# ELECTRIFYING PROGRESS

## Scaling Zero Emission Deliveries in India

prosus

CII Cleaner Air Better Life

CII Confederation of Indian Industry

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# Foreword

This report, **'Electrifying Progress: Scaling Zero-Emission Deliveries in India'** underpins our mission to catalyse the transition to green mobility within the e-commerce sector in India. With India's online food delivery market growing at 18% annually and e-commerce by 40%, this expansion offers economic opportunities but also creates challenges around urban mobility, air quality, and climate change. Zero-emission deliveries address these challenges while driving economic benefits. The objective of this research is to equip participants within the e-commerce ecosystems from the private and public sectors with actionable insights to accelerate the adoption of zero-emission delivery vehicles.

The benefits of transitioning to electric vehicles for e-commerce deliveries are both environmental and financial. From the environmental perspective, electric delivery vehicles will lead to better air quality as more than 8,000 tonnes of fine particulate matter can be eliminated in urban settings. With last mile logistics contributing to 50% of logistics related emissions – switching from internal combustion vehicles to electric vehicles will also drive down related emissions. The research shows that, with fluctuating costs of petrol and maintenance, drivers who adopt electric vehicles could see an 18% increase in their earning potential.

However, challenges such as high acquisition costs, credit access, limited data on vehicle performance, and residual value of the vehicle remain. The whitepaper proposes over 20 tailored solutions, from co-financing models to battery-as-a-service, from telematics to buy-back programs that will help accelerate EV adoption.

We welcome your ideas, feedback and partnership as we continue on our quest to build more resilient and sustainable e-commerce ecosystems.

**Prajña Khanna**
Global head sustainability
**Prosus and Naspers Group**

# Foreword

**Air pollution knows no boundaries. It impacts across borders, adversely impacting vulnerable citizens and deepening social inequities. The solutions, therefore, must be wide-reaching multi-disciplinary, locally rooted, and inclusive. At the Clean Air Fund, we believe that tackling air pollution is not just an environmental imperative but a priority from public health and social justice perspectives. The findings in this whitepaper 'Scaling Zero-Emission Deliveries in India' highlight a transformative opportunity to act.**

Urban last-mile logistics driven by the rise of platform-based gig economy is a significant opportunity for addressing air pollution from urban last mile deliveries in cities. Commercial delivery vehicles clock high daily mileages and as majority of them still rely on fossil fuels, they contribute significantly to ambient air emissions of fine particulate matter (PM2.5) and Oxides of Nitrogen (NOx). The whitepaper estimates that complete adoption of zero-emission vehicles in urban last mile deliveries could avoid up to 8-thousand tonne PM2.5 emissions and 176-thousand tonne NOx emissions in India cities amounting to substantial public health benefit. For context- this amounts to 20–25% of total air pollution generated from all sources in the National Capital Territory of Delhi. Given the strong growth projected in online food delivery and quick commerce, this emission potential may easily triple by 2030. Moreover, from a climate lens too, nearly 50% of carbon emissions from deliveries occur during the last-mile phase.

This whitepaper is a compelling call to action for cities, businesses, financiers, and philanthropies to urgently support scaling adoption of zero-emission vehicles in urban logistics. By enabling an inclusive ecosystem for scaled adoption of zero-emission vehicles, we can deliver goods more sustainably by creating a more equitable urban future with healthier air. At the same time, ZEV adoption can support income enhancement for gig workers which the whitepaper estimates to roughly 18% of his existing income.

At Clean Air Fund, we are proud to support work that aligns clean air priorities with livelihood enhancement, urban equity, and innovation in financing zero emission solutions. Suggested measures in this whitepaper for scaling ZEVs include- better social infrastructure, enhanced policy support, scaling new financing mechanisms via multi-stakeholder collaborations across domains which will go a long way in empowering frontline actors from gig workers to municipal administrators in the 131 non-attainment cities. As case studies on progressive use cases elaborate the whitepaper, transition to zero-emission deliveries is very much feasible at scale, if right players come together for ecosystem development to scale adoption ZEVs in urban last mile.

**Shirish Sinha**
Executive Director of Programmes
**Clean Air Fund**

# Summary for Decision Makers (SDM)

Urban last-mile deliveries are undergoing significant transformation in the way food, groceries, appliances other common household supplies are ordered and delivered in cities. Increasing reliance on online platforms means significantly higher projected growth- that is 30% year-on-year growth is expected in online food deliveries and quick commerce segments in next five years. This whitepaper titled 'Electrifying Progress – Scaling Zero-Emission Deliveries in India' highlights the immense opportunity that urban last mile vehicular fleets present for zero emission deliveries, particularly in the 131 cities in India which do not meet the national standard for outdoor air quality. The environmental gains of such a shift are significant due to high daily mileage associated with these fleets and a full-scale transition to ZEVs in urban last-mile (ULM) logistics could prevent 8 thousand tonnes fine particulate matter (PM2.5) emissions and 176 thousand tonnes of Oxides of Nitrogen (NOx) emissions each year in the country. This mitigation potential is comparable to nearly a quarter of Delhi's total annual air pollution burden and expected to grow 3-4 times by 2030. The last-mile deliveries are responsible for nearly half of all delivery-related emissions and are therefore vital for reducing overall environment footprint of deliveries.

The analysis presented in this whitepaper estimates that EV adoption also leads to significant income enhancement benefits to gig workers- estimated to be 18% increase in their yearly income. Key reason or this is lower total cost of ownership associated with high speed EVs- roughly half of their fossil fuel counterparts. Switching from fossil fuel-based vehicle to EV translates to 70-80% fuel cost savings for fleet operators, which is already driving adoption across platform and aggregators. Sizeable number of gig workers are adopting zero emission vehicles including registered electric vehicles (EVs), low-speed EVs and bicycles, but immediate affordability of EVs, gaps in common infrastructure in cities, uncertainty regarding EV's end-of-life or resale value, EV range anxiety are key barriers for scaling their adoption.

The whitepaper emphasizes the need for fit-for-purpose solutions that align with the operational demands of ULM deliveries and measures to de-risk future investments in zero emission vehicular fleets (See Figure SDM.1) . The emerging battery technologies like aluminium-air and solid-state batteries hold the potential for longer range and faster refuelling as required in applications, while predictive maintenance and real-time analytics with Integration of IoT, telematics and BMS-based monitoring present significant opportunity to increase operational efficiencies as required for round the clock and time bound deliveries.

The whitepaper showcases ongoing innovation by the private sector in the country. Innovative solutions such as co-financing arrangements, lease-to-own programmes, flexible rental or subscription-based models, asset management solutions and pay-as-you-earn (PAYE) models improve gig workers' access to EVs and at the same time they are reduce risk for lenders. Digital credit tools, alternative scoring methods, P2P lending, and blockchain-based processing can further simplify financing for gig workers. To overcome challenges related to higher upfront cost of EVs (1.5-2 times higher than fossil fuel counterparts), supply-side measures such as low interest ZEV loans to gig workers, coverage of urban last mile logistics under priority sector lending and Government-backed Credit Guarantees are suggested as summarised in the Table SDM1[1] .

De-risk investments in zero emission fleets would require more action from manufacturers or OEMs in near future to come up with structured buybacks (buyback using predetermined method) on all EV models, while Government may consider this as a necessary requirement for EV models to be eligible for any demand or supply side incentives akin to the requirement related to minimum service warranty under the latest PM E-Drive Scheme. De-coupling ownership of battery from vehicle is another key measure to improve EV affordability or reduce risk related to EV adoption and therefore a corrective policy measures (See Table SDM.1) are suggested to create a level playing field for swappable EV technologies and Battery-as-a-service models to be able to attract significant capital investment.

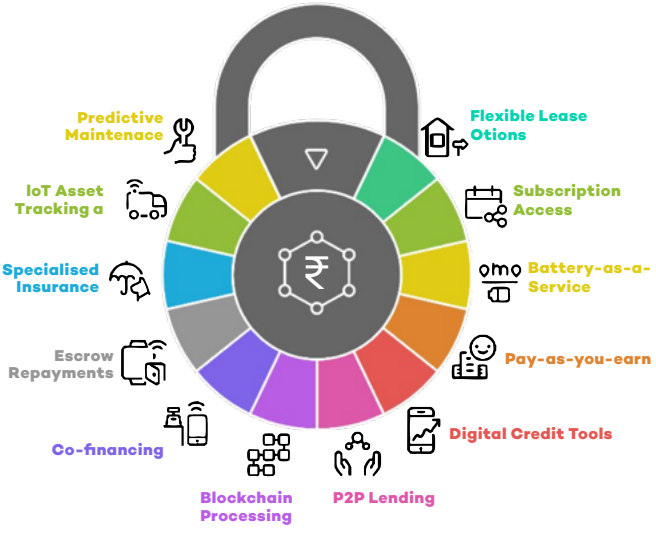


**Figure SDM1**
Key Emerging Solutions Highlighted in the Whitepaper

[1]More details of recommended measures including implementing agency can be found in Section 6 of the Whitepaper

The transition demands supporting infrastructure and ecosystem in the cities, especially in 131 National Cean Air Programme (NCAP) cities who would benefit the most from this transition. Significant challenge related to 90% charging infrastructure yet to be built in urban area can resolved by looking closely into challenges related to business viability for charging and swapping stations operators. Few immediate steps for this include- fixed demand charges waiver for LT connection (until a single digit 'charger-to-EV' ratio is reached in particular city) and rationalisation of GST for standalone ACC batteries (for use in swappable EVs) as well as charging/swapping services. The whitepaper recommends leveraging blended financing to quickly expand EV/battery charging networks in urban areas, while prioritising investments based on hosting capacity maps in 131 NCAP cities. City governments and gig economy sector companies can join hands to secure dedicated parking bays for gig workers, implementing dedicated Non-Motorised Transport (NMT) lanes which can also accommodate low-speed EV lanes, and developing social infrastructure for drivers e.g. proper resting areas. Digitally connected & managed charging/battery swapping stations, once prioritised in 131 NCAP cities with National as well as State level digital aggregation platforms and specialised mobile apps, can go a long way in reducing range anxiety and further supporting RE integration.

Finally, the whitepaper highlights the crucial need for a common framework to report & track on 'Zero Emission Vehicles (ZEVs)' adoption in 131 NCAP cities in urban last mile deliveries. Any such framework in the future shall account for all ZEVs, not just registered EVs, while prioritising impacts of ZEV adoption in cities- saved air pollution & public health costs, resilience building and social/economic impacts on gig workers including income enhancement. Low speed EVs, e-cycles, bi-cycles etc. remain relevant as low-cost ZEV options, especially in dense urban areas where they are feasible. These options are important from an inclusivity standpoint, as women, persons with disabilities, the elderly, low-income individuals, and other vulnerable sections of gig workers may find high-speed vehicles either uncomfortable or unaffordable.

**In conclusion, electrifying India's urban last-mile deliveries is necessary and achievable goal. It supports public health, environmental sustainability, and economic inclusion. This whitepaper provides a clear roadmap for coordinated action, calling on cities, private enterprises, financial institutions, and technology providers to work together and build a robust ecosystem that makes zero-emission deliveries the new standard.**

## Table SMD1

# Summary of Recommended Measures to Scale Zero Emission Urban Last Mile Deliveries

| | Recommended Measure |
|---|---|
| | **SUPPLY-SIDE MEASURES TO IMPROVE ZEV AFFORDABILITY** |
| 1 | Government-backed low Interest (4%) ZEV loans to gig workers |
| 2 | Inclusion of ZEV loans for the urban last-mile applications under the Priority Sector Lending (PSL) |
| 3 | Dedicated Credit Guarantee Scheme (CGS) or Window for ZEV adoption in urban last mile deliveries under the Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) |
| | **DE-RISK INVESTMENTS IN ZERO EMISSION FLEETS** |
| 4 | Minimum performance warranties and structured buybacks (using predetermined method) on EV models from OEMs/manufacturers as necessary conditions for availing demand incentives and financing under the PSL or CGS in the future |
| 5 | 'Type approval certification procedure' for homologation of swappable EVs 'without batteries' for enabling their registration at local RTO. Subsequently, the 'Swappable-battery' EVs can be defined and tracked separately under the PM E-Drive Scheme and Vahan dashboard. |
| 6 | Voluntary industry standard for battery swapping with (a) minimum quality standards, (b) framework for interoperability & (c) clear responsibility matrix in event of any potential fault. |
| | **IMPROVE BUSINESS VIABILITY OF BATTERY-AS-A-SERVICE & CHARGING SERVICES** |
| 7 | Rationalisation of GST on (a) standalone ACC batteries for swappable EVs & (b) charging/swapping services to 5% GST aligned with concessional GST rate applicable to EVs |
| 8 | Fixed demand charges waiver for LT connection, in 131 NCAP cities, until a single digit charger to EV ratio is reached pan city. |
| | **SECONDARY MARKET DEVELOPMENT** |
| 9 | Design and issue following guidelines on priority for- (1) ACC battery Design for Environment (DfE) and (2) environmentally-sound end-of-life battery management |
| 10 | Standard for interoperable BMS-based common communication protocol & digital EV battery passport with a dedicated EV/ACC battery EPR portal and dashboard |
| | **ECOSYSTEM DEVELOPMENT IN 131 NCAP CITIES** |
| 11 | Create hosting capacity maps (HCMs) & explore blended financing to scale public charging infrastructure in 131 NCAP cities |
| 12 | Common framework to report & track on 'Zero Emission Vehicles (ZEVs)' adoption in 131 NCAP cities accounting for all ZEVs in urban last mile deliveries. Additionally, impacts of ZEV adoption in cities to prioritise- saved air pollution & public health costs, resilience building & social impacts on gig workers including income enhancement. |
| 13 | Enforcement for equitable street design in cities with dedicated NMT-s-LSEV lanes and dedicated social infrastructure for gig workers in dense urban areas |
| 14 | Digitally connected & managed charging stations (using OCPI, OCCP & open-ADR) with National as well as State level digital aggregation platforms and specialised mobile apps in 131 NCAP cities to reduce anxiety and support RE integration |
| 15 | a. EV Mechanic Skilling & Reskilling Initiatives<br>b. Dedicated ZEV training & IEC campaigns for gig workers |

# 1

## INTRODUCTION

# Scaling Zero Emission Deliveries

**This whitepaper focusses on development of multistake-holder-led ecosystem for last mile deliveries in metropolitan India while emphasising on adoption of electric vehicles as a proven clean fuel technology for their wide scale adoption to achieve zero emission deliveries. Within the vast space of urban last-mile (ULM) deliveries, we focus on two market segments- quick commerce and online food delivery platforms which are predominantly active across urban India and ubiquitous in all metro cities. These online marketplaces or platforms typically operate via a network of dark stores and delivery partners or so-called gig workers. Their fleets accordingly include a mix of delivery partner-owned and leased or rented vehicles. Role of gig workers and relevant stakeholders in the ecosystem, as mapped in Figure 1, therefore remains pivotal as the key stakeholder group for accelerating adoption of zero emission or sustainable transportation. Platform-based gig workers are estimated to be 14.7 million in India in the year 2024 and this figure is expected to increase by 60% to 23.5 million in FY 2029-30** (NITI Aayog, 2022a).

Our study captures the ongoing efforts by the private sector to design solutions for zero emission deliveries (ZEDs) in the urban last mile (ULM) segments. Section 2 of this report captures key macro-economic trends and why this sector is crucial for cleaner air in cities and a cooler planet beyond job creation and livelihoods. Fit-for-purpose ZED solutions are discussed in section 3 and it also captures the learnings, successes and challenges from various ZED initiatives by prominent platforms or delivery aggregators in the country. Financial solutions remain a critical lever to scale positive change underway in ULM logistics and Section 4 is focussed on associated issues of affordability, access to capital and financing risks specific to zero emission vehicles (ZEVs) and how new age innovative solutions are paving a way for wide-scale adoption and derisking investment. Multi-collaborative initiatives are going to be crucial for ZEDs from the perspectives of both fit-for-purpose solutions and de-risking investments into ZEVs. Section 5 presents our analysis from deep dive into efforts that are underway and those needed in the near future to develop a conducive ecosystem for Zero emission deliveries. Finally, all recommended measures and policy suggestions are further mapped and summarised in Section 6 for quick reference of decision makers in Government and corporates in concerned subsectors.

