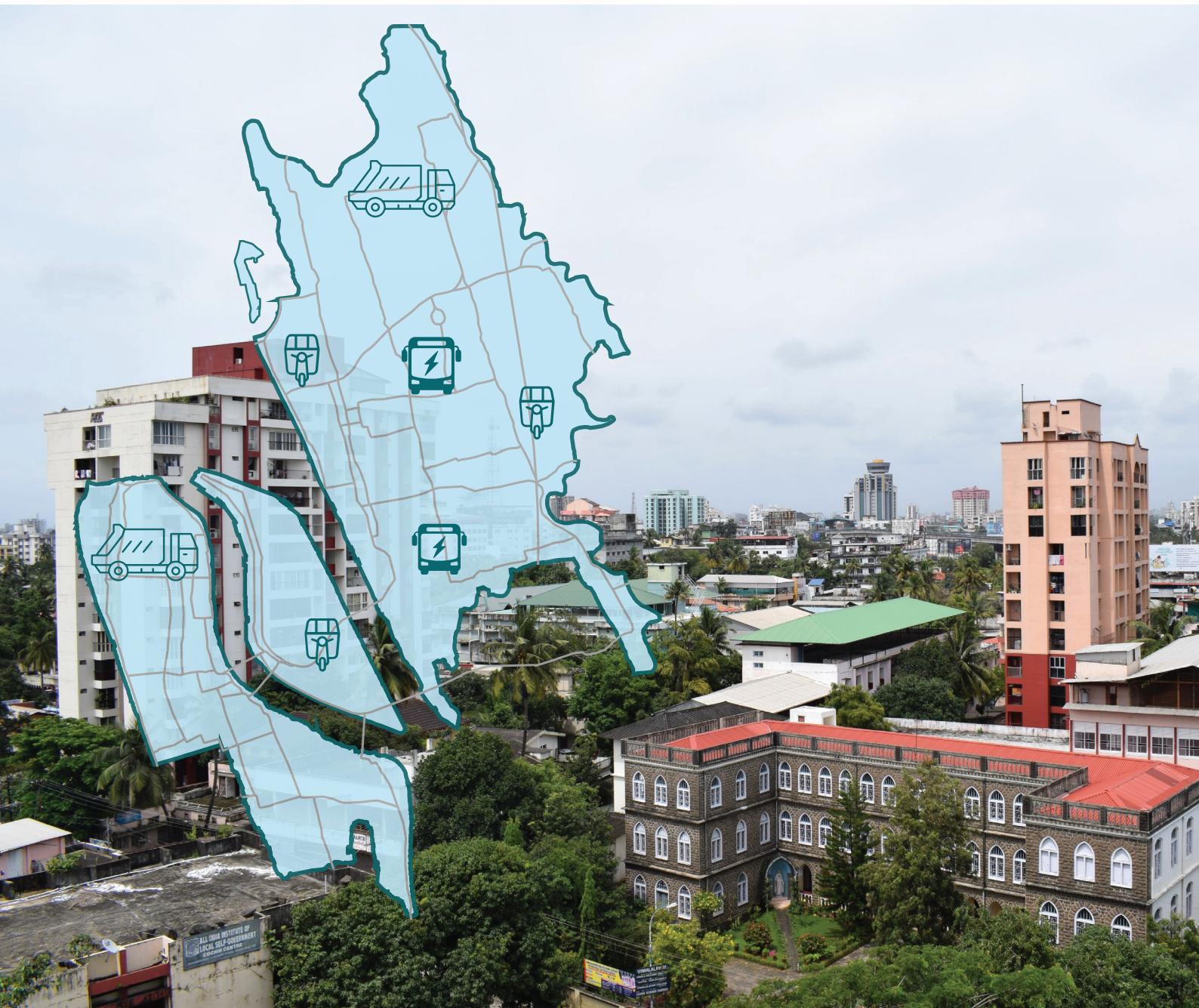




# E-Mobility City Action Plan

## Kochi City



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**Acknowledgement:** ICLEI South Asia would like to express its sincere gratitude to the officials from Kochi Municipal Corporation (RMC), Kochi Metropolitan Transport Authority (KMTA), KSEB, RTO Kochi, KSBL, Builders Association and OEMs in Kochi for their insights and guidance. The inputs from the Advisory Group members were crucial in finalizing the document.

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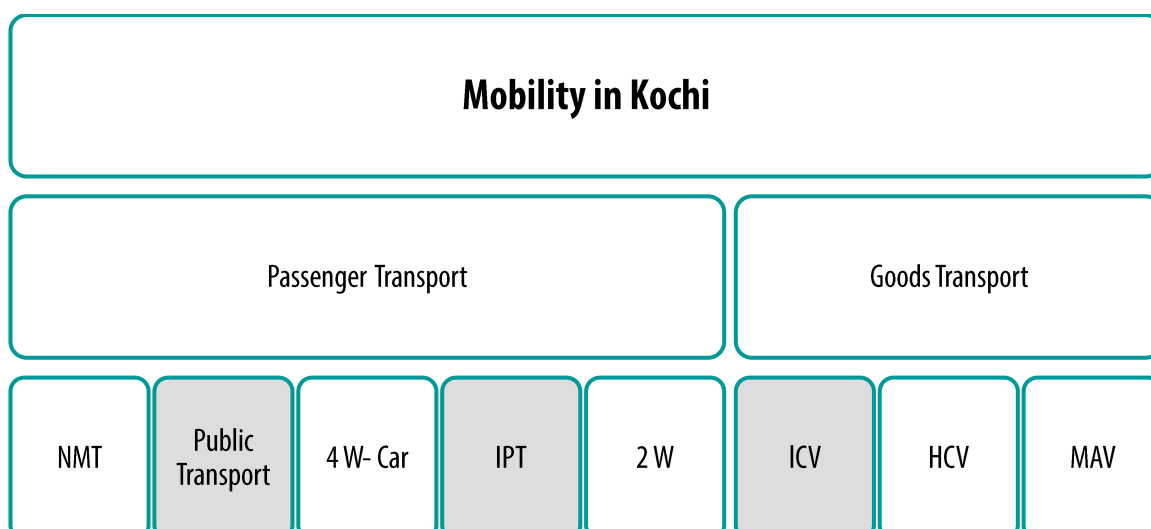
# 1 Background

Electric Mobility revolution is gaining momentum in Indian cities and is being promoted by the central government through various incentives to reduce the country's reliance on fossil fuels and reduce Greenhouse Gas (GHG) emissions from the transport sector. Indian cities are also aiming to integrate sustainable and low emission alternatives in urban transport. But long-term actions are required for mass adoption of e-mobility in Indian cities. ICLEI South Asia embarked an initiative to "Support Indian Cities in Taking Leadership on Electric Vehicles (EV)" to aid the cities to identify priority interventions and take necessary steps towards accelerated transition to EVs. This initiative included several interactions and discussions with the city stakeholders during visits to 10 project cities - Coimbatore, Gangtok, Kochi, Lakshadweep, Meerut, Nagpur, Panaji, Rajkot, Shimla and Surat. Consultations with the major stakeholders impacting EV transition in cities included advisory groups, industry experts including the advocacy group, charging infrastructure developers, vehicle technology/OEMs and financial institutions. As a part of the initiative, ICLEI South Asia team visited Kochi on 20th – 21st July, 2022 to interact with the stakeholders and understand the existing EV transition situation in the city, challenges, opportunities and further suggest a way forward.

