



Workshop Proceedings on electrification of Solid Waste  
Collection in Surat

25<sup>th</sup> November 2020

**SUSTAINABLE URBAN FREIGHT INITIATIVE  
A COLLABORATIVE APPROACH**



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**PUBLISHED BY**

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# INTRODUCTION

## BACKGROUND

### SUSTAINABLE URBAN FREIGHT INITIATIVE

This Workshop is a part of TERI's *Sustainable Urban Freight Initiative* aimed at creating local and national support structures for cost and emission reduction from Urban Freight in India. With this aim, TERI is forming a consortium of all public and private stakeholders of urban freight including Urban Local Bodies, Vehicle Manufacturers and Civil Society members. This *Sustainable Urban Freight (SUF) Group* aims to share, create and disseminate knowledge to facilitate interventions to reduce emissions and costs from urban freight activities in India. The SUF Group will facilitate continuous initiatives through both policy and practice. One of the major objectives of this working group is to facilitate clean technology pilots in various applications of urban freight in Indian cities.

Urban Freight broadly includes all movement of goods within urban areas. This includes a wide range of commodities with varied transportation requirements. Effectively reducing cost and emissions from urban freight, especially through technological transitions like EVs, cannot have a blanket approach for all. Each type of urban freight will have its own mobility pattern with specific load and range requirements. In many cases, the need may even differ based on location.

One of the first targets of the SUF Group is to facilitate EV pilots in Surat city. For the same, Surat Municipal Corporation and TERI are organising a series of workshops focussed on electrifying specific use-cases of urban freight in Surat. The first targeted use-case is Municipal Solid Waste Collection.

### WORKSHOP OBJECTIVES

This workshop was organised by TERI and Surat Municipal Corporation on 25<sup>th</sup> November, 2020 with a specific objective to

- ❖ *Facilitate Electrification of Municipal Solid Waste Collection in Surat.*

The workshop aimed to bring together private and public stakeholders of solid waste collection in Surat and manufacturers of EVs to discuss introduction of Electric vehicles in **Solid Waste Management (SWM)**. The **sub-objectives** of the workshop were:

- ❖ *Discuss potential of EVs in Surat SWM*
- ❖ *Understand requirement of SMC for EV pilot in SWM*
- ❖ *Understand OEMs feedback on availability and ability of EVs for SWM in Surat City*

# AGENDA AND PARTICIPANTS

## AGENDA

The workshop was held on 25<sup>th</sup> November 2020 from 1130 to 1330 hours using Google Meet Platform.

Broadly, the agenda constituted of discussions on the following sections:

- ❖ Current SWM operations in Surat and EV potential of the same
- ❖ Availability and ability of EVs to be applied in Solid Waste Collection
- ❖ Experience of applying EVs in SWM activities elsewhere in India
- ❖ SMCs vision of decarbonising solid waste collection in Surat
- ❖ Way forward for EV pilot in Surat's SWM

Detailed agenda of the workshop is included in the annexure of this document.

## PARTICIPANTS

The workshop involved participants representing Surat Municipal Corporation, various Original Equipment Manufacturers (OEMs) and TERI.

- ❖ Surat Municipal Corporation
  - Mr. Eliyaskhan Pathan, Executive Director, SWM Department
  - Mr. Jwalant Naik, Solid Waste Manager
  - Mr. Harshul Parekh, SWM Policy Consultant
  - Mr. Kamlesh Yagnik, Chief Resilience Officer
- ❖ Original Equipment Manufacturers (OEMs)
  - Ashok Leyland Ltd.
  - Tata Motors Ltd.
  - Volvo Eicher Commercial Vehicles Ltd.
  - Kalinga Ventures Private Ltd. (Vidhyut EVs)
  - Mahindra and Mahindra Ltd.
  - Piaggio Vehicles Private Ltd.
  - Gayam Motor Works
- ❖ TERI
  - IV Rao, Senior Visiting Fellow
  - Sharif Qamar, Associate Fellow and Area Convenor
  - Aravind Harikumar, Research Associate

