**

According to the Department of Energy, United States of America, electric vehicles are cheaper to run daily compared to vehicles powered by gasoline. This implies that charging an electric vehicle costs half that of fueling a conventional vehicle. Companies like United Parcel Service (UPS) and FedEx are integrating electric or hybrid vehicles into their daily operations. UPS currently has over 8,500 alternate fuel vehicles and by 2022, 66% of the UPS fleet will shift to electric vehicles. Twelve large cities worldwide, including Los Angeles, Mexico City and Seattle, recently pledged to incorporate all-electric buses in public transportation fleets beginning in 2025.

*Takeaway for India:* This is an example of the commercial success seen in the case of vehicles run by electricity. This article offers a better understanding on how electric vehicles are better in terms of cost-of-ownership, while being environment-friendly. [Read more](#)

## **China weighs further cuts in electric-car subsidies | Policy**

According to a recent article by Bloomberg News, China is now mulling on further reduction in subsidies. The move, although still under consideration stages, is a push to OEMs to work towards more innovative technologies rather than rely on the fiscal policy of the country. However, electric vehicles only with the range higher than 200 km on a single charge to be eligible for the incentives. The intent of the new subsidies is to reduce 'range anxiety' which occurs in most vehicle owners owing to an apparent limited range of an electric vehicle. Another aspect of the existing set of subsidies is for vehicles which have range of over 400 km, that offers further reduction of 50,000 yuan (₹5 lakh approx.). For vehicles with a range of 300 km the subsidies are lesser.

*Takeaway for India:* India can learn for their upcoming EV adoption to possibly categorise subsidies based on the range of a vehicle. Such move could be seen as 'bold' in the early stage of EV adoption; however, such move is likely to spur innovation and therefore, catalyse faster adoption of EV. [Read more](#)

## **China's cobalt dominance meets blockchain-backed resistance | Strategy / Policy**

Cobalt is the prime source of cathodes and a critical element in the development of Lithium-ion batteries. Since, most electric vehicle manufacturers need Cobalt as the critical source, China's strategy of controlling Cobalt in the future means no electric vehicle would be made without involving Chinese companies. The Dominican Republic of Congo has the largest Cobalt reserve globally and Chinese organizations are silently controlling or beginning to control these resources. The country which controls the biggest reserve of Cobalt would eventually control of the electric vehicle industry.

*Takeaway for India:* China's dominance in the supply of Cobalt would mean that India may have to consider a free trade agreement with China. Alternatively, the Government of India could explore options regarding global reserves of supply chain materials like Cobalt, if it intends to become an electric vehicle powerhouse in the near future.

[Read more](#)

## **Electric buses have lower emissions regardless of electricity source, study says**

Union of Concerned Scientists, a non-profit advocacy organization, has recently concluded that electric buses have lower CO<sub>2</sub> emissions, even if electricity drawn to power the buses comes from fossil fuel dominated grid. The argument made in favor of electric buses is based on the overall lifecycle of carbon emissions based on millage. The result from this study also confirms that the lifecycle emissions for electric buses could be further reduced by eliminating fossil fuel-based generation from the grid.

*Takeaway for India:* Whereas the Government of India is pushing for adoption of electric vehicles, it also has ambitious climate action targets under the Paris Agreement. Adoption of electric buses by transit agencies across the country would help to achieve the goal of 30% electric vehicles by 2030 and simultaneously achieve India's climate goals. [Read more](#)



## UPDATES FROM INDIA

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### Mahindra partners with Zoomcar to introduce electric cars for rentals | OEM

Mahindra & Mahindra have collaborated with Zoomcar, the popular self-driving car rental company and offered 50 Mahindra e2O Plus electric vehicles in Pune. These vehicles can be subscribed through Zoomcar's ZAP program without the hassle of purchasing a car. The program intends to facilitate connections, shared, and electric mobility in Pune, in line with the government's vision for 2030. This initiative is one of the first steps forward, after the announcement of Maharashtra's EV policy. [Read more](#)

### Maruti WagonR, Swift electric variants will get made in India lithium-ion batteries | OEM / Manufacturer

Suzuki in collaboration with Toshiba and Denso (Toyota subsidiary) are planning to set up India's first Lithium ion battery in Gujarat. The plant is set to be operationalized by 2020. From 2021, all Maruti models would be equipped with Li-ion batteries. Suzuki will hold 50% stake in the battery plant while Toshiba and Denso will hold 40% and 10% respectively. The internal sourcing of battery pack would result in significant cost benefits to Suzuki as an OEM.