# 2 Snapshot of Mobility in Kochi

Kochi earlier known as Cochin is a major port city on the west coast of India and commercial capital of Kerala. The city is part of the district of Ernakulam, and is thus often also called by the name of Ernakulam, which refers to the mainland part of the city. The city of Kochi, with its population of 6.01 lakhs, is the most densely populated city in the state and is part of an extended metropolitan region with a population of 2.1 million, the largest urban agglomeration in Kerala. The civic body that governs the city is the Kochi Municipal Corporation (KMC), which was constituted in the year 1967, and the statutory bodies that oversee its development are the Greater Cochin Development Authority (GCDA) and the Goshree Islands Development Authority (GIDA). In 2011, Kochi Municipal Corporation had a population of 6.4 lakh in 94.86 sq.km of area, KCR had 12.23 lakh in 369.72 sq.km area and GCDA had 20.01 lakh in 632 sq.km. In the last decade all the administrative areas have observed a rise in population by ~8.6%.

Being a port city, many of the economic activities in Kochi are linked with the port. Kochi is the gateway through which more than 80% of the hill products of Kerala is exported to other nations. Major industries like Fertilisers and Chemicals Travancore (FACT), Travancore Cochin Chemicals (TCC), Hindustan Machine Tools (HMT), Apollo Tyres etc are in Kochi Planning Area. During the year 2015-16, Gross State Value Added by Ernakulam district was 6,811,53.2 Million INR, registering a growth rate of 12.73 per cent over the year. It also contributes to 12.7 per cent of GDP of Kerala.



## 2.1 Passenger Transport

Kochi is historically a water-based city which has grown along with its water network. However, currently city is experiencing increased dependency on private motor vehicles for personal trips, leading to increased vehicular congestion and emissions. As per the Kochi CMP made in 2017, UA experienced 2107218 daily trips with per capita trip rate at 1.04, average trip length at 10.8 Kms and average speed at 23 Kmph. The graph below represents the modal share in the region.

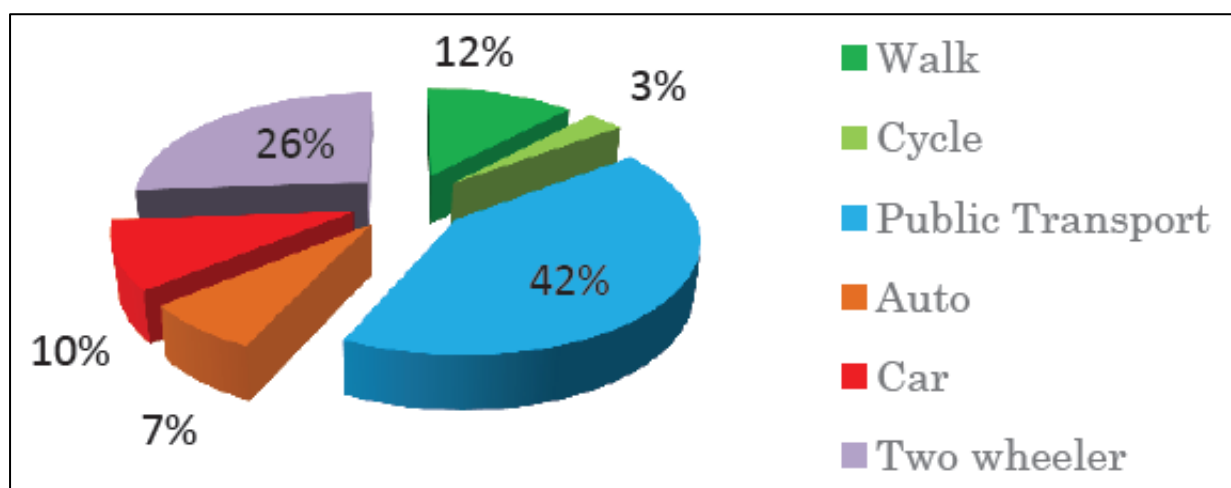


Figure 1: Mode Share in Kochi

## 2.2 Freight Transport

Although majority of planners are concerned with passenger mobility, little consideration has been given to urban freight transport. Kochi is one of the major ports in India with considerable goods movements. Container as well as other goods movement mainly happens in three directions, through 17 and Northeast to NH 47. All these needs include the freight movement through the inner city.

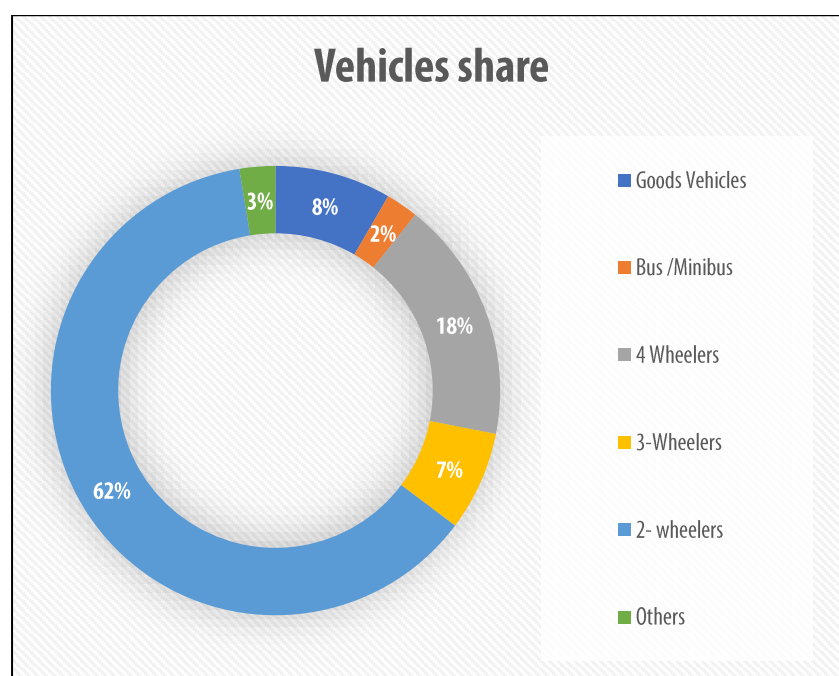


Figure 2: Traffic share in Kochi

As per the baseline formulated by Kochi Municipal Corporation under EcoLogistics initiative, it was observed that almost 25 % of traffic entering from Trissur constituted of commercial vehicles used for goods transport. When converted into PCU, the share would



be considerable high. On average the mode share of freight vehicles in entire Kochi is 14%. However, the share when converted into PCU comes around 35%. Further, in goods vehicle segregation LCVs accounted for 42.7% of the total goods vehicles.