## WELCOME REMARKS AND SETTING THE CONTEXT

(By Mr. Kamlesh Yagnik, Climate Action Expert, IUC India & Chief Resilience Officer, Surat)

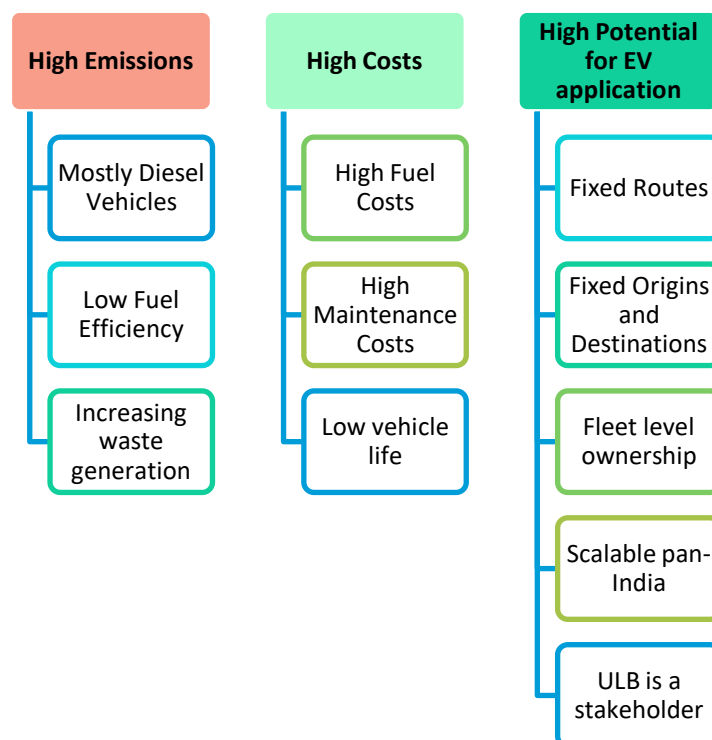
As a long-standing advocate of climate action in Surat, Mr. Kamlesh Yagnik emphasised the need for technological transition in Surat's transportation sector. He assured the eagerness of Surat's Government, Industry and Civil Society for interventions for sustainable growth. While looking forward to EV pilots in various vehicle applications and a subsequent EV policy for Surat, Mr. Yagnik highlighted the essential five factors to be considered for clean transport technology transition: costs, necessary infrastructure, performance of EVs (range and payload), wider choice of EVs and policy support.

## EV POTENTIAL OF SWM IN SURAT

(Presentation by TERI based on past research)

Based on TERI's previous research study, State of SWM in Surat and EV potential of the same were presented. With the presentation (attached in the Annexure-II), TERI highlighted the potential in electrifying the primary door-to-door waste collection in Surat. This is being carried out currently with about 490 Small Commercial Vehicles (SCVs). These vehicles on average cover 39-53 kms per day in about 3 trips on fixed/planned routes. Almost all the vehicles operate on diesel carry about 800 kgs on a typical trip. The low fuel efficiency of these vehicles, their fixed/planned routes, ease of setting up charging solutions and the influence of SMC in the same were cited as the reasons for high potential of EV application in this segment.

### Why Electrify Solid Waste Collection?



## SMC'S VISION FOR ELECTRIFYING SWM IN SURAT

SMC expressed clear intent in transitioning their existing municipal waste collection to electric. The Solid Waste Management department at SMC would lead this with both investment and policy regulation. SMC expressed interest for an initial pilot of 70-80 electric vehicles with an average payload of 800-1000 kgs. Based on successful pilot study, SMC envisions to deploy 800-1000 vehicles by 2022. Initially, the vehicles for street sweeping and litter bins can be converted to EVs. For the door to door collection vehicles, three aspects need to be considered

- ❖ slow speed,
- ❖ frequent stops and
- ❖ tipping arrangement

The representatives from SMC expressed concerns regarding payload of EVs, the effect of overloading on their performance and also ability of loaded EVs to operate in gradient at the waste transfer stations. The transfer station is 6 meters above the ground with a 7% slope. Therefore, the vehicle should be able to travel at said inclination carrying a load of 1000 kgs. Also, the vehicle for primary door to door collection should be able to manoeuvre through small streets. SMC requested OEMs present in the workshop to clearly express their interest in such in EV pilot deployment, availability of the EVs and their ability to effectively reduce economic costs of municipal solid waste management in Surat.

