

# **Will electric 3-wheelers be the norm in India?**

Mobility LU Presentation | IIT BHU Chapter





## Executive summary

- **Electric three-wheelers are set to be the norm in India, having experienced a steep rise with favorable policies over the years.**
- **The Government will invest about ₹10000 crore over the next four years to tap into this opportunity of growth and create added incentive for local manufacturers.**
- **The battery swapping market is expected to rise at over 30% CAGR and battery prices will go down 50% over the next 6 years.**
- **The proposed EVaaS model will rise in the Indian setup and key players should look to acquire end-to-end ownership of their model ecosystem.**
- **With surveys and expert analysis indicating this model to thrive, the EV three-wheeler segment will flourish in India in the coming years.**



# There is a huge growth opportunity for electric three wheelers in India

## Market dynamics of Indian electric vehicles industry

### Drivers

- Favorable government policies and subsidies.
- Heavy investment by automakers in EV technology.
- Growing concerns about environment pollution.
- Increased vehicle range per charge.

### Restraints

- Lack of standardization of charging regulations for EVs.
- Growing concern over the disposal of drained EV batteries.

### Opportunities

- Use of battery swapping mechanism for electric three wheelers.
- Electric vehicles as a service model moving forward.
- Owning the end-to-end model to drive growth.

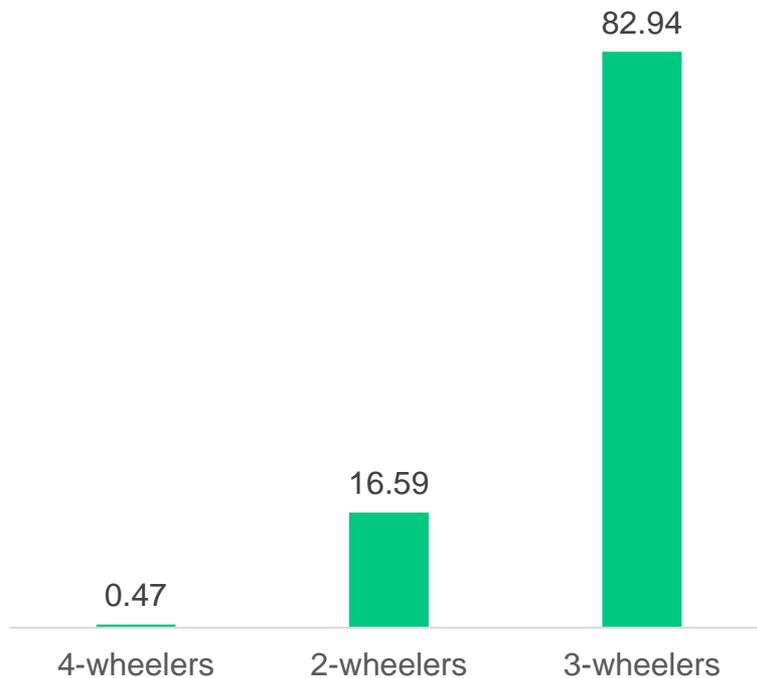
### Main Benefits

- Lowered costs due to battery swapping mechanism.
- Complete control of the ecosystem to avoid hassles.
- More efficient last-mile connectivity.

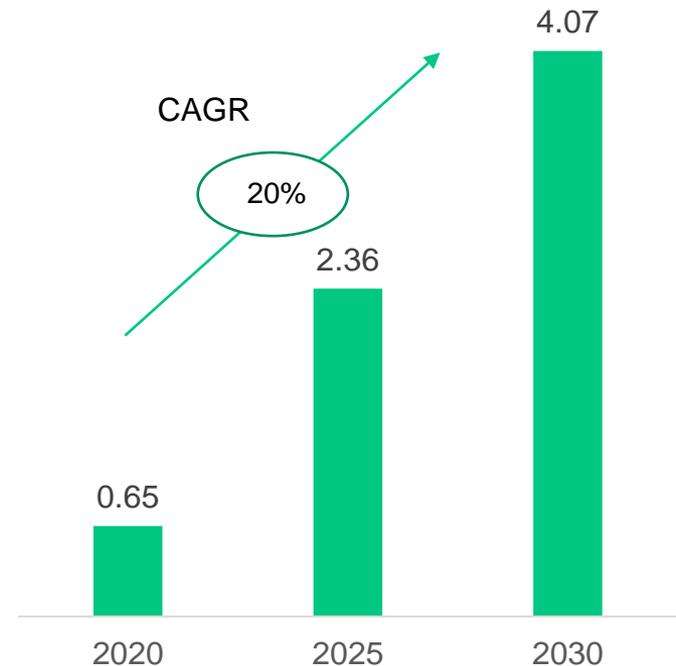
# Electric 3-wheelers capture a huge share of the Indian EV market and continue to grow at a steep rate.