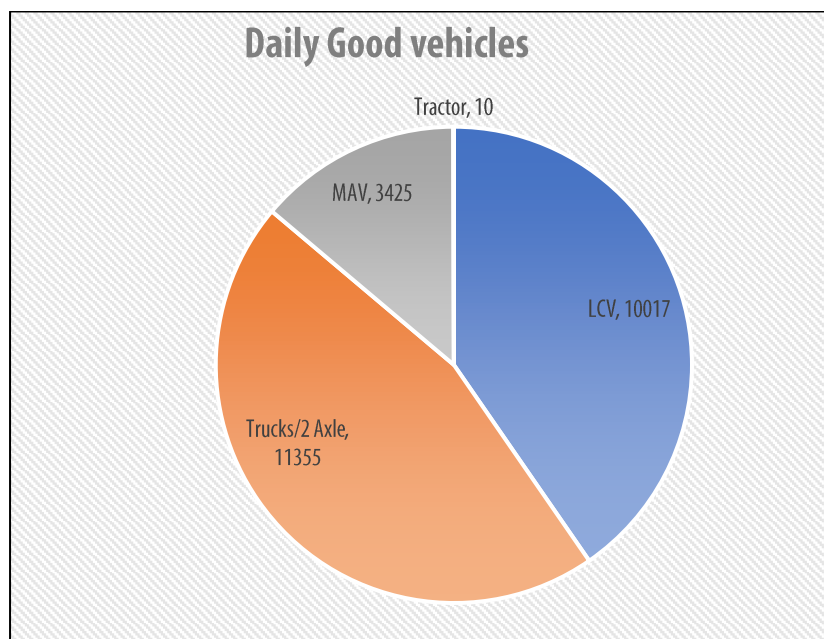


Figure 3: Freight vehicles sales

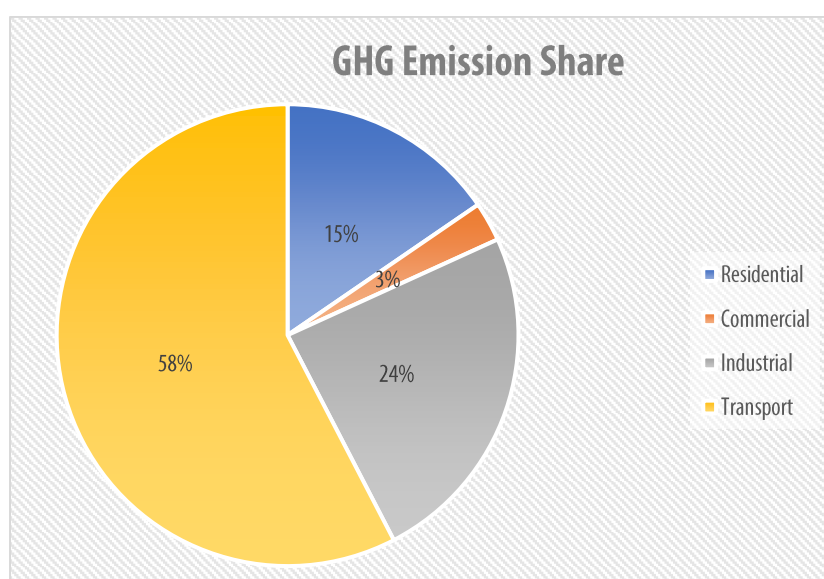


Figure 4: GHG Emission in Kochi

## 2.3 GHG emissions profile

As per the Solar City Master Plan for Kochi, the GHG emissions inventory was prepared in accordance with the approved principles and standards of the Global Protocol for Community-Scale Greenhouse Gas Emissions (GPC). During the year 2012-13, total emission was found to be 508400 tonnes of CO<sub>2</sub>e with transport sector contributing massive 58 per cent of it. Total Emission from the transport sector in 2012-13 was found at 2929300 tonnes of CO<sub>2</sub>e.

## 3 Situation Analysis

### 3.1 Policy Framework to Promote E-Mobility in Kochi

Kochi comes under purview of Kerala E-Mobility Policy launched in 2019. The EV Policy launched by state government in 2019 act as foundation for promotion of E-Mobility in Kochi. The policy brings focus on E-mobility as an opportunity to support the national commitment to reduce GHG emissions. It also envisages to promote E-Mobility to improve the air qualities in urban areas, promote shared mobility and clean transportation along with improved operational efficiency of public transport fleet. Few of the highlights are listed below

- Electric vehicles expo, e-mobility zones (pilot in tourist spots)
- Target - about 1million EVs on road by 2022 and 3000 buses, 2 lakh two-wheelers, 50000 three-wheelers, 1000 goods carriers, and 100 ferry boats by 2020.
- Incentives to setup charging station in existing buildings and all new buildings with more than 10 equivalent car space (ECS) to have 20% EV ready spots with conduits installed
- Electric vehicles expo, e-mobility zones (pilot in tourist spots) and fiscal and non-fiscal incentives to encourage users to transition to EVs.
- Capacity building and re-skilling through development of training centres, including EVs and autonomous vehicles (AVs) in curriculum, skilling programs and testing AVs in mobility corridor.
- Time of the Day (ToD) tariff will be made applicable for all Public Charging Stations (PCS), Bulk Charging Stations (BCS) and all charging infrastructures having Connected Load / Contract Demand above a specific limit.
- E-mobility State Level Task Force' set up by the state government to initiate, develop and sustain e-mobility in the state

### 3.2 Timeline of E-Mobility milestones in Kochi

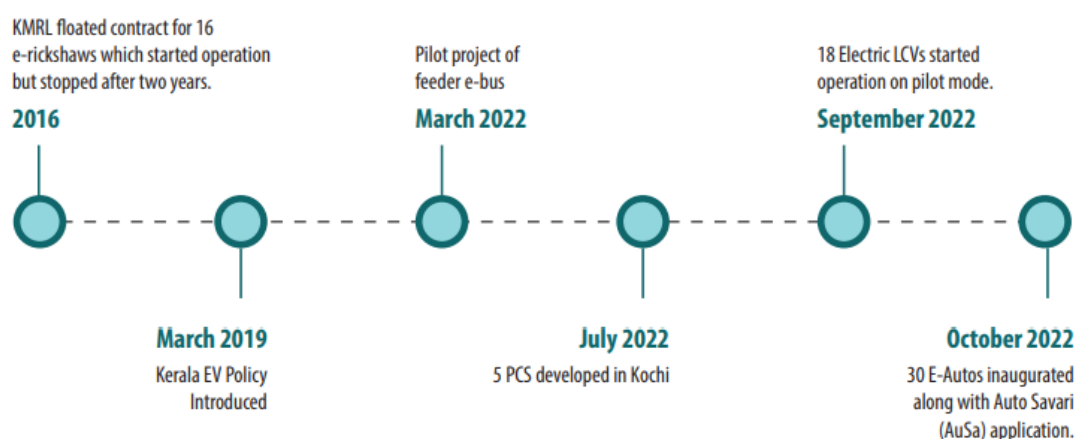


Figure 5: E-mobility milestones in Kochi

### 3.3 Electric vehicle ownership

As per the data accessed from Vahan Dashboard, the sales of Electric vehicles are increasing in Kochi. The share of EV's in new registration has been increased from less than 0.1 per cent in 2019 to over 6.7 percent in year 2022. The graph below represents the details.