[Read more](#)

### NITI Aayog to organize India's first Global Mobility Summit

Government of India's think tank, NITI Aayog will organize the first global mobility summit: MOVE, help drive Government's goals for vehicle electrification, renewable energy integration and job growth, thus, speeding up India's transition to a clean energy economy. The event will happen in New Delhi on 07 and 08 Sep 2018. To be inaugurated by the current Prime Minister of India, Narendra Modi, the MOVE Summit will focus on six key areas – Asset Utilization and Services, Comprehensive Electrification, Alternate Energy, Reinventing Public Transport, Logistics and Goods Transport, Data Analytics and Mobility. MOVE Summit aims to bring together and engage with key stakeholders within the rapidly transforming global mobility landscape and to evolve a public interest framework for a shared, connected, zero emission agenda for the future. [Read more](#)



## India sees slower shift to EVs in blow to green vehicles goal | Markets

Although there is considerable push from state-run bodies for electric vehicles, the shift towards the adoption of EVs at a national level is lacking a concrete plan. This article presents a long-term sustainable plan for the government to bring in electric vehicles. According to Bloomberg New Energy Finance, the inflection point for higher EV adoption will come with falling battery prices by 2030. Having said that, the fact cannot be undermined that India needs subsidies to cover the high upfront cost of EV. According to the CEO of Niti Aayog, the country's policy should be geared towards electric two-wheelers, three-wheelers and public transportation, as it has a relatively low rate of car ownership. This would further ensure a smoother transition to electric vehicles. [Read more](#)

## ISRO's lithium technology is a game changer for electric vehicles: How satellite tech will help car manufacturers | Technology / New Developments

The Indian Space Research Organization (ISRO) will be transferring its space-grade Lithium-ion technology at ₹1 crore on a non-exclusive basis for use in automobiles. This initiative by ISRO will boost the development of indigenous electric vehicles in India. Local cars and two-wheeler manufacturers will get access to top technology to help them gain pace in developing batteries of various size, capacity, energy and power density required for EVs. Over 130 companies have applied for the Request for Quotation (RFQ) document. Currently, ISRO manufactures these lithium-ion cells in batches as per needs with various sizes and power (1.5 amperes to 100 amperes) to power its rockets and satellites. ISRO further does not want any royalty from the buyers of this technology as the main motive is to enable and help the industry to develop and grow. ISRO will source lithium-ion batteries from Bharat Heavy Electricals Ltd (BHEL) as the technology has been transferred to the power equipment major. [Read more](#)

## Tata Motors supplies Tigor Electric Vehicles to Cognizant | Market Trends

Information Technology giant, Cognizant Technology Solutions has procured 10 Tata Tigor Electric vehicles to use at their Hyderabad campus. Tata Power will supply and install two fast charging stations within the campus and Tata Finance will be assisting in the procurement of these vehicles. With this step, Cognizant has become one of the first companies in India to embrace the potential of EVs as innovative convergence between energy and mobility.

[Read more](#)

## India's fixation with cheap cars is stalling its electric vehicles dream | Markets

India's trend of 'having more for less' is hindering government's ambitious plan to only sell electric vehicles (EVs) in the country by 2030. According to a report by Bloomberg New Energy Finance on long term EV outlook, EVs will represent just 10% of India's total passenger vehicle fleet in 2040. The industry also seems to second the outcome of the report, highlighting the fact that monetary support is required from government to popularize EVs in a price-sensitive market like India. The report also suggests that India should create strict EV quotas following Chinese model and link it to their production based on types of zero- and low-emission vehicles. [Read more](#)

## Electric vehicles are the future of India, Vivek Wadhwa Is 99% sure of this | Markets

Vivek Wadhwa, an American technology entrepreneur, researcher and academician, believes that in next five years, electric vehicles will be dirt cheap in India. This, in turn, will push entrepreneurs in India to explore opportunities in manufacturing EVs and other infrastructure in the electric vehicles ecosystem. Considering that 14 of the world's 20 most polluted cities are in India, adoption of EV is in the best interests of the country. [Read more](#)



## EV @ WRI

### Is the Tesla Model 3 our ride to a sustainable future? | OEMs / Manufacturer

Electric vehicles are cleaner, but they are only part of the climate solution. Of late, electric vehicles are gaining a lot of attention, however, the question is: Is this the path to a completely sustainable solution? The blog post shares three possible pathways for automakers, i.e. new approaches for tomorrow's market that car companies could embrace as well as the **avoid-shift-improve** (ASI) framework. [Read more](#)



# EVFEATURE

## THE FUTURE OF MOBILITY IN INDIA'S PASSENGER-VEHICLE MARKET

By Shivanshu Gupta, Neeraj Huddar, Balaji Iyer, and Timo Möller

First published in **McKinsey & Company, Insights, July 2018 issue**

"Through the Automotive Mission Plan, the National Electric Mobility Mission Plan (NEMMP), and other initiatives, the government seeks to achieve two objectives—facilitate long-term growth in the industry and reduce emissions and oil dependence.