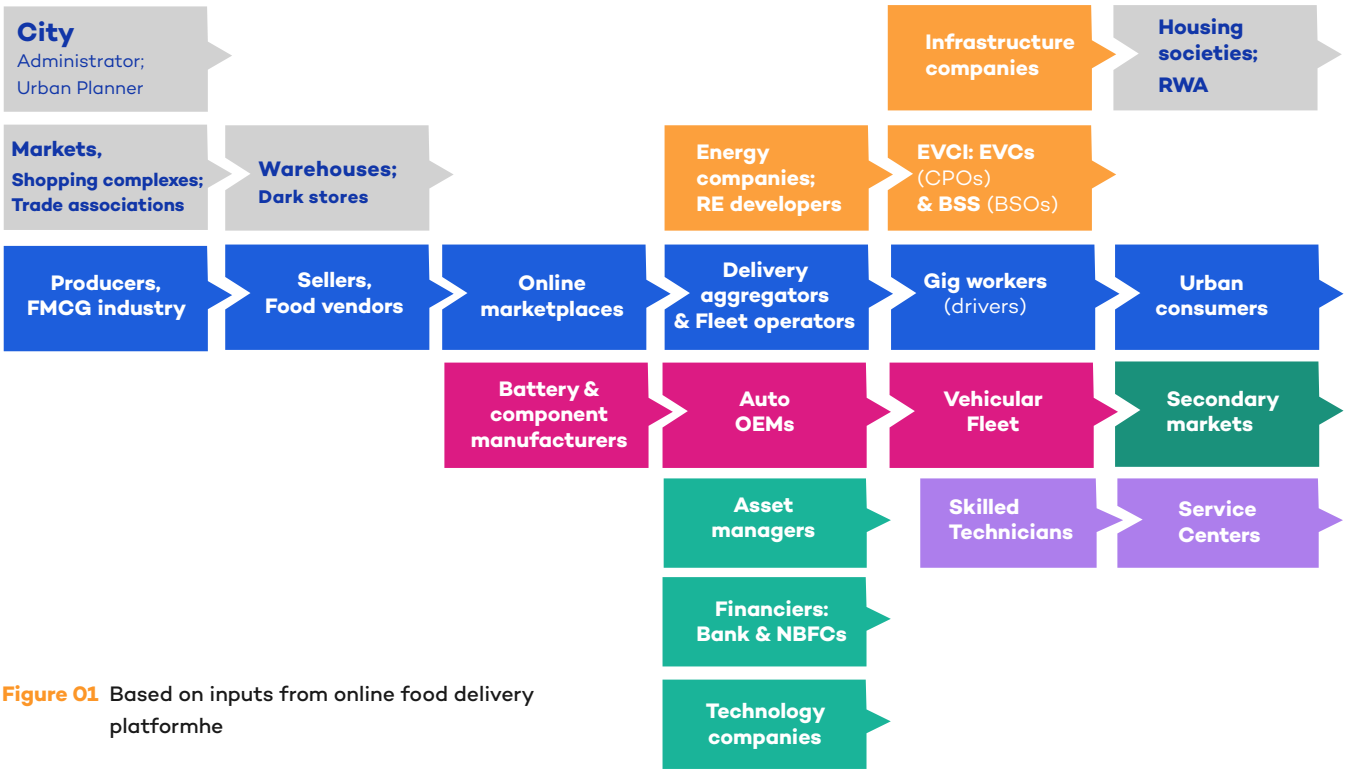


**Figure 01** Based on inputs from online food delivery platformhe

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# Growth Scenario & Pathways to Zero Emission Deliveries

Emergence of hyperlocal delivery models in the last decade is a result of market disruption which heavily relies on use of e-commerce, information and digital technology. Online platforms have added to the convenience of the modern day urban consumers, as they are less likely to go outside for shopping groceries and food motivated by varied factors including- convenience, productivity, value of personal time, traffic congestion, outdoor air pollution and noise pollution. In fact, the growth in urban last-mile B2C deliveries in metropolitans is now majorly driven by proliferation of online delivery services. As per the credible market insights available in public domain, online food deliveries have grown significantly in India in recent years at 2.8 times from 2019 to 2023 and is further expected to grow[2] at 18% CAGR in the upcoming year from 2025 to 2030 *(Swiggy-Bains 2024)*. Similarly, quick commerce or instant online grocery deliveries witnessed unprecedented growth in the post-COVID years, and it is already a major constituent of all e-commerce sales in India at nearly two-third in 2024 *(Flipkart-Bains 2025)*. Although, this market segment started with grocery deliveries, it has quickly consolidated home appliances and consumer electronics as well. As a reason, the quick commerce is projected to grow even faster than the online food deliveries at a CAGR of approximately 40% by 2030 *(Flipkart-Bains 2025)*.

**Hyperlocal marketplaces** have also created new job opportunities in the form of delivery partners or so-called gig economy workers. As per our analysis, gig workers owned vehicles represent approximately 5-7 % of the total vehicles on road (MoRTH 2024, NITI Aayog 2022a). A major chunk of this is 2 wheelers (that is bikes, scooters, low-speed EVs) and a sizeable chunk of cycles specially in the dense urban demand centres in metropolitans. The ULM logistics in India primarily deploy 2– & 3- wheel vehicles where proven solutions already exist for service and delivery aggregators to be able to entirely switch to zero emission deliveries, predominantly the electric vehicles (EVs) including low-speed EVs and to an extent to the non-motorised transport (NMT) modes such as bicycles. As explained in more detail under section 4 and in case studies *(1 and 2)* from delivery aggregators, EV models currently in market are not fully customised to the needs of specific end-use applications in urban last mile deliveries of food and groceries, but unique characteristics of this segment present significant opportunity to achieve zero emission deliveries.

Overall EV sales penetration rate in India stands at 2% currently *(Vahan Dashboard 2024)* and this amounts to a total of 8% of all vehicles on road in 2024 *(own analysis[6])*. Within the concerned vehicle categories for urban last mile deliveries, that is 2 wheelers (2W) and 3 wheelers (3W)-cargo, the sales penetration now stands at 5% and 53% respectively[7] *(Vahan Dashboard, 2024)*, while vehicular penetration on road as part of the overall stock of these segments are estimated to be 1% and 22% of all 2Ws and 3Ws on the road respectively.

[2] Cf. 1.5 times the growth rate in Indian food services industry, estimated at 10-12% CAGR

[3] CAGR stands for Compound Annual Growth Rate

[6] based on historic vehicle registration data and assuming 15 years as usable life of all vehicles on average

[7] Sales penetration at 0.4%, 11%, 0.1% and 2% for light-medium cargo, buses, trucks and passenger cars respectively in the year 2023.

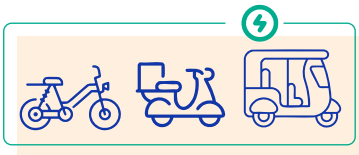
## The total cost of ownership (TCO)

for ULM vehicle segments is analysed as part of this study to understand cost dynamics for these specific applications and results are plotted in figure 2. TCO is an important tool for understanding overall affordability from vehicle life cycle covering all cost components e.g. upfront cost, battery replacement cost, service and maintenance, fuel consumption assessed over 10 years for all vehicle options here. The resulting '10-years TCO' is analysed for 2W and 3W options for both Electric Vehicle (EV) and Internal Combustion Engine Vehicle (ICEV) technologies as shown in the Figure 02. Despite significant battery replacement costs[8], the E2W and E3W cargo have the lowest TCO (INR 10.4 La and 4.8 La respectively) of all analysed options and as clear from the figure, it is found to be 57.5% and 42% lower compared to their ICE counterparts. This is owning to significantly lower fuel cost associated with EVs- 81% and 70% lower for E2W and E3W compared to their EV counterparts as calculated over 10 years usage using current fuel/electricity tariffs for commercial applications. With 2Ws as prominent vehicular category utilised in ULM deliveries, the estimated TCO difference between EV and ICE translates into saving worth 18% of a delivery income[9].

While TCO is important overall economic perspective, upfront cost remains a crucial factor from delivery partner or gig worker's affordability perspective. Despite favourable TCOs, upfront cost for E2W and E3W still remains high- 1.5-times and 1.9-times compared to their ICE counterparts and is perceived as a major challenge for adoption among gig workers or delivery partners. The role of low-cost financing is therefore pivotal for increasing adoption of EVs in ULM delivery applications specially as roughly 50% of the 2Ws are financed, compared to 80-90% four wheelers (4Ws) in India (NITI Aayog 2022b). Gig workers' aspiration for ICEVs especially ICE motorcycle and availability of even more affordable second-hand motorcycle is therefore seen as an added challenge for adoption of EVs in ULM deliveries. To emphasise this, we additionally calculated and plotted the TCO for second-hand motorcycle (Refer to ICEV_2W_SL in Figure 02) as well and it is found to have the highest TCO among the 2W ULM segment at INR 13.8 la, while vehicle acquisition cost remains very low- 3% of the total TCO. The acquisition cost is found to be 8% and 35% of the TCO for new ICEV 2Ws and new E2Ws respectively.

## Tailpipe emissions

of particulate matter and Oxides of Nitrogen (NOx) are major concern for human health and commercial vehicles delivering higher mileages (as compared to private vehicle) are the biggest contributor to these transportation related air emissions. It is estimated if all platform-based gig workers in India transitioned to zero emission vehicles (that is- a mix of EV and NMT options), it will save the country 8 thousand tonne of fine particulate matter (PM2.5 ) emissions and 176 thousand tonne of Oxides of Nitrogen (NOx gas) emissions in air pollution (own analysis based on MoRTH 2024, ICCT-DieselNet 2024, NITI Aayog 2022a & ARAI 2021) across urban India which is significant amount of air pollution savings[10]. To put this in context- air pollution from urban last mile logistics in India currently amounts to 20-25%[11] of all air pollution generated in National Capital Territory of Delhi (NCTD) from all varied sources and sectors (own analysis based on MoRTH 2024, NITI Aayog 2022a & TERI-ARAI 2018). From the global climate perspective, up to 50% of the entire carbon emissions associated with delivery can be traced back to the last-mile phase and with no intervention, we can expect worldwide last-mile delivery increase emissions by 32% (CMC-SE 2022; WEF 2020). Finally, based on market growth projection noted for the online food deliveries and quick commerce earlier in this section, it is estimated that above mentioned emission mitigation potential of ULM deliveries in gig economy sector is going to be at least 3.7 times by the year 2030.



**Total cost of ownership** (TCO) of electric vehicles (EVS) is roughly half **(42-58% lower)** compared to the internal combustion engine vehicles (ICEVS) currently in the market- specifically for E2W & E3W-cargo vehicles dominant in urban last-mile delivery applications.

**Other key findings of CII CABL cost analysis**

- EVS have 70-81% lower fuel cost compared to ICEVS
- EV adoption can lead to savings worth 18% of delivery partner or gig worker' total income
- EVS upfront cost is still 1.5-2 Times icevs
- Despite the lowest acquisition cost, the second-hand ICE motorcycles has the highest TCO of all 2W options

## Air pollution reduction

potential of gig economy sector in india

- **8 thousand tonne**- fine particulate matter/ PM2.5 emissions
- **176 thousand tonne**- Oxides of Nitrogen/ NOx emissions
- Projected to be **3.7 times** in next 5 years by 2030

[8] 11 & 14% for E2W and E3W respectively

[9] assuming nominal income of delivery partner at INR 30 thousand per month

[10] Assuming an average travelling distance of 125 km per day for a delivery partner & 280 operating days in a year

[11] 25% of all particulate matter emissions and 20% of all NOx emissions

# Total cost of ownership/TCO (10-years) for urban last mile logistics

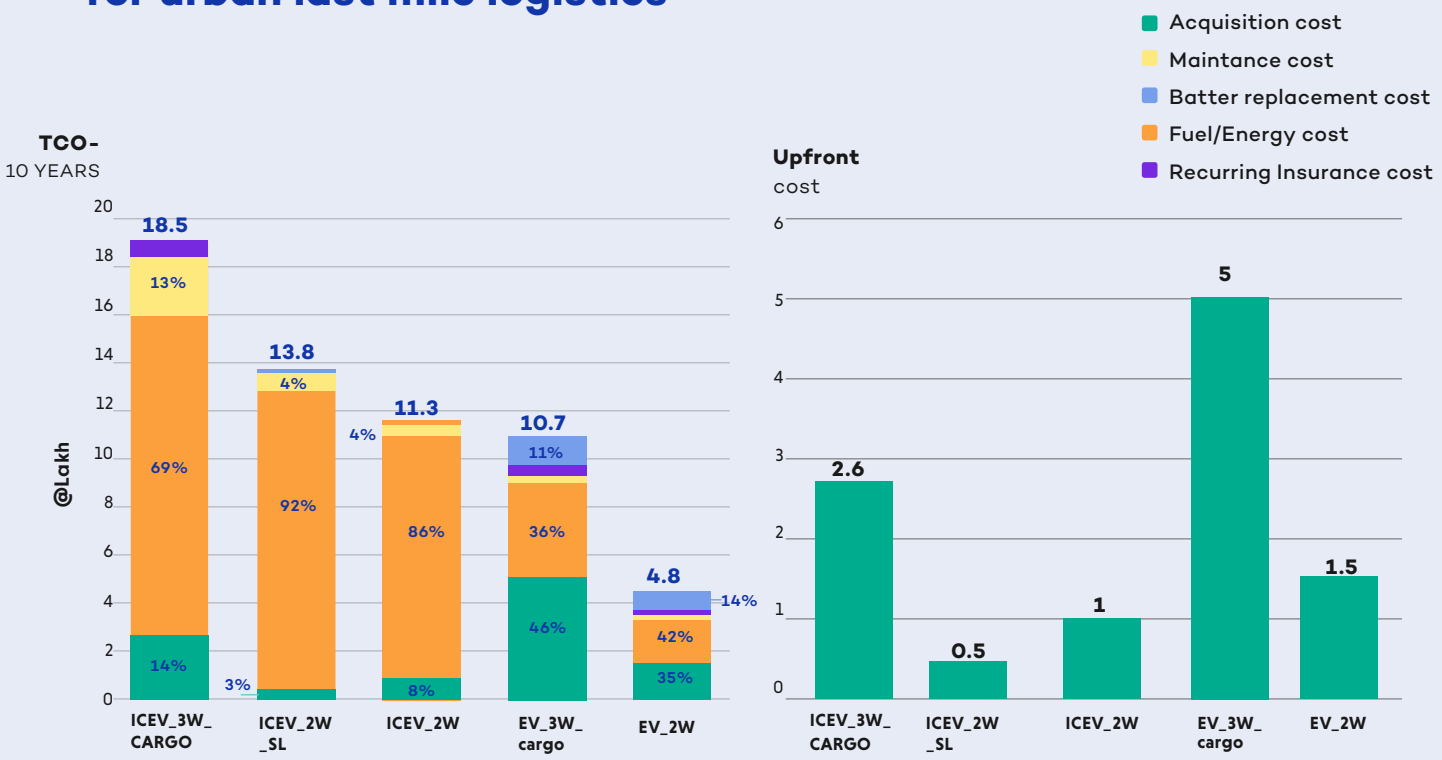



**Figure 02** Total cost of ownership/TCO (10-years) for urban last mile logistics

*Source: CII CABL (2024) analysis*

## Note

1. ICEV and EV refer to traditional 'internal combustion engine' and 'electric vehicles' respectively
2. SL refers to second life of the vehicle or a second-hand vehicle, primarily used in the context of gig worker owning or operating it.
3. The Total Cost of Ownership (TCO) is calculated over 10 years' time horizon, as named 'TCO- 10 years' here. Key assumption for this calculation is the average daily distance travelled in urban last mile (ULM) delivery applications at 80 kilometres and 125 kilometres.
4. Acquisition cost is the landed cost of vehicle. This includes ex-showroom vehicle price, road tax, insurance cost,registration fee etc. As the latter costs vary across states, Delhi rates across vehicle models were used for undertaking the above analysis.

## CASE STUDY 1

# Electrifying Food Deliveries with Targeted 100% Zero Emission Deliveries in 2030

Zomato, one of India's largest online food delivery platforms, with roughly 21 million monthly active customers, 4,40,000 independent delivery partners (DPs), and operations spanning 800+ cities. Recognizing that the largest share of its Scope -3 emissions comes from last-mile deliveries undertaken by independent delivery partners using petrol-based two-wheelers, Zomato has set an ambitious goal of facilitating 100% electric vehicle (EV)-based food deliveries by 2030, with the broader aim of achieving Net Zero emissions across its food ordering and delivery value chain by 2033. The company is actively working to enable the transition of the delivery fleet to electric two-wheelers through three prolonged approaches including educating delivery partners about EV benefits, building partnerships to improve access to EV rentals and creating financing pathways for EV ownership.

**EV Awareness:** Zomato raises awareness via its "Delivery Partners" YouTube channel in six regional languages and through timely app updates. These updates not only promote EV-related information but also share details on exclusive offers, new partnerships and access to an EV helpline.

**EV Accessibility:** Access to EVs has been further simplified through partnerships with over 40 EV rental agencies, battery swapping companies and logistics service providers. These integrations allow delivery partners to rent EVs and locate nearby charging or swapping stations directly through the app.

**EV Bike Ownership:** For those interested in owning an EV, Zomato has facilitated financing partnerships with Non-Banking Financial Companies that offer loans without requiring collateral or credit scores, significantly lowering the barrier to entry.

In 2025 alone, these efforts have resulted in completing over 87 million EV-based food deliveries - a 40% increase from the 2024. Zomato grew its EV-based delivery partners count to nearly 37,000 across 425+ cities. These efforts not only reduce emissions by 10.53% per kilometre since 2022 but also help build the broader EV ecosystem by improving access, awareness and affordability for thousands of delivery partners.

*(Source: based on inputs from Zomato in 2025)*

## CASE STUDY 2

# EV Shift – Building a Greener, Smarter Delivery Network

Swiggy

As India's leading on-demand convenience platform, Swiggy has set an ambitious goal: to transition to a 100% electric delivery fleet by 2030. With a network of over 4.5 lakh delivery partners across food and quick commerce, the company is not only addressing its climate impact—but actively shaping the contours of sustainable urban logistics in India.

Swiggy's electrification strategy is rooted in ecosystem orchestration at scale. In just one year, the company expanded its partner network 2-3x, onboarding 50+ collaborators across OEMs, fleet operators, charging infra players, driver + vehicle providers, and financiers. What began in a few metros is now a nationwide effort—with EVs now offered across all Tier-1 and most Tier-2 cities

Swiggy's electrification strategy is built around access, affordability, and adoption. Delivery partners today can choose from 70+ EV models—ranging from low-speed vehicles (ideal for partners without driving licenses) to high-performance, 100+ km range bikes.

The company works with Yulu, Zypp, Baaz, Bike Bazaar, Hero, TVS, Kinetic, RidEV, and others to offer flexible rental plans and 3PL options, addressing multiple affordability and asset ownership barriers.

Swiggy is also investing in the digital infrastructure needed to make EVs viable at scale—integrating real-time battery swap station locators, rental booking APIs, and DE-focused EV education directly within the app. Acknowledging the role of social norms and individual behaviour change in accelerating EV adoption, Swiggy is actively investing in app-led campaigns, on-ground activations, and vendor incentives to drive awareness and adoption.


