



# Electric Vehicle - Clean Commuting

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# Brief Introduction

- An electric vehicle, also called an EV, uses one or more electric motors or traction motors for propulsion instead of the traditional fossil fuel.
- First electric carriage was built in 1830s and the first electric automobile was built in 1891 in the United States.
- Types : Battery electric Vehicle  
Hybrid Electric Vehicle  
Plug-in Hybrid Electric Vehicle  
Fuel Cell Electric Vehicle
- Electric vehicles will play a pivot role in changing the environment and economy around the globe in the next two decades.

# Why we need EV?

- Fast depletion of fossil fuel.
- Usage of EV will result in significant reduction in air pollution (CO2 emission) as transportation accounts for one third of all energy usage.
- With rapid urbanization around the globe electric vehicle is the need of the hour to serve everyone.
- Energy is not consumed while the electric vehicle is stationary, unlike internal combustion engines which consume fuel while idling thereby making it energy efficient.
- Facilitate employment growth in a sun-rise sector.
- In December 2019, in the Climate Risk Index 2020 released by the environment think tank, Germanwatch, India's rank has worsened from the 14th spot in 2017 to 5th in 2018 in the global vulnerability ladder and did not improve further. This makes it all the more reason for India to make electric vehicles a priority in the fight against the reliance on fossil fuels.