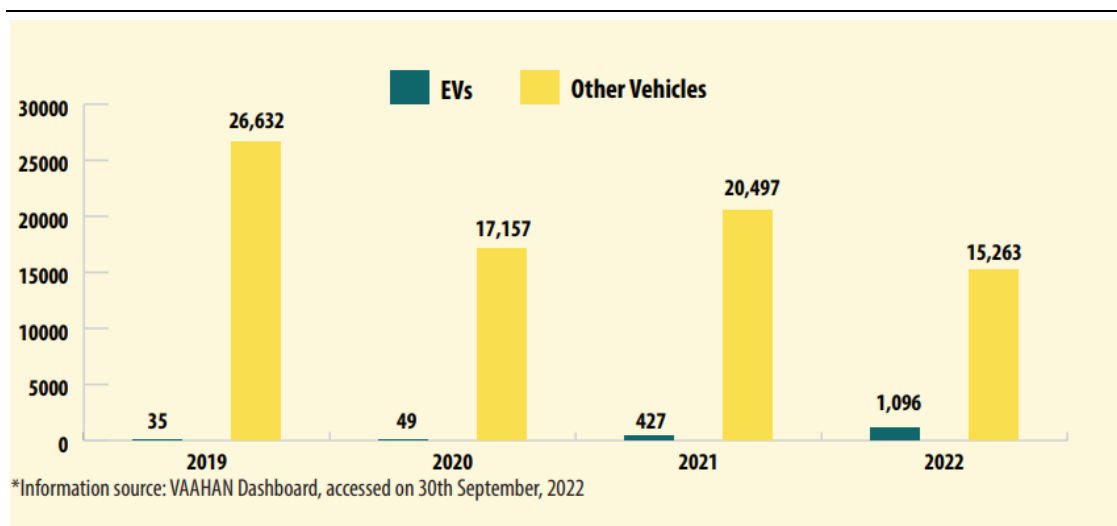


Figure 6: EVs vs other vehicles registered in Kochi (2019-2022)

### 3.4 Status of EV-Charging infrastructure in Kochi

Currently 11 EV fast chargers are being operated by Government as well as private agencies. The details are as below

Table 1: Existing Charging Stations in Kochi -Government owned

Sr. No.	Agency Name	Location	No. of chargers (with capacity)	Manufacturer	Price (Rs.) per unit
1	ANERT	KTDC Parking,	2 with 2 guns each (60kW)	EESL	13+GST+service tax
2	KSEBL	Palarivattom	2 fast connectors (120kw)	GOEC	13+GST+service tax
3	KSEBL	Vyttila	2 fast and 2slow (157kW)	GOEC	13+GST+service tax
4	KSEBL	Gandhinagar	2 fast and 2+1 slow (172kW)	GOEC	13+GST+service tax
5	KSEBL	Kaloor	2 fast and 2+1 slow (172kW)	GOEC	13+GST+service tax
6	KSEBL	Kalamasseri	2 fast and 2+2 slow (194kW)	GOEC	13+GST+service tax
7	KSEBL	Angamaly	2 fast and 3+1 slow (187kW)	GOEC	13+GST+service tax

Table 2: Charging Station Set Up by private sector service provider.

Sr. No.	Party Name	Location	No. of Chargers Capacity of chargers	Manufacturer	Price charged per unit
1.	PulsePower	Kakkanad - Mamala	1 with 1 gun (60kW)	PulsePower	19.9+GST and service tax
2.	Drivethru	Centre Square Mall M.G Road Pothis, Banerji Road	1 with 1 gun (60Kw)	V Power Ltd.	20+GST and service tax



3.	Zeon Charging	Gokul Ootupura restaurant, Padivattom Grand Mall	1 with 1 gun (60Kw)	Zeon	19.5+GST and service tax
4.	Ather Energy	Kacheripady, MG Road, Panampilly Nagar	1 with 1 gun (3.3kW)	Ather	

In addition, KSEB is planning to install 100 pole mounted charging points.

### 3.5 City readiness for adoption of E-Mobility

Based on interaction with stakeholders associated with EV ecosystem in Kochi, the readiness index was synthesized after scoring the parameters impacting EV transition. Twenty-five parameters were listed under 6 categories including:

Supporting regulatory ecosystem

Supply chain preparedness

Consumer willingness

Public charging infrastructure

EV ready building readiness

Electricity load implication awareness.

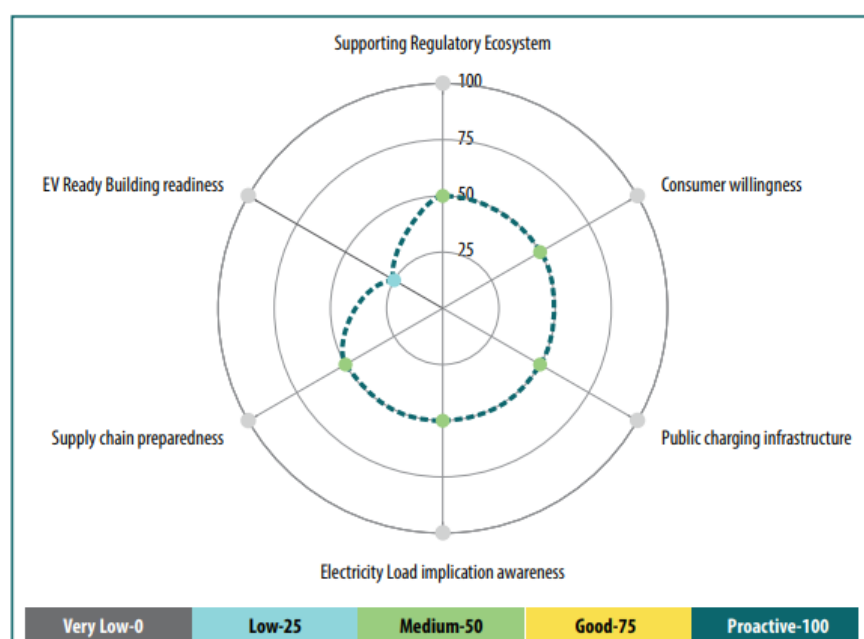
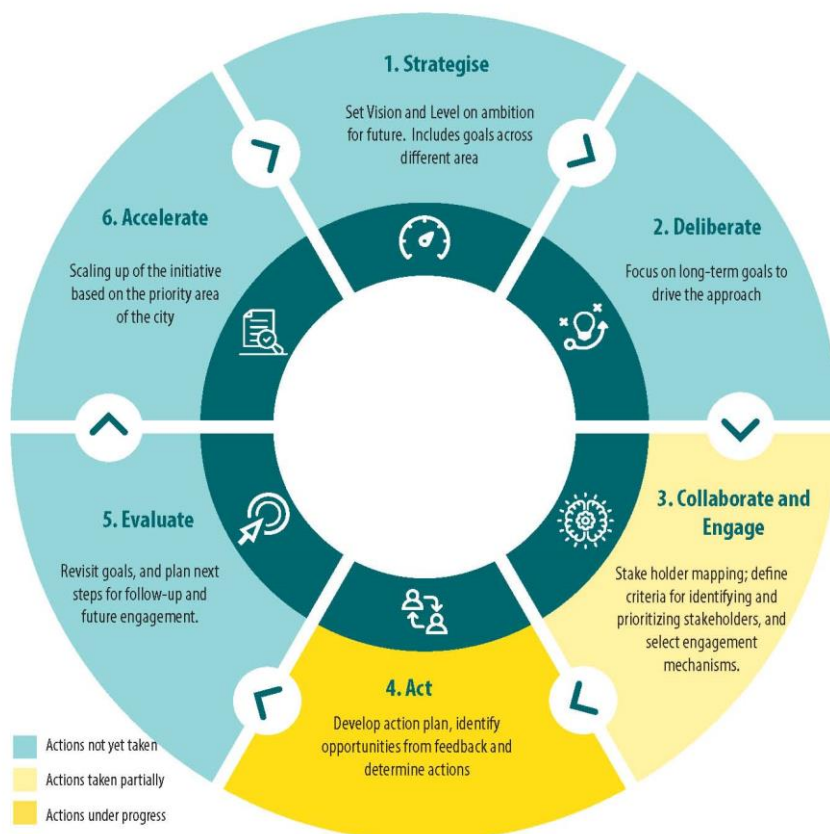


Figure 7: City level readiness index for adoption of E-Mobility in Kochi

## 4 City Level Action Plan for Kochi for faster transition towards E-Mobility

### 4.1 Cities Engagement Approach

Six step cities engagement approach was used to develop action plan for electric mobility in Kochi. The approach is illustrated in figure below



The approach was presented to stakeholder forum with representation from agencies responsible for various aspects of EV Ecosystem in the meeting held on 21<sup>st</sup> July 2022 in Kochi.