SMC indicated that the method of procurement is not finalised. However, it can be done in 3 ways:

- ❖ SMC will purchase the vehicles and hand over the vehicles to operators under a contract
- ❖ Contractor will purchase, operate and maintain the vehicles under contract with SMC
- ❖ SMC and operator will purchase the vehicles together under a contract

## OEM'S FEEDBACK FOR ELECTRIFYING SWM IN SURAT

(Presentation by respective OEMs)

The OEMs were invited one by one to introduce / share updates on their products and to inform the group on their preparedness towards SWM and deployment of EVs in the SWM sector.

### **Ashok Leyland Limited (ALL)**

Ashok Leyland expressed their experience in electric bus segment and indicated that new vehicle models may need to be developed for SWM application. ALL requested exact design requirements for the application and suggested planning of a pilot project in a specific zone with fixed routes and distances. During the discussion round, ALL indicated a timeline of 9-12 months for deploying EVs after receiving requirements from SMC.

### **Tata Motors Limited (TML)**

TML clearly expressed their keen interest in EV pilot deployment in Surat SWM. TML indicated their pioneering work in India's EV segment and market leadership in commercial segment (including SWM applications). TML indicated the potential of integrating the current market leader TATA Ace's electric version into SWM applications. TML also requested some more inputs from SMC like range, payload, overload margin, type of charger, type of application etc. Regarding EV product they are in the preliminary stage and need inputs from SMC but their product platform is completely ready. They are willing to work on priority basis for EV where they need to focus on fine tuning of certain aspects. However, TML would like to know what the future roadmap is and highlight the need to focus on the

ecosystem being developed around the vehicles which includes the type of charging, parking lots, depots, time schedule, etc.

#### **Volvo Eicher Commercial Vehicles Limited (VECV)**

VECV expressed that their product will need customization based on application. Indicating their upcoming 2 Tonne load EV, VECV sought clarity on potential need for higher load vehicles for EV pilot. Also, VECV requested clarity on what the limitations are, the mode of communication with the SMC, the timeline we are looking at, procedure for buying process. VECV commented that we should not try to fit an EV in the current operation to replace current ICE vehicle. Instead, we should alter the current operation based on the type of EV and its specifications. That is, to focus on optimising transportation with EVs rather than replacing ICE vehicles with EVs.

#### **Mahindra and Mahindra Limited (M&M)**

M&M clearly expressed their interest for EV pilot in Surat's SWM application. M&M presented the potential of their newly launched electric *TREO-Zor* (three-wheeler cargo) Model in the same application. While describing the potential of the new EV, M&M highlighted the environmental and economic benefits from applying *Treo Zor* in freight applications.

#### **Vidhyut EVs**

Vidhyut EVs clearly expressed their interest in EV pilot in Surat SWM. Based in Rourkela, functioning since 2013 Vidhyut EVs has a focus on electrical cargo. They have been working with the Municipal Corporations of Chhattisgarh, West Bengal and Jharkhand for various public utility applications. While presenting the potential of their current vehicles in Surat's SWM application, they also indicated that they can help deploy charging infrastructure although they are not currently doing so.

#### **Piaggio Vehicles Private Limited**

Piaggio clearly expressed their interest in EV pilot deployment in Surat's SWM application. Piaggio expressed the potential of their upcoming cargo three wheeler's potential for the same. During the discussion round, Piaggio requested SMC to keep the tender open to proposals from both three wheeler and four wheeler EVs.