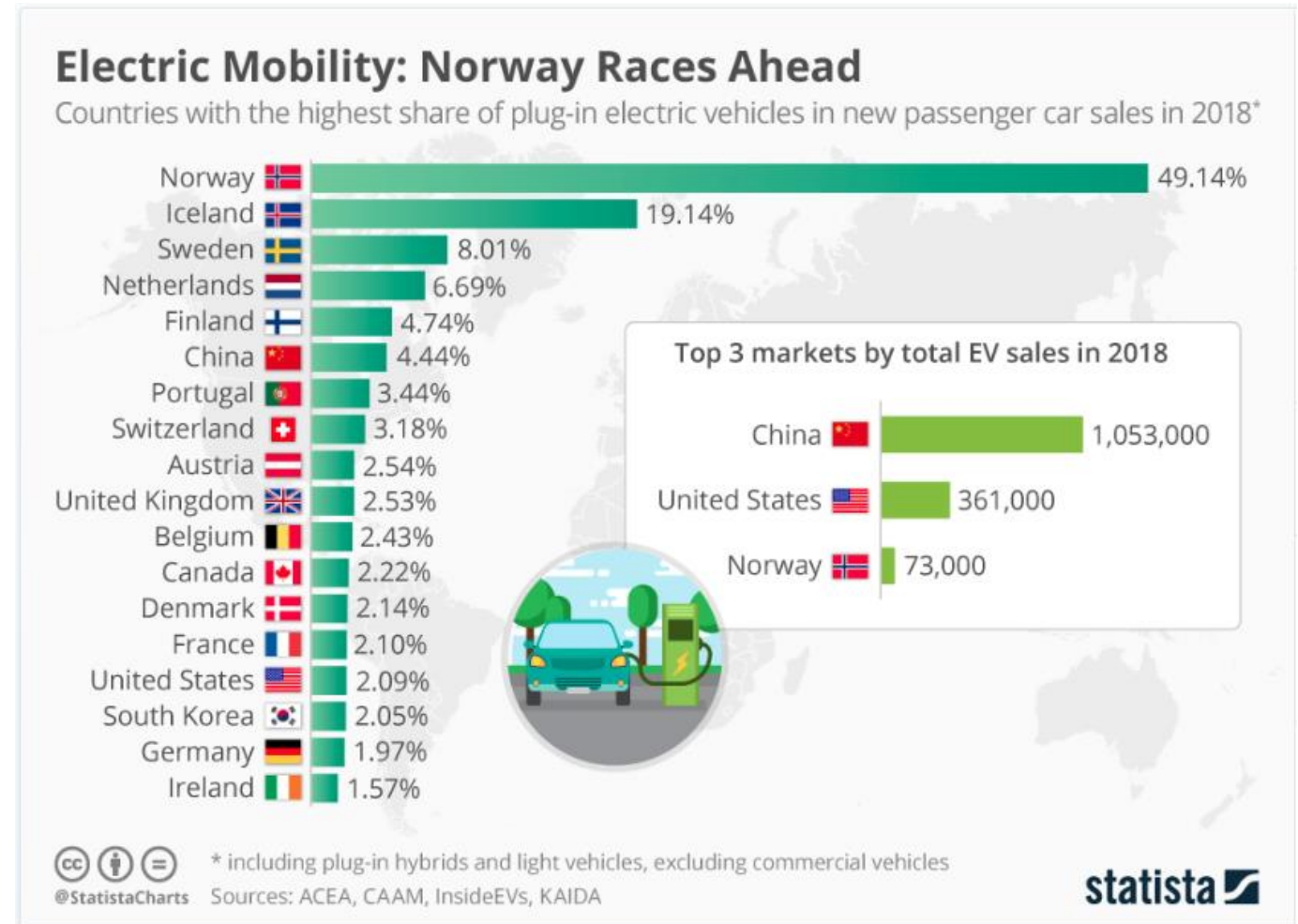
# EVs in India : Market Scenario

- Presently, EV market penetration is only 1% of total vehicle sales in India, and of that, 95% of sales are electric two-wheelers.
- GOI has set a target of 30% electric vehicles on Indian roads by 2030 to combat pollution.
- Currently India has only 150 charging stations. GOI has recently sanctioned setting up of 2636 number of charging stations across 62 cities in India which will reduce range anxiety to a considerable extent.
- Phasing out of combustion engine vehicle is at the initial stage to encourage purchase of eco-friendly electric vehicle.
- Many Indian startups and other manufacturers have come up with EVs for commercial usage and they have already hit the Indian roads.
- Presently, India is targeting to deploy 5 to 7 million electric vehicles in the country by end of 2020 and target of 40,00,00 passenger battery electric cars (BEVs) by 2020, thus avoiding 120 million barrels of oil and 4 million tons of CO<sub>2</sub>.