## 3-wheeler EV growth and market share in India

Market Share of EVs (FY 2019) in India (%)

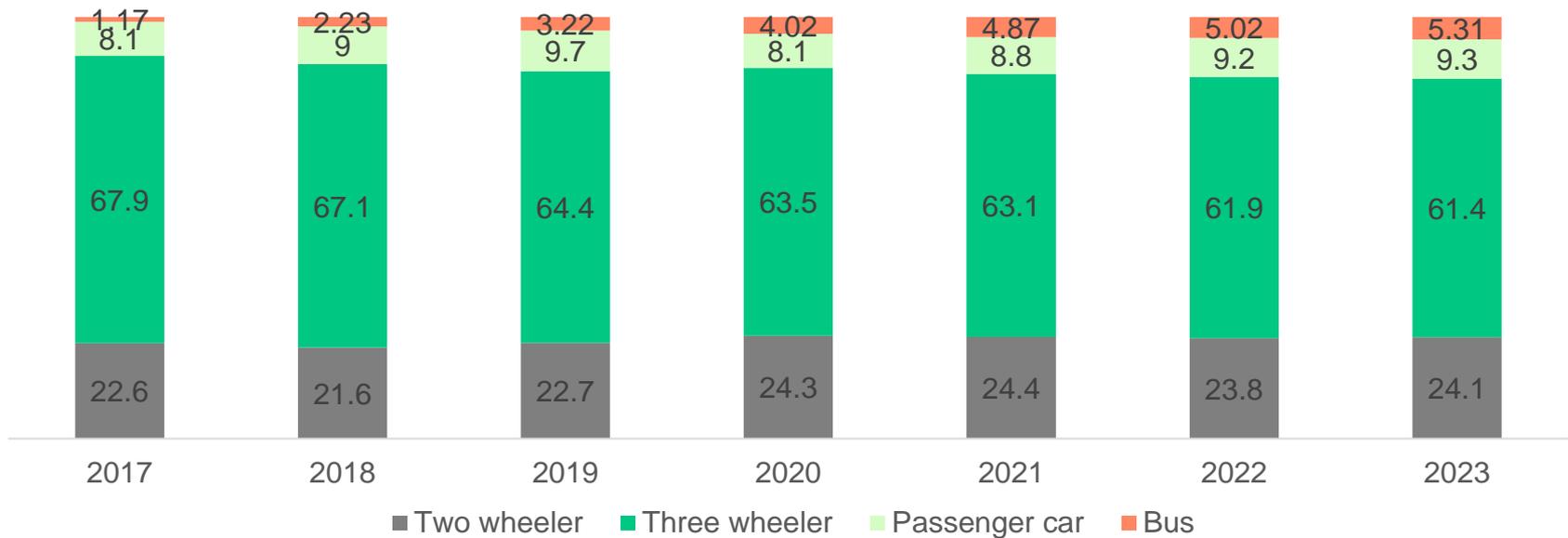


3-wheeler EV units across India (millions)



# Electric three-wheelers hold a majority volume percentage in the Indian electric vehicles market

Composition of the electric vehicle market in India  
(volume %)



*“The primary goal is to improve Delhi’s air quality by bringing down emissions from the transport sector. To do so, this policy will seek to drive rapid adoption of Battery Electric Vehicles (BEVs) such that they contribute to 25% of all new vehicle registrations by 2024.”*

- Delhi Electric Vehicle Policy 2019



# The Government has introduced a major outlay of ₹10,000 crore under Phase-2 of FAME between 2019 and 2022, which is over a 10-fold increase from Phase-1

## Faster Adoption and Manufacture of Electric Vehicles (FAME) in India (Phase-2)

### Outlay and Target

- Government has announced an outlay of ₹10,000 crore for Phase-2 of the FAME scheme.
- Target is to boost electric mobility and increase the number of electric vehicles in commercial fleets

### Projected Vehicle Count

- Government will incentivize purchase of **500,000 three-wheelers** with an outlay of ₹2,500 crore, with added incentives for manufacturers.
- The purchase of 7,090 electric buses with an outlay of ₹3,545 crore, 20,000 hybrids with ₹26 crore, and 35,000 four-wheelers with ₹525 crore will also be supported.

