The COVID-19 pandemic-induced economic crisis has dented India’s automotive industry. Between 2019-20 and 2020-21, vehicle sales fell by 13.6%. It is estimated that the industry suffered losses of INR 2,300 crores per day and job losses of 3.45 lakhs across the sector.

Electric mobility players, however, seem unfazed by the downturn and continue pursuing ambitious electric vehicle (EV) transition goals. With the EV market expected to grow at a compounded annual growth rate (CAGR) of 44% and EV battery storage at 32% between 2020 and 2027, the e-mobility sector is well-poised to support a robust, green economic recovery for the industry in the coming years.

Leading growth in this sector is a dynamic ecosystem of more than 550 startups, making India the third-largest e-mobility startup market globally, behind only the United States and China. E-mobility startups in India are clustering to occupy strategic positions along the evolving EV value chain, spurred by policies that aim to increase localization and value-addition in manufacturing processes, and EV adoption in transport networks. Even as traditional automotive manufacturers and operators slowly move to incorporate e-mobility products and services, startups are consolidating their positions as industry leaders in this disruptive transition.

With investors looking to make their next big bet in e-mobility, and policymakers pursuing transport electrification as part of the national sustainability agenda, India’s e-mobility startups are carving out a niche for themselves in the country’s competitive automotive industry.

Figure 1 | E-mobility startup landscape in India and top start-ups by sub-sector

- **Electric Mobility Services**: 8%
- **Charging Infrastructure**: 20%
- **Battery Solutions**: 5%
- **Conversion Kits**: 2%
- **Urban Logistics**: 1%
- **EV Financing**: 1%

**Auto Manufacturers**: 63%
- Two-wheeler: Ola Electric, Ather Energy, Hero Electric
- Three-wheeler: Euler Motors, Adaptr Motors, Gayam Motor Works
- Four-wheeler: Mean Metal Works, Aspen Bower, Laureti Motors
- Others: Etrio, PMI Electro, Mobility Solutions, PiBeam

**Charge Point Operator**: ChargiZone, EV Motors India, EVI Technologies
**Manufacturing**: Log9 Materials, Grinotech
**BMS**: Ion Energy Labs, IgrenEnergy Technologies, Esmito
**Ride-Hailing Services**: SmartE, Lithium Urban Technologies, BluSmart
**Self-Drive Rentals**: Yulu, Mobycy, eBike

**Battery Swapping**: Racenergy, Lithion Power, Battery Smart
**Recycling**: Lohum, Ziptrax

**Charging Infrastructure**: Exicom Tele-Systems, Cellerate Systems, Flowtrik
**Network Service Provider**: BrightBlu, Numocity, ElectreeFi

Source: Data compiled by WRI India from Tracxn, Crunchbase and other public domains
Key Areas of Innovation Across Sub-sectors

E-mobility startups operate across a range of sub-sectors along the supply and value chain for EVs. Significant areas of startup activity include auto manufacturing, EV charging, passenger transport services, battery solutions, EV financing, vehicle conversion kits and urban logistics.

Figure 2 | The growth of start-ups per year

![Graph showing the growth of start-ups per year from 2012 to 2020](image)

**Source:** Data compiled by WRI India from Tracxn, Crunchbase and other public domains

### Auto Manufacturing

More than 300 EV manufacturing startups are operating in India, accounting for the majority of the funding raised (more than $700 million) in the sector. More than 75% of these startups are involved in two-wheeler and three-wheeler manufacturing, driven by technology readiness and market competitiveness of EVs in these vehicle segments.

Electric two-wheeler (e-2W) startups – Okinawa, Ather Energy and Revolt Motors – were among the highest-selling e-2W brands in the 2020-21 fiscal year. Ola Electric, a new entrant in the market, has launched its e-2W models for pre-booking and is expected to begin deliveries before the end of 2021. In the electric three-wheeler (e-3W) space, thus far dominated by informal e-rickshaw manufacturers, startups like Kinetic Green and Gayam Motor Works are competing with automotive OEMs like Mahindra Electric and Piaggio to increase market share in the e-auto segment. Other startups, including Strom Motors, PMI Electro Mobility Solutions and Celestial E-Mobility are developing electric cars, buses, trucks, tractors, and cargo vehicles.

As consumer demand grows in the e-2W segment, startups are setting up large-scale manufacturing facilities by taking advantage of financial,
infrastructural and employment incentives being offered by different state
governments. On the consumer end too, it is startups that are aggressively
marketing EVs and promoting customer trust in the EV market through
buy-back guarantees, vehicle exchange programs and vehicle leasing plans.