## 4.2 Strategy Development

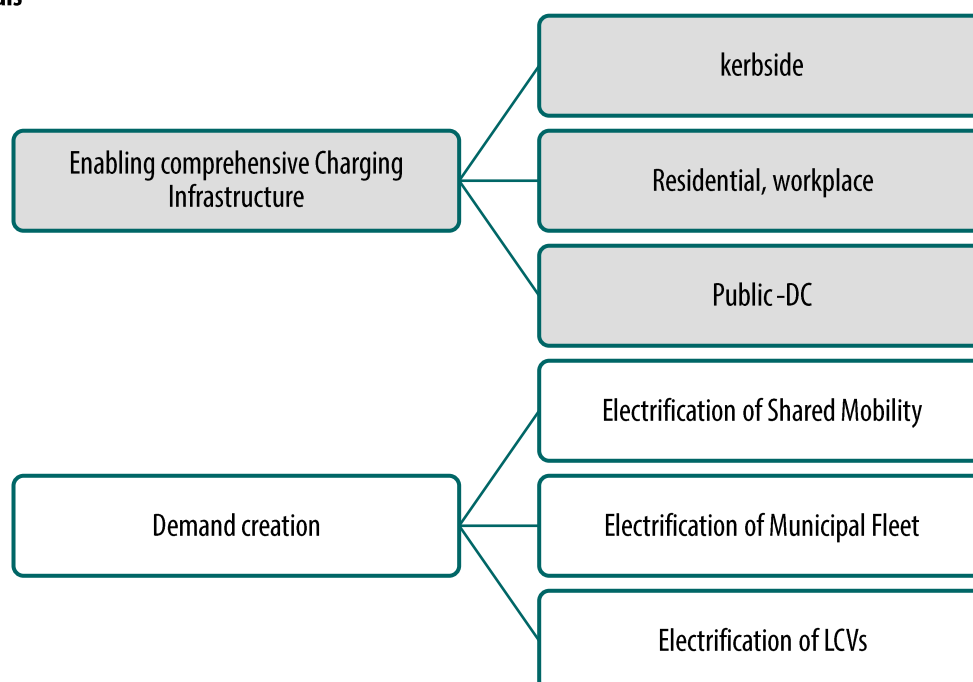
### 4.2.1 Vision and Goals

The project team and KMC gathered input from key stakeholders, industry experts, and the elected representatives to inform strategy development. As stated above meeting was conducted to gather input regarding barriers to EV ownership and potential City actions to enable EV adoption. The workshop was also focused to brainstorm actions to promote EV adoption across departments. The input gathered through the engagement activities helped to identify barriers to EV adoption in the City and inform actions most likely to accelerate the transition from fossil ICE vehicles to EVs.

**Vision:** Climate protection forms a key part of the City's core values, policies and programs. It requires strategic planning, policy and actions across all sectors. Emissions from transport sector accounts for 55 % of greenhouse gas emissions in the City. Making the transition from fossil fuel powered vehicles to low or zero emission electric vehicles is crucial. Therefore Kochi's Electric Mobility strategy focuses embrace ***E-Mobility as the opportunity to promote shared Mobility and clean Transportation of people and goods and ensure environmental sustainability, pollution reduction, energy efficiency and conservation to encourage clean and green Kochi.***

**Goals:** The city understand the importance of specific goals required to achieve vision. The goals listed below aim to increase EV readiness of new buildings, improve access to public charging and reduce some of the barriers related to EV charging retrofits along with pilots to show viability of EV's across the use case of LCV's , Municipal fleet and Buses.

#### City Goals



## Objectives

The Electric Vehicle Strategy seeks to accelerate the transition to EVs in line with the sustainable transportation hierarchy to reduce greenhouse gas emissions from transportation in the city. To that end, the strategy has the following high-level objectives:

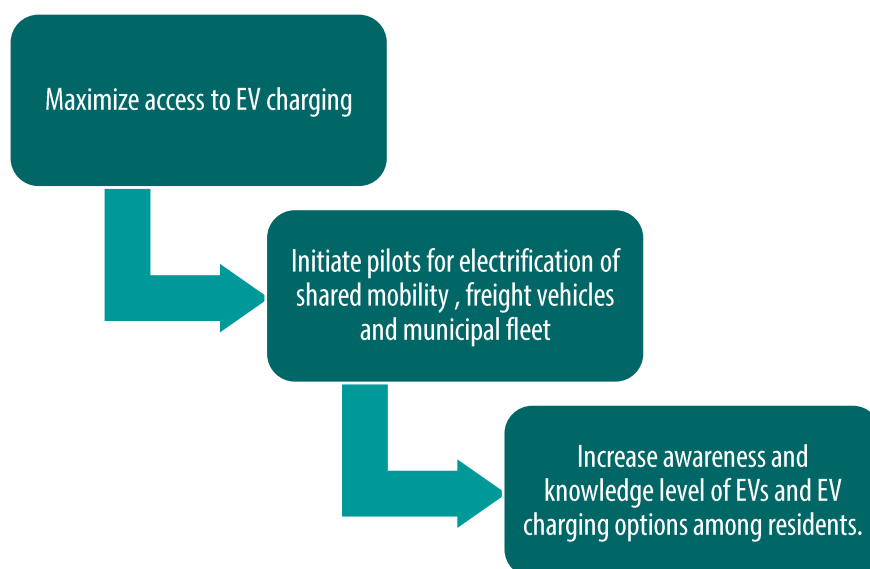


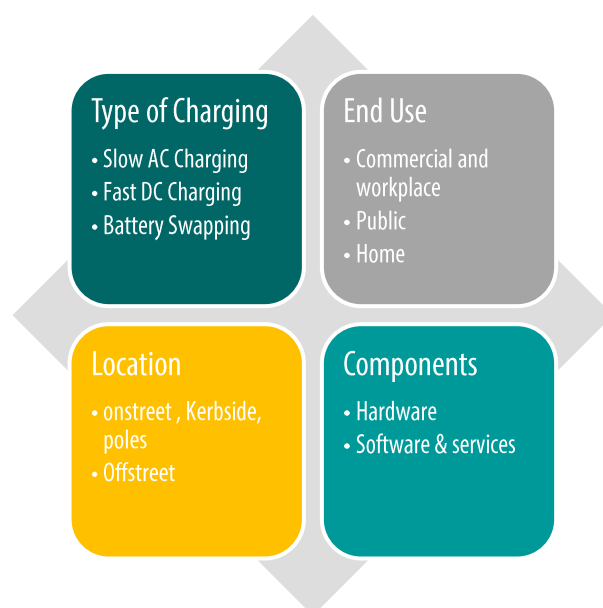
Figure 8: Kochi city strategy for E-Mobility adoptions

The actions in this strategy aim to increase EV readiness of new buildings, improve access to public charging and reduce some of the barriers related to EV charging retrofits.