**The results are tangible:**

- -EV delivery partner count has grown 7x in the last year.
- -We are piloting a model wherein all bulk (XL) orders can be fulfilled via 100% electric fleets.
- -Over 4,500 tonnes of $CO_2$ emissions have been avoided to date because of EV deliveries.
- -More than 465 tonnes of $CO_2$ were saved through Swiggy's Eco Saver delivery option which offers users the opportunity to minimise last mile emissions, at no added cost, in exchange for slightly longer delivery time -- enabling smarter order batching and lower fuel consumption.

Yet challenges remain. The absence of a second-hand EV market, lack of gig-focused EV models, and sparse infrastructure beyond major cities continue to hold back wider adoption. Swiggy is tackling these through pilots in battery swapping, app-led automation for discovery and financing, and an aggressive push to scale its vendor network to additional 30–35 partners in the next 12 months.

What sets Swiggy apart is its systems-level approach—treating EV adoption not as a pilot, but as core infrastructure for the future of delivery. By aligning platform design, partner incentives, and climate goals, Swiggy is helping make zero-emission delivery the default—at scale, and on schedule.

(Source: based on inputs from Swiggy in 2025)

# Issues for Scaling Zero Emission Deliveries in Urban Last-Mile

## SUPPLY SIDE

### 4. Vehicles OEMs
Vehicle reliability & durability concerns

Lack of customised OEM models

Trade-off between cost & reliability of vehicles

Faster degradation under frequent charging cycles

Battery lifespan & performance as a key uncertainities

### 5. Services
Lack of efficient and prompt servicing

Frequent maintenances & breakdowns

Lack of skilled manpower for quick troubleshooting

Fragmented services ecosystem

Uncertainity in maintenance costs

### 6. Secondary markets
Uncertain EV residual value

Higher depriciation rate (Cf. ICE)

Lack of established secondary markets

Absence of structured buyback programmes

from OEMs or 3rd parties

### 7. Policy support
Evolving policy landscape & inconsistant subsidy support

Absence of government-backed guaranties

Lack of priority sector lending limiting access to low-cost-capital


### 8. Financing
Unavailability of customised financing for the gig economy segments

High interest, lower LTV ratios & short tenures (Cf. ICE)

Credit worthiness of gig workers with formal credit history and proper documentation to avail financing

## DEMAND SIDE

### 1. Gig workers
Vehicle preferences based on socioeconomic: low speed EV, NMT

Awareness and aspiration: EV vis-a-vis ICE

High upfront EV cost & tariffs at charging stations

High upfront EV cost & tariffs at charging stations

### 2. Energy Infrastructure
Charging stations' accessibility & distribution

Access to home chargers for gig workers

Infrastructure availability for battery swapping stations

Technology standardization for battery swapping

### 3. Technology and markets
Lack of robust tracking & management systems to seamlessly reposses / redeploy EV assets

Market volatlity due to rapid changes in technology and market prefernces

Technological limitations for higher range & faster charging in these specific capacity segments of EVs

**Figure 03** Key Issues for Scaling Zero Emission Deliveries in Urban Last-Mile

*Source: CII CABL (2024) Analysis based on primary inputs from stakeholders*

3

# Fit-for-Purpose Solutions for Zero Emission Deliveries

**The successful integration of electric vehicles into last-mile delivery hinges on availability of technology solutions tailored to the specific operational demands of the sector. Addressing technological challenges is crucial to ensure that EVs not only match but surpass the performance and reliability of traditional internal combustion engine (ICE) vehicles in the context of delivery services. Unique Characteristics of ULM deliveries that need attention of Original Equipment Manufacturers (OEMs) for launching customised models include-**

1. **Time sensitive or round-the-clock deliveries needing robust and durable vehicle designs**
2. **High-mileage operations with diverse environ mental conditions and terrains means that vehicles must be highly adaptable with least impact on performance and battery efficiency.**
3. **High-volume orders with different delivery types e.g. food, groceries, large parcels etc. require varying loads capacities, storage capabilities and performance attributes resulting in customized solutions.**

## 3.1
# Fit-for-Purpose Vehicles

EVs, especially in the two-wheeler segment, often struggle to meet the rigorous demands of last-mile deliveries, which require high mileage and consistent performance under varying environment conditions. The longevity and efficiency of batteries are key concerns of fleet operators. Frequent charging cycles and extensive usage lead to accelerated battery degradation, impact vehicle performance and increase operational costs.

A clear gap in customised OEM models for urban last-mile (ULM) deliveries is gradually being addressed by select manufacturers through targeted innovations. Yulu, for instance, has designed purpose-built low-speed EVs like the Miracle and DeX tailored for hyperlocal deliveries, supported by battery-swapping and AI-based fleet optimisation (see case study 03). Zen Mobility is catering to large and bulk-order segments with modular, cargo-optimised EV 3Ws and high-uptime operations through Zenflo (see case study 05). Omega Seiki Mobility is leading in tech innovation, integrating CVT and IPC technologies, while also pioneering factory-fitted AC and autonomous EVs for enhanced comfort and efficiency (see case study 06).

Also, the current battery technologies may not provide the required range and quick charging capabilities essential for high-volume, time-sensitive delivery operations. When the leading delivery platform Swiggy embarked on its fleet electrification pilot in 2022 (See case study 02) about 75 electric 2-wheeler (E2W) models were being sold in Indian market with details as below in Table 01. Swiggy could target 10 of these E2W models suitable for its fleet electrification pilot, while the desirable EV specs for Swiggy delivery partners include EV speed greater than 40 kph and range beyond 90 km at a price less than INR 100 thousand (Swiggy 2022).

**Table 01** Desirable ULM characteristics for different E2W Category based on speed

| | E2W Category | Speed (km/hr) | Battery range (km) | Models in market (number) | Price (thousand INR) |
|---|---|---|---|---|---|
| 1 | **Low speed** | **≤ 25** | **45-90** | **40** | **40-90** |
| 2 | **Medium speed** | **≤ 55** | **50-120** | **21** | **60-100** |
| 3 | **High speed** | **>80** | **70-180** | **14** | **75-200** |

*Source: Swiggy (2022)*

Also, there is a wide quality spectrum between low-cost assembled EVs and high-end models. As a result, the low-end EVs often suffer from reliability issues, leading to increased vehicle downtime and maintenance costs. Creating EVs specifically designed for last-mile delivery or tailored designs can address unique operational requirements such as payload capacity, range, manoeuvrability and durability. As per our discussion with stakeholders, ideal specs for UM segments are mentioned in Table 02. There are very few models who meet these specs and are also affordable to the delivery partners. Additionally, modular configurations of these EVs are required for ULM deliveries to allow for easy customisation and scalability, catering to various delivery scenarios and facilitating easier maintenance. Investing in R&D to improve battery life, vehicle range, and energy efficiency enhances the viability of EVs in intensive delivery operations. Developing an intuitive (software) platform/interface as well as use of IoT and telematics enhanced health and performance metrics enhances user experience for delivery partners or gig workers. It also facilitates easy access to essential services and supports training and aftersales support initiatives.

| | Fit-for-purpose vehicle specs for ULM deliveries | | Unit | Food deliveries | Quick commerce | |
|---|---|---|---|---|---|---|
| | | | | E2W | E3W | E2W |
| 1 | **Payload capacity** (kg) | | Kilogramme | 50-100 | 300-500 | 80-110 |
| 2 | **Speed** (kph) | | Kph | 60-80 | 40-80 | 40-80 |
| 3 | **Refuelling time** | Fast charging or battery swapping | Minutes | 5 | 30 | 30-40 |
| | | Standard charging | hours | 3-4 | 5-6 | 4-5 |
| 4 | **EV Range** | | Km/charge | 70-100 | 80-120 | 80-100 |

*Source: CII CABL (2024) Analysis based on Stakeholders' inputs*

## 3.2
# Advanced Battery Storage Solutions

**As per our consultations with all stakeholders, fit-for-purpose EVs for the ULM need to consider specialized vehicle models and advanced energy (storage & charging) solutions as summarised in the figure 4. Innovative battery solutions for developing high-capacity, fast-charging, and longer-lasting batteries are needed for ULM delivery operations to reduce range anxiety and improve operational efficiency.**

The Indian electric two-wheeler and three-wheeler market is evolving rapidly to cater to the operational needs of last-mile deliveries. Lithium-ion battery chemistries are a preferred choice due to higher energy density, longer cycle life, and improved efficiency and these are summarised in the Tabel 3 along with few other emerging alternatives such as metal-air. Lithium Iron Phosphate (LFP) and Nickel Manganese Cobalt (NMC) are the two most widely used lithium-ion chemistries in the ULM deliveries segment. Each is suited to specific vehicle categories based on performance and cost. Low-speed electric two-wheelers with speeds of up to 25 kmph, ranges of 45 to 90 km, and prices between INR 40,000 to 90,000 primarily rely on LFP batteries. These batteries are economically viable for low-speed vehicles due to their lower cost and moderate energy density of 90-160 Wh per kg, which aligns with the operational requirements of this category. Medium-speed electric two-wheelers, which operate at speeds of up to 55 km/hr and offer ranges between 50-120 km, rely on NMC batteries due to their higher energy density of 200-250 Wh per kg. This category priced between INR 60,000 – 1,00,000 is well-suited for urban deliveries requiring moderate speeds and extended ranges. High-speed electric two-wheelers exceeding speeds of 80 km/hr with ranges between 70 to 180 km and prices between INR 75,000 to 2,00,000 demand superior performance. NMC batteries are the preferred option for these vehicles, offering the required energy density and range. However, safety concerns associated with NMC batteries necessitate advanced battery management systems to ensure thermal stability. Electric (cargo) three-wheelers, designed for payloads of 300 -500 kg and ranges of 80 to 120 km per charge, predominantly use LFP batteries. The thermal stability and cost-effectiveness of LFP batteries make them ideal for heavy-load operations in food delivery and quick commerce.


**Emerging battery** chemistries have the potential to significantly enhance the range an economic viability of electric vehicles in the last-mile delivery segment. Aluminium-air (Al-air) batteries, with significant higher energy density at 1,300 Wh per kg, is under-development in the country and can offer substantial range improvements. While these batteries are not rechargeable in a conventional sense (See case study 04 for more details of the Al-air battery under development in India for last-mile logistics), their lightweight design and relatively lower cost make them suitable for high-range applications. Similarly, solid-state batteries provide energy densities of 300-500 Wh per kg and promise longer ranges, improved safety, and lower thermal risks. However, the high manufacturing costs of solid-state batteries currently limit their adoption. Lithium-sulphur batteries, offering energy densities of 400 to 600 Wh per kg, present another promising alternative. In future, these advanced cell battery chemistries could deliver extended ranges at comparable cost but require further research to address stability and cycle life challenges and reduce cost.

Dominance of Lithium Iron Phosphate (LFP) and Nickel Manganese Cobalt (NMC) batteries in the Indian market is driven by their ability to balance cost, range, and performance. While LFP batteries offer affordability and reliability, NMC batteries provide higher energy density and extended range, making them suitable for various urban logistics applications. Looking ahead, advancements in battery chemistries such as aluminium-air, solid-state and lithium-sulphur hold significant potential to transform the last-mile delivery sector. These emerging technologies promise enhanced efficiency, reduced costs, and improved energy storage solutions, playing a crucial role in scaling zero-emission vehicle (ZEV) adoption in India.

**Table 01** Desirable ULM characteristics for different E2W Category based on speed

| | ACC battery technology | Energy density (Wh/kg) | Cycle life (number of cycles) | Cost (INR/kWh) | Advantages | Limitations | Use case |
|---|---|---|---|---|---|---|---|
| 1 | **Lithium Iron Phosphate** (LFP) | 90-160 | 2,000-3,000 | 15,000-20,000 | Cost-effective, high thermal stability, safe | Lower energy density compared to NMC, limited range | Medium-speed E2W (≤ 55 km/hr), Heavy-duty E3W |
| 2 | **Nickel-Manganese Cobalt** (NMC) | 200-250 | 1,000-1,500 | 20,000-25,000 | High energy density, lightweight, efficient | Expensive, lower thermal stability, safety concerns | High-speed E2W (> 80 km/hr), Premium E2W & E3W |
| 3 | **Aluminium-Air** (Al-air) | 1,300 | N.A. (unlimited) | 10,000-15,000 | Extremely high energy density, lightweight, low cost | Needs replacement of aluminium plate as well as electrolyte solution for refuelling | Long-range, low-cost applications |
| 4 | **Solid-State** | 300-500 | 3,000-5,000 | 40,000-50,000 | Higher safety, longer life, higher energy density | High cost, complex manufacturing | High-end, long-range E2W & E3W |
| 5 | **Lithium-Sulphur** (Li-S) | 400-600 | 500-1,000 | 15,000-20,000 | High energy density, lightweight, lower cost | Short cycle life, stability concerns | Long-range a pplications, cost-effective E2W/E3W |

*Source: CII CABL Analysis 2024 adapted from NITI Aayog 2024, PSA 2024, DST 2020, Stakeholder Consultations 2024*

Note: - 1 & 2 are already existing for the application, while 3-5 are emerging or under-development.

## CASE STUDY 3

# Redefining Zero Emission Mobility for Urban Last Mile Deliveries

Established in 2017, Yulu is India's largest EBITDA-profitable shared electric vehicle (EV) company, focused on delivering sustainable urban mobility-as-a-service (MaaS). With a vertically integrated platform that includes IoT-enabled EVs, a proprietary technology stack, and an intelligent battery-swapping network, Yulu has carved out a unique niche in the country's mobility landscape. Yulu's low speed EVs, the Miracle and the DeX, are purpose-built for hyperlocal commuting, leisure travel and goods delivery, and have been developed in collaboration with Bajaj Auto Ltd.

Yulu has strategically aligned its offerings with the quick commerce sector, which accounts for the lion's share of its business. Its user-friendly rental plans enable delivery partners to access EVs without the burden of vehicle ownership. The service is supported by Yuma Energy – Yulu's associate and India's leading battery-as-a-service (BaaS) company – whose dense network of 300 battery swapping stations alleviates range anxiety and ensures uninterrupted operations. Yulu has also built strong partnerships with leading delivery platforms such as Zomato, Swiggy, Zepto, Flipkart, and BigBasket, reinforcing its position as a key enabler of hyperlocal logistics.

Technology is at the core of Yulu's operational and customer service processes. Yulu's AI-powered fleet management system anticipates demand and ensures optimal vehicle deployment in high-demand areas, while the Yulu app simplifies booking and battery reservations and offers a range of rental plan options to flexibly cater to different users' needs. Smart diagnostics built into the vehicles proactively flag maintenance needs, delivering a seamless and reliable experience for users.

Yulu has democratised access to affordable mobility for lakhs of gig workers, including women who appreciate its safety and ease of use. Being affordable, easy to learn and maintenance-free, Yulu enables delivery partners to earn 30-35% more than people using petrol-powered bikes. As of May 2025, Yulu has deployed over 45,000 shared EVs, empowered over 2,70,000 delivery partners and powered 1.3 billion kilometres of green journeys.

Yulu has established itself as a cornerstone of India's urban mobility landscape. Through its scalable and sustainable approach, Yulu not only supports the rapid growth of quick commerce but also champions the nationwide shift to zero-emission urban transport.

*(Source: based on inputs from YULU in 2025)*

## CASE STUDY 4

# Advancing Clean Mobility with Aluminium-Air Battery Technology

Chakr Innovation

Chakr has been pioneering aluminium-air battery technology as an alternative to conventional lithium-ion batteries. This innovation offers a promising solution for clean mobility by addressing critical challenges such as raw material dependence, cost efficiency, and environmental impact. Unlike lithium-ion batteries, which require rare earth metals and are heavily dependent on imports, aluminium-air batteries utilize abundant aluminium, making them a more sustainable and cost-effective option.

One of the key advantages of aluminium-air battery technology is its high energy density, allowing for extended driving ranges. Since this technology is highly energy dense, aluminium-air powered vehicles can achieve 3-5 times the range of current lithium-ion EVs and Chakr's Aluminium-air battery 'under-development' is certified to be 40% higher compared to conventional lithium-ion technology. Additionally, the design of Al air battery enables mechanical recharging within 3 to 5 minutes by replacing depleted aluminium plates, ensuring a refuelling experience similar to conventional fuel stations. This feature makes them particularly suitable for commercial fleets, last-mile delivery vehicles, and long-haul transportation, where faster refuelling time is crucial.

From an economic perspective, aluminium-air batteries present a compelling case for cost reduction in EV adoption. The capital cost associated with this technology is expected to be 10% lower than current lithium-ion powered EVs. Additionally, the operational cost is much lower than internal combustion engine (ICE) vehicles, making it a financially viable alternative.

Chakr's innovation is gaining attention within the electric mobility sector, with pilot projects demonstrating the feasibility of aluminium-air batteries in real-world applications. The shift toward aluminium-air batteries aligns with India's vision for self-reliance in the EV supply chain and supports the broader goal of achieving net-zero emissions in transportation. As Chakr continues to refine and scale its aluminium-air battery solutions, the potential to revolutionize the EV industry remains substantial. By providing a high-performance, cost-effective, and sustainable energy source, Chakr is contributing to a cleaner and more efficient mobility future.

*(Source: based on inputs from Chakr in 2025)*

## CASE STUDY 5

# Revolutionizing large order fleet with Zen Mobility

Zen Mobility, an EV manufacturer specialising in 3- and 4-wheeler electric vehicles, has redefined zero-emission last-mile delivery in India. Through its fleet management arm, Zenflo, the company caters to the unique needs of e-commerce, quick commerce, and grocery delivery with purpose-built vehicles and innovative solutions.

To address large-order and bulk delivery needs, Zen Mobility has developed the EV-3W, positioning itself as a key player in the larger-order delivery segment. Its modular cargo solutions, including temperature-controlled boxes for grocery and food deliveries, ensure tailored efficiency for various logistics requirements. These vehicles combine lightweight, durable designs with advanced lithium iron phosphate (LFP) batteries, offering a lifespan of over five years and rapid charging capabilities. IoT-enabled features such as real-time tracking and route optimization further enhance operational efficiency.