### **EXPERIENCE SHARING OF EVs IN SWM APPLICATIONS**

#### **Presentation by Gayam Motor Works (GMW)**

GMW's Chief Operating Officer presented their experience in deploying EVs for SWM for multiple Municipal Corporations in Telangana and Andhra Pradesh. These also include deployment in capital cities of Hyderabad and Vijayawada. Vehicles with a payload of 600 kgs were deployed in Hyderabad. Based on their experience, certain challenges were highlighted by GMW.

#### **Challenges indicated in SWM application:**

- ❖ **Overloading:** Vehicle capacity in 600 kg but were always overloaded to up to 1100 to 1200 kg. Although the vehicle could bear the heavy load, load sensors were included to avoid overloading (Municipal Corporation of Vijayawada)
- ❖ **Tracking Usage:** There was no control over accessibility or no track of inventory of these vehicles. To overcome this, an integrated dashboard to track vehicles was suggested. The



dashboard includes enabling immobilizations and dealing with rough handling, over speeding, etc. Each vehicle could be tracked.

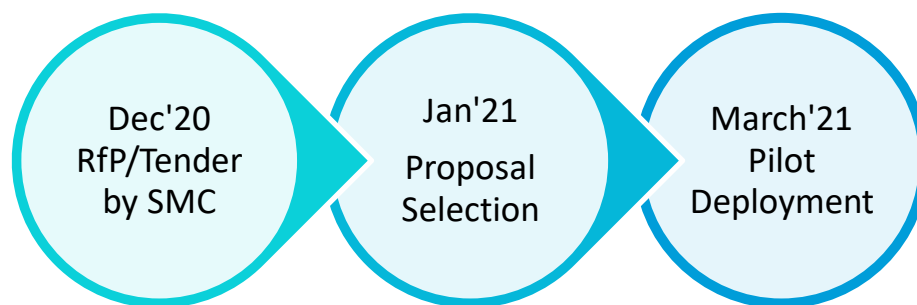
- ❖ **Gradient:** In cities like Tirupati and Vishakhapatnam, a lot of streets going uphill (terrain) was a challenge.
- ❖ **Training Drivers:** Training of drivers is very important for successful operations of EVs in SWM application. Technology interventions can take care of mishandling. GMW has developed a mobile app for the same.

This section of the workshop was intended to improve capacity of SMC as well as the OEMs in deploying EVs in Solid Waste Applications. Even though EVs are being deployed in cargo segments, there are many challenges which are specific to the application.

The workshop aimed at forming partnerships between private and public stakeholders for reducing cost and emissions from Municipal Solid Waste Management. The OEMs were exposed to a potential buyer of their new technology vehicles (SMC), and SMC was exposed to a wide range on EV manufacturers in India. SMC clearly expressed their interest in EV pilot of 70-80 vehicles for SWM in Surat.

Based on inputs received from OEMs and with TERI's assistance, SMC will release a Request for Proposal (RfP) for pilot deployment of 80 Vehicles in the Central Zone of Surat.

## *Pilot Deployment Timeline*



SMC envisions pilot deployment in March 2021. Hence, OEMs will have 1.5 to 2 months to deploy once their proposal is selected and order is placed by SMC. Subsequently, SMC and TERI will monitor and study the deployment. Based on observation of successful economic benefits from deploying EVs, adequate provisions will be made in SMC's **SWM policy** to plan transition of entire fleet (800-1000 vehicles) into electric. The provisions in SWM policy will nudge the third-party contractors through incentives and mandates to transition entire waste collection in Surat by 2022.

TERI's Sustainable Urban Freight Group envisions to use this experience to guide all Urban Local Bodies in India to transition waste collection to electric.