## 4.3 City Action Plan

### 4.3.1 Objective 1: Maximize access to EV charging

For scaling up EV adoption, a clear understanding of the necessary EV charging infrastructure is required as one-size-fits-all approach will not be the way forward. The charging requirement for a commercial E-4W that covers more kilometers per day than a private vehicle is higher. So, while it is anticipated that the bulk of private e-4W charging would be from home chargers, the commercial E-4W would prefer public charging. Even the operation of commercial E-4W fleet varies significantly based on the type of load they carry, i.e. passengers or goods. In case of 2W and 3W, battery configuration of fixed vs. detachable decides if the charging option will be through plug-in charging or battery swapping, respectively. The illustration break downs aspects related to EVSE's



#### 4.3.1.1 Types of EV Chargers

There are three types of electric chargers available for EVs depending on the level of charging that they provide:

- Level 1 Charging (Slow Charging): It is the basic charging equipment with slow speed. It uses an Alternating Current (AC) plug and can be used on home circuits. It takes around 8 to 12 hours to charge a battery through this equipment. It is mainly used in households for overnight charging of the EV.
- Level 2 Charging (Standard/Moderate Charging): It provides an average charging time of 4 to 6 hours. It is compatible with all EVs including plug-in electric hybrid vehicles. These stations are mostly installed in public parking spaces, commercial and residential buildings.
- Level 3 Charging (Rapid Charging): It can charge a battery up to 80% in 20-30 minutes using Direct Current (DC) plug. However, it is not compatible with all the EVs. They can be installed only in public charging stations.

Table 3: List of prominent EVSE types in India

Charger Type	Charger Connectors	Rated Voltage (V)	No of Charging Points/ Connector Guns (CG)	Charging vehicle type(W=wheeler)
Fast	CCS (Min 50 KW)	200-750or higher	1 CG	4W
	CHAdeMO (Min 50 KW)	200-500or higher	1 CG	4W
	Type-2 AC (min 22 kW)	380- 415	1 CG	4W, 3W, 2W
Slow/Moderate	Bharat DC-001 (15 kW)	48	1 CG	4W, 3W, 2W
	Bharat DC-001 (15 kW)	72 or higher	1 CG	4W
	Bharat AC-001 (10 kW)	230	3 CG of 3.3 kW each	4W, 3W, 2W

#### 4.3.1.2 National Government Guidelines for Setting EV Charging Stations

The following guidelines have been issued by the Central Government regarding the setting up of EV charging stations in India:

- The Government of India has made guideline to set up an EV charging station every 3 kms in the cities, 25 kms on the highway.
- The Government of India has made it license-free for any individual to set up an EV charging station in India following the guidelines of the Power Ministry of India.

#### 4.3.1.3 Infrastructural Requirements for Setting EV Charging Station

The following infrastructure requirements are necessary for setting up an EV Charging Station The requirement depends on type of EVSE (Fast or Slow):

- Installation of a transformer, substation equipment, and safety equipment.
- 33/11 KV cables and associated equipment for line and meters.
- Civil works and installations.
- Land space for charging vehicles and entry or exit of vehicles.
- Installation of all the EVSE.

#### 4.3.1.4 City Level Actions for improving access to EV charging

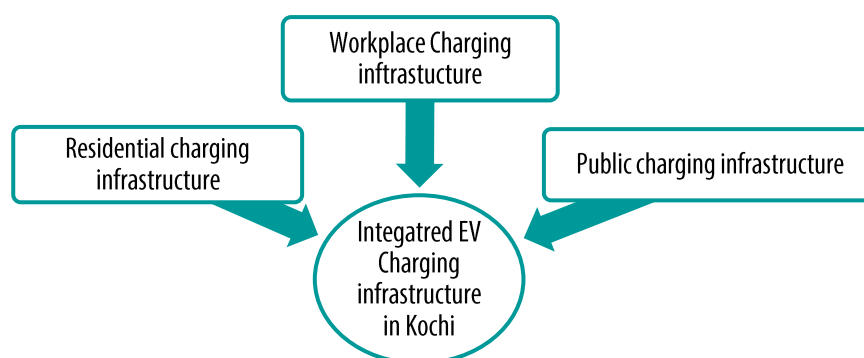


Figure 9: Classification of EV charging strategies

#### 4.3.1.5 Residential Charging infrastructure

##### Deliberation

To ensure all new construction in the city, including single storey homes, multi-storey buildings, and commercial buildings provide EV charging capability, requirements for EV-ready parking spaces can be added to the building Bylaw. While the authority of a KMC to require EV charging infrastructure in new construction is limited, the state government has crucial role in the regards. Access to home charging in multi-storey buildings can be increased by requiring all residential parking spaces in new construction to be equipped with Level 2 charging capability. The city should plan for 20% of residential parking spaces to be EV-ready for new constructions. Below are crucial aspects to be included in building by laws to make them EV ready

##### Actions

- Incorporate requirement of separate power outlets capable of providing Level 2 charging for 100 % residential parking space, along with provision of additional load due to EV charging into building bylaws.
- Incorporate requirement for EV Charging stations for 20 percentage of parking spaces in new commercial buildings into building bylaws
- Ensure EVSE data for new development is tracked by nodal person from Kochi Municipal corporation in meaningful to have robust data base of EV charging equipped parking spaces in building across the city

##### Stakeholders

- Town and Country Planning Office, Kochi Municipal Corporation, Kerala state electricity board and private developers

##### Project approval stage

- Mention the total parking bays (by vehicle types)
- Calculate the number of EV bays by vehicle types
- Mark Public charging points by charger type, vehicle type on the plan
- Provide for additional electrical load, meters and transformers

##### Building-use permission stage

- Affidavit for meeting standards and safety compliance as per MoP guidelines
- NoC from DisCom (Grid readiness, load calculations including EVCI)
- NoC from Chief Electricity Inspector (Standards & electrical safety)
- NoC from Fire inspector (Fire safety)

##### Operations stage

- NoC from Chief Electricity Inspector (Standards & electrical safety) every 2 years

Figure 10: Stages of integrating EV charging at residences

#### 4.3.1.6 Workplace Charging and Retrofitting in existing buildings

##### Deliberation

Retrofitting of multi-storey buildings with EV charging infrastructure can be challenging and quite costly depending on the location of the parking spaces and the proximity to the electrical panel. Therefore, KMC can consider providing incentives for installations of EV charging infrastructure in existing multi-storey buildings, in proportion with increasing access to DC fast charging, will effectively accelerate EV adoption. However, till the time existing buildings are retrofitted, Workplace charging can provide an alternative for residents who do not have access to EV charging at home, and provides support for residents who have long commutes and need to top-up their batteries while at work prior to the return trip home.



## Actions

- KMC should consider providing retrofit financial or tax incentives for multi storey apartment to improve access to home charging
- Sensitisation training to developers on EV charging requirement, technologies and potential configuration in building construction and retrofits which could be disseminated to builders, contractors and developers
- Explore opportunities for providing charging for during work hours
- Review potential opportunities and amendments requirement for onsite parking to decrease barriers to EV charging.