Zen Mobility has deployed over 1,500 EVs in 20+ Indian cities, including Delhi NCR, Mumbai, and Bengaluru. These operations are supported by partnerships with major e-commerce platforms and fleet operators, alongside attractive financing options and a robust service network that ensures 97% vehicle uptime. The fleet has travelled over 12 million kilometers, significantly reducing carbon emissions and supporting India's net-zero goals.

*(Source: based on inputs from Zen Mobility in 2025)*

## CASE STUDY 6

# Incorporation of cutting-edge technologies in last-mile deliveries

Omega Seiki Mobility (OSM), an Indian electric vehicle manufacturer, is driving innovation in the electric mobility ecosystem with a focus on sustainability, energy efficiency, and cost-effectiveness. OSM has revolutionized last-mile delivery through its cutting-edge electric three-wheelers, featuring industry-first Continuously Variable Transmission (CVT) technology for enhanced efficiency and performance.

A significant leap in OSM's technology roadmap has been its strategic partnerships, focusing on integrating advanced power electronics in its vehicles. Through this collaboration, OSM is deploying Integrated Power Converter (IPC) technology in its upcoming range of electric three-wheelers. This proprietary tech is set to enhance energy efficiency, reduce vehicle downtime, and improve overall performance.

Further strengthening its market position, Omega Seiki Mobility is preparing to launch India's first electric three-wheelers in both passenger and cargo segments with factory-fitted air conditioning, a move that sets a new benchmark in comfort and innovation in the L5 category. This initiative is a response to growing customer demand for more premium, climate-resilient solutions especially in urban and semi-urban areas where extreme temperatures can impact driver and rider well-being. The AC-equipped models aim to improve productivity, rider satisfaction, and adoption of EVs in the commercial space.

Taking its innovation journey further, Omega Seiki Mobility is now venturing into autonomous electric vehicles, starting with the development of self-driving electric three-wheelers. This bold step reflects the company's ambition to integrate artificial intelligence and smart navigation into last-mile transport. The autonomous platform under development will initially cater to controlled environments like industrial parks and gated logistics zones, with the long-term goal of making public road deployment a reality. This innovation could revolutionize urban mobility by reducing dependency on drivers, improving safety, and offering round-the-clock delivery capabilities.

*(Source: Adapted inputs from Omega Seiki Mobility in 2025)*

**Figure 04** Fit-for-Purpose Solutions for Zero Emission 'Urban Last Mile' Deliveries

| Vehicle | Battery Storage | Charging | Service & resale |
|---|---|---|---|
| **a.** Tailored design for payload capacity, speed, refueling time & range | **a.** Longer lasting batteries under high-mileage conditions | **a.** Expanded charging & swapping networks | **a.** Service & performance warranties |
| **b.** Durability, manoeuvrability & modular configuration | **b.** Faster charging for refueling capabilities | **b.** Faster, efficient & smart charging or swapping | **b.** Standardized resale benchmarks & structure buy-backs |
| **c.** IoT, telematics & BMS based monitoring solutions for enhanced health & performance | **c.** Standardized components: batteries & connectors | **c.** Interoperable & discoverable charging points or swapping stations | **c.** Cohesive support & maintenance networks |
| **d.** Software & Ai-based solution for seamless driving & alleviated range anxiety | | | **d.** Skilled technicians & periodic reskilling programmes |

*Source: CII CABL (2025) Analysis*

## 3.3

# Fit-for-Purpose and Smart Charging Infrastructure

Insufficient and unevenly distributed charging infrastructure leads to range anxiety among delivery partners, hindering efficient route planning and delivery fulfilment, a major factor for adoption of ICE vehicles. Existing charging stations suffer from low utilization due to limited EV penetration and preference for home charging, affecting the business viability of EV charging as a service. At the same time, access of all gig worker to home charging remains poor. Utilisation rate for EV charging stations in India is around 30%, with home charging accounting for approximately 70% of utilisation compared to public charging station (based on primary stakeholder inputs).

**As much as charging infrastructure in India faces significant gap, which is 90% of the required infrastructure yet to be built, it is a significant opportunity to leverage smart & energy efficient charging infrastructure.**

As per the latest national guidelines for Electric Vehicle Charging Infrastructure (EVCI[12] ) guidelines and standards, there should be at least one EV charger for 3 EVs (MoP 2024). Currently, there are 25 thousand public charging stations (MHI 2024) and estimated 3,000 battery swapping stations[13] in India which implies availability of one charger for 30 EVs. This highlights a significant infrastructure gap with the country requiring an additional 90% of the necessary chargers to meet the growing demand for electric vehicle (EV) adoption. (CII-CABL analysis 2024). To address this major gap in demand for rapid EV charging, the PM E-DRIVE Scheme in 2024 allocates Rs. 2,000 crores for establishing 72 thousand public charging stations. Out of this, 48 thousand chargers are supported dedicatedly for e2W and e3W which will be either LEVDC[14] or LECCS[15] charger with a minimum charging capacity of 12 kilo Watt (MHI 2024c). It is expected that by the time PM E-DRIVE Scheme is fully implemented in 2026, the gap may not significantly improve due to the rising number of EVs expected on road and even by assuming conservative EV growth at 8%[16] , the EV/charger ratio only improves from 30:1 in 2024 to 25:1 in 2026. Collaborations between private and public sectors can further accelerate the deployment of widespread, reliable, and standardised charging and swapping infrastructure. Despite policy push from the Government, commercial complexes, shopping malls, market/trade associations and residential societies/RWAs, may still be hesitant to set up public charger at their premises. Under the PM E-DRIVE Scheme, the MHI aims to support the development of EV charging infrastructure by providing up to 80% subsidy on the necessary upstream infrastructure (behind-the-meter). In specific instances, the Ministry may authorize increased funding, potentially covering 100% of the project cost, including upstream power infrastructure, to facilitate the deployment of critical charging infrastructure.


[12] *Guidelines for installation and operation of Electric vehicle Charging Infrastructure released by Ministry of power in 2018 and revised on sept 2024.*

[13] *As per India Battery Swapping Association (IBSA)*

[14] *Light Electric Vehicle Direct Current (LEVDC) as per IS-17017-2-6*

[15] *Light Electric Combined Charging System (LECCS) as per IS-17017-2-7*

[16] *Average yearly decadal growth rate of EVs in India excluding the exception years during COVID-19 pandemic*

## Infrastructure

As much as charging infrastructure in India faces significant gap, which is 90% of the required infrastructure yet to be built, it is a significant opportunity to leverage smart & energy efficient charging infrastructure. Integrating smart technologies enables optimised charging schedules, energy management, and reduced operational costs through efficient electricity usage. Battery swapping is emerging as a viable solution to reduce downtime and lower operational costs for electric vehicle (EV) fleets, particularly in high-utilisation segments such as last-mile deliveries. By decoupling battery ownership from vehicle ownership, swapping models enable faster refuelling and minimise the high upfront costs associated with EV adoption. This approach not only enhances fleet efficiency but also addresses concerns related to battery degradation and residual value. A robust battery-swapping infrastructure is essential to support vehicles designed for faster refuelling in ULM delivery applications. A strong case in point is SUN Mobility, which has modular and HVAC-enabled battery systems support a wide range of vehicles from two-wheelers to heavy-duty trucks offering both Battery-as-a-Service and Mobility-as-a-Service solutions in collaboration with leading OEMs and delivery platforms, making it a key enabler of fast-charging infrastructure for urban last-mile (ULM) deliveries (see case study 07).

## While battery swapping

offers a solution for faster refuelling times, 5 minutes for each swap[17], crucial for extensive and round-the-clock delivery operations, the lack of level playing field for swappable EVs (vis-a-vis fixed battery EVs) across national-level policies is key barrier for investment into swapping technologies and scaling use of swappable EVs in ULM deliveries. Although battery swapping as a technology has recently been accommodated in the EVCI Guidelines by the Central Government by way of an amendment in 2025 (MoP 2025), it still requires further policy action to create a level playing field for EVs with fixed batteries or those with removable and swappable batteries. Actionable steps on this front are accordingly proposed in latter pats of this section to create a level playing field within national policies with respect to battery swapping technologies.

Inadequate or sparse network of battery swapping stations, missing fast charging capabilities at existing Public Charging Stations (PCSs) and lack of hosting capacities in the distribution grid are additional pain points for stakeholders to scale electrified ULM applications. Additionally, scalability of battery swapping is currently constrained by the absence of standardised components such as battery packs, connectors, and charging protocols. Developing and implementing industry standards for EVs, EV components, charging protocols, and safety measures can streamline manufacturing and maintenance processes. Standardisation reduces production, operational and service costs by enabling mass production, simplifying supply chains, and facilitating bulk procurement. The evolution of industry standards in India is poised to lead to better quality and safety of EVs, interoperability standards


still need prioritisation for faster, efficient and discoverable charging/swapping points. To further mitigate interoperability-related challenges for battery swapping, it is important that a regulatory mechanism is developed for:

1. **Minimum quality standard for cells, battery and Battery Management System (BMS)**
2. **Clean responsibility matrix & independent BMS monitoring to identify fault source/sources**

While adoption of open platforms (OCPP, OCPI, Open-ADR) is proposed for interoperability between all existing and new PCS, a voluntary industry standard is proposed for interoperability across different swappable models and swapping service providers. Interoperability between all PCSs is also crucial for addressing EV adoption barrier for gig workers as range anxiety is the second biggest barrier for them in addition to barrier for acquiring and owning EVs. Digitally connected & managed charging stations therefore need to be prioritised for all PCSs in 131 non-attainment cities to implement Open Charge Point Interface (OCPI), Open Charge Point Protocol (OCPP) & Open-ADR standards for seamless interoperability (between stations), discoverability for reduced range anxiety and smart grid-integration capabilities (to enable VGI and renewables' integration) as suggested in the CII-Invest India Fleet Electrification Report (CII-Invest India 2023) and subsequently notified in the latest amendment to the GoI's EVCI Guidelines in 2024 (MoP 2024). These allow CPOs to seamlessly register assets, push live operational data, and integrate third-party apps with the forthcoming Unified Digital Super App to be developed by the Bharat Heavy Electricals Limited (MHI 2025).

[17] Refuelling time in typical battery swapping station as per inputs from Battery Swapping Operator (BSO)

Establishing uniform protocols for EV battery swapping ensures compatibility between different manufacturers, reducing fragmentation in the market and enhancing user convenience. A well-defined framework for battery swapping standardisation can foster innovation while maintaining safety and performance benchmarks. Interoperability in EV charging infrastructure allows users to access a common network of chargers, eliminating range anxiety and improving infrastructure utilisation. Similarly, standardised battery-swapping mechanism enables seamless exchange across multiple service providers, enhancing the viability of swapping as a cost-effective alternative to fixed charging. This is particularly critical for commercial fleets and last-mile delivery operators, where operational efficiency directly impacts profitability. Collaborative efforts between industry stakeholders, policymakers, and research institutions are essential to developing robust standards that support transition to zero emission deliveries.

Additionally, the current Goods and Services Tax (GST) structure for lithium-ion batteries creates a financial barrier for battery swapping infrastructure expansion. While batteries integrated into EVs are taxed at a concessional 5% GST rate, standalone battery purchases attract an 18% GST, leading to higher costs for battery replacement and swapping models. This tax disparity discourages investment in battery-as-a-service models and increases the total cost of ownership for EV users, particularly in the two-wheeler and three-wheeler segments. A uniform GST rate for lithium-ion batteries, irrespective of their mode of purchase, is essential to foster EV adoption, support battery-swapping networks, and enhance affordability. Following action are suggested to improve business viability of Charging Point Operators (CPOs) and BSOs and create a level playing field for battery swapping.

1. **Create a level playing field within national policies with respect to battery swapping**

   **a.** Define and track fixed-battery vis-a-vis swappable-battery EV models distinctively under the demand-side incentives (PM E-Drive Scheme) in different vehicular segments to be able to take stock of progress made with two distinct technologies.

   **b.** Design & release 'type approval certification proce dure' for homologation of swappable EVs 'without batteries' to facilitate State/UT-level enforcement on registration of swappable EVs. (*MoRTH advisory notified in August 2020: Circular RT 11036 72 2017*)

   **c.** Rationalisation of GST on Advanced Cell Chemistry (ACC) batteries: reduce GST on standalone ACC batteries to 5% for promoting battery swapping model and swap pable EVs[18].

   **d.** Create a 'voluntary industry standard' or SOP for battery swapping with standards or guidelines for willing industries to manufacture swappable batteries with common battery mechanical features, connector/charging ports and charging protocol (BMS) to facilitate scaling of swapping technologies in India.

2. **Scale infrastructure & improve business viability of EV charging and battery swapping-**

   **a.** Create hosting capacity maps for Electric Vehicle Charging Stations (EVCSs), especially the FCSs and Battery Swapping Stations (BSSs), and undertake necessary investments in upstream electrical infrastructure, on priority, in areas with commercial centres and dense demand centres in metropolitans and other National Clean Air Programme (NCAP) cities on priority.

   **b.** Explore blended financing to scale public charging infrastructure in a manner that commensurate investments from private sector are sought against public investment (on the lines of the National Highways for EVs[19]) in upstream electric and EV charging infrastructure to prioritise public charging cum swapping infrastructure in urban areas with high commercial activity and demand centres with greater than 1000 persons per hectare (pph) for gig economy services including- shopping complexes, market/trade centre, commercial centre, RWAs and housing societies etc.

   **c.** Revise GST on charging and swapping services: reduce GST on from existing 18% to 5% till the time the EVSE/EV ratio reaches a single digit or is less than 10

   **d.** Issue a waiver or concession on fixed demand charges for LT connection, till EVSE/EV ratio reaches a single digit (<10) for any Public Charging Stations (PCS) including non-captive BSS as per the new National EVCI Guidelines.

[18] To address inverted GST structure as ACC battery sold separately attracts 18% GST vis-a-vis 5% when sold as part of the EV

[19] Link: https://nhev.in/about-us-ev/

## CASE STUDY 7

# Transforming Last-Mile Delivery Through Innovative Battery Swapping Solutions

SUN Mobility is a prominent player in the battery-swapping industry, supporting the transition to zero-emission last-mile deliveries. With a network spanning over 100 battery-swapping stations in 23 cities, the company has enabled over 630 million kilometres of electric mobility, abating approximately 40,000 tonnes of emissions. SUN Mobility's innovative approach addresses the needs of diverse vehicle segments, from low-speed two-wheelers to heavy commercial vehicles, demonstrating a versatile solution for urban and inter-city logistics.


SUN Mobility offers two distinct battery-swapping solutions tailored to specific mobility needs. The first focuses on micro-mobility, catering to low-speed two-wheelers and light commercial vehicles (LCVs) up to 1 tonne. The second targets heavy electric vehicles (HEVs), including 3-tonne commercial vehicles, 55-tonne trucks, and various types of buses. These solutions are supported by robust HVAC systems at swap stations, ensuring batteries are cooled before charging, enhancing safety, and extending battery life.

The company's modular battery packs are designed for flexibility and efficiency. A single battery pack powers two-wheelers, while multiple packs can be combined for larger vehicles, such as e-rickshaws, e-autos, and e-loaders. This architecture supports continuous upgrades and adapts to evolving cell chemistries, ensuring improved range, reliability, and energy density.

Operating through two business models, SUN Mobility provides Battery-as-a-Service (BaaS), allowing customers to pay only for energy consumed, with a modular solution across vehicle types enabled through partnerships with OEMs like Piaggio, Omega Seiki etc. The Mobility-as-a-Service (MaaS) model offers comprehensive fleet solutions, including vehicles, energy infrastructure, maintenance, financing, and data management, utilized by partners such as fleet operator and delivery platforms.

*(Source: based on inputs from Sun Mobility in 2025)*

## CASE STUDY 8

# Solar Integrated Battery Swapping Station

Swappie, developed by SKS Cleantech, is a battery-swapping station designed to cater to the three-wheeler (3W) electric vehicle (EV) segment. The company employs a solar-grid hybrid technology, where 50% of the energy required for charging is sourced from the conventional power grid, while the remaining 50% is harnessed through solar panels. A single operational station is equipped with approximately 50 battery chargers and serves around 25 vehicles, optimizing the battery replenishment process for efficient fleet operations.

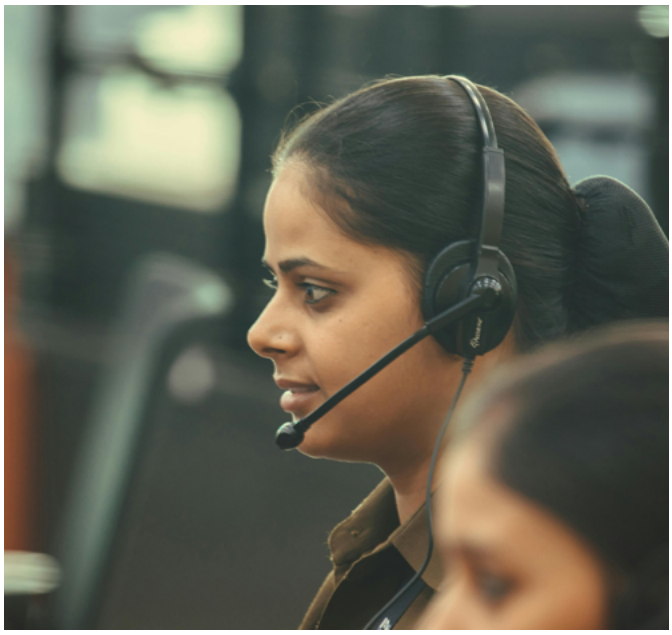
The success of Swappie is anchored in a combination of technological innovation, a well-structured business model, and affordability. The company integrates renewables-based charging, utilizing solar energy to mitigate challenges associated with grid instability. This hybrid charging infrastructure not only enhances the reliability of the battery-swapping ecosystem but also contributes to the larger objective of decarbonizing transportation. Additionally, while the ongoing EV revolution is largely concentrated in Tier I cities, Swappie's potential for penetration into Tier II and Tier III markets could prove transformative. These regions often face irregular and unstable energy supply issues, making Swappie's hybrid model an essential solution to facilitate widespread EV adoption beyond metropolitan areas. Affordability is another key advantage, as the cost of swapping a single battery at Swappie is INR 3-3.5 per kWh, which is notably lower than the cost of regular charging, thereby reducing operational expenses for EV users.