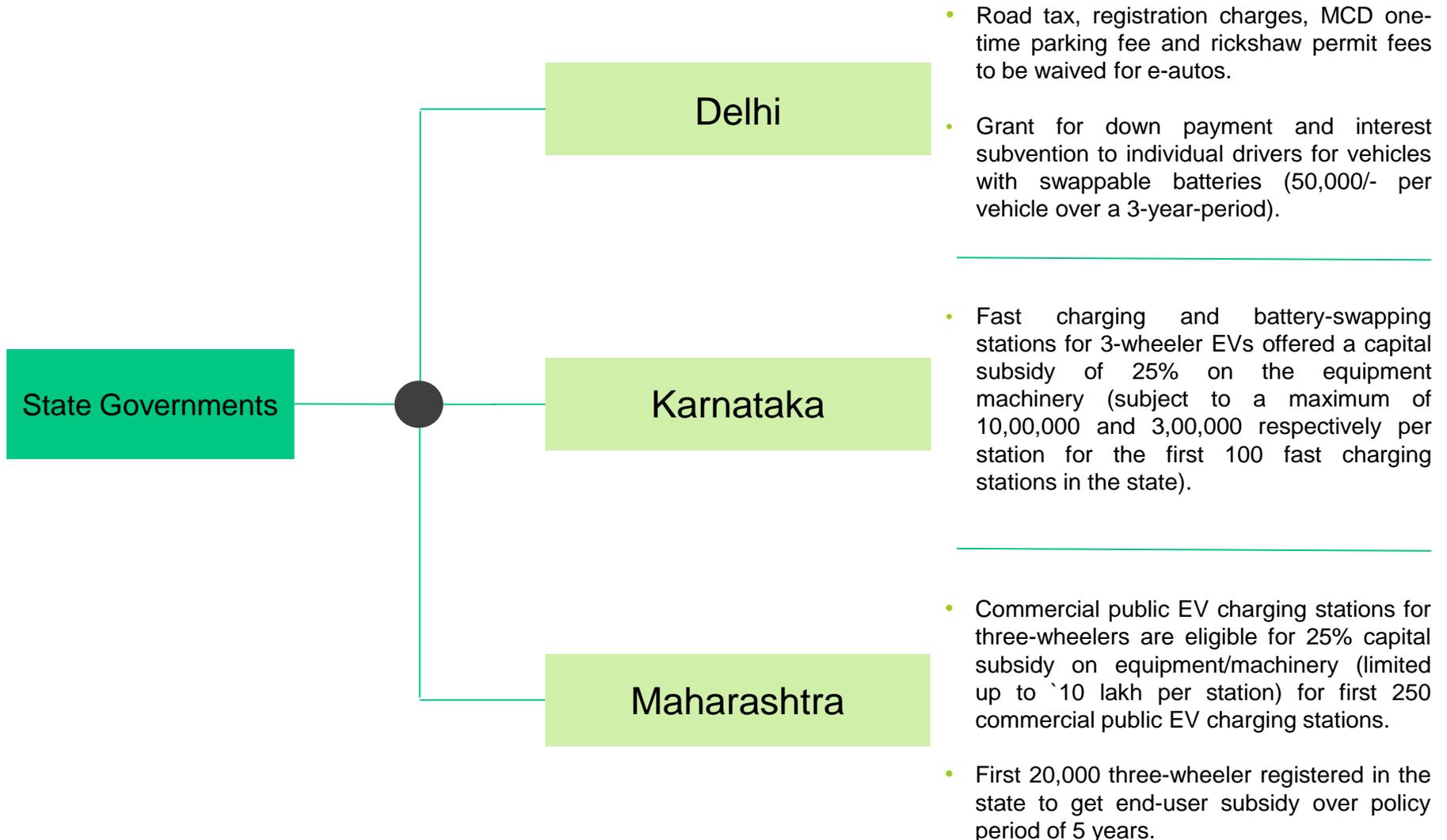
### Battery-Specific Incentives

- An incentive of ₹10,000 per kilowatt (kW) for two-, three- and four-wheelers, based on the size of their batteries, is planned.

### Tax Sops

- EVs will be placed in a GST slab of 5% as compared to the 12% slab for ICE vehicles.
- The GST on Li-ion batteries has been lowered from 28% to 18%.

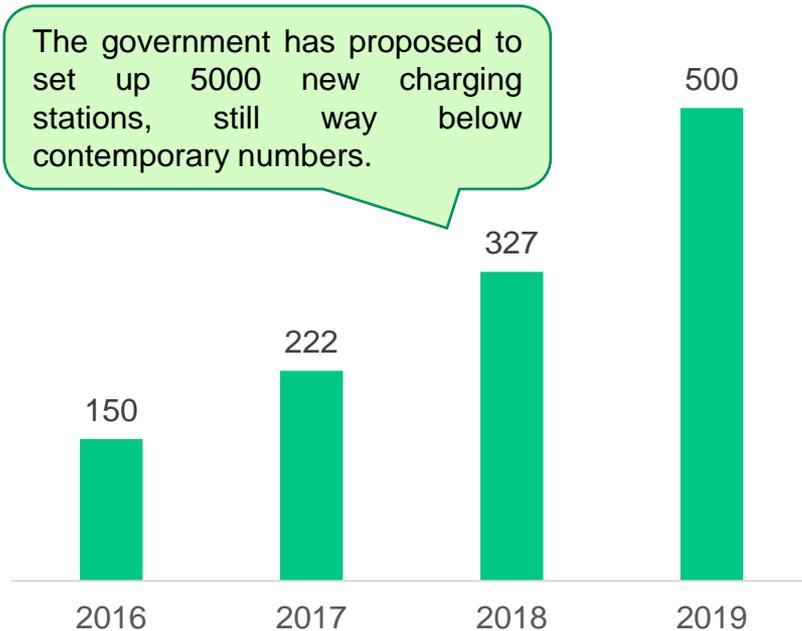
# State governments are enabling the transition to 3-wheeler EVs in India



