

ELECTRIFICATION POTENTIAL OF URBAN FREIGHT VEHICLES

Delhi LGV Electrification Survey

Operations, Economics and Barriers to Electrifying Light Goods Vehicles in Delhi · Final Report, October 2023

Sandeep Gandhi · Geetam Tiwari · Manoj M. · Shivani Nandal · Shivanshu Singh

TRANSPORT DEPARTMENT
Government of NCT of Delhi

TRIP CENTRE

SGA sustainable mobility solutions

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About this publication. This report presents a primary survey of 2,000 owners and operators of light goods vehicles in Delhi, carried out in January and February 2023, and its findings on the potential for and barriers to electrifying these vehicles. SGArchitects prepared the report as technical consultant to TRIP-C, IIT Delhi, under a memorandum of understanding between GNCTD and TRIP-C; it was submitted to TRIP-C and handed over to the Transport Department, GNCTD, in October 2023.

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Cover photograph: survey enumerator interviewing a goods-vehicle driver in Delhi. Photographs: SGArchitects survey team. Map base: © Google Earth. Logos are the property of their respective organisations.

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We are grateful to the 2,000 owners and drivers of goods vehicles across Delhi who gave their time to answer the survey, and to the survey enumerators who collected the data at markets, mandis and industrial areas in January and February 2023.

Abbreviations

3W	three-wheeler
4W	four-wheeler
AC	alternating current
CapEx	capital expenditure
CNG	compressed natural gas
CPK	cost per kilometre
DC	direct current
EMI	equated monthly instalment
EPK	earning per kilometre
EV	electric vehicle
FMCG	fast-moving consumer goods
GNCTD	Government of National Capital Territory of Delhi
GST	Goods and Services Tax
ICE	internal combustion engine
IIT Delhi	Indian Institute of Technology Delhi
kg-km	kilogram-kilometre
km	kilometre
kWh	kilowatt-hour
LCV	light commercial vehicle
LGV	light goods vehicle
MoU	memorandum of understanding
NCT	National Capital Territory
OEM	original equipment manufacturer
OpEx	operating expenditure
PPK	profit per kilometre
SGA	SGArchitects
TCO	total cost of ownership
TRIP-C	Transportation Research and Injury Prevention Centre, IIT Delhi
₹	Indian rupee; 1 lakh = 1,00,000

Executive Summary

Small goods vehicles with a payload of about 0.5 to 1.5 tonnes dominate urban freight in Indian cities, and most of their daily operations already lie within the range and payload of commercially available electric models. Yet in Delhi, despite the Delhi Electric Vehicle Policy, 2020, fewer than 0.01% of new light goods vehicle (LGV) sales were electric. This study, carried out for the Transport Department, Government of NCT of Delhi (GNCTD), through the Transportation Research and Injury Prevention Centre (TRIP-C), IIT Delhi, set out to understand why.

A structured interview survey of 2,000 owner-operators of LGVs (carts, three-wheelers, four-wheelers and pick-up trucks of up to 1,500 kg payload) was conducted in January and February 2023 at wholesale markets, mandis and industrial areas across Delhi. It recorded vehicle and fleet details, daily operations, revenue and costs, and owners' perceptions of electric vehicles.

91% single owners

Most LGVs are owned and driven by single-vehicle owner-operators

76% <100 km/day

Three-quarters of vehicles travel under 100 km a day — within electric range

91% overloaded

Nearly all trips carry more than the rated payload

1% electric

Only 1% of surveyed vehicles were electric; 31% of owners knew of EV subsidies

₹18.3 per km

Average earning, against a cost of ₹10 and profit of ₹8.3 per km

3/4 buying soon

Of owners plan to replace or add a vehicle within five years

Key findings

- **Operations suit electrification.** Three-wheelers and four-wheelers make up 92% of the fleet. Most vehicles make one or two return trips a day, and daily distance, trip time and working hours rise with payload capacity.
- **Overloading is a barrier.** Only 16% of three-wheelers and 11% of four-wheelers operate within their rated payload. Excess weight would cut the range of electric vehicles.
- **Electric three-wheelers have taken off; four-wheelers have not.** Electric models now account for about 73% of goods three-wheeler sales in Delhi, but only about 1.5% of comparable four-wheeler sales. Four-wheeled electric models are fewer, costlier and offer no more range than electric three-wheelers.
- **The loan period decides the purchase.** Over a 15-year life, electric vehicles cost less per km than CNG vehicles (₹4.31 against ₹8.07 for three-wheelers; ₹5.41 against ₹7.52 for four-wheelers). During the five-year loan period, however, an electric four-wheeler costs slightly more per km than a CNG one.
- **Public charging is costly and poorly designed.** Public charging tariffs at survey locations ranged from ₹10 to ₹100 per kWh. Many operators cannot charge at home, and some chargers force vehicles onto the footpath or carriageway.

- **Owners want cheaper electricity and finance.** Cheaper electricity and lower interest rates were ranked the top two enablers of electrification.

Key recommendations

- Cap public charging tariffs at ₹6–10 per kWh, supported by minimum demand guarantee models for charge point operators, and develop public depots for overnight parking and charging.
- Correct the layout of public chargers and issue design guidelines for safe charging locations.
- Encourage electric four-wheeler models costing ₹6–8 lakh with payloads above 900 kg, a range of 100–120 km and DC fast-charging, using demand aggregation; pair them with DC charging at planned freight vehicle stands.
- Run awareness campaigns with OEMs and operators' associations on range, cost and charging.

01

Background

Studies conducted in Indian cities show that urban freight is dominated by small goods vehicles with a payload capacity of around 0.5 to 1 tonne (Gandhi et al., 2019). These include three-wheelers and four-wheelers such as the Tata Ace and pick-up trucks, and they are therefore significant contributors to carbon emissions and local pollution. These vehicles and their operations contribute 75% of all freight-related emissions within the city, which in turn account for about 25% of all vehicular emissions. To make matters worse, most of these are single-vehicle fleets that remain largely unorganised, resulting in less than 20% utilisation of the kilometres deployed.

However, because of their short trip lengths and peak payload requirements, most current logistics trips by small freight vehicles can easily be electrified. Studies show that more than 80% of the daily operations of these internal combustion engine (ICE) freight vehicles are within the weight and range limits of currently available commercial electric freight vehicles (Gandhi et al., 2019). There is thus a significant need, and significant potential, for electrifying small freight vehicles. Yet the rate of electrification of freight vehicles in the country remains very low. The main reasons for the low penetration of electric vehicles (EVs) in the freight sector are understood to be a lack of supporting policy, limited charging and parking infrastructure, and limited access to finance to overcome the high upfront capital cost — even though the operating cost and total cost of ownership (TCO) remain attractive compared with ICE vehicles.

To overcome these bottlenecks, the Government of National Capital Territory of Delhi (GNCTD) has put significant measures in place. These are embedded in the Delhi Electric Vehicle Policy, 2020 (GNCTD, 2020), which provides fiscal and non-fiscal incentives for vehicle owners, together with ecosystem development measures (through the Switch Delhi campaign), including large-scale investment in charging stations across the state. Electric vehicles have since begun to enter the freight sector, but mainly through larger aggregators such as e-Del. While the bulk of freight operations in Delhi are expected to be run by single-vehicle or small-fleet operators, their transition to electric freight vehicles has been minimal. According to the VAHAN database, only two of 21,885 LGVs sold in Delhi were electric — less than 0.01% of LGV sales.

The reasons for such low adoption of electric freight vehicles, despite the range of fiscal and non-fiscal incentives available, need to be investigated. To this end, GNCTD, under a memorandum of understanding (MoU) with the Transportation Research and Injury Prevention Centre (TRIP-C) at the Indian Institute of Technology Delhi (IIT Delhi), initiated a study to understand the gaps and requirements for the electrification of light goods

vehicles in Delhi. This report develops a baseline for urban freight characteristics in Delhi — including daily trips, average trip length, average weight per trip, vehicle models and ages, current operational characteristics and current TCO — based on primary surveys. It also identifies bottlenecks in the electrification of this mode. The report presents the details of the survey, its findings and broad recommendations that may be considered to accelerate the adoption of electric freight vehicles in the state.

02

Survey Methodology

To meet the objectives of the study, a primary survey based on interviews with users was designed. Survey enumerators administered the survey form to owners of LGVs with a payload capacity of 0.5 to 1.5 tonnes. A pilot questionnaire was first administered to a sample of 50 respondents; the results were analysed and the questionnaire was revised in light of the pilot findings. The appointed enumerators administered the final survey in January and February 2023, collecting a total of 2,000 samples. The overall response rate was 80%.

The final questionnaire was divided into four parts with a total of 40 questions:

1. personal and vehicle details;
2. operational details;
3. revenue and cost details; and
4. user (owner) perception.

Each form took about 15 minutes to complete. About 99% of forms were completely filled; only 30 forms had missing data, mostly for questions on odometer reading, customers served and parking location during working hours. No form had more than two questions, or 5% of the required responses, missing. Annexure 1 reproduces the survey questionnaire.

2.1 Survey locations

Survey samples were collected from different zones of Delhi, concentrated mainly in north and north-east Delhi near wholesale markets. Locations included Azadpur, Bawana, Burari, Chandni Chowk, Fatehpuri, Ghazipur Mandi, Old Delhi, Jahangirpuri, Jhilmil, Kashmere Gate, Mandoli, Naya Bazar, Okhla, Samaypur Badli and Shastri Park. Survey locations were identified on the basis of the density and movement of freight vehicles, and included mandis, wholesale markets and industrial areas such as Azadpur (Asia's largest fruit and vegetable market), Old Delhi (noted for its large wholesale goods markets), Bawana and Okhla (industrial areas). The survey locations are shown in **Figure 1** and photographs in **Figure 2**.

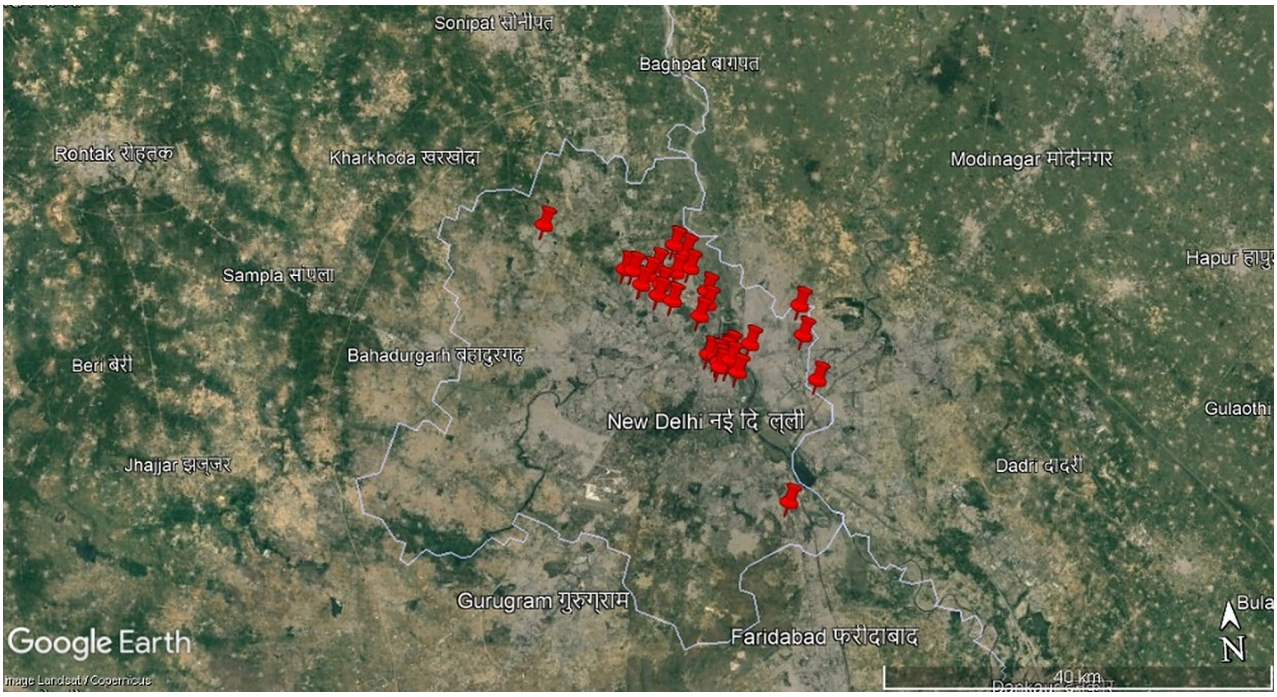


Figure 1 Map of Delhi showing survey locations

Source: Study team; base map © Google Earth



(a) Wholesale market street, Old Delhi



(b) Interview at Okhla



(c) Interview at Jhilmil

Figure 2 Survey locations and fieldwork

Source: SGArchitects survey team

03

Survey Data and Analysis

The survey form was divided into four parts. This chapter presents the data and findings from each part.

3.1 Part 1: Personal and vehicle details

Respondents were asked 11 questions in this part. Two concerned personal information about the owner, such as name and contact number. The remaining nine concerned vehicle details such as year of registration, fuel type, odometer reading, vehicle type (three- or four-wheeler) and vehicle model. Responses to these nine questions were used both directly and indirectly to derive the findings: answers on vehicle number, year of registration, year of manufacture and odometer reading were used to derive additional data for the analysis. The range, mean and standard deviation of the responses are presented in **Table 1**.