In the Automotive Mission Plan 2026, the government and industry set a target to triple industry revenues, to \$300 billion, and expand exports sevenfold, to \$80 billion. To meet these aims, it is estimated that the sector could contribute more than 60 million additional direct and indirect jobs, and the result could be improved manufacturing competitiveness and reduced emissions."

Incumbents in the automotive industry should prepare for a changing landscape as India grows into the world's third-largest passenger-vehicle market and global trends disrupt the sector.

India is expected to emerge as the world's third-largest passenger-vehicle market by 2021.<sup>1</sup> It took India around seven years to increase annual production to four million vehicles from three million.<sup>2</sup> However, the next milestone—five million—is expected in less than five years. Hitting that mark will depend on today's rapid economic development continuing, with a projected annual GDP growth rate of 7 percent through 2020,<sup>3</sup> ongoing urbanization, a burgeoning consuming class, and supportive regulations and policies. With this growth in mind, we set out to build a perspective on the trends shaping the Indian market, the value proposition for the automobile industry in India, and imperatives for winning in the market. This article explores all three.

### Key trends shaping the Indian passenger-vehicle market

The market for passenger vehicles in the country will evolve in the context of several larger trends, some specific to India, and some relevant globally.

#### Favorable macroeconomic and demographic trends

Currently, the automotive sector contributes more than 7 percent to India's GDP.<sup>4</sup> The Automotive Mission Plan 2016–26 sets an aspiration to increase the contribution to 12 percent.<sup>5</sup>

A number of economic trends could help in meeting this target. Rapid urbanization means the country will have over 500 million people living in cities by 2030—1.5 times the current US population. Rising incomes will also play a role, as roughly 60 million households could enter the consuming class (defined as households with incomes greater than \$8,000 per annum) by 2025. At the same time, more people will join the workforce. Participation could reach 67 percent in 2020, as more women and youth enter the job market, raising the demand for mobility.

Some of them would leap straight into four-wheeler segment, and others will graduate from two- to four-wheelers. Over 44 percent of the consuming-class households will be in 49 growth clusters—for example, Delhi is expected to have the same GDP per capita at purchasing power parity as the entire country of Russia in 2025.<sup>6</sup> Cities like Delhi are a sweet spot for car manufacturers to target.

In the future, these macroeconomic and demographic trends could shift pockets of growth in passenger-vehicle market. Mini cars and hatchback cars have been the mainstay for the automobile industry in India, with

share around 50 percent and growth of 6 to 7 percent between financial year 2014 and 2017. These segments will continue to maintain a dominant position, but the majority of growth is expected to come from new segments such as compact SUVs, sedans, and luxury vehicles.

### Continued government focus on supporting the industry

Through the Automotive Mission Plan, the National Electric Mobility Mission Plan (NEMMP), and other initiatives, the government seeks to achieve two objectives—facilitate long-term growth in the industry and reduce emissions and oil dependence.

In the Automotive Mission Plan 2026, the government and industry set a target to triple industry revenues, to \$300 billion, and expand exports sevenfold, to \$80 billion. To meet these aims, it is estimated that the sector could contribute more than 60 million additional direct and indirect jobs, and the result could be improved manufacturing competitiveness and reduced emissions.