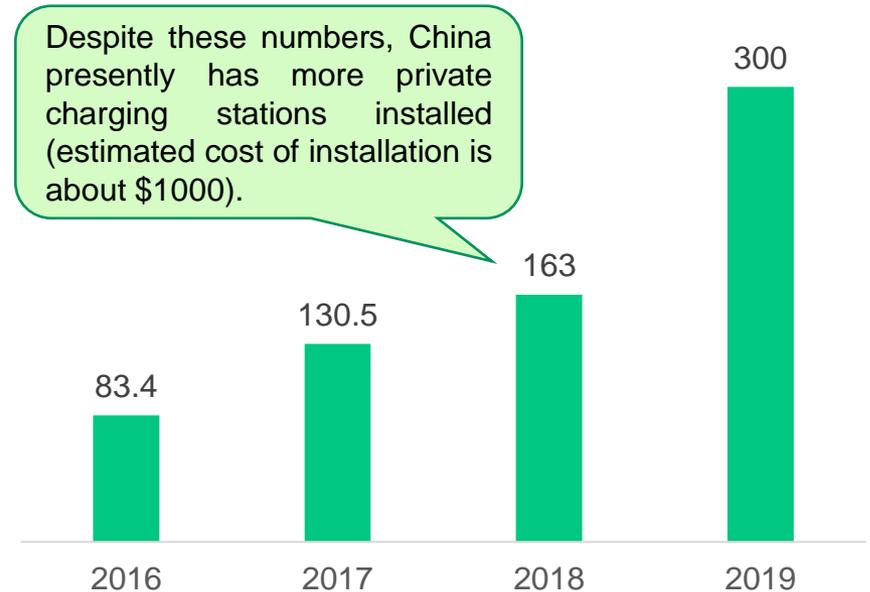
# Despite of the government's efforts to set up public charging infrastructure, the numbers continue to be far below the mark