Table 1 Range, mean and standard deviation of responses on personal and vehicle details

Question	Minimum	Maximum	Mean	Standard deviation	Responses
Fleet size (vehicles)	1	25	1.22	1.07	1,996
Vehicle type	—	—	—	—	2,000 (772 three-wheelers; 1,228 four-wheelers)
Fleet utilisation (%)	20	100	99.53	5.2	2,000
Odometer reading (km)	115	17,00,000	1,24,438	1,15,057	1,984

Source: Analysis of primary survey data

3.1.1 Vehicle type

All respondents answered the question on vehicle type. The analysis shows that 62% of the vehicles were four-wheelers and 38% three-wheelers. This section presents the capacity, model and fuel type of each vehicle type. The study is limited to LGVs: four categories of freight vehicles with a payload of up to 1,500 kg were covered (**Table 2**).

Table 2 Categories of freight vehicles covered in this study

No.	Category	Description	Payload capacity
1	Carts	E-carts and some three-wheeler models	Up to 500 kg
2	Three-wheelers	Goods three-wheeler models, e.g. Bajaj, Piaggio	501–699 kg
3	Four-wheelers	Goods four-wheeler models, e.g. Tata Ace	700–999 kg
4	Pick-up trucks	Pick-up truck models, e.g. Mahindra Bolero	1,000–1,500 kg

These four categories were chosen because most three-wheelers have a load-carrying capacity of 500–700 kg, most four-wheeled vehicles other than pick-up trucks have a capacity of 700–1,000 kg, and current pick-up trucks have a capacity of 1,000–1,500 kg.

Vehicle type by payload capacity

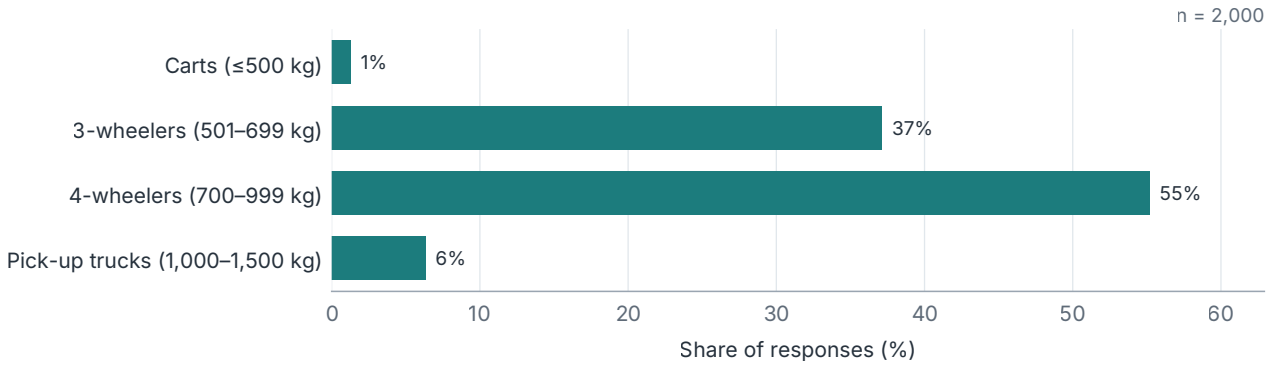


Figure 3 Distribution of vehicles by type and payload capacity

Source: Analysis of primary survey data

Vehicle model by type

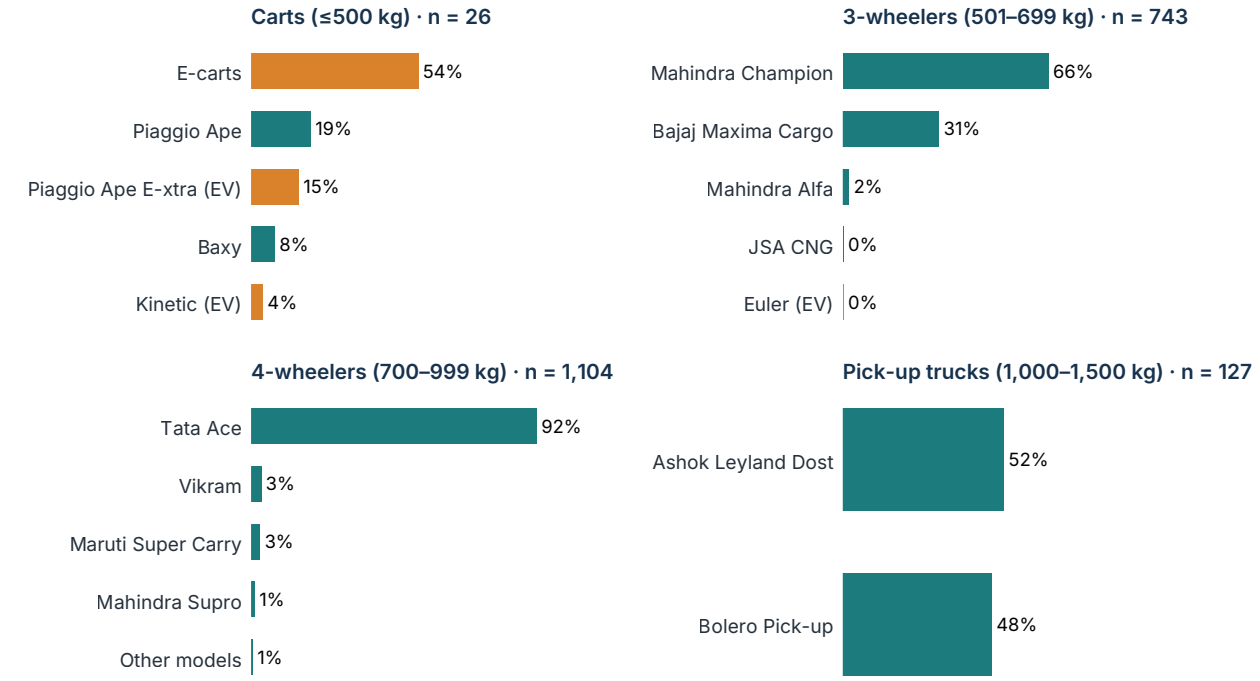


Figure 4 Vehicle models within each payload category

Source: Analysis of primary survey data

Vehicle type by fuel

All respondents answered the question on fuel type. Only 1% of respondents used electric vehicles; the remaining 99% used ICE vehicles, mostly running on CNG. All the electric freight vehicles observed were either three-wheelers or e-carts.

3.1.2 Commodities carried by freight vehicles

Almost all respondents (1,996 of 2,000) answered the question on the commodities carried. The most common commodity was food and grains (44%), followed by mixed loads[1] (26%) and courier and e-commerce goods (8%). By capacity, vehicles under 700 kg (carts and three-wheelers) carry a relatively higher share of perishable food, FMCG, groceries and food grains, while vehicles of 700 kg and above (four-wheelers and pick-up trucks) carry a higher share of courier and e-commerce goods, solid waste and mixed commodities. **Table 3** and **Figure 5** present the distribution of freight vehicles by commodity carried, and **Figure 6** and **Figure 7** compare vehicle types and commodities.

[1] Mixed: carrying more than one commodity during the day, on different trips.

Table 3 Commodities carried by freight vehicles

No.	Commodity	Responses	Share (%)
1	Food grain	870	43.5
2	Perishable food	32	1.6
3	Liquor	1	0.1
4	FMCG	47	2.4
5	Courier and e-commerce	164	8.2
6	Cash	2	0.1
7	Pharmacy	13	0.7
8	Hotel and restaurant	17	0.9
9	Electronics	44	2.2
10	Solid waste	91	4.5
11	Clothes and accessories	52	2.6
12	Printing and publishing	42	2.1
13	Construction and demolition	34	1.7
14	Oil and natural gas	17	0.9
15	Mixed	512	25.6
16	Other	58	2.9
	Total	**2,000**	**100.0**

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

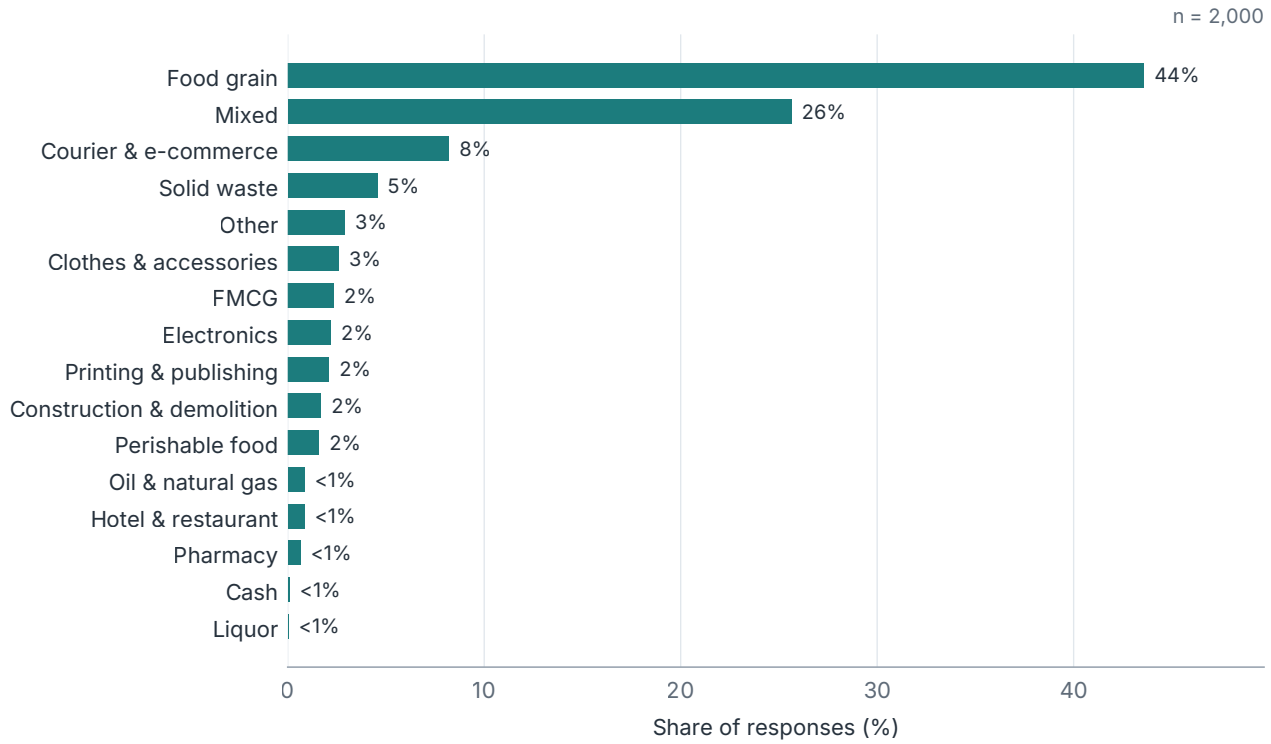


Figure 5 Commodities carried by freight vehicles

Source: Analysis of primary survey data

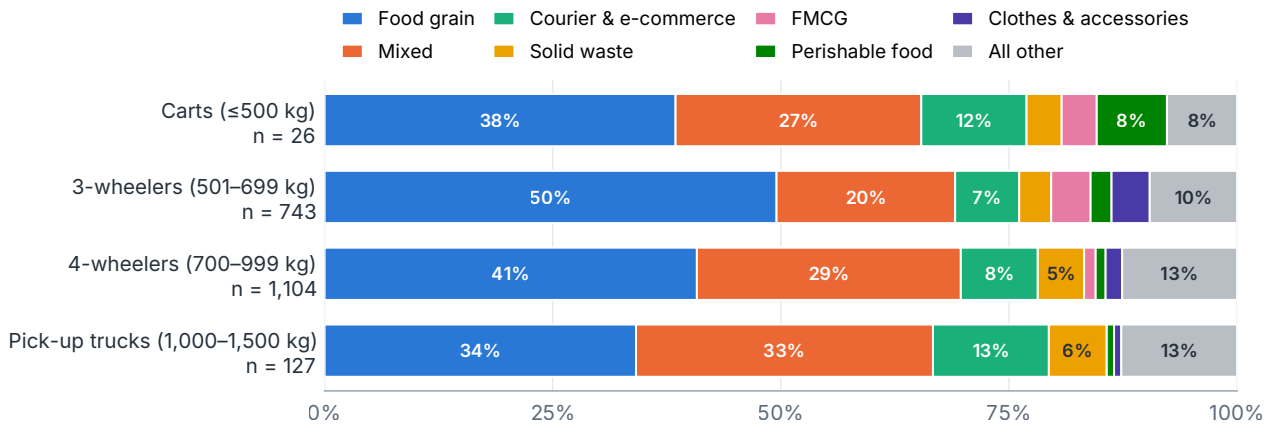


Figure 6 Commodities carried, by vehicle payload capacity

Source: Analysis of primary survey data. Commodities each below 3% of trips in every category are grouped as "All other".