The impact of Swappie's battery-swapping service is evident in its ability to extend the operational duration of three-wheeler EVs. By eliminating the downtime associated with conventional charging, drivers can maximize their earnings. For example, an EV three-wheeler that previously covered 70-80 km per day is now capable of traveling over 120 km with the support of battery swapping, significantly increasing productivity. On the environmental front, Swappie's hybrid charging mode leads to substantial carbon savings, reducing $CO_2$ emissions by approximately 1.3-1.5 kg per kWh of energy utilized.

*(Source: based on inputs from SKS Cleantech in 2024)*

## 3.4

# Supporting Ecosystem for Service and Maintenance



Servicing of new ULM fleets itself presents challenges that are very unique to EVs. In the ULM delivery sector, vehicle downtime directly translates to income loss for delivery partners or gig workers and leads to service delays, making efficient and prompt servicing essential. Limited availability of trained technicians and service centres specialising in EV maintenance leads to prolonged downtime and increased operational costs. The rapid evolution of EV technology outpaces the development of requisite skills and training among service personnel, affecting the quality and reliability of maintenance services. Further customisation required for different models or OEM brands leads to fragmented service ecosystems. Development of cohesive support and maintenance networks is therefore crucial for scaling electrification of ULM delivery fleets.

Lack of consistent service warranties for E2W and E3W-cargo is a major challenge for ULM deliveries. The PM E-DRIVE Scheme introduced by the Ministry of Heavy Industries (MHI) in 2024 has taken first steps in the direction by making demand incentives for EVs conditional on minimum warranty requirements from OEMs. These include coverage for vehicle as well as battery for 3 years[20]. Specific details are available under the PM E-DRIVE Scheme and its operation guidelines which is really going to help inspire financier's confidence.

### MONITORING

Further, there is an urgent need to integrate Battery Management Systems (BMS) and IoT-based monitoring in EV batteries—particularly for swappable batteries which are supposed to be used interchangeably across fleets and riders. BMS technologies offer real-time monitoring of key battery parameters such as temperature, voltage, current, and State of Charge (SoC), enabling early detection of anomalies that could lead to thermal incidents. When integrated with IoT platforms, these systems can also transmit live data to centralized dashboards, enabling predictive maintenance, tamper alerts, and asset tracking—greatly enhancing operational reliability and safety. Moreover, this level of visibility helps ensure compliance with performance standards, supports efficient inventory and load management at swapping stations, and strengthens battery lifecycle management, including second-life deployment and end-of-life handling.  Box 09 presents a business-specific case study from Intellicar-cum-Fabric IoT, a technology company enable data-driven fleet operations through real-time diagnostics, predictive maintenance, and over-the-air updates, significantly improving uptime and operational reliability.

[20] Alternatively, 20,000 km for E2W segment and 80,000 km for E3W (cargo) segment

## CASE STUDY 9

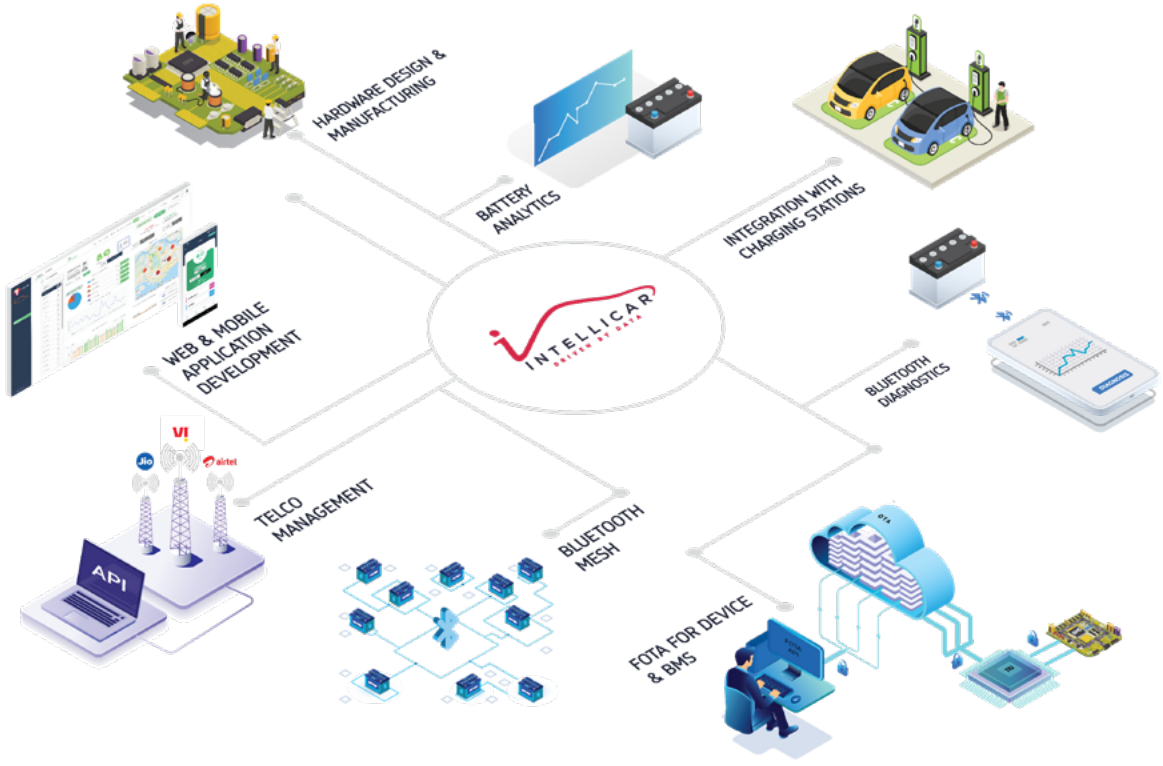
# Data-based operations & decision making in fleet management

Intellicar is a deep-tech mobility solutions company specializing in end-to-end IoT platforms for electric vehicles. Since its inception in 2015, the company has grown into a market leader in EV telematics, currently powering over 350,000 connected vehicles across India. With a vertically integrated stack—from custom hardware to cloud infrastructure and advanced analytics—Intellicar helps OEMs, financiers, fleets, and battery-swapping networks drive efficiency, safety, and sustainability.

The platform delivers high-frequency, real-time data insights for EV performance, preventive maintenance, charging optimization, and driver behaviour. Intellicar's edge computing architecture ensures scalability and reliability across diverse geographies and vehicle classes. Its intelligent diagnostics layer identifies early signs of battery degradation, controller anomalies, and thermal risks, enabling proactive action before failures impact operations via Over-the-Air (OTA) updates to all sub-components of the vehicle. Intellicar works with leading 2W and 3W OEMs, large fleet operators, and top financiers, enabling intelligent vehicle diagnostics, predictive analytics, and dynamic risk management. Its suite of solutions extends from factory-floor integration for OEMs to risk scoring and asset control for financiers, and optimized dispatch for fleets.

A sister company, Fabric IoT, complements this offering by enabling smart EV charging and renewable energy integration, ensuring that the shift to electrification is both sustainable and intelligent. By embedding intelligence into mobility, Intellicar is driving a connected, data-first future for the electric vehicle ecosystem.

*(Source: Adapted inputs from Intellicar Telematics/ Fabric IoT in 2025)*



4

# Financing Solutions for Scaling Zero-Emission Deliveries

**Financial viability is a cornerstone in the widespread adoption of electric vehicles for last-mile deliveries. Developing robust, inclusive, and innovative financing solutions is essential to mitigate risks, increase access to affordable financing, and ensure sustainable integration of EVs into delivery operations, especially considering the economic dynamics of gig economy workers.**

High upfront cost and economic viability of EV models remain key initial investment barriers. EVs generally have higher upfront costs compared to ICE vehicles (ICEV), making them less accessible, particularly for individual delivery partners and small fleet operators. While EVs may offer lower operational costs over time and comparable or better 'total cost of ownership' (TCO); the long-term benefits are often overshadowed by immediate financial constraints and the need for short-term economic viability. Gig economy workers and small businesses exhibit high sensitivity to initial costs and immediate earnings, making them reluctant to invest in higher-priced EVs despite potential long-term savings. Any potential decreases in government subsidies and incentives pose a major risk and can exacerbate affordability issues, slowing down market growth and adoption rates.

### From gig workers

and small fleet operator's perspectives, limited financing options and creditworthiness are two of the biggest impediments. Inadequate financing products exist for the ULM applications and traditional financing models are often ill-suited to the specific needs and risk profiles of EV buyers, particularly those in the gig economy. Many delivery partners lack formal credit histories or sufficient financial documentation, making it difficult to secure loans or favourable financing terms. Further to this, EV financing often comes with higher interest rates (1–9% higher than ICE counterparts) and lower loan-to-value (LTV) ratios (10–30% lower compared to ICE vehicles), increasing the financial burden on borrowers. Comparatively shorter loan periods (6–18 months less than ICE vehicles) also lead to higher monthly payments (10% higher EMIs than ICE counterparts), discouraging EV adoption in ULM deliveries (Stakeholder inputs in 2024-25, NITI Aayog 2022b, NITI-SIDBI 2024).

### It is recommended

that EV loans for urban last mile deliveries be included under the Reserve Bank of India's (RBI's) Priority Sector Lending (PSL) mandate. PSL directs 40 percent of bank lending to sectors of national importance like agriculture and MSMEs (RBI 2016) and inclusion under PSL has historically improved credit access for underserved sectors by providing regulatory incentives to lenders. EV loans for urban last mile applications be granted PSL status to improve credit flow and reduce lending risks described above. If adopted, this move could significantly scale up financing for EVs across high-impact segments such as two-wheelers, three-wheelers, and light commercial vehicles. RBI may consider specifically the gig workers and small fleet operators (urban last mile) for prioritising EV loans under PSL based on its merits such as- high EV asset utilisation rates, livelihood generation and abatement of air pollution in Indian metropolitans.

**Figure 05** Financial solutions for supporting zero emission ULM deliveries

Financial solutions for **Urban Last Mile Deliveries**

**1 Innovative financial models**

a. Flexible rental & subscription-based models including Battery-as-a-service (BaaS)
b. Lease-to-own programmes
c. Integrated payemnt solutions e.g Pay-As-You-Earn (PAYE)
d. Blended financing for expanded charging networks

**2 Leveraging FinTech**

a. Alternative credit scoring models with digital credit assessment tools
b. Fintech platforms for digital loan processing
c. P2P lending & crowdfunding platforms
d. Blockchain for secure transactions

**3 Derisking invesments**

a. Co-financing and asset management models
b. Battery swapping to decouple ownership of battery and electric vehicles
c. Standard resale benchmarks & structured buy-backs
d. Performance and services warranties including innovative insurance products
e. Priority Sector lending & Government-backed credit guarantees

*(Source: CII CABL (2025) Analysis)*

## CASE STUDY 10

# Financing Transition to Zero-Emission Last-Mile Deliveries. Please match with the word document.

Stride Green is a financial services platform which helps in accelerating electric vehicle (EV) adoption by addressing key financing and operational challenges. With a strong investment focus on cleantech, including EV and solar initiatives, the company supports businesses transitioning to EV fleets by improving access to capital and risk management solutions. As of 2024, Stride Green has financed EV deployments for fleet operators, startups, and micro, small, and medium enterprises (MSMEs), leveraging a financial framework designed to mitigate barriers such as high upfront costs and concerns about asset resale value.

Stride Green's financial solutions are structured to enhance EV adoption by integrating cash flow management, residual value support, revenue generation strategies, and telematics-driven asset management. The platform employs an escrow-based cash flow structure to improve repayment predictability, ensuring financial sustainability for fleet operators. Additionally, it addresses concerns regarding residual value by facilitating second-life battery utilization and recycling initiatives. Recognizing the importance of high vehicle utilization for economic viability, Stride Green connects fleet operators with demand aggregators, improving revenue streams and operational efficiency. Furthermore, the integration of telematics technology enables real-time tracking of asset usage, remote immobilization, and battery health monitoring, reducing financial risks and ensuring optimal vehicle performance.

Stride Green offers lease-to-own models and flexible credit facilities, alleviating the financial burden of EV procurement. Another critical issue is the lack of adequate charging infrastructure, as India currently faces an EV-to-charger ratio of approximately 135:1. To bridge this gap, Stride Green collaborates with infrastructure providers to expand charging and battery-swapping networks, ensuring seamless fleet operations. Battery performance and resale value uncertainty further complicate financing decisions, as degradation over time impacts asset valuation. In response, Stride Green integrates battery health monitoring systems and develops secondary market solutions to enhance resale potential and extend battery lifecycle utility. Additionally, fleet operators often struggle with operational complexities, including asset deployment and revenue forecasting. Stride Green mitigates these issues by integrating its financing model with OEMs, lenders, and logistics partners, creating a more comprehensive and financially feasible EV adoption pathway.

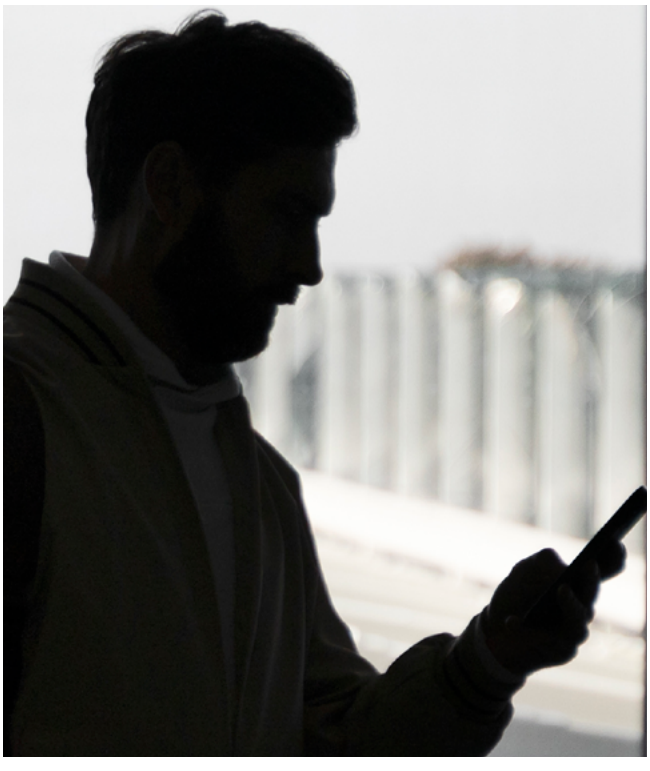
The impact of Stride Green's financial solutions extends across various segments of the EV industry, significantly contributing to fleet electrification and zero-emission mobility. It has contributed more than 23 million 'air pollution-free' kilometres through its platform leading to huge reduction in CO2 emissions. Moving forward, policy measures, public-private partnerships, and continued innovations in financing models will be instrumental in overcoming existing barriers, making EVs a more accessible and viable solution for businesses across India's logistics and transportation ecosystem.

*(Source: Based on inputs from Stride Green in 2025)*

## 4.1
# Innovative Financing Models

Implementing flexible rental models lowers the entry barrier by eliminating the need for upfront investment and providing manageable payment structures. It is worth noting that traditional vehicle rental models do not work for ULM delivery applications and need to be flexible enough to the needs of gig workers. Similarly, subscription-based or Battery-as-a-service (BaaS) models allow users to access EVs on a need basis, providing flexibility and aligning costs with actual usage patterns. Structured lease-to-own options provide a pathway to ownership while spreading costs over time, making EVs more accessible to gig workers. Lease-to-own models with reduced Loan-to-Value (LTV) requirements and extended tenure could save buyers 15–20% on initial down payments and offer EMIs up to 25% lower, making them particularly attractive for gig economy workers (NITI Aayog 2022b). Integrated Payment Solutions or Pay-As-You-Earn (PAYE) models for gig workers is an innovative mechanism suited to support EV adoption across gig workers or delivery partners. Embedding payment solutions within fleet management apps ensures seamless repayment of loans and leases, linking payments to income from delivery operations. One such example is escrow account systems where part of earnings is directly allocated towards loan repayments ensuring payment security for lenders. It simplifies the financial management for lenders as well as borrowers.


## 4.2
# Leveraging Fintech Ecosystem



Utilising digital credit assessment tools and alternative credit scoring models enhances the ability to assess creditworthiness accurately. Fintech platforms can streamline digital loan processing (the loan application and approval processes) reducing time to finance and making it easier for delivery partners to access necessary funds. Peer-to-Peer (P2P) lending platforms can democratise access to finance by connecting individual investors with potential EV buyers, bypassing traditional banking hurdles. Embedding digital loan repayments within fleet management apps could increase lender repayment security by 20–30% through escrow-linked payments (NITI Aayog 2022b), directly tied to delivery earnings. Peer-to-peer lending and blockchain solutions also have the potential to reduce loan processing time by 40% (NITI Aayog 2022b), facilitating faster EV purchases. Implementing blockchain technology can enhance the security and transparency of financial transactions related to EV ownership, including loans, leases, and payments. Crowdfunding can be explored as an alternative funding source for EV purchases, particularly targeted to community-based initiatives gig workers or small fleet operators looking to scale up.