## Public charging infrastructure for electric vehicles across India and China

# public chargers in India



# public chargers in China (thousands)

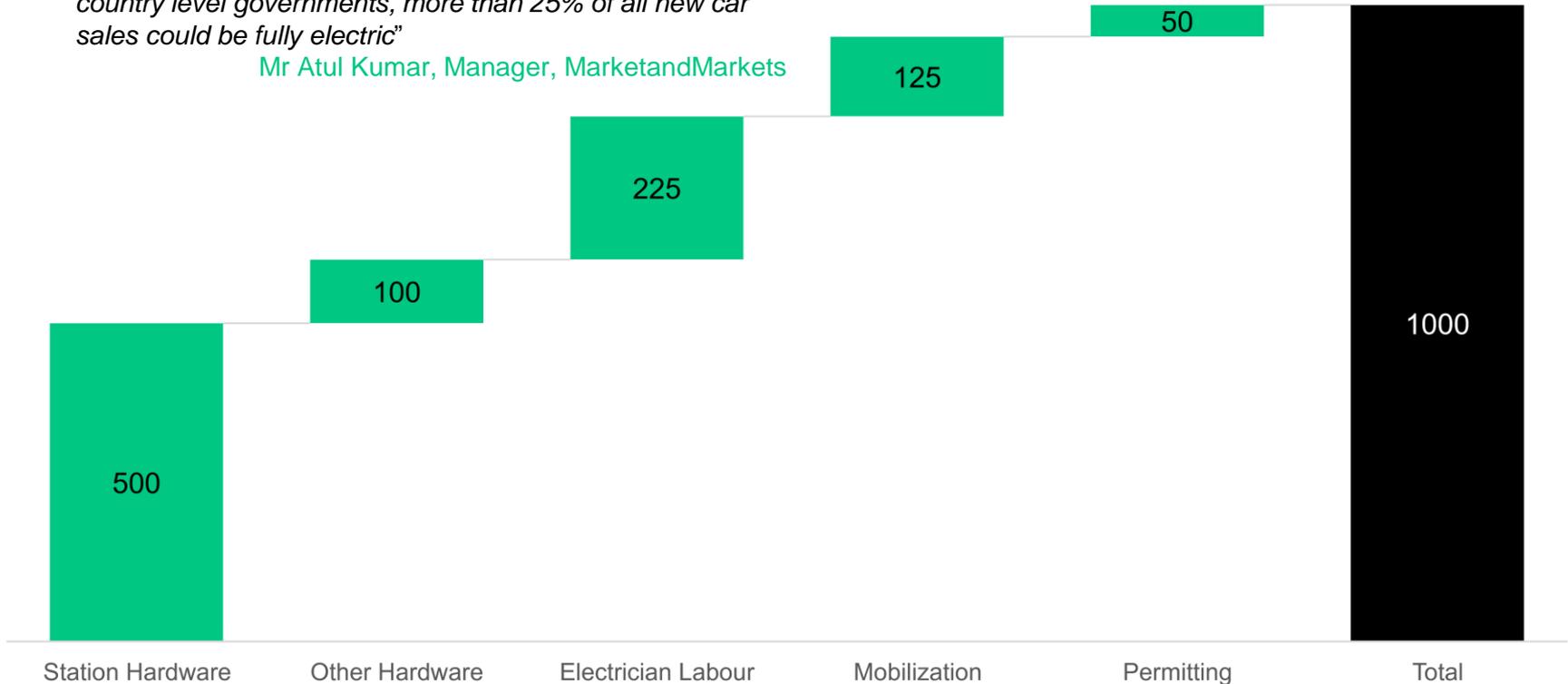


# Due to lack of standardized charging costs at public stations, setting up private charging stations will be considered

## Estimated average costs in setting up a private charging station (\$)

*“Going by the existing trend of falling battery prices, improving charging infrastructure and support from the country level governments, more than 25% of all new car sales could be fully electric”*

Mr Atul Kumar, Manager, MarketandMarkets





# Battery swapping technology is recommended for electric three-wheelers

## Battery Swapping Stations

## Public Charging Pumps

### Time of Process

- A few minutes

- Even fast charging takes over 30 mins.

### Infrastructure

- Partner with small stores to sell these.

- Heavy investments on public infrastructure.

### Charging Process

- EV owners perform the change themselves.

- Automated machinery for charging.

### Battery Longevity

- Greater battery life (helps sustain longer).

- Battery is drained faster.

### Cost of Vehicle

- Much lesser since batteries are replaced.

- Much higher due to permanent battery installation.

### Govt. Policy

- Lacks a standard policy.

- Government is establishing norms to promote this.

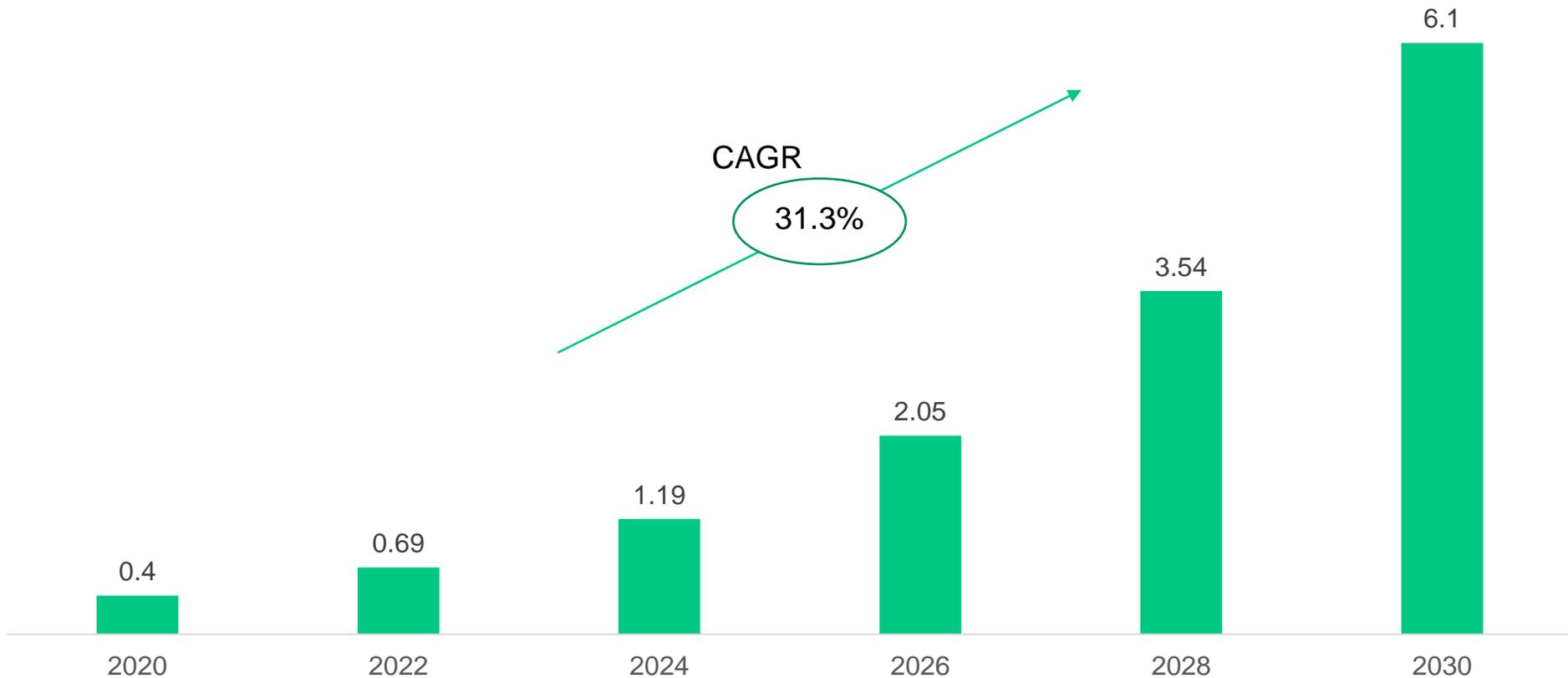
### Ecosystem

- Vehicle manufacturers can control the entire ecosystem by owning the batteries.