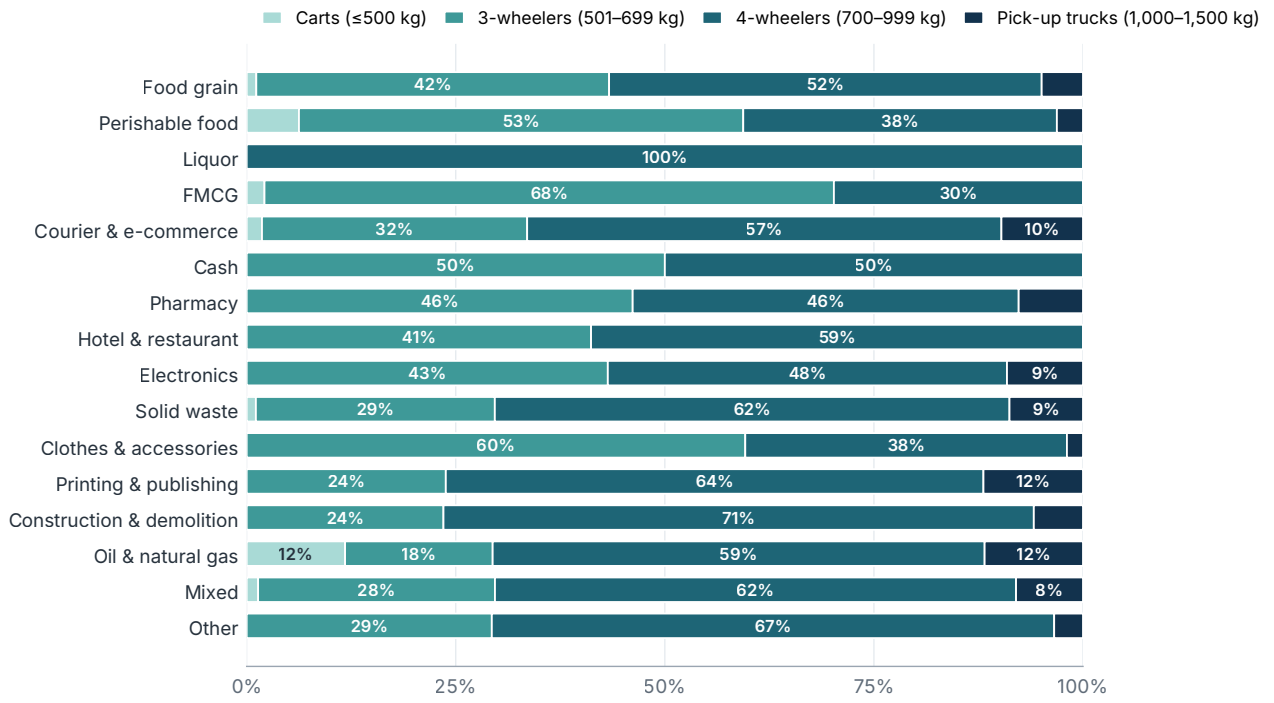


Figure 7 Vehicle payload capacity, by commodity carried

Source: Analysis of primary survey data

3.1.3 Fleet size and utilisation

All 2,000 respondents answered the questions on fleet size and fleet utilisation. The analysis shows that:

1. about 91% (1,815) of owners had a single vehicle, with average fleet utilisation of 100%;
2. 8% (159) had fleets of two to four vehicles, with average utilisation of 95%;
3. 1.15% (23) had fleets of five to ten vehicles, with average utilisation of 98%; and
4. only 0.15% (3) had fleets of more than ten vehicles, with average utilisation of 90%.

By payload capacity, owners of four-wheelers and pick-up trucks have larger fleets than owners of three-wheelers and carts. Utilisation per vehicle is higher for single-vehicle owners and lower for multiple-vehicle owners, because single-vehicle owners cannot afford to leave their vehicle unused on any given day. **Figure 8**, **Figure 9** and **Figure 10** present fleet size and utilisation.

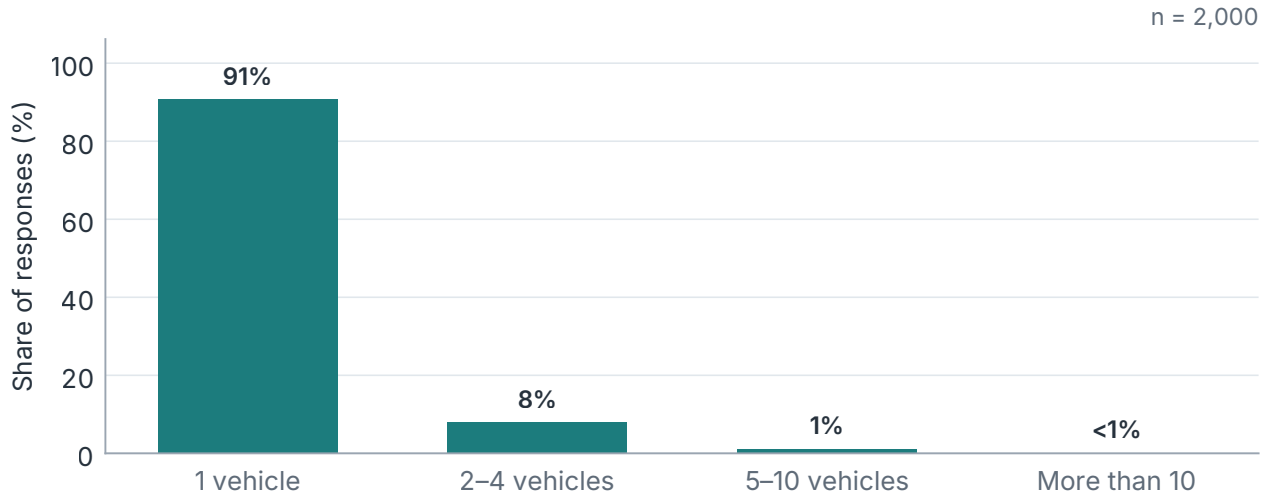


Figure 8 Fleet size distribution

Source: Analysis of primary survey data

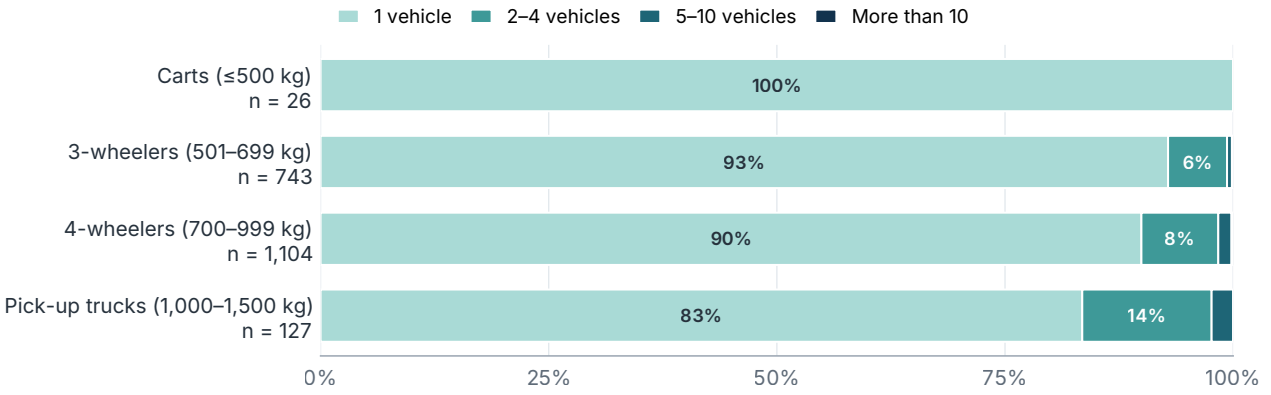


Figure 9 Fleet size by vehicle payload capacity

Source: Analysis of primary survey data

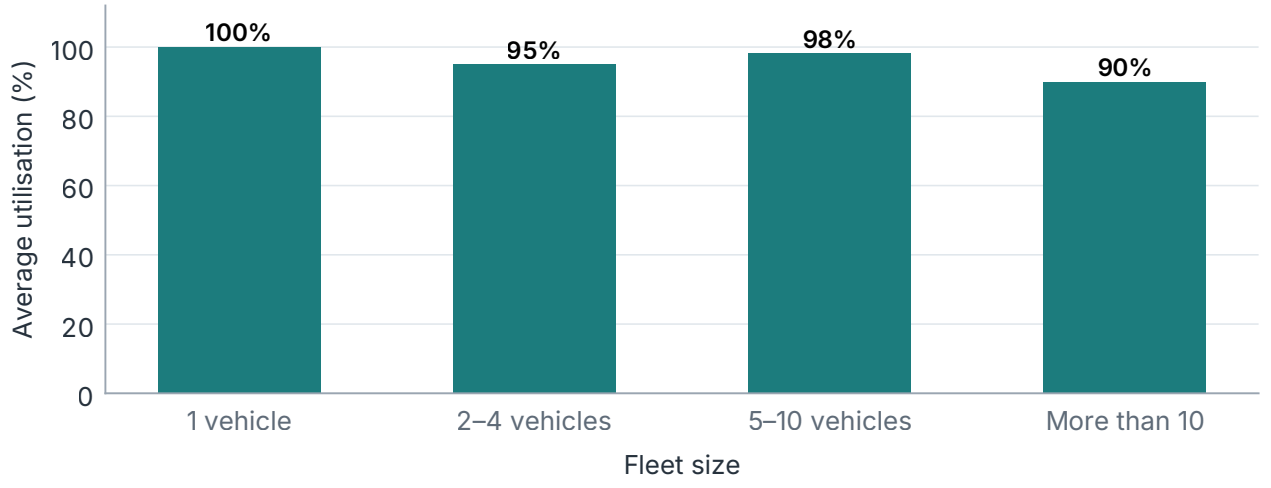


Figure 10 Average vehicle utilisation by fleet size

Source: Analysis of primary survey data

3.1.4 GST registration

Respondents were also asked about Goods and Services Tax (GST) registration. All respondents answered; only 2% of owners have a GST registration.

3.1.5 Vehicle ownership

All respondents answered the question on ownership. Only 3% of vehicles were bought second-hand; 97% were bought new.

3.1.6 Vehicle age

Owners were asked the registration year of their vehicles, from which vehicle age was derived (**Figure 11**). Some 42% of vehicles were 1–5 years old, 33% were 6–10 years old, 23% were 11–15 years old and only 2% were under one year old. By payload capacity, 58% of four-wheelers and pick-up trucks are under five years old and fewer than 15% are over ten years old. Among carts and three-wheelers, by contrast, 37% are over ten years old and only about 25% are five years old or less (**Figure 12**). The average age is 3.9 years for carts, 8.6 years for three-wheelers, 5.6 years for four-wheelers and 5.4 years for pick-up trucks. This suggests that three-wheelers can be electrified sooner.

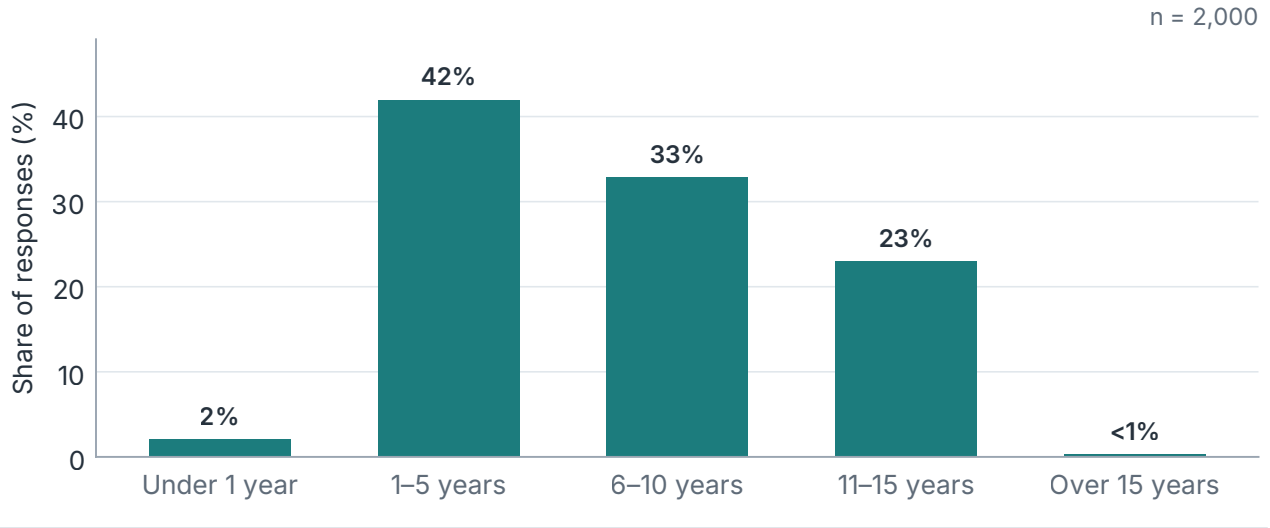


Figure 11 Distribution of vehicle age

Source: Analysis of primary survey data

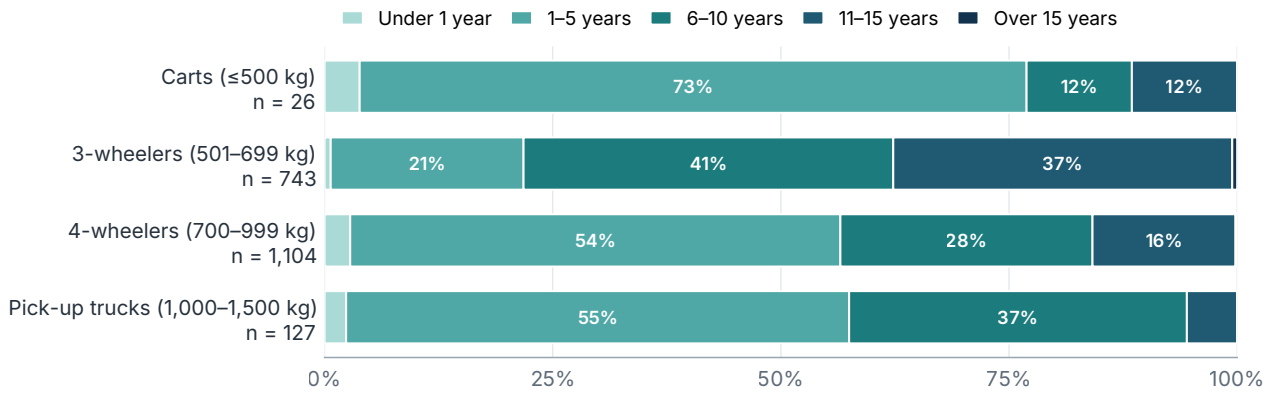


Figure 12 Vehicle age by payload capacity

Source: Analysis of primary survey data

3.1.7 Odometer reading

Odometer readings were obtained from 99% of respondents (1,984). The average distance driven was determined for each payload category: 76,502 km for carts, 1,47,567 km for three-wheelers, 1,10,118 km for four-wheelers and 1,22,787 km for pick-up trucks.