## 4.3

# De-risking Investments for Wide-Scale Adoption

**As per our analysis of stakeholder inputs, adverse risk perception of EVs among lenders is mainly fuelled by- (1) performance & reliability risks (2) asset recovery challenge and (3) market volatility of EVs due rapid technological changes. Concerns over vehicle performance and technological obsolescence contribute to cautious lending practices. Uncertainties around battery lifespan and performance over time affect the resale value and long-term financial planning associated with EV ownership. Difficulties in repossessing and redeploying EV assets, especially in the absence of robust tracking and management systems, increase lender apprehension.**

The lack of established secondary markets for used EVs creates uncertainty regarding residual values which makes lenders hesitant and increases associated perceived risks. The absence of structured buyback programs from OEMs or third parties further diminishes confidence in the asset's future value. Rapid changes in technology and market preferences amplify these perceived risks, leading to conservative financial strategies and limited capital deployment. Based on inputs from all stakeholders at focused group discussions, desirable financing solutions, which are currently deployed on a limited scale in the country, are summarised in Figure 5.

Given the unique financing risk associated with EVs as described in earlier sub-sections, it is extremely important that investments are derisked to achieve wide-scale electrification of ULM fleets. Based on landscape scanning and stakeholder inputs, shared financing or co-financing seemed to be the best bet for derisking investments in EV adoption. Such co-financing arrangements typically involve financial institutions, OEMs, delivery platforms or fleet managers and operators to distribute risks and reduce the financial burden on individual agencies or stakeholders. Incorporating co-financing arrangements, such as pooling contributions from OEMs, financial institutions, and delivery platforms, could reduce individual stakeholder risks by 35–50% (NITI Aayog 2022b, NITI-SIDBI 2024). Such collaborations have already shown success in limited pilot projects, with significant scope for scaling up. All the case studies depicting successes in wide scale adoption of ULM electrification demonstrate this to certain extent but there is still room for more collaborations to derisk investments and unlock the scale for EV adoption in ULM fleets. Beyond industry-wide collaborations for EV adoption, implementing shared infrastructure and services, such as community-based charging stations and service/maintenance facilities may help industry players optimise resource utilisation and reduces individual costs. Such collaborative solutions, role of secondary markets and fiscal policy measures that can derisk investments in electrifying ULM fleets are further discussed under the Section 6 on ecosystem development.

### Asset management systems

utilise advanced technology platforms to assist financiers, asset manager and fleet operators in tracking asset utilisation, assessing residual values, and managing all risks effectively. IoT and telematics technologies enable real-time monitoring of vehicle performance, battery health, and operational metrics, facilitating proactive maintenance (via maintenance predictions) and efficient fleet management. Analysing operational data can aid in optimizing routes, reducing energy consumption, and improving overall delivery efficiency. Developing specialised insurance products which are specifically suited to the needs of EV fleets, such as 'battery life insurance', performance guarantees and reduced premiums for eco-friendly vehicles, can mitigate financial risks and promote EV adoption. New-age asset management solutions are playing a pivotal role in accelerating commercial EV adoption by underwriting key risks across the vehicle lifecycle and integrating shared financing, telematics, and IoT-based tools for effective fleet management. For instance, Intellicar and Fabric IoT are enabling data-driven fleet operations through real-time diagnostics, predictive maintenance, and over-the-air updates, significantly improving uptime and operational reliability (see case study 09). Stride Green is easing the transition to zero-emission fleets by offering integrated financial solutions that address high upfront costs, residual value risks, and revenue uncertainty through structured financing, battery lifecycle support, and telematics-linked cash flow models (see case study 10). Alt Mobility is simplifying EV access through its leasing and full-stack lifecycle management platform, helping fleet operators and driver-cum-owners reduce TCO, remain asset-light, and improve profitability (see case study 11). Meanwhile, AMU Leasing is expanding EV ownership among gig workers and small fleet operators by offering flexible financing products, alternative credit assessment models, and resale guarantees supported by IoT-enabled fleet tracking (see case study 12).

## CASE STUDY 11

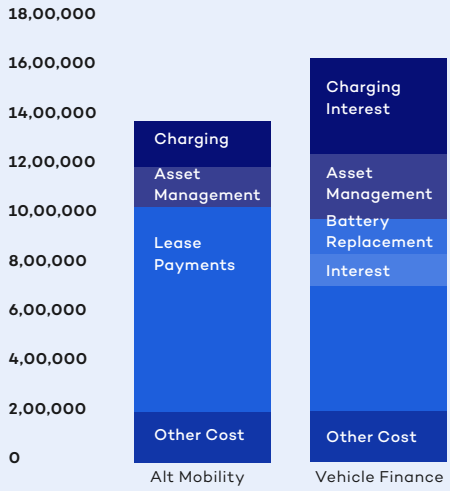
# De-risking adoption of commercial fleets via technology-enabled EV leasing & lifecycle management platform

Alt mobility solution helps in proliferation of commercial EV fleets by simplifying access to electric vehicles for commercial fleets through its EV leasing solutions, and enhances fleet uptime, logistics efficiency, and overall profitability via its tech-enabled asset management platform. Alt has built strong partnerships across all major ecosystem stakeholders including banks, NBFCs, insurance providers,OEMs, and charging point operators (CPOs) to enable seamless deployment and operation of EV fleets.

As an asset manager, Alt Mobility is currently managing a fleet of over 13,000 fully electric vehicles on lease across 30 cities to fleet operators and DCOs (driver-cum-owner). They have covered 50 million kilometres as of date. Supported by real-time fleet diagnostics, Alt's full-stack tech platform bundles multiple services- charging, insurance management, OEM service, roadside assistance, second life management etc. to ensure fleet operators or aggregators can always operate a well-maintained EV fleet. Alt also offers maintenance and charging services to fleet operators on a monthly fee. It enables fleet operators and aggregators to remain asset-light by managing vehicles across their entire lifecycle reducing total cost of ownership (TCO), minimizing operational risks, and improving profitability. Reportedly, the Alt model lowers TCO by 15% for fleet operators (details as shown in the boxed chart). It also helps lowering downpayment (significantly by -67%), interest rates (compared to self-financing) and insurance premiums for fleet operator, enabling them to deploy more (62% higher) EV assets.

*(Source: based on inputs from Alt mobility in 2025)*


**15.4% Lower** Total Cost of Ownership



## CASE STUDY 12

# Financing EV Fleets for Urban Last-Mile Deliveries

AMU
ACCELERATED
MONEY FOR U

AMU Finance and Leasing is an Non-Banking Financial Company (NBFC) specialising in tailored financial solutions for electric vehicles - two/three/four commercial vehicles, e-buses (Heavy Commercial Vehicles) - batteries, drones, and Green MSMEs. With a strategic focus on financial inclusion using sustainable mobility, the company has introduced innovative financing models that allow individual drivers, small fleet operators, and gig workers to transition to electric vehicles without the financial strain of high upfront costs. By 2024, AMU has successfully financed over 15,000 EVs across 16 states, significantly contributing to the shift towards zero-emission mobility, which is equivalent to 50 lakh+ clean KMs driven saving 500+ tonnes emissions or planting 24,000+ trees.

The company's approach is built on three fundamental pillars: customized financial products, risk mitigation strategies including in-house underwriting and collections, and a strong distribution mechanism through on-ground partnerships with Loan Service Providers (LSPs). Through flexible financing solutions, AMU has introduced a sourcing app called "MyAMU" with 150+ dynamic parameters to underwrite the asset, borrower, and the distributor. This helps lower the financial barriers for drivers, gig workers, and small business owners. A critical challenge in EV financing is the lack of formal credit history among the asset owners. To address this, AMU has implemented alternative credit assessment mechanisms that analyse income stability and minimum business guarantee commitments, ensuring broader access to financing. Furthermore, strategic partnerships with banks and NBFCs for co-lending will enable the company to offer tailored financing options that align with the operational needs of drivers, MSMEs, and fleet partners. To enhance asset utilization and mitigate default risks, AMU integrates telematics and IoT-based tracking for real-time fleet monitoring and performance optimization.

Despite these advancements, challenges persist in accelerating EV adoption across tier-2 and tier-3 cities. One of the primary barriers is affordability, as high-speed EVs with extended ranges remain expensive for many users. AMU addresses this by offering structured financing options with minimal down payments and flexible repayment plans, making EV ownership more accessible. Multi-modal charging solutions are preferred as a financing partner, including home-charging, fast charging and battery financing (Battery-as-a-Service). Another critical concern is the hesitation among small fleet operators and individual riders to transition to EVs due to uncertainties surrounding vehicle performance and resale value. To alleviate these concerns, AMU offers assure buyback and residual value schemes, instilling confidence in potential adopters.


*(Source: based on inputs from AMU Leasing in 2025)*

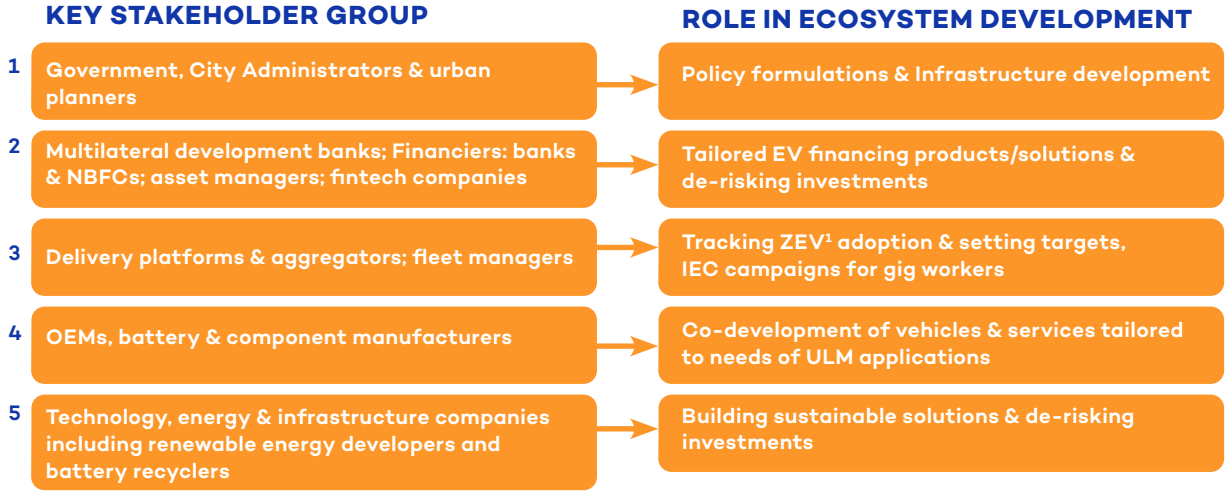
5

# Ecosystem Development

## 5.1
# Developing Collaborative Ecosystem

As clear from previous discussion and summarised in Figure 06- financiers, fintech companies and asset managers play a central role in developing the private sector-level ecosystem required to de-risk investment in electrifying ULM fleets. Delivery platforms or aggregators can collaborate with financial institutions to develop tailored financing products for their delivery partners, reducing barriers to EV adoption, particularly by sharing data on performance of EVs and earnings of drivers on EVs to show that it is reliable, bankable and supports creditworthiness. Creating partnerships between the Government, multi-lateral development agencies, banks/financers and fintech companies can foster innovation in financing models and expand access to capital for EV adoption. Collaborations between government entities, private companies, and financial institutions can further accelerate the pace of infrastructure development, standardisation efforts, and new policy formulation. Partnerships between OEMs and delivery platform/aggregators enable co-development of vehicles and services tailored to specific operational needs, ensuring better alignment and mutual benefits. Further engaging stakeholders across varied sectors such as OEMs, technology providers (IoT, telematics, software solutions, blockchains etc.), energy companies, infrastructure companies, renewable energy developers and urban planners, fosters a holistic approach to building sustainable and efficient ecosystems for zero emission urban last mile deliveries

**Figure 06** Key Stakeholder group involved in ecosystem development




[1]. *ZEV stands for Zero Emission Vehicle including- bi-cycles, electric vehicles (EV) and low speed EVs*

## 5.2
# Secondary Markets Development

### Creating structured buyback programme

and organised platforms for buying and selling used EVs enhances liquidity by providing reliable residual value benchmarks. As opposed to simple or open market buyback, structured buybacks refer to specific types of offerings where the company offers assured buyback using a predetermined method. Structured buyback offerings are currently limited and really lacking the Indian market. Structured buyback arrangements provide assurance to both lenders and buyers regarding future asset values and reduce long-term financial risks. Greaves Finance Limited (GFL), a non-banking financial company (NBFC), reportedly launched the country's very first guaranteed buyback for electric two-wheelers (Greaves Finance 2025). Launched in November 2024, the Greaves Buyback Programme introduces a structured approach to enhancing consumer confidence in electric two-wheelers by offering a guaranteed resale value after a predefined period of usage in partnership with select OEMs e.g. Ather uses the mentioned GFL (2024) platform to offer assured buyback to the users/drivers. This implies that users can get certain percentage of vehicle's effective ex-showroom value when they return it in stipulated period and specifically in Aether's case- (1) 60% buyback value after 36 months & (2) 50% buyback value after 48 months (Ather Energy 2025). This assurance not only reduces financial risks for the customer but also promotes transparency and peace of mind during the vehicle ownership cycle. In addition to consumer benefits, the program supports the broader ecosystem by

establishing standard resale benchmarks. This helps original equipment manufacturers (OEMs) and dealers in building trust among prospective buyers, ultimately contributing to increased brand loyalty and market stability. Furthermore, Greaves Finance complements the buyback offering with customized financing solutions, making electric mobility more accessible and affordable for a diverse customer base. As early adopters look to upgrade or replace their vehicles, the absence of formal buy-back mechanisms leads to low resale value realisation. This further leads to informal resale practices, and missed opportunities for battery recovery, reuse, or recycling and undermines circularity objectives outlined in the Battery Waste Management (BWM) Rules.

### Measures to develop secondary markets

such as standardising warranty terms, buy-back valuations, guidelines/SOPs for repurposing, recycling & design for environment (DfE) are supposed to lead to enhanced transparency, strengthened industry accountability, and an integrated approach to EV battery lifecycle management. EV battery still have 80% capacity left at their end-of-life (EoL) in automobile applications, development of an ecosystem for 'battery repurposing' in stationary energy storage applications and battery recycling therefore adds value and improves overall asset economics. EV growth also poses significant risks of resource mismanagement, environmental degradation, and informal sector proliferation if not governed by robust EoL management and tracking systems. Beyond batteries, several valuable EV components such as rare earth minerals, magnets, electric steel, aluminium alloy, plastics etc. can be refurbished and reused in various industrial, stationary energy storage, renewable energy and automotive applications. This is also important from circular economy and resource efficiency perspective as emissions of particulate matter and oxides of nitrogen and sulphur (PM, NOx & SO2) from EV production accounting the raw material extraction are 1.5-2.5 times higher than ICEV production (Rangaraju et al., 2015).

Recognising these challenges, the Ministry of Environment, Forest and Climate Change (MoEFCC) introduced the Battery Waste Management (BWM) Rules (2022) and its subsequent amendment in 2025, to operationalise Extended Producer Responsibility (EPR) regime for batteries (MoEFCC 2022, MoEFCC 2025). The BMW rules are not specific to electric vehicle (EV) batteries and apply to all battery types with the aim to ensure collection, recycling, reuse, and environmentally sound disposal of used batteries. To facilitate and track compliance on BWM Rules, an EPR Battery Portal (CPCB 2025) managed by the Central Pollution Control Board (CPCB) is established as a digital interface for registration, EPR obligations, and returns filing by producers, importers, recyclers, and refurbisher. However, the portal in its current form functions as an EPR compliance dashboard than an integrated tracking system, presenting following gaps persist for field implementation.

1. **Fragmented data: Battery data is entered in bulk over the EPR portal lacking the granular information needed for traceability down to the serial number or chemistry of ndividual batteries.**
2. **Lack of data interoperability: Disconnected datasets between producers, sellers, consumers, and recyclers hinder efficient reverse logistics and enforcement.**
3. **Insufficient traceability: The portal does not yet enable real-time monitoring of the ownership cycle or ensure verification of recycling/refurbishment claims.**
4. **Enforcement challenges: In the absence of robust trace ability, regulatory agencies may face difficulties in identifying non-compliance and leakages into the informal sector.**

While total 3,422 producers and 400 recyclers are registered over the national EPR portal for batteries, there is not even a single refurbisher (CPCB 2025) that is registered over the portal so far. This reflects a worrying trend for high value ACC or traction batteries used in EVs with high economic potential for repurposing in stationary energy storage applications. It is worth noting that the first EPR compliance cycle which was supposed to commence in the year 2024-25 has now been deferred to the year 2026-27 as per the BWM Rules amendment (MoEFCC 2023) in the year 2023 (See Annexure 3. for more details).

As EV battery technologies evolve and gigawatt-hours of used batteries begin re-entering the value chain through second-life or recycling, data-driven governance becomes indispensable for a robust circular economy on ACC batteries used in EVs. The QR/barcode-linked EPR registration data by producer, as introduced under the Battery Waste Management (Amendment) Rules, 2025 is a welcome step for tracking individual battery information, it is not clear whether ownership, usage and repair information can also be updated in real-time or mechanism for doing so.

### To improve EV battery traceability

we propose a dedicated Centralised EV Battery Registry integrating real-time tracking of battery serial numbers, battery chemistry, ownership and repurposing /repair information etc. Such a centralised registry would enable full traceability

of EV battery units from manufacturing or import to end-of-life in EV applications and facilitate data-sharing with all ecosystem players. Transitioning from a static compliance system to a dynamic digital backbone of battery lifecycle management will in turn- (1) support efficient verification of EPR credits, collection targets, and recycling/refurbishment outcomes, (2) enhance accountability and transparency in the EV battery value chain, and (3) Improve refurbishment & recycling levels by being able to track specific EV battery chemistries and improve their design-for-environment in Indian context.