**EV-as-a-Service**

There are close to 50 startups that provide EV ride-hailing services and
offer self-drive EV rentals for passenger transport. Self-drive rental services
are predominantly focused on the low-power e-2W segment, while ride-
hailing services include e-3Ws and e-cars. Corporate employee transport,
another area of interest for EV-as-a-service providers, is expected to grow
rapidly in the post-pandemic period as employees return to workplaces.

Five of the top ten funded e-mobility startups - SmartE, Yulu, Lithium
Urban Technologies, Blu Smart and Mobycy – operate in the EV-as-a-
service sub-sector and have collectively raised over $90 million. These
startups also benefit from government incentives such as purchase
subsidies, vehicle tax exemptions, and reduced electricity tariffs for EV
charging. With reduced operational costs resulting in more favourable
total cost of ownership (TCO) for commercial EVs, and with government
mandates being established for fleet electrification, more and more
passenger transport operators are transforming their fleets to EVs. As a
result, the number of startups in this sub-sector is expected to grow rapidly.

**Charging Infrastructure**

More than 100 startups are working in the charging infrastructure domain
across the country. They include EV charger manufacturers, charging
service operators, and charging network/solutions providers. Charging
and battery swapping service operators constitute more than half of all
startups in this sub-sector, specializing in different market requirements
like residential charging, public charging, fleet solutions, and fast charging
networks. Examples of operators include Lithion Power, Fortum, Statiq,
ChargeZone and PlugNGo.

Other operators are providing low-cost, innovative solutions for light
EVs. For example, Magenta Power offers streetlight chargers that can be
integrated with existing road infrastructure, while Charzer retails and
operates low-power charge points that can be installed at local shops and
eateries. Electreefi, a charging network provider, integrates available public
charging points on a consumer application for locating and transacting at
public charging networks. Finally, a few startups like SUN Mobility, are
building integrated full-stack solutions from battery and charging system
manufacturing to battery swapping service provision.

Charging infrastructure operations are expected to take time to achieve
profitability due to low EV volumes in the market. Furthermore, Indian
standards for charging infrastructure are still under development, due
to which local manufacturing of charging connectors and components
is still limited. As a result, startups in this sub-sector have only raised
about $25 million. However, the FAME II scheme and state EV policies
provide incentives focused on accelerating the installation of charging
infrastructure. As EV uptake in the commercial and personal vehicle
segments picks up, the charging infrastructure market is set to scale up
steadily.

7. Kumar, P., & Kanuri, C. (2020). Total cost of ownership of electric vehicles: Implica-
org/blog/total-cost-ownership-electric-vehicles-implications-policy-and-purchase-de-
cisions
Battery Solutions

More than 25 startups are working on battery manufacturing, battery management systems (BMS) and battery recycling, alongside more established companies. They have collectively raised $18.5 million.

Given the high cost of lithium ion (Li-ion) batteries, which account for 40-50% of the cost of an EV, startups like Log9 Materials are exploring other battery chemistries to localize manufacturing and reduce imports, and to improve the affordability and energy density of EV batteries. Ion Energy, a BMS manufacturer, provides applications for EVs and battery energy storage systems (BESS), which can be used in EV charging installations. With an estimated EV battery capacity requirement of 250 giga-watt hours (GWh) annually by 2030, the battery solutions market will see significant growth in the future. The battery recycling market, which currently has very few startups including Lohum and Ziptrax, is also expected to reach 22-23 GWh by 2030.

Market development in battery manufacturing will be supplemented by greater value-addition, as government policies push for higher localization of component and cell manufacturing in addition to battery pack assembly. For example, the Government of India’s INR 18,000 crore production-linked incentive (PLI) scheme for advanced battery chemistries is expected to further stimulate the growth of indigenous battery manufacturing.

Others

More than 40 startups are working in other sub-sectors of the EV value chain, such as EV last-mile freight services, EV financing, vehicle conversion/retrofit kits, and e-commerce platforms for EVs.

A small but growing number of fin-tech startups like Revfin, Autovert, and Welectric are stepping in to fill the financing gap for EVs, especially for commercial fleets. They are entering the market with features like revolving credit limits, full-service leases, and GPS tracking for vehicle lenders/insurers. In addition, the rapid growth in e-commerce and hyperlocal delivery, especially during the pandemic, has attracted investments for startups working in urban freight operations. Startups like EvenCargo and LoadExx are introducing EV-based last-mile logistics to take advantage of this growth.