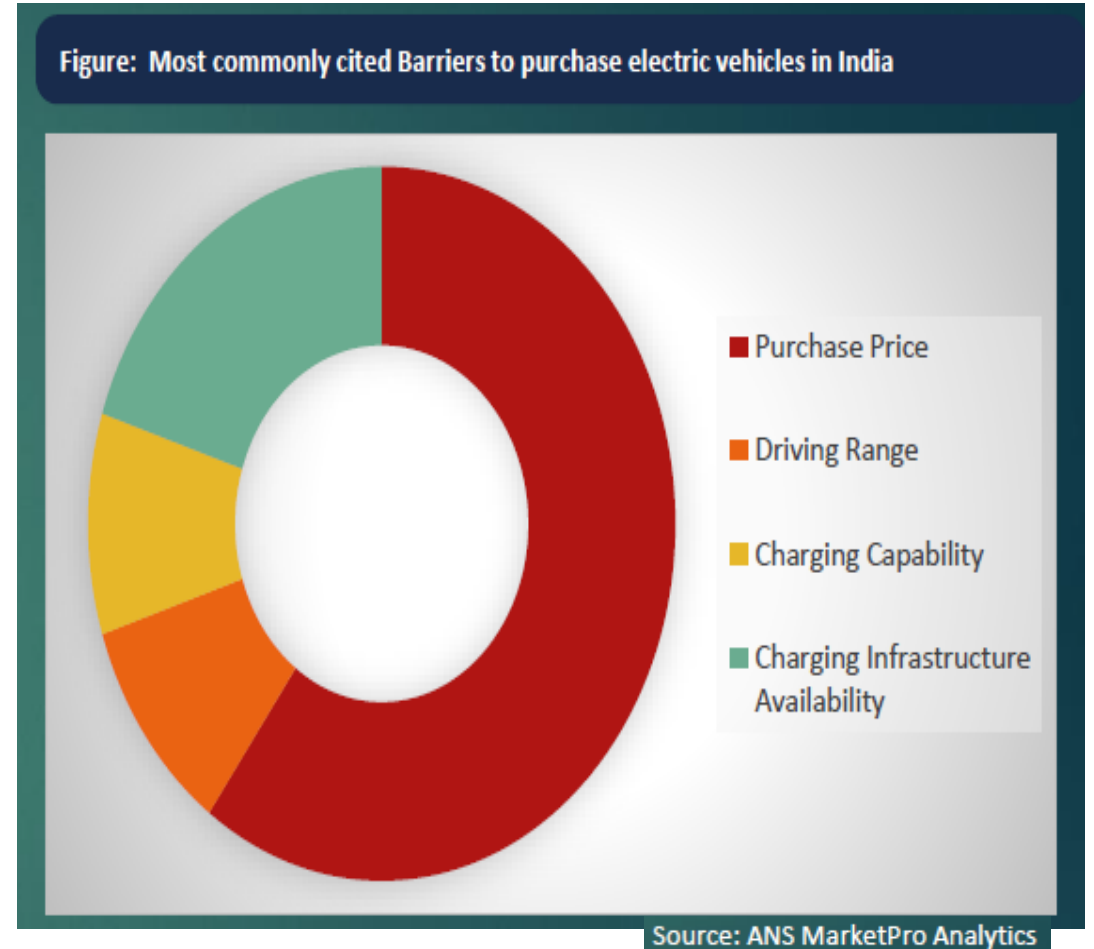
# EVs outside India : A faster adoption

- In Norway, one in three vehicles (33% approx) registered is plug-in electric.
- While only 4% of China's vehicles are electric, Norway is rapidly approaching the 50% mark with 49% of its new cars running on electricity in 2018 with Iceland and Sweden reaching 19% and 8% EV penetration.
- China's auto industry is rapidly turning all-electric and aims at having around 5 lakh public charging stations by 2022.
- UK and France are targeting 100% electric cars by 2040.



# Challenges in Indian EV Industry

- The average on-road price of electric vehicles in India is not attractive enough for consumers.
- Inadequate charging infrastructure.
- Reliance on battery imports.
- Range anxiety among consumers.
- Inadequate electricity supply in parts of India.
- Lack of quality maintenance and repair options.
- Changing the mindset of consumers, i.e adopting to a new technology.



# GOI Initiatives to boost EV Industry

- The Government of India started Faster Adoption and Manufacturing of Hybrid and Electric vehicles (FAME) w.e.f 1<sup>st</sup> April 2015 – I & II scheme which provides financial incentives for attractive EV production and creation of electric transportation infrastructure.
- 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.
- Recently the Government released a two-pronged strategy aimed at both buyers and manufacturers, in which it offers \$1.4 billion in subsidies to buyers while imposing a hike on import tariffs to increase manufacturing of these vehicles by domestic companies.
- The Power Ministry is close to finalising a policy for electric vehicles charging infrastructure that proposes granting subsidies to PSUs for setting up a basic charging station network in big cities and highways for gaining momentum in electric vehicle sales.
- NITI Aayog, which is coordinating with various ministries, state governments and stakeholders for the e-mobility policy, will also be seeking inputs from the department of heavy industries, the finance ministry, the department of science and technology, the ministry of road transport and highways and the ministry of urban development for encouraging EVs in India.
- The government announced Rs 1,50,000 income tax deduction on interest paid on loans for purchase of electric vehicles during the Union Budget 2019-20.