**While the Battery Waste Management** (BWM) Rules, 2022 establish a forward-looking Extended Producer Responsibility (EPR) framework, effective implementation hinges on having clear, standardised procedures for each stage of the battery waste lifecycle. However, the existing Battery Management and Handling Rules, 2001, which are still referenced by many stakeholders, are outdated and misaligned with current technologies, digital tracking systems, and the environmental risks posed by modern battery waste. To bridge this gap, it is essential to update the 2001 rules and operationalise point 17 of the BWM 2022 Rules, which mandates CPCB to issue guidelines for environmentally sound management of EoL batteries. These guidelines should provide necessary protocols and SOPs for doorstep collection, formal take-back models, ensuring safe, categorised interim storage, mandating the use of authorised transporters with digital tracking, setting quality and safety benchmarks for refurbishment, and defining chemistry-specific recycling protocols to maximize material recovery. This integrated approach will enable a compliant, transparent, and circular battery waste ecosystem in India. Following measures are suggested to improve overall EOL management of EV batteries -

1. **Design for Environment (DfE) Guideline for minimum necessary considerations to be applied by EV or battery producers at the time of designing battery to make refurbishing & recycling easier and cost-effective**
2. **Guidelines for environmentally sound EoL battery management including but not limited toformal ACC battery collection and take-back models with safe storage & transportation,quality and safety benchmarks for refurbishment, chemistry-specific recycling protocols to maximize material recovery**
3. **Standard for interoperable Battery BMS-based common communication protocol and digital passport for unique identification and tracking of historic information such as manufacturing, sale, import/export, usage/cycle, ownership, repair/repurposing etc. for proper EOL management of EV/ACC batteries**
4. **Dedicated & centralised EV/ACC battery portal for enhanced traceability on battery EOL management**

## 5.3
# Enhanced Policy Support

A transition to Zero Emission Deliveries (ZEDs) is imminent and imperative. In this section we assess some of the key policy-level gaps and solutions for the ZED transition. The standalone State policy framework, namely 'Delhi Motor Vehicle Aggregator and Delivery Service Provider Scheme' 2023, proposes EV adoption targets for all delivery service providers to achieve 100% electrification in 2-wheeler and 3-wheeler vehicle segments by 2027[21] (GNCTD 2023). The summary of Delhi policy as applicable to urban last mile deliveries is provided in the Annexure 2 of this report and it is worth noting that the State policy incentivises-

1. **Fleet electrification or** EV adoption by the way of exempting all electric vehicles from the annual fees. Proposed annual fees, which are in the range of INR 50-200 per vehicle (for new onboarded ICEV), depend on the vehicle category and fuel type as detailed in the table A2.2 (Refer annexure 2).
2. **Fleet modernisation** to vehicles meeting the latest emission norms, as ICEVs less than 2 years old age or Bharat Stage 6 (BS-6) vehicles accrue half of the prescribed annual fees (INR 50-200) per vehicle (for new onboarded ICEV).

**The Delhi policy** provides a robust regulatory framework for fleet electrification and modernisation as needed for reducing harmful tailpipe emissions (air pollution and greenhouse gases emissions) in severely polluted Delhi, it overlooks the role of low-cost ZEVs including-Low Speed Electric Vehicles (LSEVs) and bi-cycles for urban last mile deliveries. The LSEVs, as defined under the Central Motor Vehicle Act: Rule (2) Subrule (u) (MoRTH 2023), do not require registration unlike EVs exceeding speed limit of 25 kmph. Low-Speed Electric Vehicles (LSEVs) and bicycles as ZEV options present cost-effective and operationally feasible solutions for short-distance urban deliveries, especially in the dense urban areas. Integrating these low-cost ZEVs into policy frameworks is imperative from the perspective of- (1) cost-efficient transition to clean vehicular technologies in dense urban areas that justify use of LSEVs and bicycles and (2) an inclusive transition which also takes into factor the section of gig workers or delivery partners e.g. women gig workers, aged and economically weaker sections who cannot afford or are not comfortable with motorised vehicles. However, infrastructure readiness remains a critical barrier to these low-cost ZEV options. Urban road networks are traditionally designed for mixed-traffic movement, often failing to accommodate the needs of Low-Speed Electric Vehicles (LSEVs) & bicycles. The lack of dedicated lanes results in inefficiencies and safety concerns, discouraging the use of these sustainable modes. Enforcing the already existing Urban and Regional Development Plans Formulation and Implementation (URDPFI) Guidelines (MoHUA 2015) at the local level for equitable street design can address this challenge by integrating LSEVs and bicycle traffic and limiting them to dedicated lanes. This will also ensure safer and more efficient movement on road, while promoting active and low-emission mobility solutions. In addition, dedicated social and physical infrastructure e.g. dedicated ZEV loading/unloading bays, shaded areas for gig-workers' rest etcetera can be provided for gig workers and ZEVs used in ULM deliveries in commercial areas (street food hubs, shopping malls/complexes etc.) and dense demand centre with more than 1,000 persons per hectare (pph).

Other state policies in this regard, namely for the states of Kerala, Maharashtra and Union Territory of Chandigarh, are in the draft stage. These remaining state policies mainly focus on enforcement of licensing regime for aggregators/service providers and compliance for the same (Government of Kerala 2024, Government of Maharashtra 2024, Chandigarh Administration 2024), but together fail to consider ZEV adoption. Therefore, it is suggested that the Central Government model guidelines in this regard, that is the 'Motor Vehicle Aggregators Guidelines 2020' (MoRTH 2020), are revised to mandate that all state policies to mandate tracking of ZEV adoption in ULM fleets in 131 cities that presently do not meet the national ambient air quality standards and are referred as non-attainment or NCAP[22] cities (CPCB 2025b).

Moreover, it is not clear how reported information from state or city level portals will be utilised for ecosystem development toward 'zero emission' urban last mile deliveries and therefore it is preferable to have a common voluntary approach by select or all delivery platforms or service aggregators for ZEV adoption in ULM deliveries. This approach will need prioritise following as part of the corporate reporting-

I. **Air pollution saved in cities due to switch from ICEVs to ZEVs- tailpipe emission savings of criteria pollutants (outdoor air) that is**

   **(a) fine particulate matter (PM2.5) and (b) Oxides of nitrogen (NOx) emissions.**

II. **Global climate impact in- (a) $CO_2$-eq ($CO_2$ and non-$CO_2$ greenhouse gases savings) and (b) Black Carbon which is a constituent of the tailpipe PM2.5 emissions above**

III. **Climate adaptation impacts especially in relation to growing heat stress in urban areas as air pollution and urban heat together lead to increased heath impact in cities**

IV. **Social impact such as fuel savings, livelihood or job creation and other benefits to gig workers or delivery partners from ZED transition**

V. **Adoption of renewable electricity (onsite or offsite) for charging/swapping of EVs can lead to further reduction of PM and SO2 emissions from use of grid electricity. In addition EVs and charging infrastructure can further support RE integration obligations and therefore supporting transition to clean energy**

[21] same is stipulated in 2028 for 4-wheeler vehicle segment

[22] NCAP stands for National Clean Air Programme

Beyond infrastructure, access to finance remains a key enabler of EV adoption. Urban last-mile delivery is a high-velocity, low-margin business. Small fleet operators often rely on small ticket-size loans ranging from ₹1 lakh to ₹10 lakh to procure EVs particularly E2Ws and E3Ws. These loans are typically considered high-risk by financial institutions due to-

1. **Lack of historical creditworthiness of borrowers (first-time entrepreneurs or gig workers)**
2. **Rapid depreciation with EVs as opposed to ICE due to inherent technological characteristics**
3. **Inadequate understanding of EV asset performance in operational contexts**
4. **Absence of targeted credit risk mitigation tools specific to EVs**

**As a result,**

either the interest rates remain high or the credit is altogether denied, forcing many small players to rely on informal financing or high-cost leasing models. Also, the absence of government-backed credit guarantees specific to the EV sector increases lender risks restricting the availability of affordable financing especially for small fleet operators. Introducing targeted credit guarantee schemes for EV financing can mitigate these risks, encouraging financial institutions to offer favourable loan terms. Besides, EVs are yet to be prioritised under the priority sector lending (PSL), limiting access to low-cost capital. This financing gap can be bridged under the Government of India established 'Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE)' at the Ministry of MSMEs (MoMSME) and Small Industries Development Bank of India (SIDBI) (CGTMSE 2024). This initiative can play a pivotal role in enabling collateral-free ZEV (EV/LSEV) loans to MSMEs by providing credit guarantee coverage of up to 85% for loans up to ₹ 50 lakh and up to 75% for loans above ₹ 50 lakh and up to ₹ 5 Crore.

Classifying EV financing under PSL particularly for high-utilization sectors such as urban last-mile deliveries can significantly enhance financial viability by facilitating lower interest rates and improving return on investment for fleet operators. Finally, strengthening and extending financial incentives to the demand sector e.g. tax benefits, interest subvention, reduced EV registration and insurance fees can enhance affordability and encourage adoption of EVs in ULM deliveries. Government investments in charging infrastructure and supportive policies create a conducive environment for EV operations and bolster investor confidence.

## 5.4
# Market Education and Awareness

Stimulating demand for used EVs and accelerating electric mobility adoption in India will require targeted efforts to educate and empower key stakeholders, particularly gig economy workers who form the backbone of urban last-mile delivery networks. A critical first step is to develop tailored training packages for gig workers that go beyond operational skills to include financial literacy, credit management, and a clear understanding of the long-term economic and environmental benefits of EV adoption. These efforts must address the current skills gap through comprehensive, industry-aligned skilling programs. Strategic partnerships between academia, industry, and government will be key to designing relevant curricula, while public awareness campaigns and OEM-led initiatives can further amplify reach and impact. Digital platforms such as food delivery services, ride-hailing apps, e-commerce aggregators, and energy service operators are well-positioned to act as powerful enablers of this change. Leveraging their existing onboarding systems and extensive driver networks, these platforms can serve as scalable touchpoints for delivering skilling and awareness modules. What's needed is a structured partnership model, where the government collaborates with platforms to provide free, modular training on ZEV maintenance and operations, covering essential topics such as-

1. **Battery charging & swapping etiquettes**
2. **Driving behaviour to optimise range and vehicle/ battery safety**
3. **Best practices for basic EV troubleshooting and acting on software/AI/telematics-based diagnostics from real-time monitoring of State of Charge (SoC) & battery health**
4. **Financial and digital literacy for EV systems**

These modules can be delivered through app-based tutorials, video content, and brief on-ground sessions, making the training accessible, low-cost, and easily scalable across urban India. At the same time, to support safe and sustainable EV adoption at scale, India must cultivate a skilled technical workforce equipped with specialized EV knowledge in areas such as power electronics, battery diagnostics, thermal management, and vehicle software systems. However, EV-specific technician or mechanic trainings remains limited in scale and reach. There is a pressing need for dedicated curriculum to keep existing mechanics/technicians skills up to date with rapidly evolving EV technologies while mainstreaming EV technician trainings across National Skill Development Corporation (NSDC) and its sectoral bodies, such as the Automotive Skills Development Council (ASDC), ITIs, private skilling centres, and OEM-led service networks. Doing so will establish a future-ready service ecosystem, reduce safety risks, and create high-demand green jobs paving the way for an equitable and sustainable electric mobility transition.

6

# Recommended Measures for Scaling Zero Emission Deliveries

### Urban last mile

leets are rapidly expanding and present a significant opportunity for zero emission deliveries to reduce air pollution health impacts. From the perspective of ecommerce and food delivery platforms as well as fleet operators or aggregators, they present significant opportunity to reduce operational costs and emission footprint of these logistic operations. Encapsulating the importance of this sector, this section summarised a set of clear recommended measures based on the discussion and evidence presented in the previous sections focussed on fit-for-purpose solutions and derisking investments in new electric vehicle fleets and allied infrastructure such as battery swapping and charging infrastructure.

These recommended measures are captured in Table 4. along with details of the implementation agencies and are classified as following-

1. Fiscal policy measures for improving access to low-cost EV financing
2. Nation & sub-national EV policy measures
3. Secondary markets development
4. Nation & Sub-National 'Vehicle Aggregator' policies
5. Urban Land use reforms
6. Corporate policy measures

## TABLE 4

Recommended Measures for Scaling Zero Emission Deliveries

| S.N. | Recommended Measure | Executing agency |
|---|---|---|
| | **FISCAL POLICY MEASURES** | |
| 1 | **Government-backed low-Interest EV-cum-LSEV[23] loans to gig workers:** Government-backed, low-interest EV-cum-LSEV loans (up to 1 Lakh credit) at 4% per year interest[24] for all gig workers enabling affordable vehicle ownership. | **Ministry of Labour & Employment** |
| 2 | **Inclusion of EV loans for the urban last-mile applications[25] under the Priority Sector Lending (PSL)** framework to catalyse formal credit flow and enhance risk appetite among financial institutions. | **Ministry of Finance; Reserve Bank of India** |
| 3 | **Dedicated Credit Guarantee Window under Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE)** for Electric Vehicles (EVs) and Low Speed Electric Vehicles (LSEVs) used in Urban Last-Mile Delivery: risk coverage of up to 85% for Loans up to ₹50 Lakh & risk coverage of up to 75% for loans above ₹50 Lakh and up to ₹ 5 Crore. | **Ministry of Micro Small & Medium Enterprises; Small Industries Development Bank of India** |
| | **NATION AND SUB-NATIONAL EV POLICY MEASURES** | |
| 4 | Availability of **'Structured buy-backs' from EV manufacturers or OEMs** as mandatory requirement for EV model's eligibility under the demand-side incentives (PM E-Drive Scheme[26]) from 2026 onwards | **Ministry of Heavy Industries; EV manufacturers** |
| 5 | **Define 'fixed-battery vis-a-vis swappable-battery' EV models** for the demand-side incentives (PM E-Drive Scheme) under different vehicular segments. Also, two EV technologies are suggested to be tracked under the VAHAN Dashboard for registered vehicles distinctly. | **Ministry of Heavy Industries; Ministry of Road Transport & Highways** |
| 6 | **'Type approval certification procedure' for homologation of swappable EVs 'without batteries'** to facilitate State/UT-level enforcement on registration of swappable EVs as per the GoI/MoRTH advisory notified in August 2020: Circular RT 11036 72 2017. | **Automotive Research Association of India; State Transport Departments** |
| 7 | **Rationalisation of GST-**<br>**a.** **Revise GST for ACC[27] batteries:** reduce GST on standalone ACC battery to 5% for promoting battery swapping model & swappable EVs<br>**b.** **Revise GST on charging/swapping services:** reduce GST on from existing 18% to 5% till the time the EVSE/EV ratio reaches a single digit or is less than 10 | **Ministry of Finance; GST Council** |
| 8 | **Voluntary industry standard' for battery swapping technologies to address-**<br>**a.** Necessary interoperability aspects- swappable batteries with (i) common mechanical-cum-electrical features; (ii) standardised BMS charging & communication protocol<br>**b.** Regulatory mechanism for- (i) minimum quality standard for cells, battery and BMS in swappable technologies; and (ii) clear responsibility matrix & independent BMS monitoring to identify fault source/sources | **Selected EV manufacturers, Infrastructure companies, BSOs & battery manufacturers anchored at Bureau of Energy Efficiency (BEE)** |

[23] LSEV stands for Low-speed electric vehicles with speed ≥ 25 kmph

[24] Based on subsidised interest rate at 4% available under the Kisan Credit Card Scheme

[25] Due to the highest EV utilisation rate in this segment and ability to directly reduce urban air pollution

[26] Similar to minimum service warranties requirement implemented under PM E-drive scheme 2024

[27] ACC stands for 'advanced chemistry cell' batteries utilised for traction application in EVs

| | | |
|---|---|---|
| 9 | **Hosting capacity maps (HCMs) for EVCSs** (especially FCSs and BSSs) for necessary investments in upstream electrical infrastructure, on priority, in commercial centres and dense urban demand centres (residential areas with >1000 pph) in metropolitans and total 131 non-attainment cities on priority. | **Ministry of Power; Bureau of Energy Efficiency (BEE); DISCOMs** |
| 10 | **Explore blended financing to scale public charging infrastructure**[28] in urban areas with high commercial activity and demand (>1000 pph) for gig economy services including- shopping complexes, market/trade centre, commercial centre, RWAs and housing societies etc. | **Bureau of Energy Efficiency (BEE)** |
| 11 | **Issue a waiver or concession on fixed demand charges for LT connection till EVSE/EV ratio reaches a single digit (<10)**, for any PCSs including non-captive BSS (as defined in latest amended National EVCI Guidelines in 2024). | **Ministry of Power; Bureau of Energy Efficiency (BEE); DISCOMs** |
| 12 | **Digitally connected & managed charging stations:** All new EVs and public charging stations (PCSs) in 131 non-attainment cities to implement Open Charge Point Interface (OCPI), Open Charge Point Protocol (OCPP) & Open-ADR standards for seamless interoperability (between stations), discoverability for reduced range anxiety and smart grid-integration capabilities (to enable VGI and renewables' integration) as per latest EVCI Guidelines in 2024[29] . | **CPOs, BSOs & EV manufacturers anchored by State Nodal Agencies (DISCOMS) and Central Nodal Agency (BEE)** |
| 13 | **National and State level digital aggregation platforms and specialised mobile apps** in 131 non-attainment cities for all publicly available charging infrastructure | **State Nodal Agencies and Central Nodal Agency- BEE** |
| | **SECONDARY MARKET DEVELOPMENT** | |
| 14 | **Design (ACC battery) for Environment (DfE) Guidelines** for minimum necessary considerations to be applied by EV or battery producers at the time of designing battery to make refurbishing & recycling easier and cost-effective | **Ministry of Environment Forest Climate Change, Central Pollution Control Board** |
| 15 | **Guidelines for environmentally sound End-of-life battery management** including but not limited to formal ACC battery collection and take-back models with safe storage & transportation, quality and safety benchmarks for refurbishment, chemistry-specific recycling protocols to maximize material recovery | **Ministry of Environment Forest Climate Change, Central Pollution Control Board** |
| 16 | **Standard for interoperable BMS-based common communication protocol & digital EV battery passport** for unique identification and tracking of historic information such as- manufacturing, sale, import/export, usage/cycle, ownership, repair/repurposing etc. for proper EOL management of EV or ACC batteries. | **Ministry of Environment Forest Climate Change, Central Pollution Control Board** |
| 17 | **Dedicated & centralised EV/ACC battery portal and dashboard** for enhanced traceability on ACC battery End-of-Life management (as opposed to existing portal by CPCB for all batteries and primarily for EPR compliance under the BWM Rules[30]). | **Ministry of Environment Forest Climate Change, Central Pollution Control Board** |
| | **NATION & SUB-NATIONAL 'VEHICLE AGGREGATOR' POLICIES** | |
| 18 | Amend the national guidelines- 'Motor Vehicle Aggregator Guidelines' (MoRTH 2020), to provide a **common framework to all States/Cities for disclosure on 'Zero Emission Vehicles (ZEVs)' adoption rates** by all aggregators or delivery platforms and prioritise action in 131 non-attainment cities. | **Ministry of Road Transport & Highways, State Transport Departments, Urban local bodies (ULBS) in 131 non-attainment cities[31]** |
| 19 | Expand scope of existing vehicle adoption targets for delivery/aggregator platforms, under 'Delhi Motor Vehicle Aggregator and Delivery Service Provider Scheme' (GNCTD 2023), for **accounting for all zero emission vehicles or ZEVs in urban last mile deliveries** (currently limited to registered EVs) to include primarily the registered EVs, Low Speed EVs (LSEVs) and NMT including bicycles[2]. | **Government of NCT Delhi** |
| | **URBAN LAND USE REFORMS** | |
| 20 | **Dedicated NMT-cum-LSEV lane-**<br>a. Enforce National 'Urban and Regional Development Plans Formulation and Imple mentation' (URDPFI) Guidelines (MoHUA 2015) for equitable street design in cities with dedicated NMT/cycle track or lane<br>b. Safely accommodate all NMT and LSEVs options with speed < 25 kmph by amending URDPFI Guidelines. | **Ministry of Housing and Urban Affairs (URDPFI Amendment);**<br><br>**ULBs in 131 non-attainment cities (Implementation)** |
| 21 | **Dedicated social infrastructure** such as shaded areas for rest and loading/unloading bays for gig workers and ZEVs used in ULM deliveries in commercial areas (street food hubs, shopping malls/complexes etc.) and dense demand centre or residential areas in urban areas with more than 1,000 persons per hectare (pph). | **Ministry of Housing and Urban Affairs; Urban local bodies in 131 non-attainment cities** |