## AGENDA

11:30-13:30, 25<sup>th</sup> November 2020  
Join: <https://meet.google.com/jfd-uufj-fft>

11:15 – 11:30 Hrs. Registration

### THEME | Workshop- Electrification of Solid Waste Collection in Surat

11:30 – 11:40 Hrs. **Welcome Remarks**  
Mr. Kamlesh Yagnik  
Chief Resilience Officer, Surat; & Senior Climate Action Expert, IUC India

11:40 – 11:55 Hrs. **Presentation on EV Potential in Surat's Solid Waste Management (SWM)**  
Aravind Harikumar, Research Associate, TERI

11:55 – 12:10 Hrs. **Surat Municipal Corporation's perspective on electrification of SWM in Surat**  
Mr. EH Pathan, Executive Engineer, SWM Dept., SMC

12:10 – 12:40 Hrs. **Original Equipment Manufacturer's (OEM) feedback on application of EVs in Surat's SWM**  
1. Ashok Leyland Ltd.  
2. TATA Motors Ltd.  
3. Volvo Eicher Commercial Vehicles Ltd.  
4. Mahindra and Mahindra Ltd.  
5. Kalinga Ventures India Pvt. Ltd. (Vidhyut-EVs)  
6. Piaggio Vehicles Pvt. Ltd.

12:40 – 12:50 Hrs. **Experience Sharing of Applying EV in Solid Waste Collection, Vijayawada**  
Mr. Raja Gayam, CEO, Gayam Motor Works

12:50 – 13:10 Hrs. **Open Discussion**  
Moderated by IV Rao, Senior Visiting Fellow, TERI

13:10 – 13:20 Hrs. **Way Forward**  
Mr. EH Pathan, Executive Engineer, SWM Dept., SMC

13:20 – 13:30 Hrs. **Thank You Remarks**  
Sharif Qamar, Associate Fellow and Area Convenor, TERI

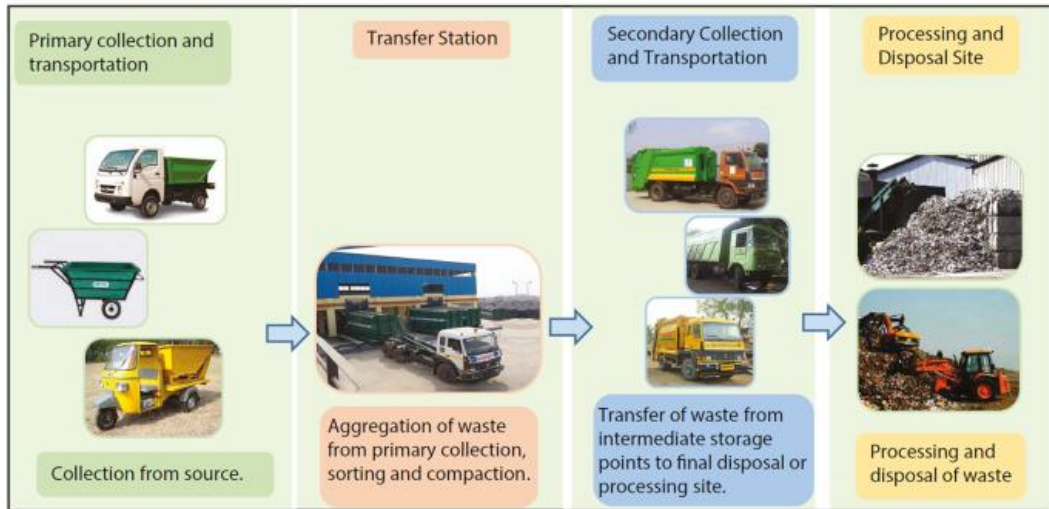


## Urban Freight Cost and Emission Reduction Guidance Facility, Surat

### Why Electrify Municipal Solid Waste Collection?

- **High Emissions**
  - Mostly Diesel Vehicles
  - Low Fuel Efficiency
  - Increasing waste generation
- **High Costs**
  - High Fuel Costs
  - High Maintenance Costs
  - Low vehicle life
- **High Potential for EV application**
  - Fixed Routes
  - Fixed Origins and Destinations
  - Fleet level ownership
  - Scalable pan-India
  - ULB is a stakeholder