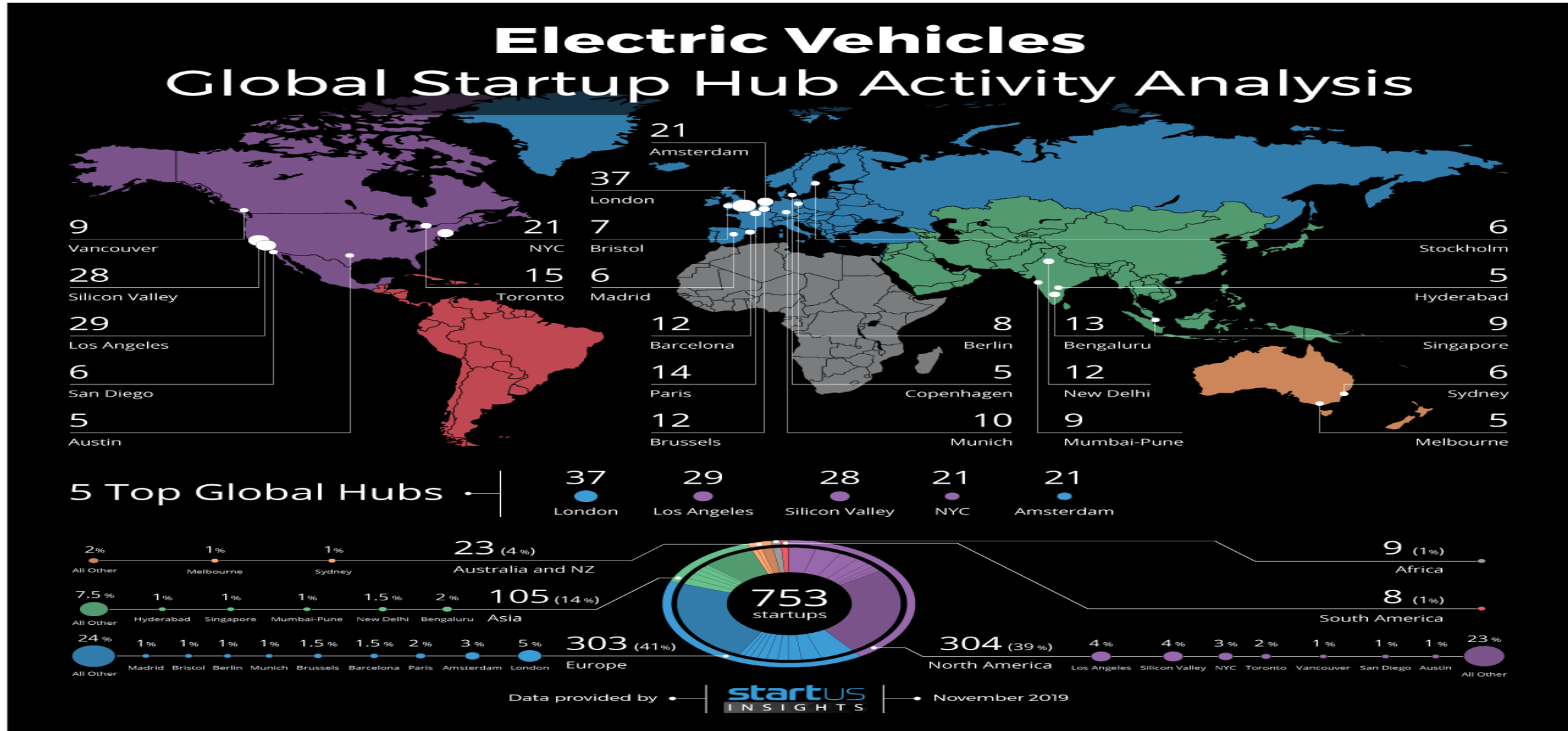


# What India needs to focus on to boost EV Industry



- India must develop strong Research and Development (R&D) capacity leading to commercialization in Electric vehicle ecosystems keeping in mind 'Make in India' goal.
- Rolling out incentives to the consumers for purchasing EVs as well as to the manufacturers/traders in the form of tax benefit/tax discount.
- The charging infrastructure should be rapidly developed. Installation of chargers should be allowed on street parking, parking lots and any public charging space.
- A model that brings together IITs, young and talented #startups, private manufacturing and CSR could be put in place.
- India needs to ensure that electric buses, cars and taxi fleets used by the government departments become viable.
- Steps to be taken to gradually phase-out ICE vehicles.
- CSR funding to be arranged through corporate companies/PSUs to boost the #startups involved in EV industry.
- #Startups will play a pivotal role in the evolving electric mobility space around the world.