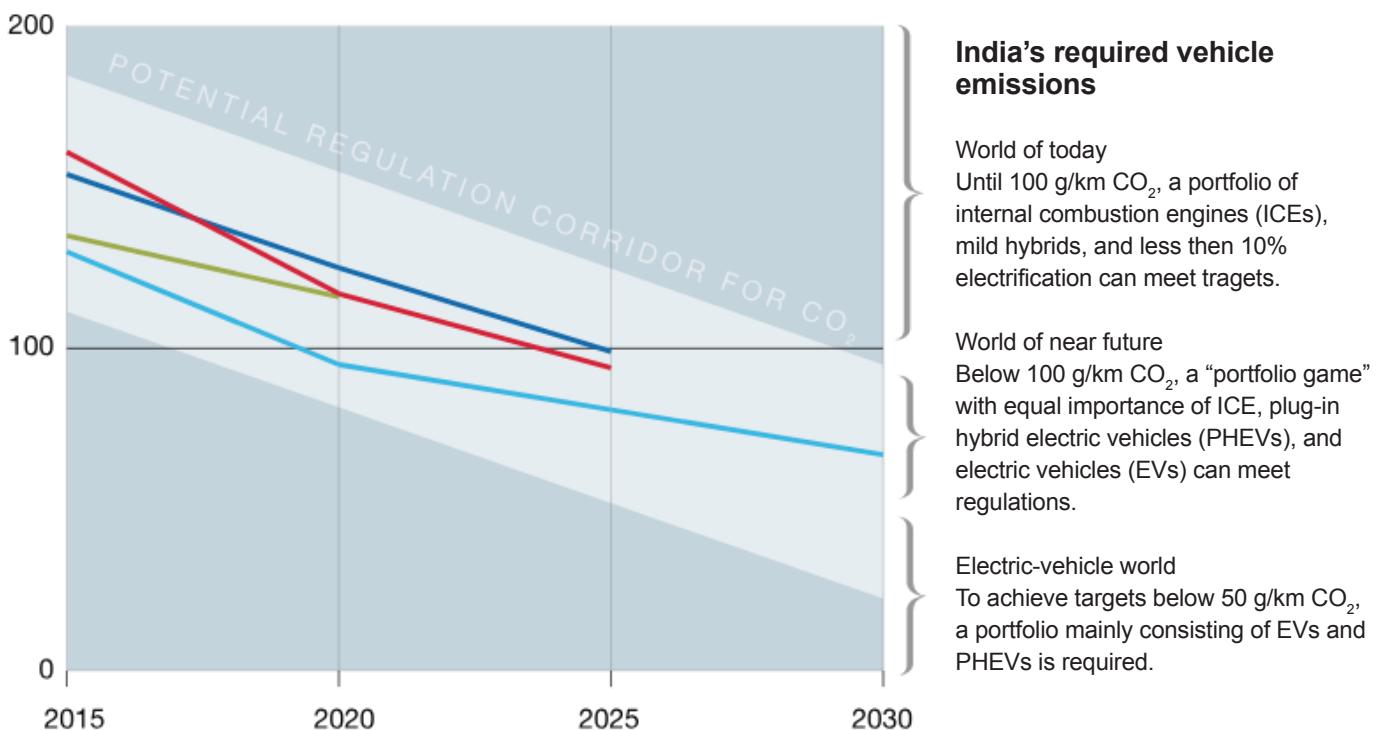
To tackle emissions, the government seeks to bring local standards up to par with global standards, enabling India to leapfrog from BS-4 to BS-6 emissions (the Euro 6 equivalent) by 2020 (Exhibit 1). Additionally, India has implemented Corporate Average Fuel Efficiency norms in which the manufacturers have to improve their fuel efficiency by 10 percent between 2017 and 2021 and by 30 percent or more from 2022.

Exhibit 1

### India seeks to bring emissions standards in line with global standards.

Change in regulation of grams per kilometer (g/km) of CO<sub>2</sub>,<sup>1</sup> index (2004 = 100)

— China — EU — India — US<sup>2</sup>



<sup>1</sup> To ensure comparability, CO<sub>2</sub> figures are cycle adjusted and normed to New European Driving Cycle.

<sup>2</sup> Environmental Protection Agency will most likely relax fuel efficiency standards for model years 2022-25.

Source: McKinsey&Company | International Council on Clean Transportation; McKinsey analysis

Additionally, to address pollution from old vehicles, the government is working on an initiative that focuses on formulation of end-of-life or scrappage policies. It plans to give incentive for the adoption of these policies with the help of lower taxes, discounts on purchase prices, and simple compliance processes. To reduce dependency on oil imports, the government is promoting adoption of alternative fuels through FAME2, which is an extension of the original FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) initiative. Where “FAME1” offered incentives to electric

vehicles (EV) and hybrid EV buyers, FAME2 is expected to incentivize electrification of the public-transport fleet of buses and taxis, as well as facilitate demand for all types of alternative fuel. Furthermore, to enable immediate adoption, a lower goods and services tax of 12 percent is applied to battery electric vehicles, compared with 31 to 48 percent for other vehicles.

### The development of India as a manufacturing hub

The World Economic Forum ranks India 30th on the global manufacturing index, which assesses the manufacturing capabilities of more than 100 countries. The government's "Make in India" initiative has played an important role in elevating country's position. In the past three to four years, India improved on nine out of ten parameters for ease of doing business.