Funding and Investments in E-mobility Start-ups

The ongoing pandemic has neither slowed down the investments coming into the e-mobility sector nor made a significant dent in growth and expansion targets of startups. E-2W manufacturers Ather Energy and Ola Electric have, in total, invested INR 3,000 crores in setting up manufacturing facilities in Tamil Nadu during the pandemic. At the other end of the market, EV-as-a-service startups like Oye Rickshaw and DOT pivoted to delivery services as passenger transport services were halted. Yulu, an e-2W rental startup, reportedly grew 2.5 times in fleet size and revenue by providing vehicles to front line workers and delivery professionals.
Notable partnerships have been announced in the past few months among e-mobility startups. Omega Seiki, a commercial e-3W manufacturer, entered a strategic partnership with Log9 materials to use Log9’s rapid-charging battery technology in their vehicles. E-Trio, another e-3W manufacturer, announced a partnership with Zypp Electric, a last-mile delivery platform. Lithium Urban Technologies, an EV corporate employee transport provider, acquired SmartCommute, a transport software provider.

E-mobility startups have raised a total of $850 million since 2012, of which almost 90% was raised since 2018. In the final quarter of 2020 and the first quarter of 2021, startups like Lohum, Euler Motors, Blive, Ather Energy, Ion Energy Labs, and Ultraviolette raised over $57 million from Indian and global investors. This indicates that investor sentiment in the e-mobility sector remained strong through the pandemic.

In addition to more traditional funding sources like VC firms and strategic investors, e-mobility startups are attracting investments from development finance and climate finance sources. ADB Ventures, International Finance Corporation (IFC), and Green Growth Equity Fund are among the active investors in this space.


Enabling Policies for Nurturing Start-up Innovation

Startups are leading innovation and growth in several parts of the e-mobility sector. They are also actively contributing to the holistic development of the EV ecosystem through partnerships to grow the sector. Targeted policy incentives and reforms by the central and state governments can support the continued dynamism and scalability of EV startups. Some instrumental policy and implementation mechanisms for enabling startup activity in the sector include:

- **Inclusive eligibility criteria for EV schemes and programs:**
  Startups developing battery technologies, BMS, and other components are well-positioned to enable indigenous innovation for the Indian context. Unburdened by legacy products or technologies, startups can create cutting-edge solutions tailored to the local climate, road quality, EV use, etc.

  Ensuring that startups are eligible for, and can take advantage of, preferential EV schemes and programs, will be integral to creating a level playing field that encourages innovation in the EV sector. For instance, the PLI scheme for ACC batteries requires beneficiaries to have minimum production capacities of 5GWh. However, to ensure that the scheme does not solely benefit large incumbents in the sector, some part of the funding can be reserved for smaller capacity production facilities for technological innovation.

- **Incubation, R&D and skill development support:**
  Various state governments have innovation cells, startup funding initiatives and other support programs. Such platforms allow e-mobility startups to gain support from government-led incubation programs.

  Partnerships with universities and technical institutions help startups gain access to R&D facilities and funding and growth opportunities. In addition, government-supported skill development programs create a trained workforce that can be employed by e-mobility startups.

- **Shared manufacturing and plug-and-play facilities:**
  Setting up manufacturing facilities can pose significant barriers even for market-ready startups. States looking to attract industrial activity in the e-mobility sector can provide shared facilities for prototyping and small-scale manufacturing to eliminate barriers for scaling up startup operations. Further, EV parks with plug-and-play facilities will incentivize small companies and startups to accelerate production capabilities.

- **Financing support mechanisms:**
  Access to financing is a critical challenge for startups along the e-mobility value chain. The Government of India’s Credit Guarantee Scheme for Startups (CGSS) is an effective mechanism in this regard, allowing startups to avail of business loans without any collateral.

  Similar support can be extended by designating electric mobility as a Priority Lending Sector at the central level for EV commercial fleets or through allocated EV infrastructure funds through state infrastructure funding programs.
• **Single-window clearances and streamlined processes:**
  From vehicle certification to registration, applications for power connections, and tax and subsidy reimbursements, e-mobility startups interact with government agencies for a range of regulatory requirements and clearances. Streamlining these processes and setting up a single-window clearance mechanism would significantly reduce time and cost implications for startups and expedite project implementation.

The e-mobility sector is expected to play an instrumental role in creating green jobs and economic growth while supporting pathways to clean and low-carbon transportation in India. A thriving innovation ecosystem for electric mobility can accelerate the EV transition while creating a competitive domestic industry in the global EV market.
About WRI India

WRI India, an independent charity legally registered as the India Resources Trust, provides objective information and practical proposals to foster environmentally sound and socially equitable development. WRI India’s mission is to move human society to live in ways that protect Earth’s environment and its capacity to provide for the needs and aspirations of current and future generations. Through research, analysis, and recommendations, WRI India puts ideas into action to build transformative solutions to protect the earth, promote livelihoods, and enhance human well-being.

We are inspired by and associated with World Resources Institute (WRI), a global research organization. Currently over 150 researchers are working with WRI India in our offices in Delhi, Mumbai and Bengaluru.

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