- Huge investments required to establish stations in multiple places.

# The battery swapping system has shown substantial rise in India

Battery Swapping Market Size in India  
(million \$)

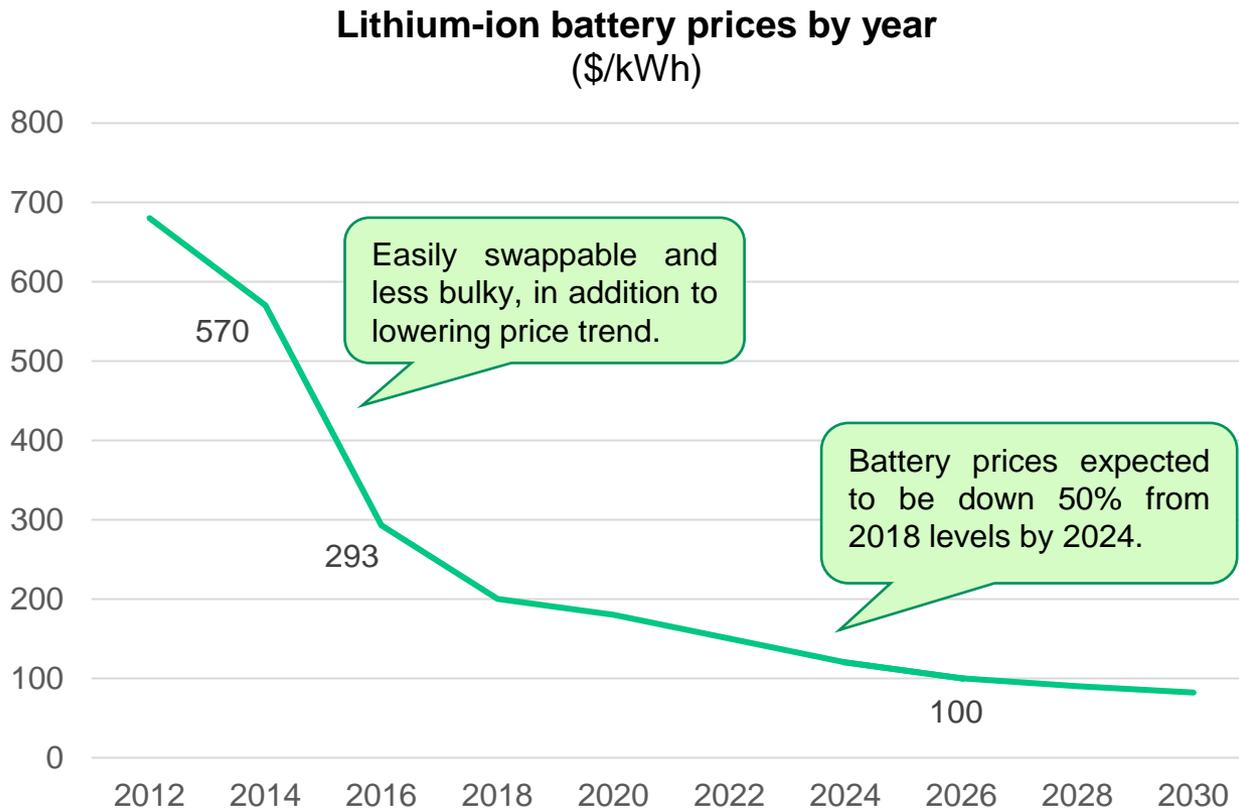


# The market is making a transition from traditional Sealed Lead-Acid batteries to Li-ion batteries.

	SLA Battery	Li-ion Battery
<b>Current Scenario</b>	<ul style="list-style-type: none"><li>• Majority of three-wheeler EVs use it.</li></ul>	<ul style="list-style-type: none"><li>• Only a few market players have used it.</li></ul>
<b>Durability</b>	<ul style="list-style-type: none"><li>• Provides 300 charging cycles, only 6-8 months.</li></ul>	<ul style="list-style-type: none"><li>• Provides 1500 Charging Cycles, 3-5 years.</li></ul>
<b>Environmental Impact</b>	<ul style="list-style-type: none"><li>• Frequent replacement produces toxic waste.</li></ul>	<ul style="list-style-type: none"><li>• Due to longer life, produces less &amp; harmless waste.</li></ul>
<b>Cost of Battery</b>	<ul style="list-style-type: none"><li>• Very Cheap but inefficient.</li></ul>	<ul style="list-style-type: none"><li>• Expensive due to limited supply but efficient.</li></ul>
<b>Availability</b>	<ul style="list-style-type: none"><li>• Imported from China.</li></ul>	<ul style="list-style-type: none"><li>• Imported from China &amp; Malaysia.</li></ul>
<b>Charging time</b>	<ul style="list-style-type: none"><li>• Takes 8-10 hours to charge</li></ul>	<ul style="list-style-type: none"><li>• Takes only 1.5-3 hrs. with low self-discharge</li></ul>
<b>Scalability</b>	<ul style="list-style-type: none"><li>• Heavy(120kg), Unsafe &amp; Fixed in the Vehicle</li></ul>	<ul style="list-style-type: none"><li>• Light(35 kg) , Safe &amp; Swappable easily.</li></ul>