Although there is still a long way to go before India becomes a leader in the manufacturing arena, companies in the automotive sector are embracing this opportunity to leverage India as a hub for low-cost, high-quality products. After creating a strong value proposition in mini cars, India is gaining global recognition in the compact sedan and SUV category.

### The potential for global disruptions

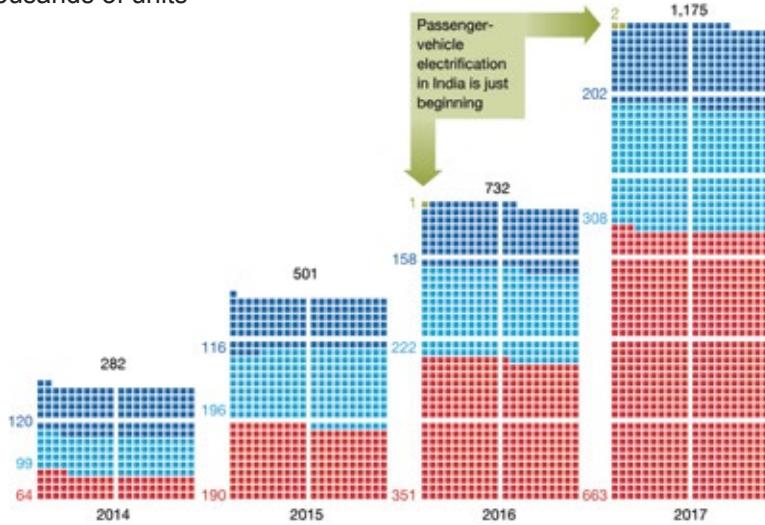
The global automotive industry is undergoing a cascade of disruptions that will reshape it in unexpected ways, and India will be no exception to this. Four key trends will shift markets and revenue pools, change mobility behavior, and build new avenues for competition and cooperation.

**Electrification.** Electrification has just started to take off in India (Exhibit 2). Factors such as declining prices of batteries and supportive policies from the government are stimulating the segment's growth. In 2017, only 2,352 units of electric vehicles were sold.<sup>7</sup> However, early signs of growth are visible through an order for 10,000 electric vehicles by the government's energy-service company known as Energy Efficiency Services Limited. Likewise, local governments in ten cities, with populations of one million or more people, have placed orders for 390 electric buses during phase one. In the next phase, the order book is expected to be in the range of 1,000 e-buses.<sup>8</sup>

#### Exhibit 2

### India electric vehicle market has just taken off, and it is minuscule compared with markets in China, Europe, and the United States.

Sales of battery electric vehicles (BEVs), plug-in electric vehicles (PHEVs) and hybrid electric vehicles (HEVs), thousands of units<sup>1</sup>



<sup>1</sup> Figure may not sum because of rounding.

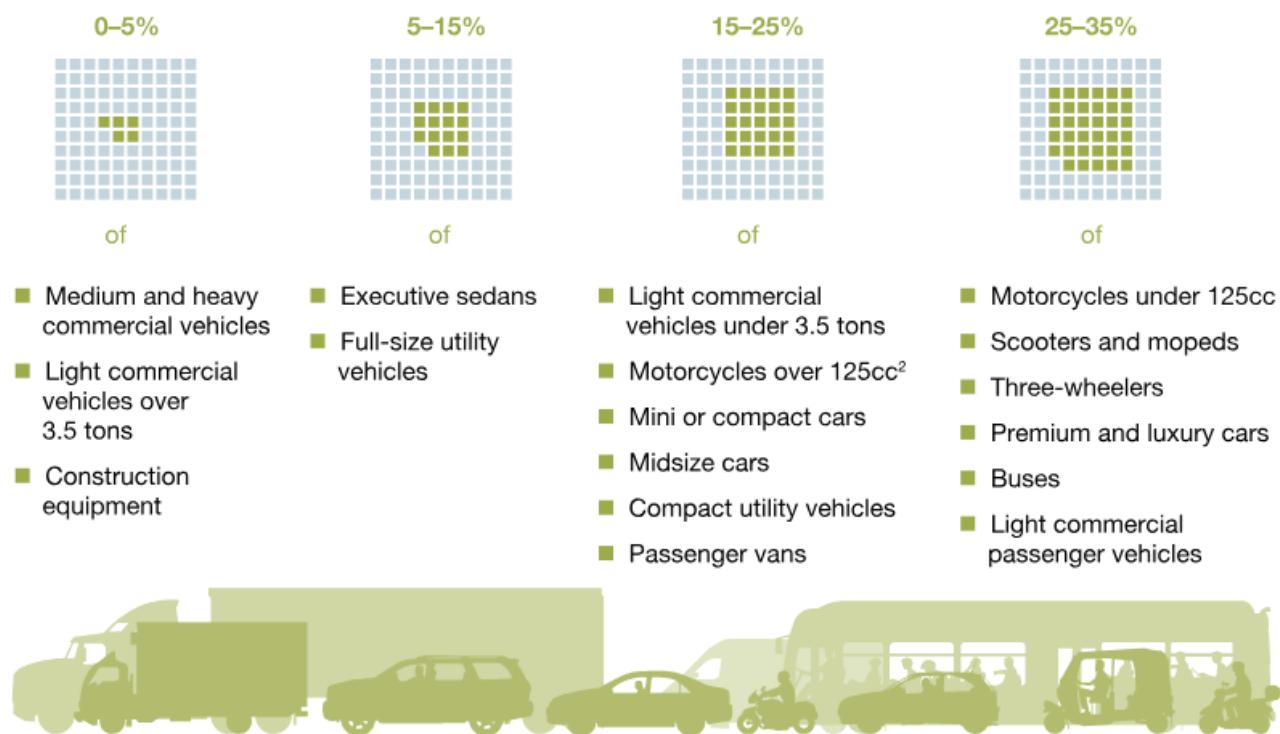
Source: McKinsey&Company | Electric Vehicles World Sales Database