3.2 Part 2: Operational details

Thirteen questions were asked in this part. Eight were used to derive findings directly, while answers to five were combined with other responses to derive additional data. The range, mean and standard deviation of the responses are presented in **Table 4**; the findings from each question follow.

Table 4 Range, mean and standard deviation of responses on operational details

Question	Minimum	Maximum	Mean	Standard deviation	Responses
Trips per day	1	8	1.83	1.2	1,999
Average stops per trip per day (excluding origin and destination)	0	20	0.96	1.6	2,000
Average customers served on a typical trip	1	30	2.08	1.8	1,966
Average weight per trip (kg)	80	4,000	1,236.9	519.9	1,999
Total km covered per day[2]	10	600	102.5	71.9	1,998
Working days per month	10	30	26.7	3.2	2,000
Accidents or crashes per month	0	9	1.13	0.4	2,000
Km of operation per crash	200	14,400	2,431.1	1,547	2,000
Average time per trip (minutes)	30	720	170.6	127	2,000
Total working hours per day	3	20	8.9	2.6	2,000

Source: Analysis of primary survey data

[2] Some freight vehicle drivers were observed making trips beyond the city boundary.

3.2.1 Type of movement

Owners were asked about their trip characteristics, and all 2,000 respondents answered. Only 18% of vehicles operate on fixed routes; 82% operate on flexible routes. The analysis by payload capacity did not reveal significant differences (**Figure 13**).

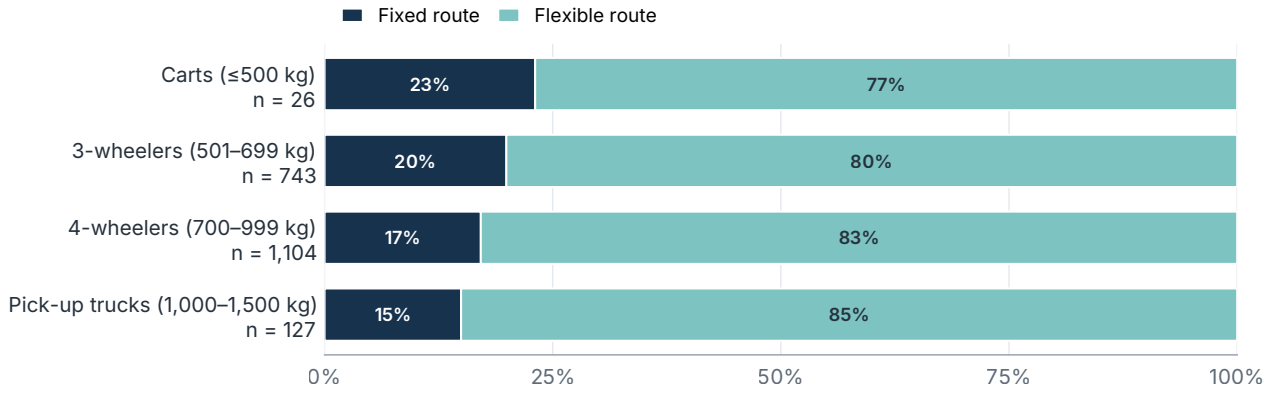


Figure 13 Type of movement by vehicle payload capacity
Source: Analysis of primary survey data

3.2.2 Delivery type

All 2,000 respondents answered the question on delivery type. Some 57% of deliveries are point-to-point and 43% are staged (multi-drop) deliveries. By payload capacity, the share of staged deliveries increases with vehicle payload capacity (**Figure 14**).

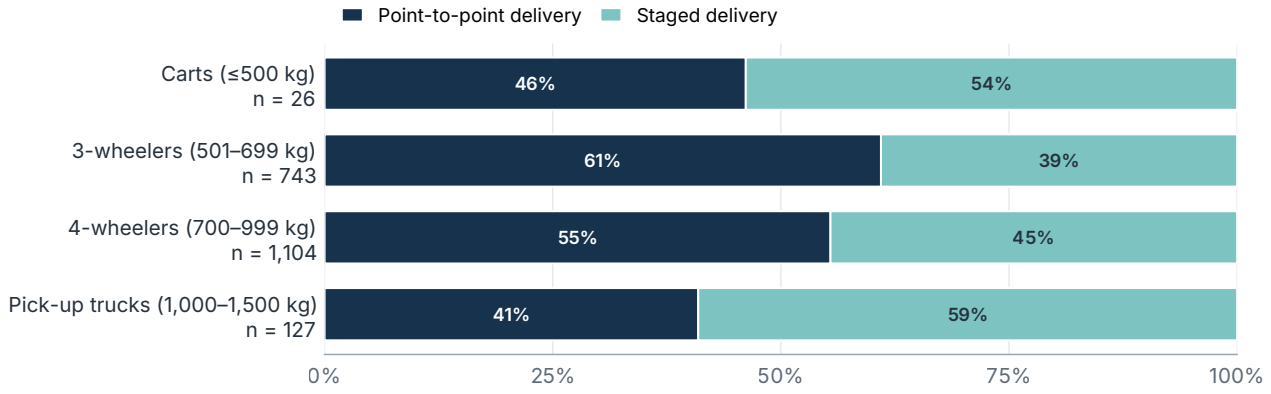


Figure 14 Delivery type by vehicle payload capacity
Source: Analysis of primary survey data

3.2.3 Number of trips per day

Owners were asked the total number of trips made each day, and 99.9% (1,999) responded. About 51% of vehicles make one trip, 31% make two trips and the rest make more than two trips a day (**Table 5** and **Figure 15**). By payload capacity (**Figure 16**), nearly 50% of oper-

ators in every category make one (return) trip a day, but the share making more than two trips a day is higher for smaller vehicles. The average number of return trips per day is 2.5 for carts, 1.86 for three-wheelers, 1.79 for four-wheelers and 1.7 for pick-up trucks.

Table 5 Number of trips per day

Response	1 trip	2 trips	3 trips	4 trips	5 trips	More than 5	Total
Responses (no.)	1,021	632	156	117	29	44	1,999
Share (%)	51.1%	31.6%	7.8%	5.9%	1.5%	2.2%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

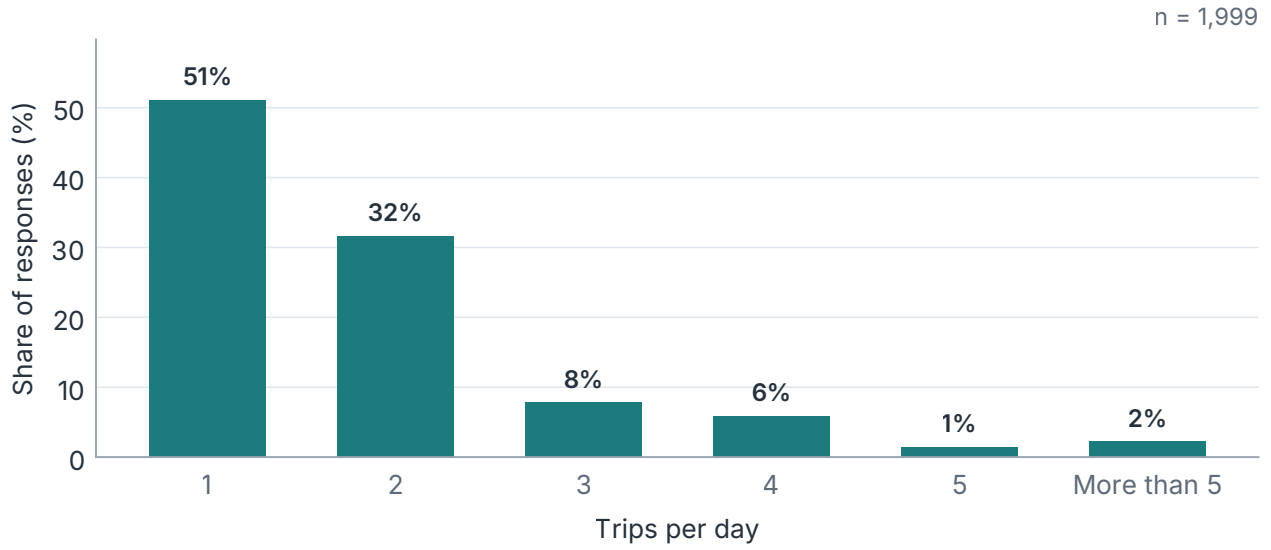


Figure 15 Number of trips per day

Source: Analysis of primary survey data

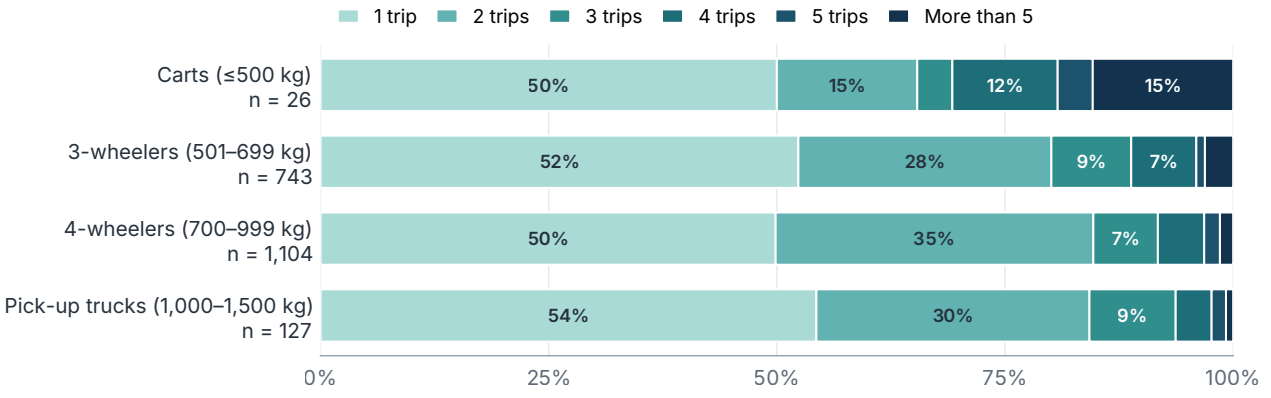


Figure 16 Number of trips per day, by vehicle payload capacity

Source: Analysis of primary survey data

3.2.4 Average number of mid-stops per trip

Owners were asked the average number of stops made between origin and destination each day. Combined with the stated number of daily trips, this was used to derive the average number of stops (for loading or unloading) per trip. All respondents answered. Some

57% of trips have no mid-stops between origin and destination, 39% have one or two, and the rest have more than two (**Table 6** and **Figure 17**). The average number of stops per trip by vehicle type is shown in **Figure 18**.

Table 6 Number of mid-stops per trip

Response	0	1	2	3	4	5	More than 5	Total
Responses (no.)	1,135	181	600	14	20	9	41	2,000
Share (%)	56.8%	9.0%	30.0%	0.7%	1.0%	0.4%	2.1%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