[28]In a manner that commensurate investments from private sector are sought against public investments (on the lines of the Nation Highways for EVs (https://nhev.in/about-us-ev/) in upstream electric and EV charging infrastructure

[29]https://beeindia.gov.in/sites/default/files/Guidelines%20and%20Standards%20for%20EVCI%20dated%2017-09-2024_compressed.pdf

[30]https://eprbattery.cpcb.gov.in/

[31]Latest list of non-attainment cities as maintained by CPCB: https://cpcb.nic.in/uploads/Non-Attainment_Cities.pdf

## CORPORATE POLICY MEASURES

| | | |
|---|---|---|
| **22** | Delivery platforms or service aggregators in India to co-create a **common methodology for tracking and reporting ZEV adoption in ULM deliveries and its impacts** includingincluding but not limited to saved air pollution and health costs, global climate impacts, climate adaptation in local areas & social impacts on gig workers[32] . | **Online food delivery & quick commerce companies; Urban local bodies in 131 NCAP cities.** |
| **23** | **EV Mechanic Skilling & Reskilling Initiatives:** Design and deliver skilling & periodic reskilling initiatives and programmes to train new and existing mechanics on EV & ACC battery maintenance. | **EV manufacturers & concerned IoT/ Telematics companies anchored by Ministry of Skill Development & Entrepreneurship** |
| **24** | **Dedicated training & IEC modules for gig workers:** training & IEC campaigns focussed on 'Zero emission vehicles in ULM deliveries' covering but not limited to financing, technical, environmental and safety aspects related to ZEVs: EVs, LSVEs & NMTs | **EV manufacturers, delivery platforms & concerned IoT/Telematics companies anchored by Ministry of Skill Development & Entrepreneurship** |

[31] This may include pilot by platform to measure health and climate adaptation impacts in cities in collaboration with city governments and other institutions in 131 NCAP cities.

# References


1 Ather Energy. 2025. Webpage: Ather Assured Buyback. Accessed on 12 May 2025

2 https://www.atherenergy.com/ather-assured-buyback ARAI-TERI. 2018. Source Apportionment of PM2.5 and PM10 concentra-tions of Delhi NCR for Identification of Major Sourc-es. August 2018. https://www.teriin. org/sites/default/files/2018-08/Report_ SA_AQM-Delhi-NCR_0.pdf

3 Automotive Research Association of India (ARAI). 2021. Indian Emission Regulations: Limits, Test cycles, Measurement of Exhaust Emissions and calculation of fuel consumption. September 2021. https://www.araiindia.com/pdf/Indian_Emission_Regulation_Booklet.pdf

4 Central Pollution Control Board (CPCB). 2025. EPR Portal for Battery Waste Management. Accessed on 14 April 2025. https://eprbattery.cpcb.gov.in/

5 CII-Invest India. 2023. Fleet Electrification in India. April 2023. https:// sustainabledevelopment.in/wp-content/uploads/2023/07/Fleet-Electrifi-cation-in-India-Digital-Low-res_compressed.pdf

6 Chandigarh Administration. 2024. Chandigarh Administration Motor Vehicle Aggregator Draft Rules, 2024(draft). https://uncomplycate.com/wp-content/uploads/2024/08/Motor-Vehi-cle-Aggregator-Rules-2024.pdf

7 CMC-SE. 2022. Revealing the secret emissions of E-Commerce. https://clean-mobility.org/wp-content/uploads/2022/07/SRG_Last_ Mile-FINAL-3.pdf

8 Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE). Accessed on 28 March 2025. https://www.cgtmse.in/Home/VS/3

9 Flipkart - Bains & Co. 2025. Report: How India Shops Online? https://www.bain.com/insights/how-india-shops-online-2025/

10 Government of Delhi (GNCTD). 2023. Delhi Motor Vehicle Aggregator and Delivery Service Provider Scheme. November 2023. https://myfleet.delhi.gov.in/policy.pdf

11 Government of Kerela. April 2024. State Motor Vehicle Aggregator Policy. https://mvd.kerala.gov.in/sites/default/files/Downloads/SSG%20 1%202_merged.pdf

12 Greaves Finance. 2025. Webpage: evfin by Greaves Finance Limited (GFL). Accessed on 12 April 2025. https://evfin.co/

13 ICCT. 2022. A global comparison of the life-cycle greenhouse gas emissions of combustion engine and electric passenger cars. November 2022. https://theicct.org/publication/a-global-comparison-of-the-life-cycle-greenhouse-gas-emissions-of-combustion-engine-and-electric-passen-ger-cars/

14 ICCT-DieselNet. 2024. BS Emission Standards for Two- And Three-Wheeled Vehicles. https://www.transportpolicy.net/standard/india-mo-torcycles-emissions/

15 Ministry of Environment Forest and Climate Change. 2022. Battery Waste Management Rules. Battery-WasteManagementRules-2022.pdf

16 Ministry of Environment Forest and Climate Change. 2025. Battery Waste Management Amendment Rules. S.O. 958 (E). February 2025. Battery-WasteManagementRules-2025.pdf

17 Ministry of Heavy Industries-Ministry of Power. 2024a. Charging Stations for Electric Vehicles. December 2024. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2086533

18 Ministry of Heavy Industries. 2024b. Draft Guidelines for Inviting Propos-als to avail incentives under the PM E-DRIVE Scheme For deployment of EV charging infrastructure in India. December 2024. https://pmedrive.heavyindustries.gov.in/docs/policy_document/ Draft%20EVPCS%20guidelines.pdf

19 Ministry of Heavy Industries. 2024c. Operational Guidelines for PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) Scheme. Dec 2024. https://pmedrive.heavyindustries.gov.in/docs/policy_document/Opera-tioal%20Guidelines%20dt.%2030.09.2024%20for%20P%20E-DRIVE.pdf

20 Ministry of Housing and Urban Affairs (MoHUA), Government of India. 2015. Urban and Regional Development Plans Formulation and Imple-mentation (URDPFI) Guidelines. Jan 2015. https://mohua.gov.in/upload/ uploadfiles/files/URDPFI%20Guidelines%20Vol%20I(2).pdf

21 Ministry of Power, Government of India. 2024. Guidelines for Instal-lation and Operation of Electric Vehicle Charging Infrastructure (EVCI Guidelines). September 2024. https://beeindia.gov.in/sites/default/files/ Guidelines%20and%20Standards%20for%20EVCI%20dated%2017-09-2024_compressed.pdf

22 Ministry of Power, Government of India. 2025. Guidelines for Installation and Operation of Battery Swapping and Charging Stations. January 2025. https://beeindia.gov.in/sites/default/files/Battery_Swapping_Guidelines. PDF

23 Ministry of Road Transport and Highways. 2023. Amendment to Central Motor Vehicle Act: Rule (2) Subrule (u). March 2023. https://morth.nic.in/sites/default/files/notifications_document/draft%20 GSR%20180(E)%20dated%2013th%20March%202023%20Hybrid%20 ELectric%20vehicles.pdf

24 Ministry of Road Transport and Highways (MoRTH), Government of India. 2024. Government of India. Webpage: Vahan Dashboard. Accessed in December 2024. https://vahan.parivahan.gov.in/vahan4dashboard/

25 NITI Aayog. 2022a. June 2022. Policy Brief: India's Booming Gig and Platform Economy Perspectives and Recommendations on the Future of Work. https://www.niti.gov.in/sites/default/files/2023-06/Policy_Brief_In-dia%27s_Booming_Gig_and_Platform_Economy_27062022.pdf

26 NITI Aayog. 2022b. June 2022. Driving affordable financing for electric vehicles in India. https://www.niti.gov.in/sites/default/files/2023-07/ ADB-EV-Financing-Report_VS_compressed.Npdf

27 NITI-SIDBI. 2024. De-Risking Lending for a Brisk EV Uptake. March 2024. https://www.sidbi.in/head/uploads/greenpathwayseseries_documents/ green-series-de-risking-lending.pdf

28 Office of the Principal Scientific to Government of India. July 2024. eMobility R&D Roadmap https://psa.gov.in/CMS/web/sites/default/files/publication/Printing%20Updated%20eMobility%20R%26D%20Roadmap%20document_11072024.pdf

29 Prosus-Ubuntoo. 2023. Electrifying Progress: Scaling Zero Emissions Deliveries of food, grocery and parcels. https://www.prosus.com/~/media/Files/P/Prosus-CORP/our-impact-pdf/Powering-Progress-report.pdf

30 Rangaraju, S., et al., 2015. 'Impacts of electricity mix, charging profile, and driving behavior on the emissions performance of battery electric vehicles: a Belgian case study', Applied Energy 148, pp. 496-505.

31 Reserve Bank of India. Dec 2019. Priority Sector Lending – Targets and Classification. https://www.rbi.org.in/commonman/English/scripts/notification.aspx?id=2342#AS6

32 Swiggy - Bains & Co. 2024. Report: How India Eats? https://www.bain.com/insights/how-india-eats-webinar/; https://blog.swiggy.com/press-release/from-dining-trends-to-delivery-dynamics-whats-driving-indias-food-services-industry/

33 World Economic Forum (WEF).2020. The Future of the Last-mile Ecosystem. https://www3.weforum.org/docs/WEF_Future_of_the_last_mile_ecosystem.pdf

34 Ministry of Heavy Industries-Government of India. 2025. India Accelerates National EV Charging Grid under PM E-Drive. May 2025. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2130225

# Annexure 1

## List of Stakeholders Consulted for Zero Emission Deliveries

| S.N. | Industry Subsector | | Organisations |
|---|---|---|---|
| 1 | A. Vehicle manufacturers or OEMs | I | Ather Energy |
| 2 | | ii | HOP Electric |
| 3 | | iii | Jitendra New EV Tech |
| 4 | | iv | Ola Electric |
| 5 | | v | Omega Seiki Mobility |
| 6 | | vi | Virtus Motors |
| 7 | | vii | Zen Mobility |
| 8 | B. Financiers & investors | i | Prosus |
| 9 | | Ii | YES Bank |
| 10 | C. Fleet managers & leasing services | i | Alt Mobility |
| 11 | | ii | Stride Green |
| 12 | | Iii | AMU Leasing |
| 13 | | Iv | LeazeX Mobility |
| 14 | | v | Bluwheelz |
| 15 | | Vi | Yulu |
| 16 | | Vii | Elastic Run |
| 17 | | Viii | Eveez |
| 18 | | ix | Zypp Electric |
| 19 | D. Food delivery platforms or e-commerce companies | I | Bigbasket |
| 20 | | ii | Meesho |
| 21 | | iii | Swiggy |
| 22 | | Iv | Urban Company |
| 23 | | V | Zepto |
| 24 | | Vi | Zomato |
| 25 | E. EV charging & battery swapping | I | EVI Technologies |
| 26 | | Ii | Bright Blu |
| 27 | | Iii | SKS Cleantech |
| 28 | | Iv | Sun Mobility |
| 29 | F. Technology companies | I | Fabric IoT/ Intellicar |
| 30 | | ii | Chakr Innovation |

# Annexure 2

## Key features of 'Delhi Motor Vehicle Aggregator & Delivery Service Provider Scheme (GNTCD 2023)' with respect to urban last mile deliveries

1. **Licensing Compliance:** E-Commerce entities must ensure all associated fleet operators are licensed under the scheme. Licensed entities need to pay security deposit and annual fees. Security deposit ranges from INR 1,00,000 per license (for fleet size up to 1,000) to INR 10,00,000 per license (10,001 or greater fleet sizes). Licence remains valid for 5 years subject to the annual fee payment (Refer bullet point 4 here). Entities owning or operating delivery vehicles are bound by scheme provisions. Operating without license invites a fine of ₹25,000 to ₹1,00,000 and vehicles can be impounded.
2. **Vehicle Onboarding:** Mandatory valid driving license and registration certificate at onboarding. All onboarded 3-W and 4-W vehicles must have commercial registrations and adhere to Motor Vehicles Act provisions. Undeclared on boarded vehicles invite fine of ₹5,000 per instance for vehicles not registered on the portal and impounding of said vehicles.
3. **Fleet Electrification Targets for goods vehicles:** All delivery fleets must be fully electric by April 2030 as per the Table A2.1. Policy framework mentions penalties for non-compliance on EV conversion targets including- suspension of licenses and restrictions on onboarding new ICE vehicles. Stricter measures such as fines up to ₹1,00,000 and vehi cles impounding are proposed if targets are not met as stipulated after April 2030.

**Tabel A2.1**
Fleet Electrification Targets in Delhi NCT

| Stipulated Deadline | EV Adoption Target: New fleet for transporting goods | |
|---|---|---|
| | Two & three-Wheelers | Four wheelers |
| April 24 | 10% | 5% |
| October 24 | 25% | 15% |
| October 25 | 50% | 25% |
| October 26 | 75% | 50% |
| October 27 | 100% | 75% |
| October 28 | 100% | 100% |

4. **Annual Fees:** Yearly fees are proposed based on fuel composition of the declared fleet over the portal e.g. INR 50 per petrol two-wheeler per year, while electric vehicles are exempt from annual fee. Table A2.1 provides more details of this. Mid-year onboarded vehicles would require pro-rata fees unless wallet has enough credits, while same applies to off-boarded vehicles leading to pro-rata reversal of any remaining credits to the licensee's wallet.

**Tabel A2.1**
Fleet Electrification Targets in Delhi NCT

| Vehicle Segment | Fuel type | | |
|---|---|---|---|
| | Electric | CNG | Petrol |
| | [INR per vehicle in a year] | | |
| Two-Wheeler | ₹0 | ... | ₹50 |
| 3W Passenger | ₹0 | ₹80 | ... |
| 3W Light Commercial | ₹0 | ₹100 | ₹200 |
| 4W Passenger (M1) | ₹0 | ₹120 | ₹150 |
| 4W Carrier (N1) | ₹0 | ₹150 | ₹200 |

**Note:**

1. ICEV Vehicles less than 2 years old accrue 50% of annual fee mentioned above
2. Pro-rata calculation of fee on basis of the onboarding month

# Annexure 3

## Regulatory framework in India for EV-specific battery waste management

**Tabel A2.1**

Fleet Electrification Targets in Delhi NCT

| EV Segment | Base Year for Targets | First Compliance Year | Collection Target in Each Consecutive Compliance Year | Compliance Period for 100% Collection & Refurbishment/ Recycling[1] | Recovery Targets[3,4] | Remanufacturing Targets[1,5] |
|---|---|---|---|---|---|---|
| **2W** | 2022–23 | 2026–27 | 70% | 7 years | **2024–25: 70%** | **5% by 2027–28** |
| **3W** | 2021–22 | 2026–27 | 70% | 7 years | **2025–26: 80%** | **10% by 2028–29** |
| **4W** | 2021–22 | 2029–30 | 70% | 14 years | **2026–27 & onwards 90%** | **15% by 2029–30, onwards 90%**<br>**20% by 2030–31** |

**Note:**

1. Collection target (for producers) framed as the minimum percentage of battery placed in market (dry battery weight).
2. Rules also stipulate 60% carry forward (on average battery quantity placed in the market per year) from one compliance cycle (7 years for 2-3 EWs and 14 years E4Ws) to the next.
3. Recovery targets (for recyclers) and remanufacturing targets (for OEMs/battery manufacturers) are same across EV segments.
4. Minimum percentage for recovery of materials (by recyclers) from collected batteries.
5. Minimum use of the domestically recycled materials out of total dry weight of a battery from OEM/battery manufacturer.

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