The pros and cons of electrification continue to evolve. Reduction in emissions and less dependency on oil imports are clear advantages of electrification. The level of adoption of electric vehicles will determine its impact on the automobile industry. According to industry experts, people carriers like buses, two- and three-wheelers, luxury passenger vehicles, and light commercial vehicles could see maximum penetration by 2030. This will be followed by other passenger vehicles, medium-and heavy-commercial vehicles, and construction equipment, which will take longer for EVs to penetrate (Exhibit 3).

### Exhibit 3

## Once the market starts evolving, penetration rates for scooters, three-wheelers, buses, and passenger vehicles in India will rise.

Expected battery-electricity-vehicle (BEV) penetration in India across vehicle segments by 2030, %<sup>1</sup>



<sup>1</sup> Survey was conducted among 26 industry executives/ experts.

<sup>2</sup> Cubic centimeters (engine-size measurement).

Source: McKinsey&Company | Industry roundtables organised by the MCKinsey Center for Future Mobility for automotive industry experts and executives, August 2017.

From a customer point of view, the value proposition of electric vehicles will be reduced total cost of ownership, particularly in applications where asset utilization can be high. India is yet to see mass-market EV platforms, but both incumbents and new entrants are making efforts and the inflection point of volume growth may not be too far out.

However, this trend requires careful planning and execution, as there are certain risks associated with it. These include dependence on China for raw material, competitive disadvantage in power electronics and battery manufacturing, and lack of infrastructure—for example, there are fewer than 1,000 charging stations in India. Moreover, many consumers remain wary of electric vehicles because of the cost, range anxiety, and lack of options.

Shared mobility. Penetration of shared mobility in India remains low compared with China and the United States, but a major shift is under way in densely populated cities where the use of e-hailing cabs costs less, comparatively, than driving a personal car. Major stakeholders from the government to automakers to venture-capital funds and cab aggregators agree that the industry will continue to grow, becoming a significant alternative to commuting in growing urban areas. For example, two of the major cab aggregators covered 500 million trips together in 2016; that number is expected to rise with innovative models like cab-pooling and pay-later options.

The pace of this change likely depends on three main triggers: first is asset utilization, where cab aggregators' ability to sweat their assets will determine their ability to expand and offer more competitive rates to customers while letting drivers earn. Second, clarity in regulations will simplify compliance and encourage more people to join the movement. Third, several cities in India are investing heavily to upgrade their transport infrastructure. This is not just limited to building metros in big cities. The role of shared-mobility players will evolve as transport infrastructure becomes mature. At the moment, rides and driver incentives are funded by private capital, which makes the model economically viable. It will be important to see how the industry fares once private capital dissipates.

Connected vehicles. Connectivity is still in the early stages of adoption in India. A minuscule share of vehicles sold in India come with factory-fitted connectivity features, but the mass adoption of smartphones, coupled with low data costs, could enable connectivity features to proliferate.