## Typical Solid Waste Collection in Indian Cities



## Solid Waste Management System in Surat



7 Zones

7 Transfer Stations

5 Contracted Agencies

7 year Contracts

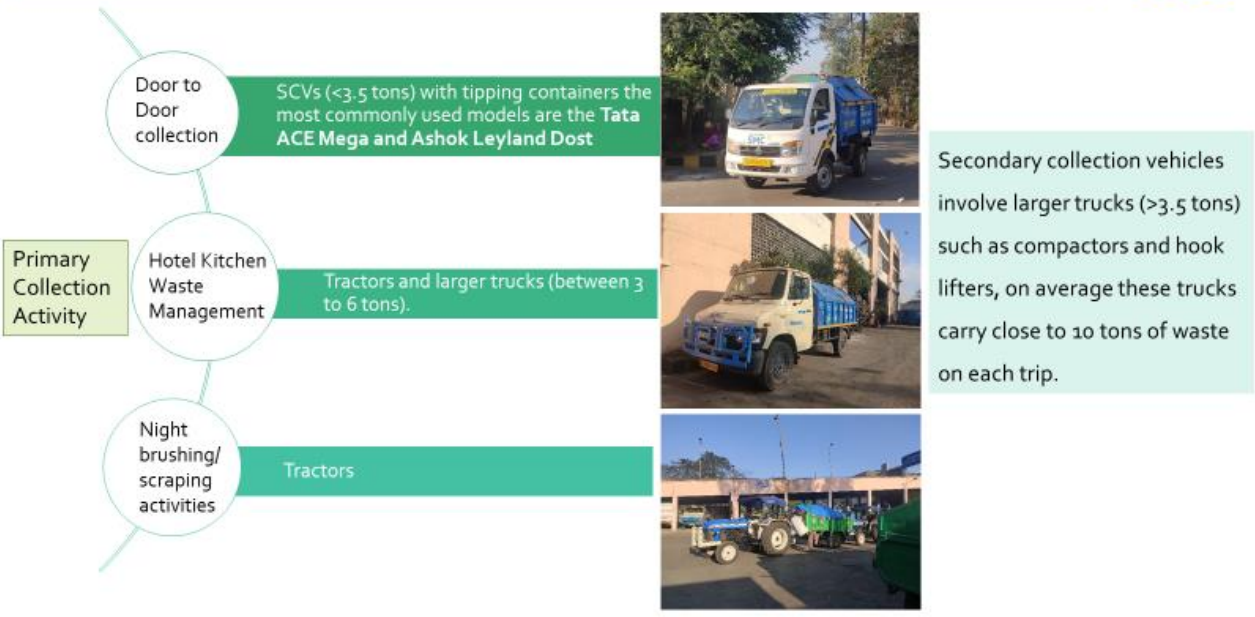
Primary collection activities:

- Door to Door collection
- Scraping and Night Brushing
- Hotel Kitchen Waste Management

Secondary Transportation:

- Transfer Station to Disposal Site in Khajod

## Vehicles used in Primary Collection



## Potential for Electrification : Door to Door Collection



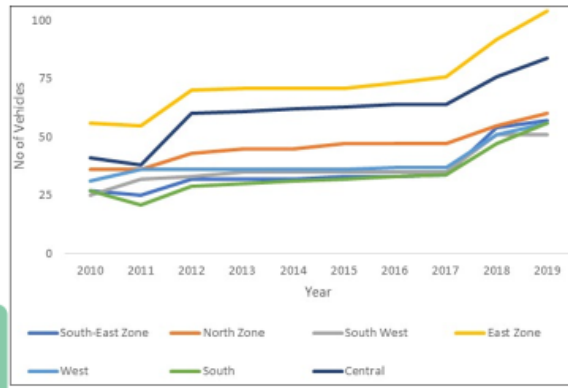
Currently there are about 490 vehicles in operation across zones.