# EV Startup Hubs Around the Globe



# EV Startup Hubs Around the Globe (Cont.)

- **#1 London | 37 Startups** - London-based startup **Lavelle Bikes** develops electric-powered bikes keeping in mind the congested roads and polluting cars. They design ergonomic bikes that come equipped with a 36 V 500 wh battery that can go up to 45 kms per hour.
- **#2 Los Angeles | 29 Startups** - Irvine-based startup **Helix Motors** develops unconventional but intelligent electric vehicles. Their Dynamic Steering Control System (DSCS) tilts the three-wheeled vehicle cabin safely and automatically like a motorcycle.
- **#3 Greater Silicon Valley Area | 28 Startups** - Set up in Santa Clara, **Seres** develops the SF5 and SF7, electric cars that look and feel like the cars of today but have enhanced safety and user interaction features. Seres' cars come equipped with LiDAR, Radar, HD cameras, and Ultrasonics to ensure safety and convenience for the driver.
- **#4 New York City | 21 Startups** - Based out of Brooklyn in New York City, **Tarform Motorcycles** develops an all-electric, fully sustainable, and intelligent bike that is already in production. Equipped with up to 80 horsepower, it can travel at almost 160km/h (100mph) and has an upper-limit range of close to 273km (170 mi). Riders can choose from a smaller 9kwh battery or a more powerful 13.5kwh battery.
- **#5 Amsterdam | 21 Startups** - Dutch startup **Silverwing** develops electric vertical take-off and landing (eVTOL) vehicles, fixing their gaze firmly in the future. The S1 eVTOL is designed to fly at 140km/h (87mph) with a range of 60km (37mi) and can carry up to 90kg of payload. It can fly at a maximum height of 200m (656ft) and produces 87 decibels of sound.

# Major Startups in EV industry (India)

S. No.	Name of	Brief Profile	Major Funding
1	Ather Energy	Based in Bengauru & founded by Tarun Mehta and Swapnil Jain in 2013 with focus in Electric Scooter.	Hero Motocorp and Mr. Sachin Bansal invested \$51-million in May 2019.
2	Yulu	Based in Bengauru & founded by Amit Gupta in 2017 with focus in Electric Scooter.	Bajaj Auto invetsed \$8-million in Nov 2019.
3	Ola Electric Mobility	Based in Bengaluru & co-founded by Ankit Jain in 2017 with focus in e-rickshaws, autos and cars.	SoftBank Corp, the Arun Sarin family, Ratan Tata and Matrix invested \$306-million in two tranches - \$56 million in February 2019 and \$250 million July 2019.
4	BattRE	Based in Jaipur & founded by Nishchal Chaudhary in 2017 with focus in Electric Scooter.	Former Tata Motors' President Gajendra Chandel invested an undisclosed amount and the company plans to raise Rs. 7 crore by the year ending 2020.
5	SmartE	Based in Delhi & co-founded by Goldie Srivastava in 2014 with focus in e-rickshaw.	Japanese conglomerate Mitsui & Co invested \$15-million in July 2019.
6	E-Trio	Based in Hyderabad & founded by Satyapoorna Chander Yalamanchili in 2017 with focus in Electric Cars.	Around Rs. 10 crore through various investors .

# Future Prospects

- The future of mobility promises to be silent, efficient, and much better for our environment.
- Public procurement is expected to be an important driver of growth in the coming years, with the purchase of four-wheeler vehicles for government offices, three-wheeled vehicles and buses for public transport
- Investments by fleet operators such as Ola and Uber, as well as some operators of food distribution services, are also expected to boost the initial growth of two- and four-wheeled electric vehicles.
- If the government's 2030 targets are met, India could save Rs. 8 lakh crore on gasoline and diesel imports for the industry during the period considered, after considering a certain level of batteries.
- The geography and diversity of India will present problems that need to be addressed jointly by GOI, tech start-ups, manufacturers and investors.
- The timely adoption coupled with the electrification of the existing vehicles and growth of charging infrastructure will create a shift, the impact of which will be felt in metropolitan cities especially given that pollution has reached catastrophic levels.
- With the median age of Indians being 27 years, the younger generation is driven for innovation, sustainability and environmental conservation. At the same time, by manufacturing vehicles, components and batteries together, various established conglomerates and startups can ensure indigenous availability of products.

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