There are several connectivity-linked applications that are picking up in India. Basic in-car entertainment, navigation, and in-car connectivity (for example, through Bluetooth) have evolved rapidly over the last decade. More advanced telematics features that utilize car sensor data, driving behavior, and vehicle-health parameters are also evolving, particularly with aftermarket solutions. Several start-ups are leveraging this data coupled with proprietary hardware and algorithms to build solutions centered on improving safety and security, tracking vehicle activity or theft, monitoring and influencing driver behavior, and enabling timely repairs and maintenance.

Car connectivity also leads to several risks around which protocols and guidelines are at very early stages, not just in India but also globally. Data security, privacy concerns, cyber threats are new challenges that vehicle connectivity creates. Moreover, car connectivity affects not just OEMs but also several ecosystem players, including insurance companies, telecom operators, and technology companies.

We see some early signs of adoption visible in the ecosystem. For example, one major vehicle-insurance player in India offers discounts on premiums if the vehicle has an antitheft device. Several automakers have recently introduced connectivity features, including infotainment, navigation, and communication interfaces. IRDA, the insurance regulatory body, has also invited views on pay-as-you-drive insurance products that use telematics to affect premium prices.

Autonomous vehicles. Autonomous vehicles (AVs) offer promise to resolve some of India's road-safety challenges. Drivers and passengers in India see about 12 percent of global road fatalities, and more than 80 percent of road accidents involve some aspect of driver error.<sup>9</sup> AVs have the potential to reduce traffic congestion and improve safety and fuel efficiency.

However, neither industry nor regulatory players are confident of rapid AV sales uptake due to fear of job loss, weak infrastructure (for instance, traffic), lack of technological readiness, and lack of self-discipline in the driving culture. That said, certain advanced driver-assistance systems feature such as park assist, navigation service, anti-lock brake assistance, electronic stability program, and others have started to make their way into vehicles in India. And once the Bharat New Vehicle Safety Assessment Program<sup>10</sup> comes into full force these features will see significant uptake.

## **Value proposition of India**

Given these trends, what role might India play in the automobile industry of the future? A few themes could emerge.

### **Win here, win all**

In many ways India is an archetype for emerging markets in regions such as Latin America, Southeast Asia, and Africa. The scale might be different, but these markets experience similar opportunities and challenges—a burgeoning consuming class, value-focused tastes and preferences, and an evolving manufacturing ecosystem, among other attributes.

Companies that have developed products in India and for India have been able to find markets in other continents as well. For instance, Ford India Private Limited is exporting over 90,000 EcoSport cars per year, almost twice the amount of domestic sales. Similarly, Hyundai and Volkswagen are using their factories in India as a global hub for compact hatch and sedans.

### **Center for frugal engineering**

For a long time, India has been known as a hub for frugal engineering. Many global companies have used jugaad (roughly translated, frugal engineering) to develop products that cost a fraction but offer enough value to attract demand. For example, a leading global automobile company selected a team of engineers in India to build a car for emerging markets. The team was asked to focus on ground-up innovation, heavy local sourcing, and local tastes and preferences. The result of this effort was a mini car sold for around \$5,000 that offered all the latest features, technology comparable to industry leaders, and localization levels of 98 percent. The company has been selling more than 8,000 vehicles every month and has become an attacker for incumbents in the small-car segment.

## Embedded software

In the near future, most automobile manufacturers will have to embed software in their vehicles to manage the complex system of hardware such as sensors, processors, and storage devices. This is a great opportunity for Indian IT and auto-component players, many of whom have started developing a global play to gain the first-mover advantage. For example, Sasken Technologies is working with more than 100 Fortune 500 companies to apply embedded software in their products. In one such case, the company collaborated with a North American Tier 1 supplier to develop a testing framework for telematics in a vehicle. Similarly, AllGo Embedded Systems, which was acquired by Visteon Corporation in 2016, was one of the first movers in the embedded multimedia and connectivity solutions space and became an important supplier to global automobile manufacturers and tier-one suppliers. Its patented technology gave Visteon Corporation a strong play in Linux and Android-based solutions.

## Hub for low-cost, high-quality managerial talent

For a number of years, multinationals have been using India as a hub for low-cost talent. However, in the past few years, India has also been recognized for high-quality managerial talent. Indians are starting to occupy major positions across industries such as consumer goods, automotive, pharmaceutical and banking, among others. Moreover, many such companies are also leveraging local talent for driving innovation through R&D centers. In the case of a leading global conglomerate, more than a quarter of their innovations are done by the team in India. Likewise, in the case of an automotive manufacturer, the local team of managers and engineers are working on products that will drive growth in the medium to long run.

## Imperatives for winning in India

As various local and global players expand their positions in India, companies need to design winning strategies for the market. The following suggestions can improve the chances of winning.