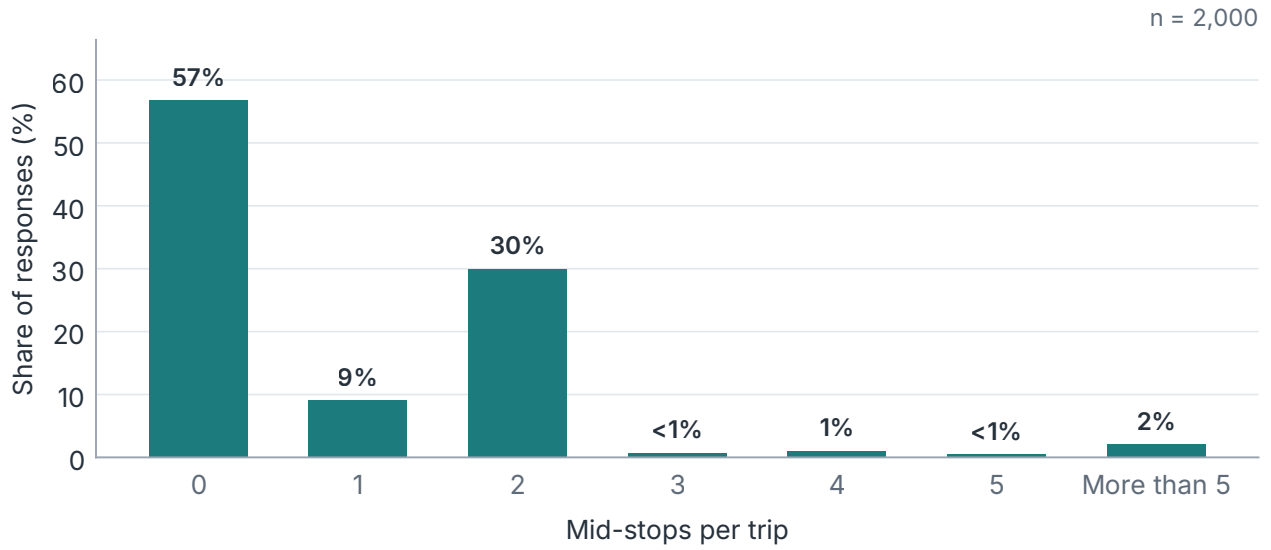


Figure 17 Number of mid-stops per trip

Source: Analysis of primary survey data

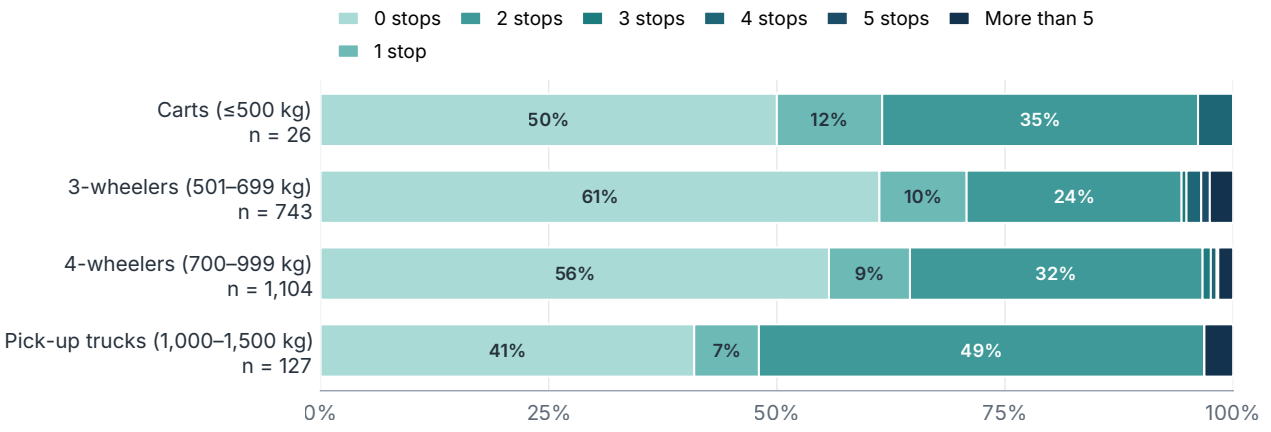


Figure 18 Number of mid-stops per trip, by vehicle payload capacity

Source: Analysis of primary survey data

3.2.5 Average number of customers served on a typical trip

This question was answered by 98% of respondents (1,966 of 2,000). About 51.7% of trips serve only one customer, 24.4% serve two customers and the rest serve more than two (**Table 7** and **Figure 19**). *The number of stops and the number of customers can differ because, for some commodities, a vehicle may drop goods at a location where more than one customer receives them.*

Table 7 Average number of customers served on a typical trip

Response	1	2	3	4	5	More than 5	Total
Responses (no.)	1,016	481	163	157	70	79	1,966
Share (%)	51.7%	24.5%	8.3%	8.0%	3.6%	4.0%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

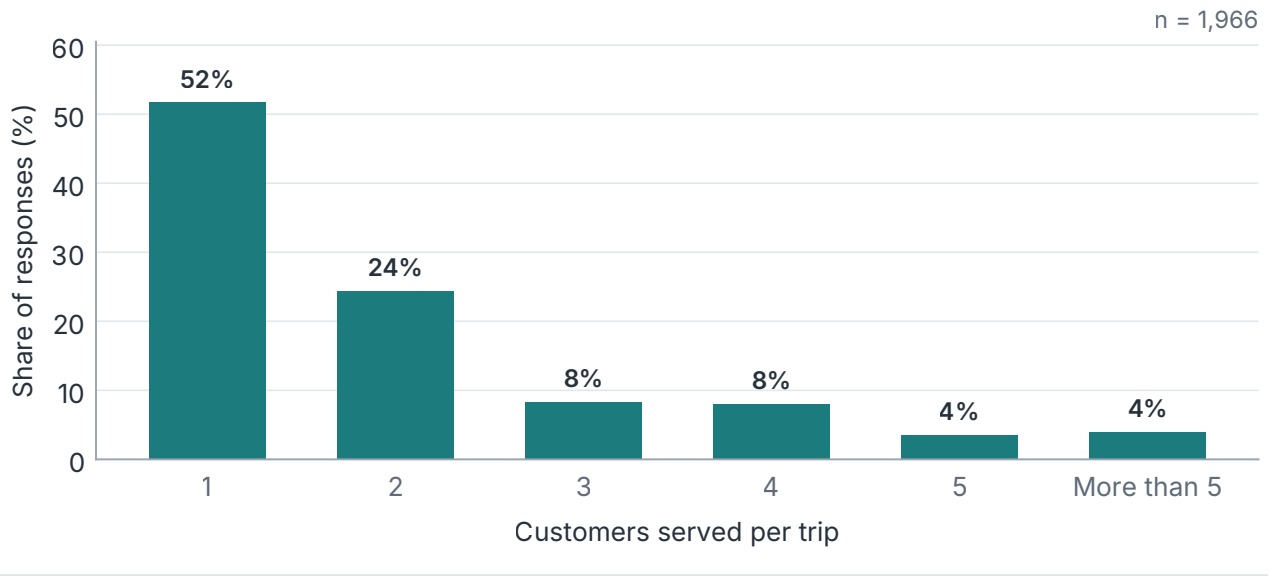


Figure 19 Average number of customers served on a typical trip

Source: Analysis of primary survey data

3.2.6 Average weight per trip

This question was answered by 99.9% of respondents (1,999 of 2,000). About 70% carry more than 1,000 kg per trip, 22% carry 700–999 kg and only 8% carry less than 700 kg. By vehicle type, weight per trip increases with payload capacity (**Table 8**, **Figure 20** and **Figure 21**); the average weight per trip by commodity is shown in **Figure 22**.

Table 8 Average weight per trip

Response	Up to 500 kg	501–699 kg	700–999 kg	1,000–1,500 kg	Over 1,500 kg	Total
Responses (no.)	109	63	436	982	409	1,999
Share (%)	5.5%	3.2%	21.8%	49.1%	20.5%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

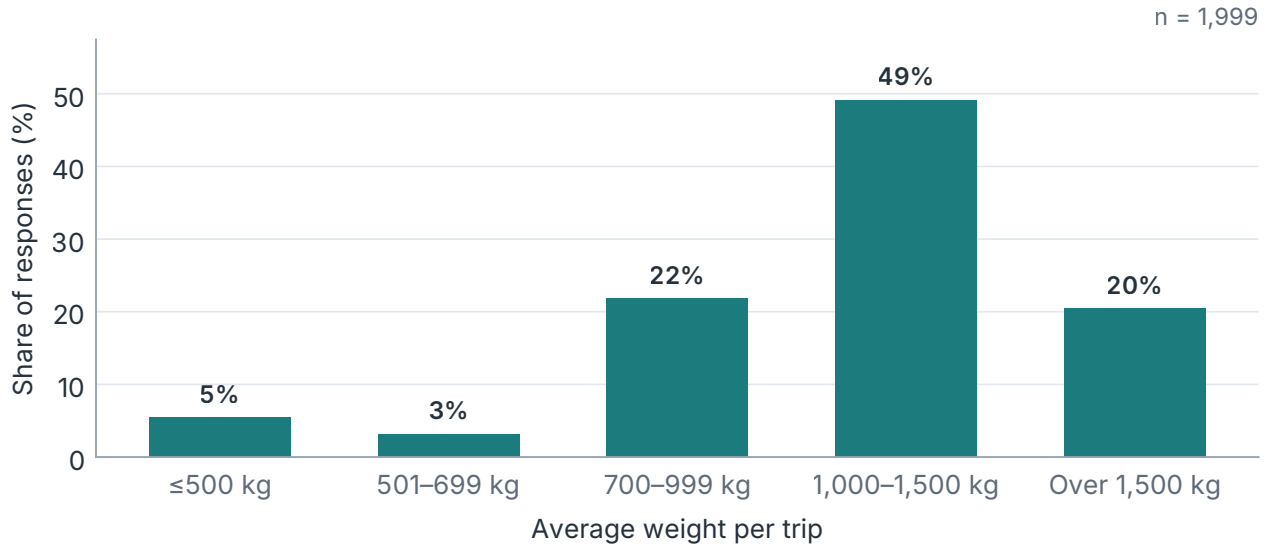


Figure 20 Average weight per trip

Source: Analysis of primary survey data

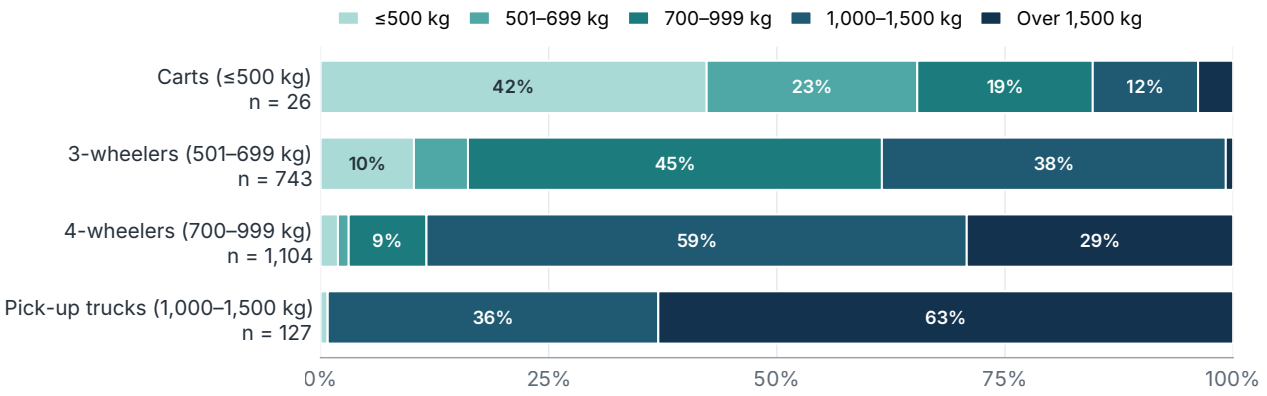


Figure 21 Average weight per trip, by vehicle payload capacity

Source: Analysis of primary survey data

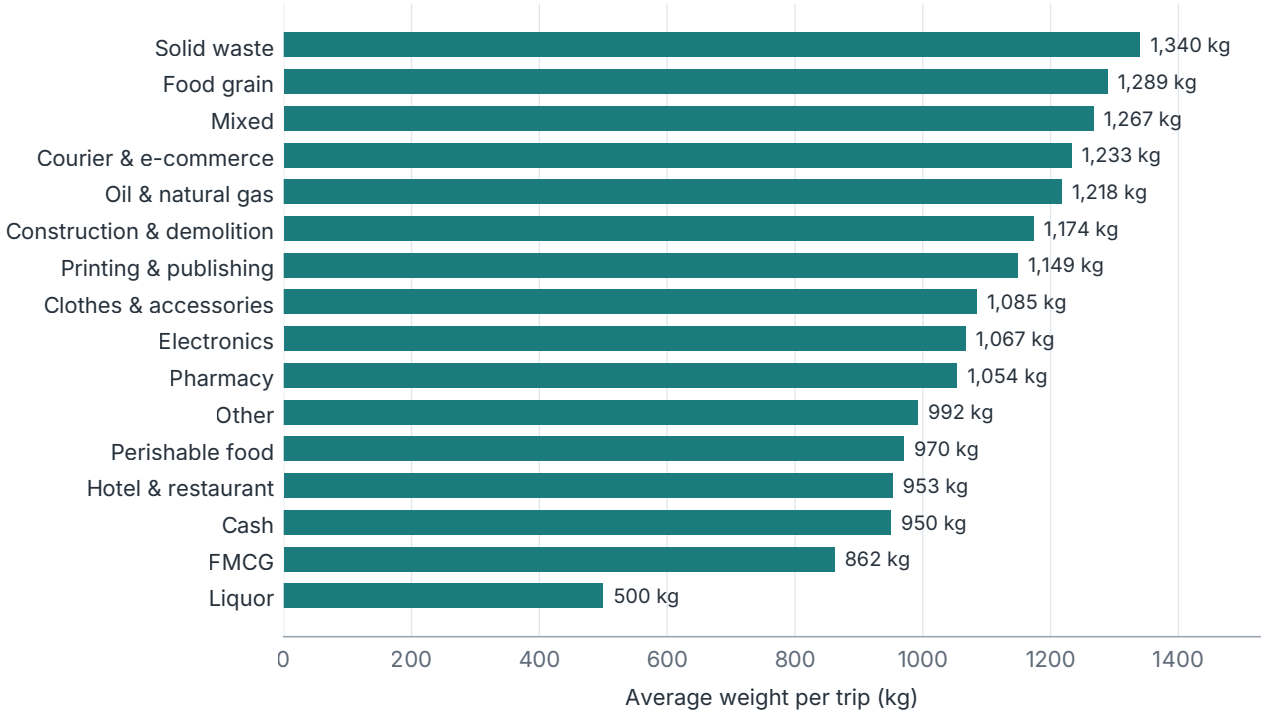


Figure 22 Average weight per trip, by commodity

Source: Analysis of primary survey data

The ratio of stated weight carried to vehicle payload capacity is presented in **Figure 23**. It points to a high share of overloaded trips. Only 9% of trips were within the payload capacity; 41% exceeded it by up to 50%, 47% carried between 1.5 and 3 times the payload, and 3% carried more than three times the payload. No vehicle type stands out as more prone to overloading. Some 92% of observations are of three-wheelers and four-wheelers, and 84–88% of these undertake overloaded trips, compared with 58–63% of carts and pick-up trucks. The share of overloaded vehicles by payload capacity is presented in **Figure 24**.