## Stakeholders

- Town and Country Planning Office, Kochi Municipal Corporation, Kerala state electricity board and Institutions, private office space owners and private developers

### 4.3.1.7 Public charging network

#### Deliberation

Public charging stations can provide access to EV charging for residents that do not have charging at home or at work. Public charging stations also provide a supplement for home and workplace charging as residents visit amenities throughout the City, and a substitute for home charging for residents who live in multi-storey buildings unequipped with EV charging or in single storey homes lacking off-street parking. Centrally located Level 2 charging stations can enable EV owners to charge their vehicles while they visit local amenities. Alternatively, Level 2 charging stations can be sited Kerbside on residential streets across on-site parking. Integration with street light infrastructure can significantly reduce the costs of Kerbside EV charging installations as the electrical supply is already available near the street and civil work is not required.

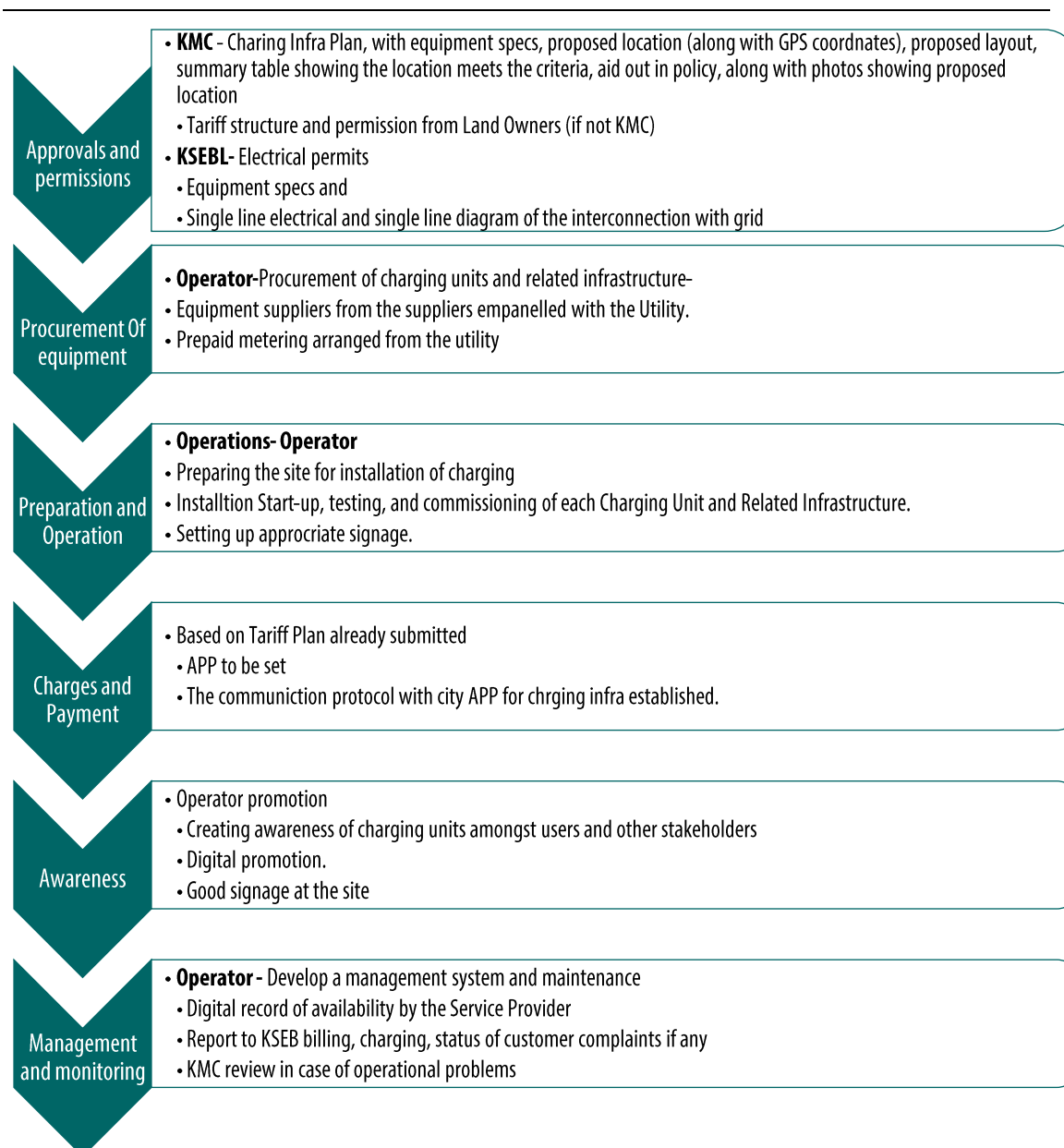
While additional kerbside charging stations can contribute to increased public awareness of EV charging infrastructure and some additional EV charging capacity, consultation conducted for the City has shown that deployment of public DC fast chargers have the most significant impact on increasing EV adoption in the City. Lengthy charging time requirements pose a significant barrier to most mainstream consumers, but when the charging time is reduced to 15 minutes or less, as in the case with newer DC fast chargers (depending on the battery and the DC fast charger power level), this barrier is removed and public charging becomes a viable substitute for home charging.

## Actions

- **Improve DC Fast Charging Access:** Deploy new DC fast charging stations in partnership with various agencies such as ANERT, and private business to compensate for lack of home and workplace charging. It will be crucial to locate the sites close to amenities, clustered together when possible and with minimal impact on pedestrian and vehicular traffic.
- **Improve Level 2 Charging Access:** Deploy Pole mounted Level 2 charging stations to expand the existing EV charging network and compensate for lack of home and workplace charging, sited close to amenities or Kerbside when possible, with minimal impact on streetscape and potentially integrated with streetlight infrastructure
- **Policy for Kerbside Charging:** Develop policy to locate Kerbside charging infrastructure in city to minimise the impact over traffic movement
- **Data Policy:** Review current station usage to determine daily usage trends and explore opportunities to maximize access and reduce congestion through financial rate structures and parking regulations
- **Shared Use of Workplace Charging Stations:** Explore possibility of making charging stations used for institutions/ work place available to the public overnight

## Stakeholder

- KSEB, KMC, TCPO, Traffic police and users



## 4.3.2 Electrification of shared mobility, urban freight vehicles and municipal fleet

### 4.3.2.1 Electrification of Municipal fleet

The Municipal fleet offer a significant opportunity to accelerate the EV adoption in Kochi. Currently, many of the tasks performed by the City's fleet and equipment (SWM vehicles) could be accomplished by an electric alternative. As City vehicles and equipment come up to be retired and replaced, an electric version should be considered first. City facilities can pose limitations on the ability to support EV charging infrastructure. Feasibility studies will reveal the opportunities for the transition to EVs for the City's fleet. Though options for electric medium and heavy-duty vehicles have been very limited in the past, but more models are beginning to be introduced into the market and are increasingly being incorporated into municipal fleets (Especially for SWM vehicles). Ongoing monitoring of these developments is required to identify opportunities to transition to EV vehicles as the technology becomes accessible and reliable.

#### Actions

- **Fleet and Equipment Policy:** Develop an "electric-first" fleet and equipment policy for the Kochi that prioritizes the procurement of electric versions of vehicles and equipment, given model availability and ability to perform the required function
  - **Feasibility Studies:** Conduct feasibility studies for each fleet category to understand financial resources required.