Reimagine and move fast. Reinvent the business because disruptions are either on the way or already here. It makes sense to adopt lean operations, bundle new products with solutions and services, and explore additional value-chain opportunities.

Make in India for India. As Indian consumers move up the income ladder, their definition of value will evolve. It will lie in higher quality and features but lower prices when compared with global markets.

Go granular. As pointed out earlier, a large share of demand in India will come from 49 clusters and rural pockets. It is important for companies to outline their addressable clusters up front and invest in appropriate products.

Partner to build relevant assets. Prepare the organization to embrace an operating model that involves nontraditional partners as high-tech and automotive worlds merge. The sheer size of the opportunity in the industry has attracted many large tech companies and start-ups. As a result, incumbents will have to adjust their operating model and prepare to work closely with nontraditional companies in the value chain.

Empower the organization in India and invest in talent. Prepare a top team of 10 to 15 leaders and give them the autonomy to drive change. Invest in talent to avoid a skills war in the future.

Embrace technology. Develop a clear and time-driven strategy for embracing digitization, big data analytics, and connectivity. Appoint a chief technology officer to build and manage the integration of new technologies.

India's automotive industry and market are on the cusp of major change. The opportunities generated by the disruptions ahead can change the competitive game for players willing to step beyond their traditional roles and engage with customers in this new, digital environment.

<sup>1</sup> IHS Auto Database, Light Vehicle Sales Forecast, [ihsmarket.com](http://ihsmarket.com)

<sup>2</sup> Society of Indian Automobile Manufacturers, [siamindia.com](http://siamindia.com)

<sup>3</sup> World Economic Outlook Database, April 2018, International Monetary Fund, [imf.org](http://imf.org)

<sup>4</sup> Based on real GDP

<sup>5</sup> The Automotive Mission Plan 2016-26 (AMP 2026) is the collective vision of the Government of Indian automotive industry.

<sup>6</sup> India's economic geography in 2025: States, clusters, and Cities, October 2014.

<sup>7</sup> Electric Vehicles World Sales Database, [ev-volumes.com](http://ev-volumes.com)

<sup>8</sup> Department of Heavy Industries, Ministry of Heavy Industries and Public Enterprises, Government of India, [hi.nic.in](http://hi.nic.in)

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Sources:

- <https://www.bbc.com/news/uk-44759150>
  - <https://www.bbc.com/news/business-44662649>
  - <https://newatlas.com/ecomotive-noah-concept-circular-economy/53547/>
  - <https://www.bloomberg.com/news/articles/2018-07-06/china-is-said-to-weigh-further-cuts-in-electric-car-subsidies>
  - <http://www.insidesources.com/electric-vehicles-reduce-cost-business/>
  - <https://asia.nikkei.com/Spotlight/Electric-cars-in-China/China-to-buy-60-of-world-s-electric-vehicles-in-2035-says-study2>
  - <https://asia.nikkei.com/Spotlight/Asia-Insight/China-s-cobalt-dominance-meets-blockchain-backed-resistance>
  - <http://www.thedrive.com/tech/22274/electric-buses-have-lower-emissions-regardless-of-electricity-source-study-says>
  - <https://www.businesstoday.in/technology/news/mahindra-zoomcar-introduce-electric-cars-rentals/story/279973.html>
  - <https://qz.com/1323337/indias-electric-vehicles-dream-will-stall-over-its-love-for-cheap-cars/>
  - <https://inc42.com/buzz/electric-vehicles-are-the-future-of-india-vivek-wadhwa-is-99-sure-of-this/>
  - <https://www.bloomberg.com/news/articles/2018-07-06/india-sees-slower-shift-to-evs-in-blow-to-green-vehicles-goal>
  - <https://www.rushlane.com/maruti-wagonr-swift-electric-cars-india-battery-12273665.html>
  - <https://www.financialexpress.com/auto/car-news/isros-lithium-technology-is-a-game-changer-for-electric-vehicles-how-satellite-tech-will-help-car-manufacturers/1246195/>
  - <https://timesofindia.indiatimes.com/business/india-business/tata-motors-supplies-tigor-electric- vehicles-to-cognizant/article-show/65039369.cms>
  - <https://www.jagranjosh.com/current-affairs/niti-aayog-to-organise-indias-first-global-mobility-summit-1530675923-1>
  - <http://www.wri.org/blog/2017/07/tesla-model-3-our-ride-sustainable-future>
  - <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-future-of-mobility-in-indias-passenger-vehicle-market>
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