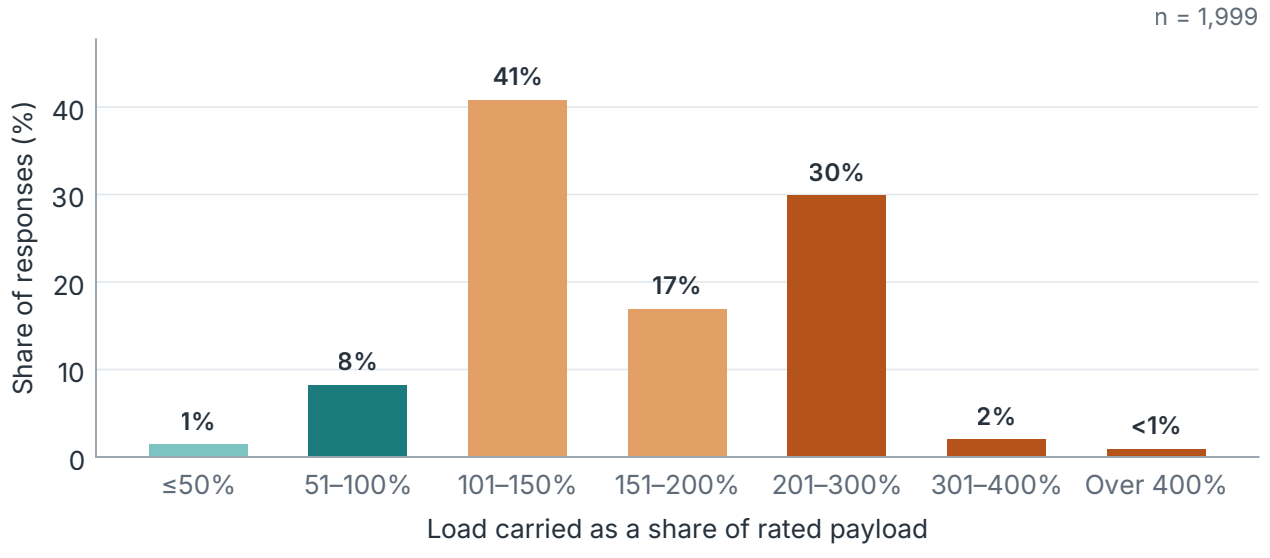


Figure 23 Weight carried as a share of rated payload capacity

Source: Analysis of primary survey data

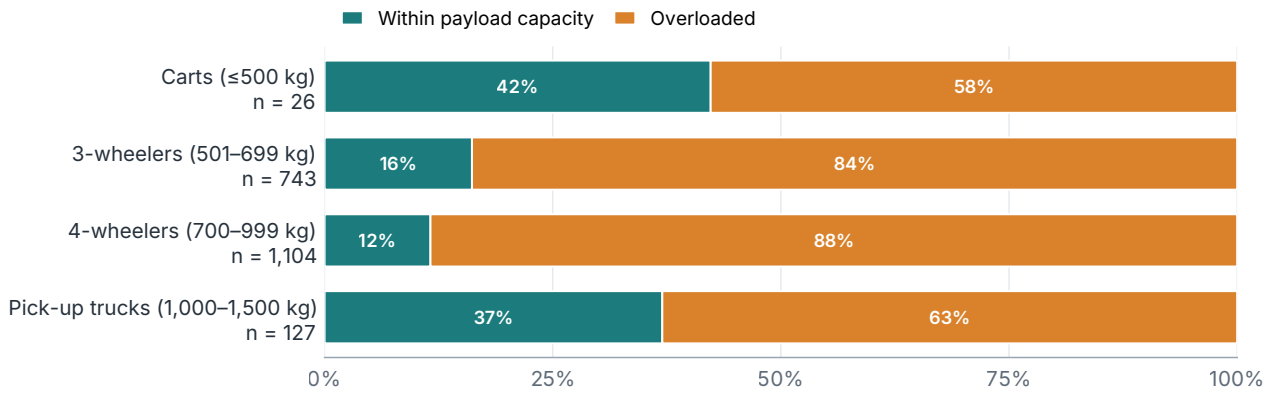


Figure 24 Overloaded vehicles, by payload capacity

Source: Analysis of primary survey data

3.2.7 Total kilometres covered per day

All 2,000 respondents answered this question. Some 27% of freight vehicles travel 50 km or less a day, 49% travel 51–100 km and the rest travel more than 100 km. The stated responses correlate strongly (0.67) with values derived from other questions in the survey. Daily utilisation, in kilometres per day, increases with payload capacity: the average is 71.5 km for carts, 86.7 km for three-wheelers, 109.8 km for four-wheelers and 138.1 km for pick-up trucks (**Table 9**, **Figure 25**, **Figure 26** and **Figure 27**).

Table 9 Total kilometres covered per day

Response	Up to 50 km	51–100 km	101–150 km	151–200 km	201–300 km	301–400 km	Over 400 km	Total
Responses (no.)	547	980	207	155	75	18	18	2,000
Share (%)	27.4%	49.0%	10.3%	7.8%	3.8%	0.9%	0.9%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

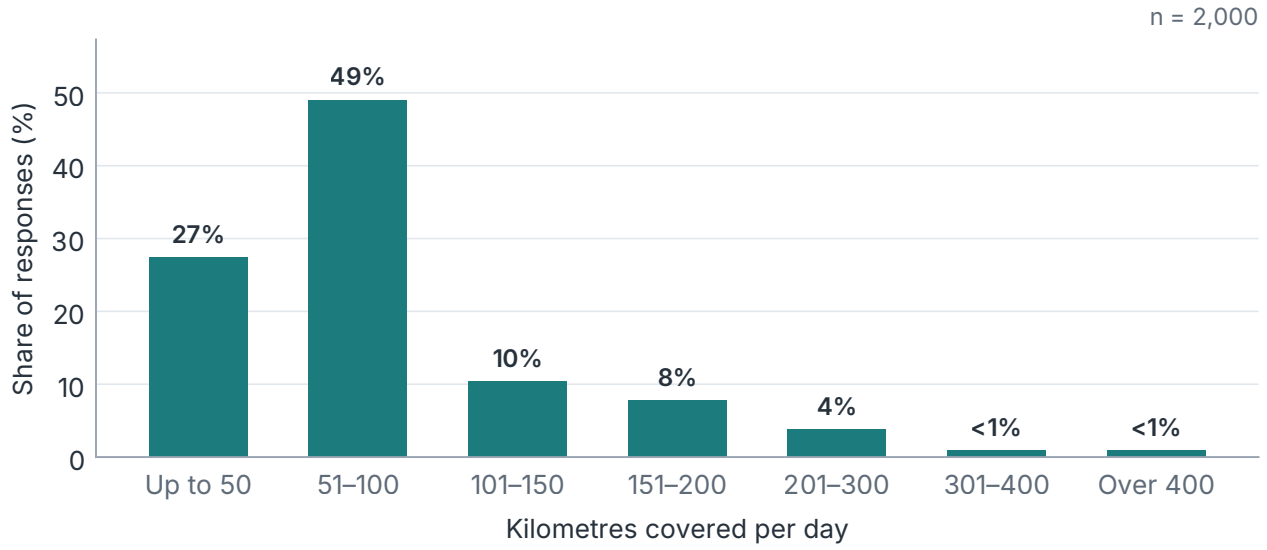


Figure 25 Total kilometres covered per day

Source: Analysis of primary survey data

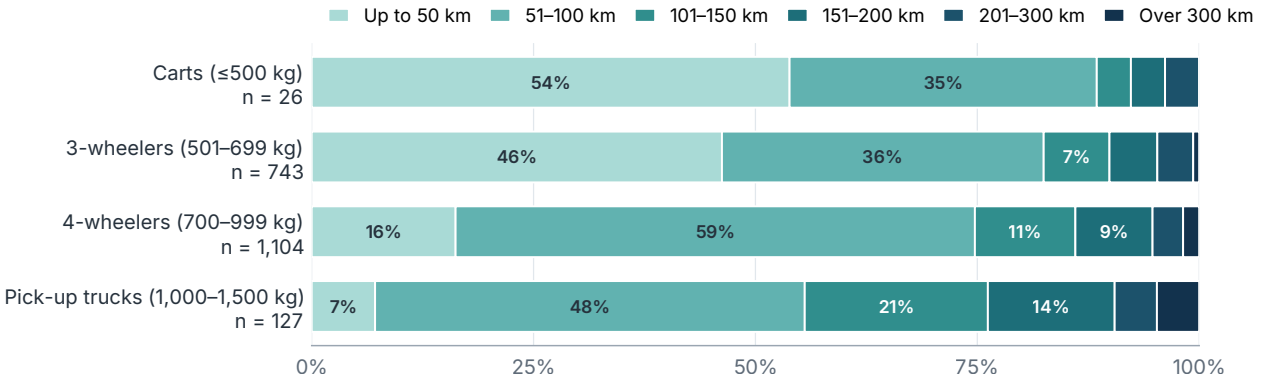


Figure 26 Total kilometres covered per day, by vehicle payload capacity

Source: Analysis of primary survey data

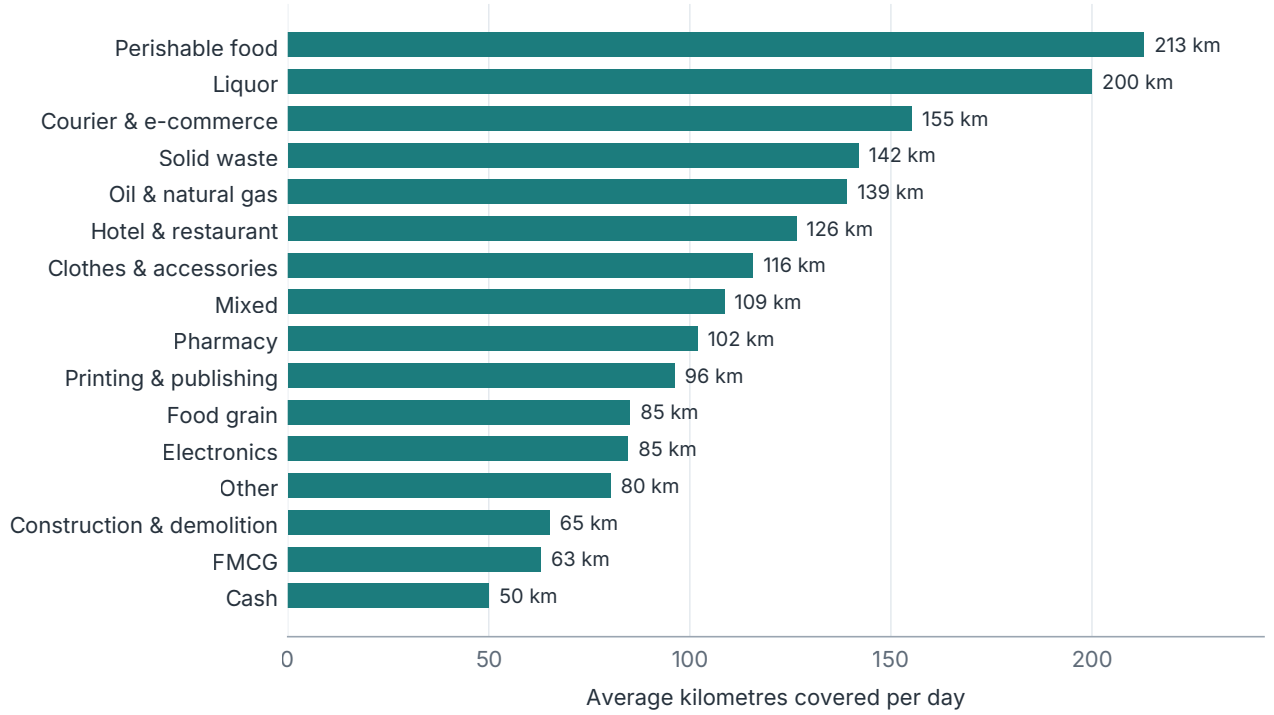


Figure 27 Average kilometres covered per day, by commodity

Source: Analysis of primary survey data

3.2.8 Average return-trip length

The average (return) trip length was derived from the responses on daily vehicle utilisation and the number of trips per day. For 30% of responses the average trip length is 40 km or less, for 44% it is 41–80 km, and for only 26% it exceeds 80 km. Disaggregated by vehicle type, the average (return) trip length is higher for higher payload capacities (**Table 10**, **Figure 28** and **Figure 29**).