*“The demand for lithium batteries in e-rickshaws is slowly and gradually going up and we expect that it would be 50 per cent of the market size by 2024.” - VK Kapoor, CMD Saera Electric Pvt.Ltd.*

# Low Lithium-ion prices are expected to drive the growth of electric three-wheelers in India





# Electric Vehicles as a Service (EVaaS) offer an effective business opportunity for three-wheeler EVs

## Goal

- To solve the issue of last mile public transport in a sustainable way.
- Dissociation of users from asset liability and transitioning to a service-based model.

## Model Objectives

- Changing societal values: decrease in the cultural value placed on vehicle ownership.
- Changing effectiveness of privately-owned car transportation: tackling congested transport systems while shifting away from the specific comfort of one's "own" vehicle.
- In the EVaaS model, users will lease the three-wheeler EVs on a short-term basis.
- Battery-swap mechanism will be incorporated at Kirana stores and small-business stores.
- Complete oversight of the battery, vehicles and recharging process.

## Proof of Concept

- Bounce, an electric two-wheeler company, used a lease-based model for its fleet of electric two wheelers.
- Milestone: 60,000 rides per day at 7-8 kms per ride with around 7,000 dock less scooters.
- Rides offered at cheap rates (Rs 5/- per km approx.) through the EVaaS model.

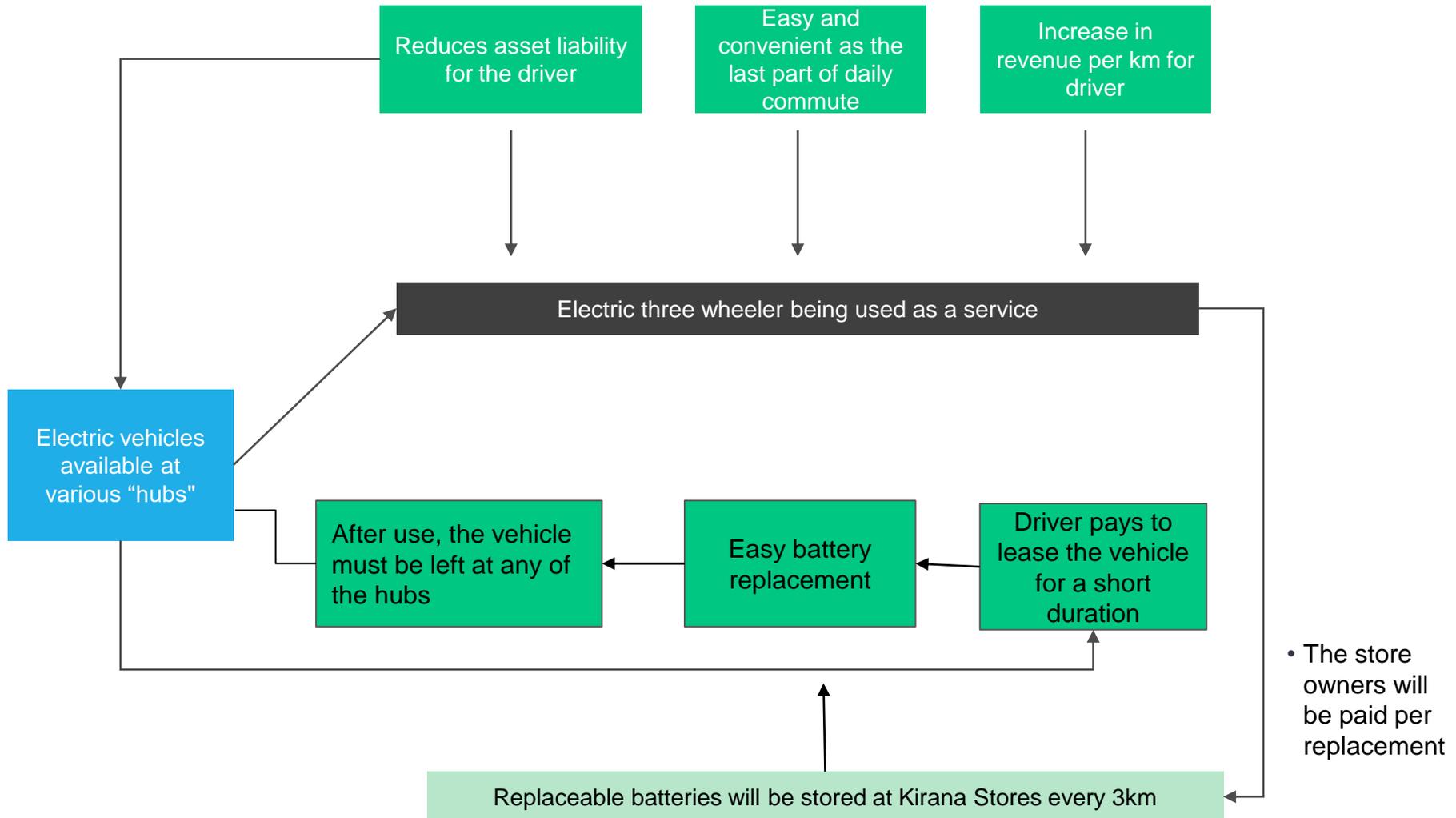
# Bounce is transitioning to the EV segment and its pilot operations indicate a great business scope under EVaaS model