- **Staff Training:** Provide training opportunities to familiarize City staff with current fleet EVs and with potential options for fleet EVs and electric equipment
- **Medium and Heavy-Duty Vehicles:** Complete an analysis of opportunities for replacing fossil-fueled medium and heavy-duty vehicles at end of life with electric alternatives, and complete a feasibility analysis to determine upgrades required at the Operations Centre.

#### 4.3.2.2 Electrification of shared mobility and freight vehicles

##### Deliberation

The Shared Mobility fleet offer a significant opportunity to accelerate the EV adoption in Kochi. Currently, public transport and IPT constitutes for 47 % of passenger trip. Moreover, LCV's form significant share of goods movement. Due to high distance operated by these fleet, the emission reduction potential is significantly high compare to private vehicles. Therefore, Kochi plans to target electrification of these high impact area on priority. It includes:

- Electrification of public transport dominated by buses and ferry boats
- Electrification of IPT dominated by Auto rickshaws
- Electrification of LCV's

##### Actions

- Initiate pilot for E-buses in Kochi: The city can explore the operationalisations of buses as the feeder for Kochi Metro. Based on the learnings and feasibility, scaleup strategy can be formulated to increase e-buses fleet for intracity operations.
- Electrification of IPT dominated by Auto rickshaws: The city is already planning the pilot for battery swapping for E-Autos operations. Based on the learning city can formulate scaleup strategy for larger level conversion of ICE-IPTs into Electric version.
- Electrification of LCV's : As part of EcoLogistics initiative, the city had operationalised electric freight vehicles. The city need to monitor the performance and identify the use cases where, electric freight vehicles can be adopted on priority. Over the time city can develop city level electrification plan for freight vehicles especially LCV's

##### Stakeholders

- KMC, CII, FICCI, Ernakulam market association, Auto union, KSBL, KMRL, KSRTC and Cochin chamber of commerce.

#### 4.3.3 Education and Outreach

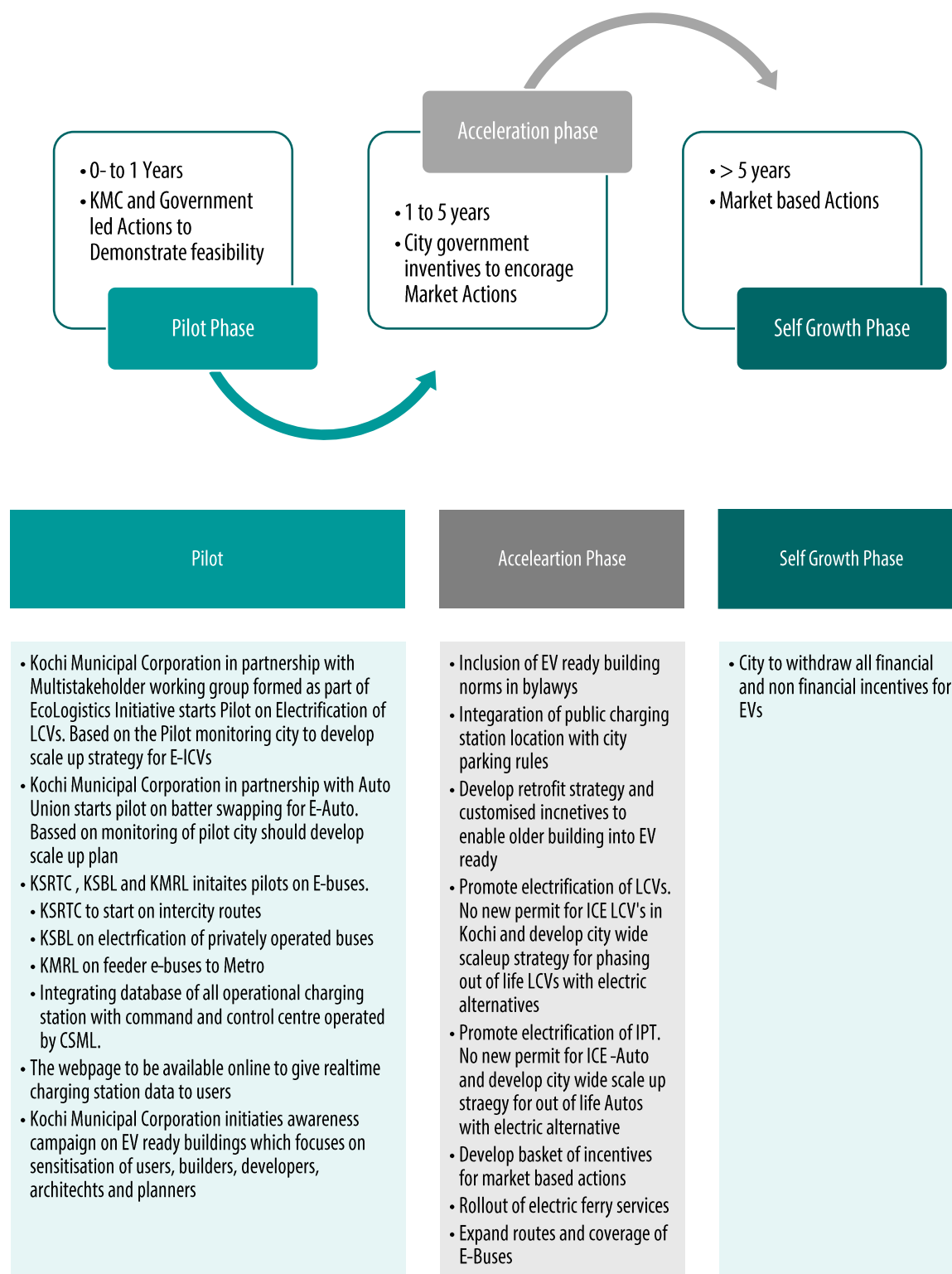
Levels of awareness of EVs and EV charging remains a barrier for residents. Common misconceptions about range, financial resources and types of charging persist and can prevent residents from purchasing EVs. The KMC has an opportunity to address these knowledge and awareness barriers through strategic education and outreach actions.

##### Actions

- **Awareness on Multi-Storey Building Retrofits:** Provide education to housing society association to facilitate EV charging retrofits in existing multi-storey buildings by clarifying means by which charging infrastructure can be installed in existing multi-storey buildings, increasing awareness of available financial incentives and promoting resources available
- **Workplace Charging:** Promote installation of EV charging infrastructure at workplaces by raising awareness among employers, building owners and disseminating information about the installation process and available financial incentives.
- **Single Storey building Retrofits:** Address knowledge gaps surrounding home charging by clarifying options for installation of charging stations in existing homes, increasing awareness of available financial rebates.
- **Charging Station Visibility:** Utilize public charging stations as an educational opportunity by enhancing signage to raise the profile of stations and disseminate EV information at the stations.
- **City Webpage:** Develop the EV webpage to increase understanding of City EV actions, details of dealers, available incentive programs and resources for EV charging.
- **Municipal Fleet Visibility:** Consider raising the profile of EV vehicles in City fleet through use of vehicle graphics.
- **Non-Financial Incentives:** Explore potential nonfinancial incentives for EV drivers including preferential parking spaces and EV-only passenger zones in high traffic areas to increase EV visibility and signal to residents the City's prioritization of EVs over other private vehicles.

## 4.4 Roadmap for E-Mobility in Kochi

Kochi needs a multipronged and multiphased implementation roadmap



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