Table 10 Average return-trip length

Response	Under 21 km	21–40 km	41–60 km	61–80 km	81–100 km	Over 100 km	Total
Responses (no.)	128	471	646	234	392	129	2,000
Share (%)	6.4%	23.5%	32.3%	11.7%	19.6%	6.5%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

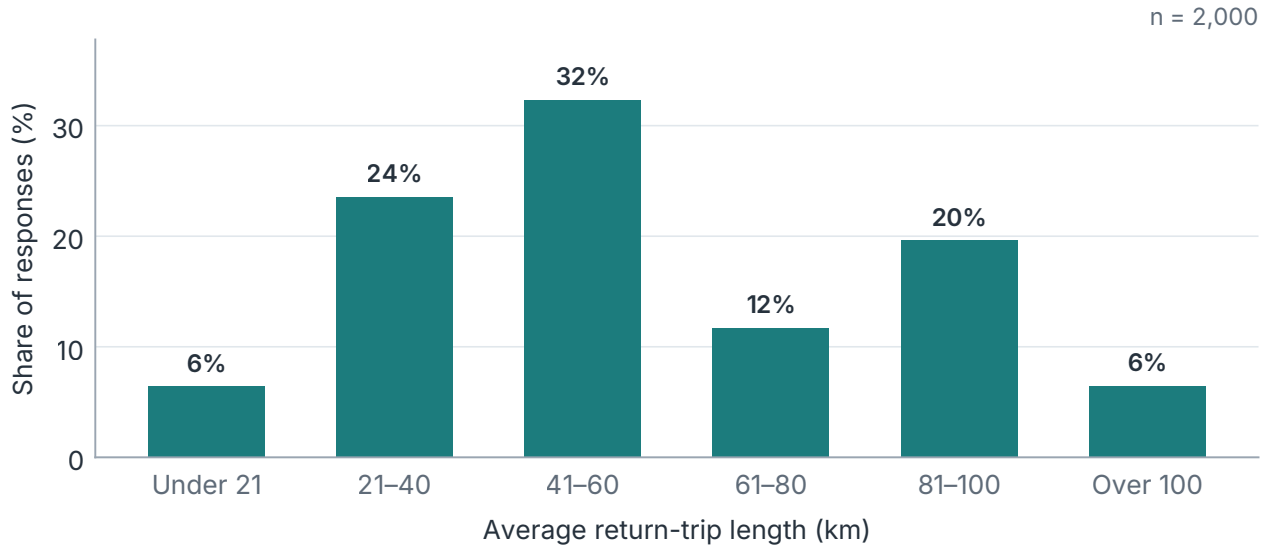


Figure 28 Average return-trip length

Source: Analysis of primary survey data

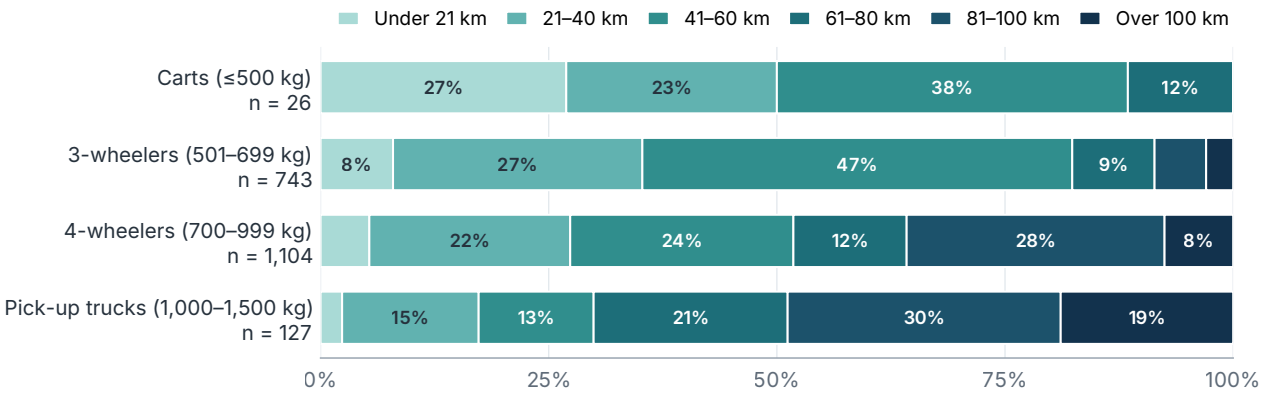


Figure 29 Average return-trip length, by vehicle payload capacity

Source: Analysis of primary survey data

3.2.9 Parking location

This question had two parts, on parking locations during non-working and working hours. All 2,000 respondents answered for non-working hours and 50% (1,000) for working hours. **Figure 30** compares parking locations in the two periods. During working hours, 90% of vehicles are parked along the road away from home; during non-working hours, most vehicles are parked at or next to the operator's home, with 27% parked along the road (**Table 11** and **Figure 30**).

Table 11 Parking location

Period	Roadside (away from home)	Private parking / in the shop	Commercial parking	Home (at or next to home)	Total
Non-working hours	536	134	96	1,234	2,000
Working hours	896	68	2	34	1,000

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

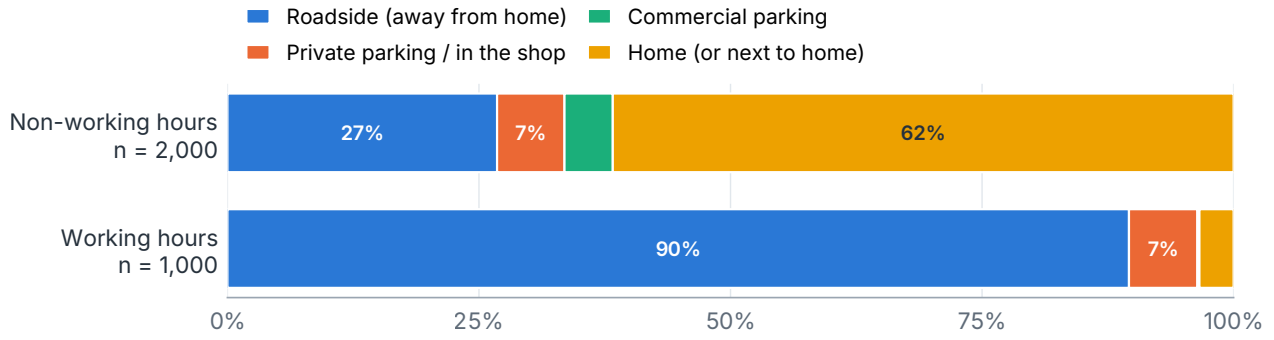


Figure 30 Parking location during working and non-working hours

Source: Analysis of primary survey data

By vehicle type, parking behaviour shows no significant difference for most vehicles surveyed. During non-working hours, 60–70% of three-wheelers and four-wheelers park at or next to the operator's home, but only 31% of pick-up trucks do so; most pick-up trucks (53%) park along the street away from home (**Figure 31**). During working hours there is little difference between vehicle types, and most owners park at the roadside away from home (**Figure 32**).

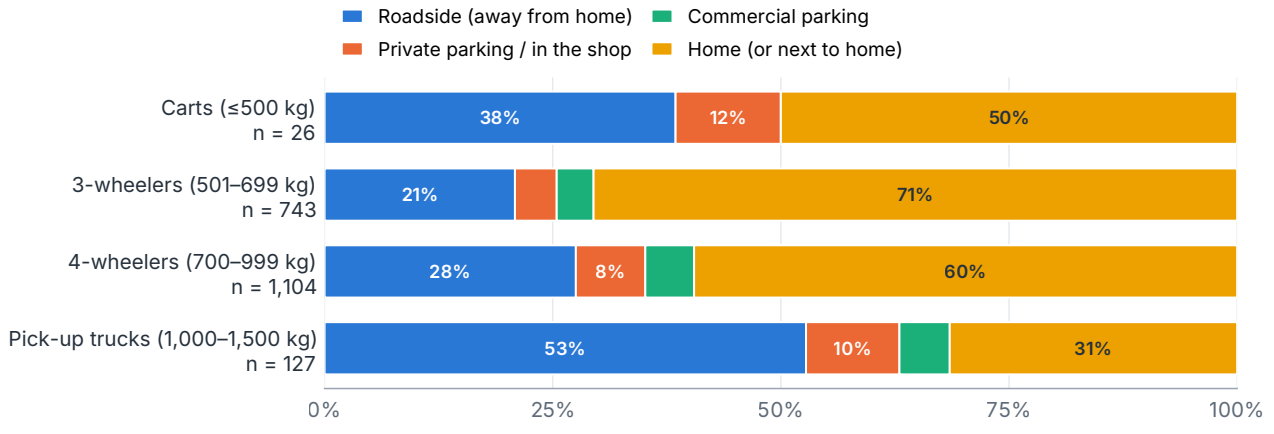


Figure 31 Parking location during non-working hours, by vehicle payload capacity

Source: Analysis of primary survey data

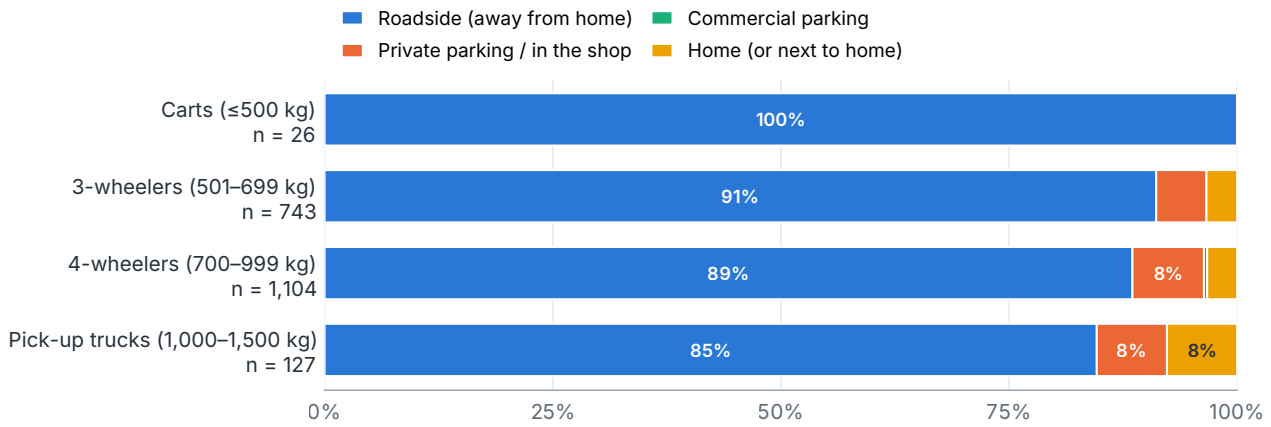


Figure 32 Parking location during working hours, by vehicle payload capacity

Source: Analysis of primary survey data

3.2.10 Number of working days in a month

All 2,000 respondents answered. About 77% work more than 25 days a month, 15% work 21–25 days and the remaining 8% work 20 days or fewer (**Figure 33**).

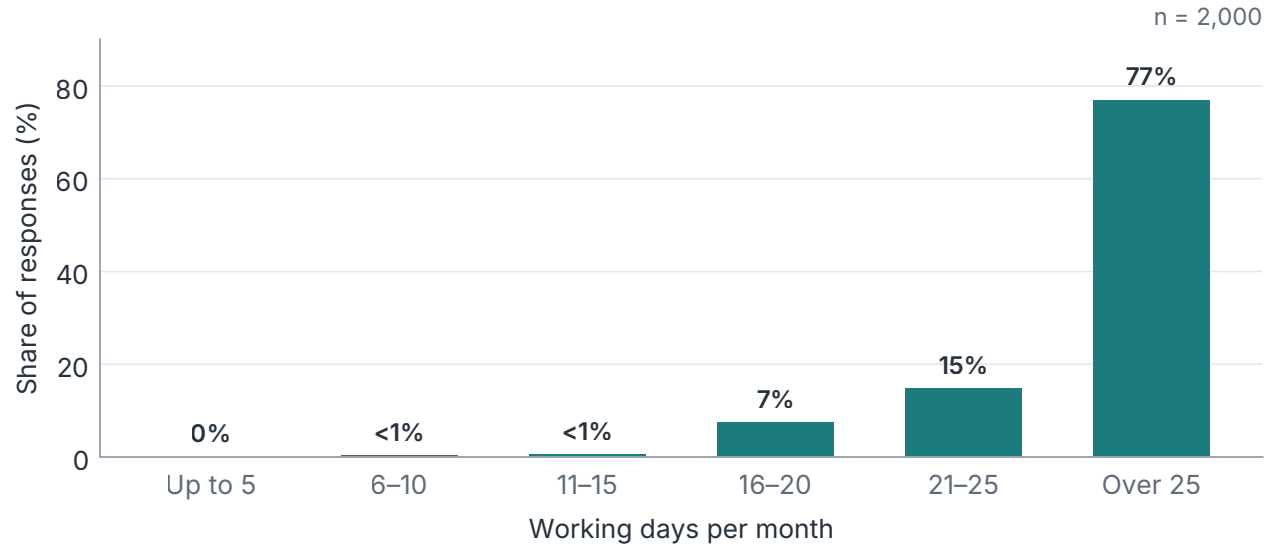


Figure 33 Number of working days in a month

Source: Analysis of primary survey data

3.2.11 Average time per return trip

All 2,000 respondents answered the question on the average duration of a return trip:

1. about 21% (428) take less than 1 hour per return trip;
2. 29% (587) take 1 to under 2 hours;
3. 33% (651) take 2 to under 3 hours;
4. 5% (96) take 3 to under 4 hours;
5. only 2% (36) take 4 to under 5 hours; and
6. 10% (202) take 5 hours or more.

Figure 34 presents the breakdown of average time per trip, and **Figure 35** shows it by vehicle type. The share of vehicles with longer trips is higher for vehicles with larger payloads.