The number of vehicles in the system has been growing continuously: From 100 vehicles in 2010 to 490 vehicles in October 2020.

The operators use closed body SCVs with movement tracking systems for primary collection.

Current Vehicles used include TATA (ACE Mega, 407, 709) Ashok Leyland Dost, Mahindra Supro Maxi truck.

Most of these vehicles are BS IV compliant.



## Primary Door-to-Door Waste Collection Technological Potential: Range



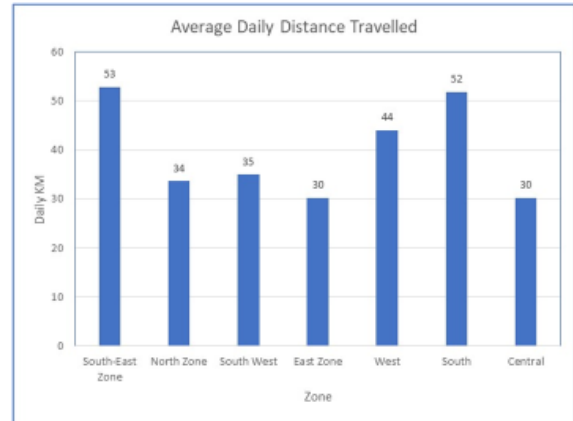
Across zones, the average distance travelled daily ranges from **30 km** in the **Central Zone** to **53 km** in the **South East Zone**

Some vehicles are likely to travel more than **70 km** as well, especially in south-west zone which spans 112 sq. km.

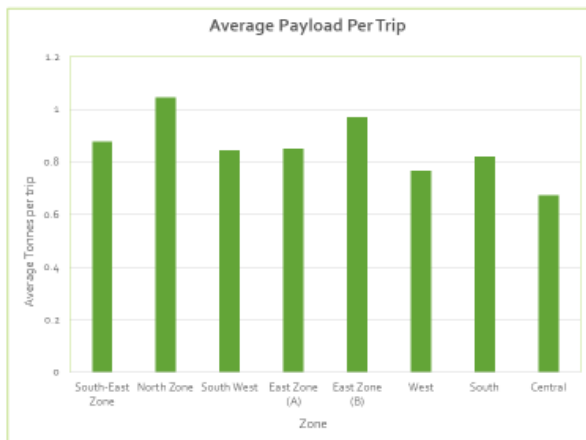
On average each vehicles makes around **3 trips** in a day.

Per trip average distance travelled: **9 km to 16 km**.

Vehicles travel on **Fixed Routes**



## Primary Door-to-Door Waste Collection Technological Potential: Payload



Average payload per trip ranged from **670 Kgs** to **1040 Kgs**.

There is evidence of overloading, especially in the north zone and east zone (B). However, a few higher capacity vehicles like TATA 407 are also used in these zones.

Higher payload observed in June (Monsoon) and October (Festive season).

Overall Average payload is around **800 kgs..**

## Primary Door-to-Door Waste Collection Economic Potential: Costs



### Assumptions

Fuel Efficiency

5km/Ltr

Daily Utilisation

39 km

Annual Maintenance

70,000 INR

## Conclusion Regarding EVs in SWM Applications



### Positive Inferences for EVs

- Overall Daily Distance: 39 km to 53 km
- Repetition of trips: 3 trips on average
- Fixed/Planned Routes (GPS tracking)
- Economic Benefits: Savings on Diesel costs
- Minimal requirement of charging infrastructure

### Technological Concerns

- Payload: 800 Kgs on Average
- EV performance with Overloading,
- EV performance when climbing up the gradient (Ramp at Transfer Station)

### Policy Recommendation

- EV pilot studies
- Incentives for Operators
- Mandatory inclusion of EVs in the fleet



## Expectation from OEMs



Understanding of EVs  
Available for application in  
SWM

Understanding of OEM's  
Interest in Pilot application  
in Surat

Ability of available EVs in  
Effectively Reducing  
Economic Costs of waste  
collection in Surat



# Thank You!

For more information please contact

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