<b>Name</b>	<b>Bounce</b>
<b>Founders</b>	<ul style="list-style-type: none"><li>• Vivekananda Hallekere, Varun Agni, and Anil G in 2014.</li></ul>
<b>Business</b>	<ul style="list-style-type: none"><li>• Low-cost, dock-less scooter rental model.</li><li>• Presently transitioning to a step-through model of EVs.</li></ul>
<b>Major Investors</b>	<ul style="list-style-type: none"><li>• Raised around \$200 million till date.</li><li>• Sequoia Capital, InnoVen Capital, Accel Partners India, Chiratae Partners, Omidyar Network, Vistra ITCL, SCI Investments, and Qualcomm Ventures.</li></ul>
<b>Key Features</b> (IoT and Hardware)	<ul style="list-style-type: none"><li>• Self-controlled fleet of vehicles and end-to-end ownership.</li><li>• In-house design and IP-management (later production).</li><li>• A supply-chain to obtain Li-ion batteries, later own them.</li><li>• Swapping takes place in kirana stores.</li><li>• IoT gadgetry for complete control and oversight.</li><li>• End-to-end model pilot results: Rs 2.5-3 saved on operational costs per ride (3X of petrol scooters).</li></ul>



3-wheeler EVs can adopt a similar EVaaS model with swappable batteries.

# Overview of the EVaaS model ecosystem





## The Indian electric-rickshaw market is currently dominated by small, unorganized local players, who registered around 85.0% of the total e-rickshaw sales in 2018

- Unorganised players sell 10,000 e-rickshaws a month against about 1,500 to 2,000 a month for organised players.
- Kinetic Green Energy and BPCL have partnered to erect battery swapping stations at its 1200 gas stations across the country.
- Mahindra & Mahindra has teamed up with SmartE and Ola Electric Mobility to build a market for premium e-rickshaws that run on swappable lithium-ion batteries.
- Omega Seiki, an electric cargo maker, has also created an app to capture data through telematics and cloud computing on vehicle positioning, running and mileage data, best route tracking.
- Noida-based Pace Electric Vehicles and Kalinga Ventures will provide Amazon India with fleet of electric cargos.

# Brands are using different ways of manufacturing for reducing TCO of the e-rickshaws.

## Brands

## Features

### CKD Units, imported from China

1. Unorganised Local Players
2. Terra Motion India Corp.

- Costs 60% cheaper than branded e-rickshaws.
- E-rickshaws assembled from these kits are not upto the standards set by the Govt.
- Only 15% custom duty is levied on imports of CKD Units.
- It costs around INR 40,000 - 60,000.

### System Integration (>70% localisation)

1. AltiGreen Propulsion Labs
2. Gayam Motor Works
3. Mahindra & Mahindra
4. Saarthi

- India offers complete duty exemption on import of core electric drive-train technology of batteries, motors & controllers from China.
- Helps in reducing the TCO, as it comes under FAME-2 scheme.
- It costs around INR 80,000-1.5 Lakhs.

### Scaled Manufacturing (>90% localisation)

1. Kinetic Green Solutions
2. Saera Electric Pvt. Ltd
3. OkPlay
4. Lohia Autos
5. Omega Seiki

- Comes under 'Make in India' initiative.
- Diverse products as per the Indian market needs like E-garbage collector, E-shop rickshaws, etc.
- It costs higher, around INR 1 lakh-3 lakhs.

Note: 1. CKD - Complete Knock-Down (CKD), a kit of the completely non-assembled parts of a product.  
2. TCO - Total Cost of Ownership.

# Expert Opinions – Breakthroughs in India’s EV Mission 2030

**Angshuman Ghosh -  
Sr. Director Analytics,  
Grab**

“Battery swapping is the way to push EV in India. The concept of EVaaS will aid in market penetration. Grab is already experimenting this idea with two wheelers in Singapore.”



**Anirudh Damani -  
Partner of Damani  
Venture Funds**

“3-wheelers is an interesting way to push EVs in India. Exploring and leveraging Ola/Uber's directive of making 40% of their fleet electric by 2025 would be a smart call at this stage.”



**Mohan Satyaranjan -  
CTO, battery swap  
startup**

“Looking forward to EVaaS. 3 wheelers are a good starting point since most of them can be standardized. However, in both battery swapping and EVaaS, careful unit economics will be a critical factor.”