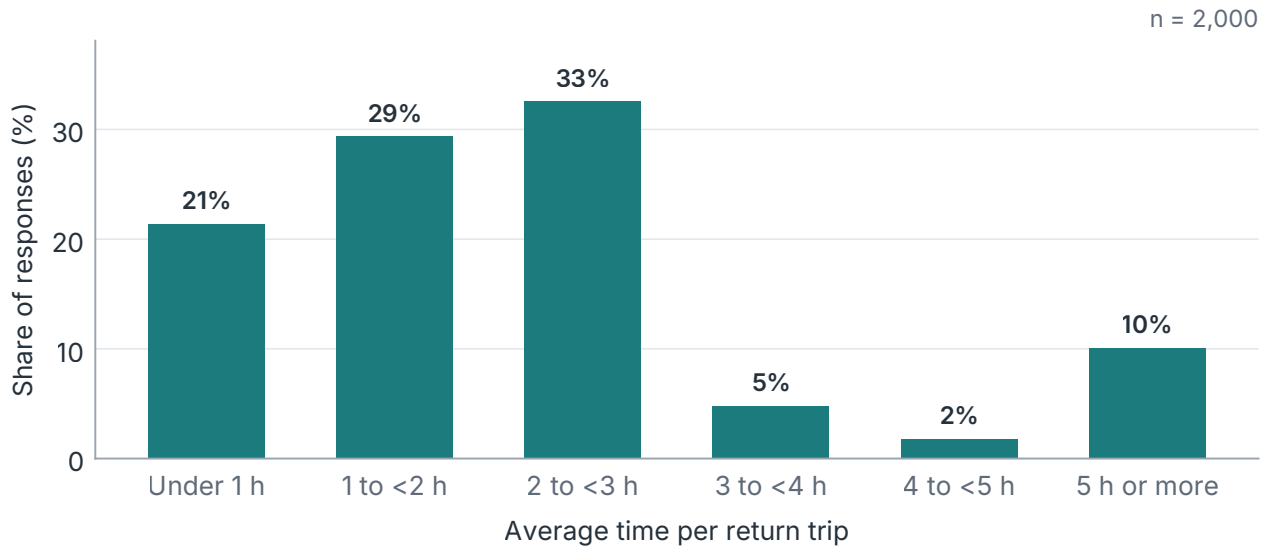


Figure 34 Average time per return trip

Source: Analysis of primary survey data

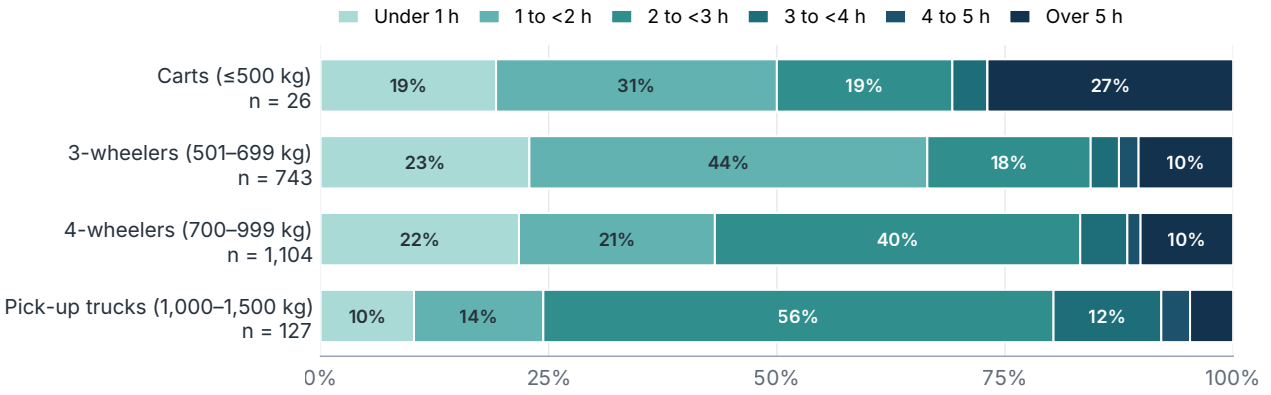


Figure 35 Average time per return trip, by vehicle payload capacity

Source: Analysis of primary survey data

3.2.12 Total working hours per day

Owners and operators were asked about their total working hours per day, and all responded. Working hours were derived from the breakdown of daily working time:

- only 2% of owners work four hours or less a day;
- 46% (929) work 5–8 hours a day;
- 43% (855) work 9–12 hours a day; and
- 9% work more than 12 hours a day.

The question had three parts: loading and unloading time, idle or rest time (between the start and end of the working day), and driving time. Their sum gives the total working hours in a day. Analysis by vehicle type is presented for each part (**Table 12**, **Figure 36** and **Figure 37**). As payload capacity increases, idle time falls while driving and loading/unloading times rise.

Table 12 Total working hours per day (derived from the stated breakdown)

Response	1–4 hours	5–8 hours	9–12 hours	Over 12 hours	Total
Responses (no.)	35	929	855	181	2,000
Share (%)	1.8%	46.5%	42.8%	9.0%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

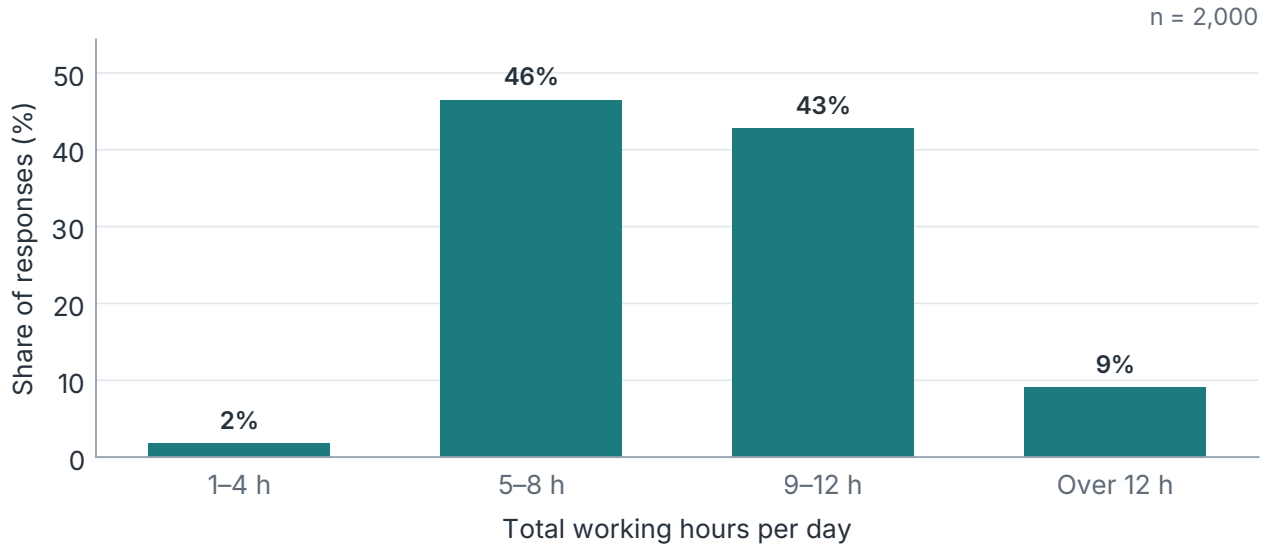


Figure 36 Total working hours per day

Source: Analysis of primary survey data

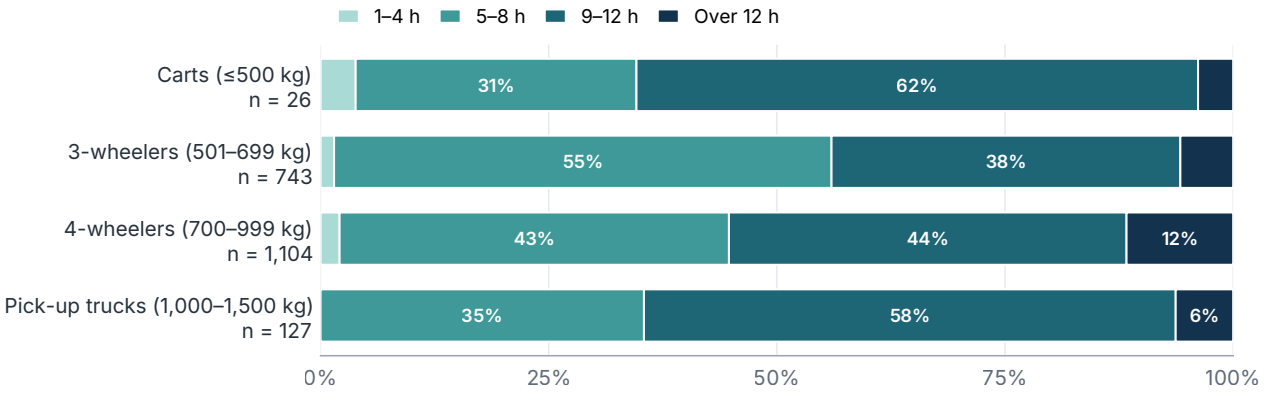


Figure 37 Total working hours per day, by vehicle payload capacity

Source: Analysis of primary survey data

Loading and unloading time

The distribution of loading and unloading time is presented in **Figure 38**. Some 2% of respondents spend less than half an hour a day loading and unloading, 14% spend half an hour to under an hour, 45% spend one hour to under one and a half hours, and the remainder spend longer (**Figure 39**).

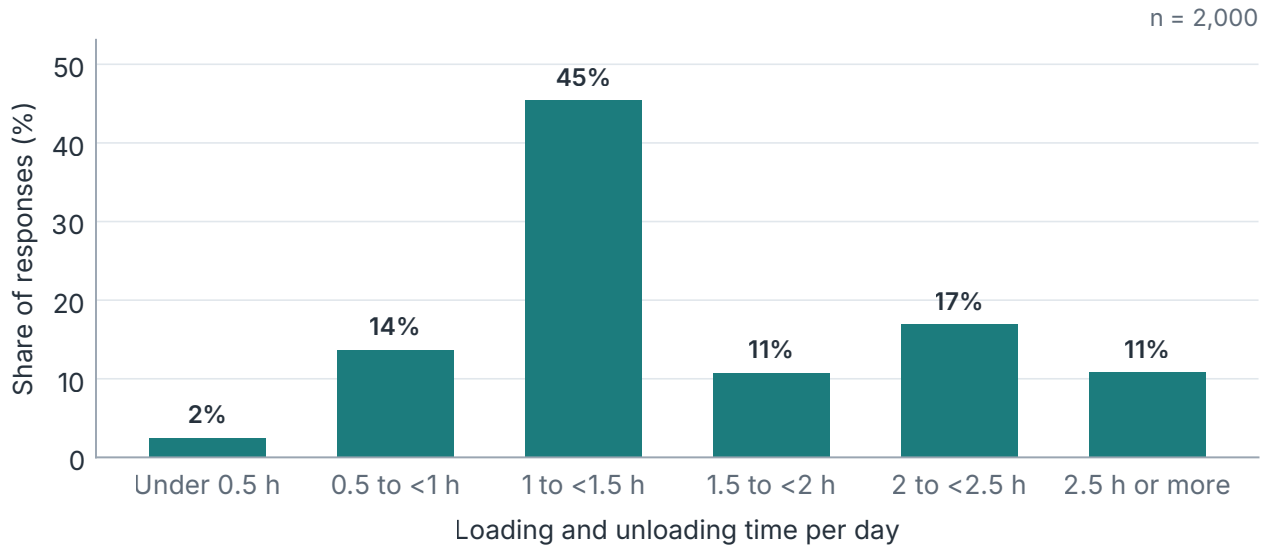


Figure 38 Loading and unloading time per day

Source: Analysis of primary survey data

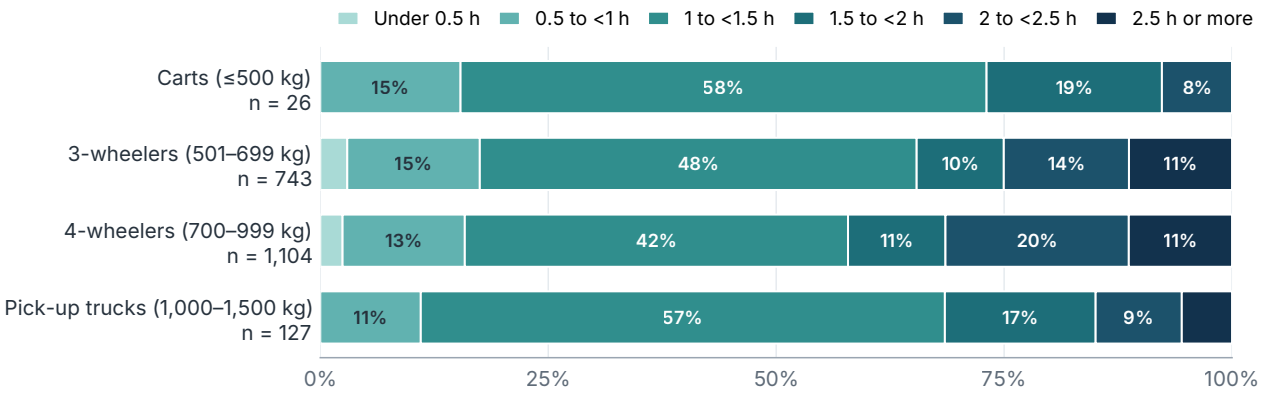


Figure 39 Loading and unloading time per day, by vehicle payload capacity

Source: Analysis of primary survey data

Idle and rest time

The distribution of idle or rest time is presented in **Figure 40**. Some 15% of respondents take less than an hour's break in a working day, 54% take one to under two hours, 31% take two to under three hours, and the remainder take more than three hours (**Figure 41**).

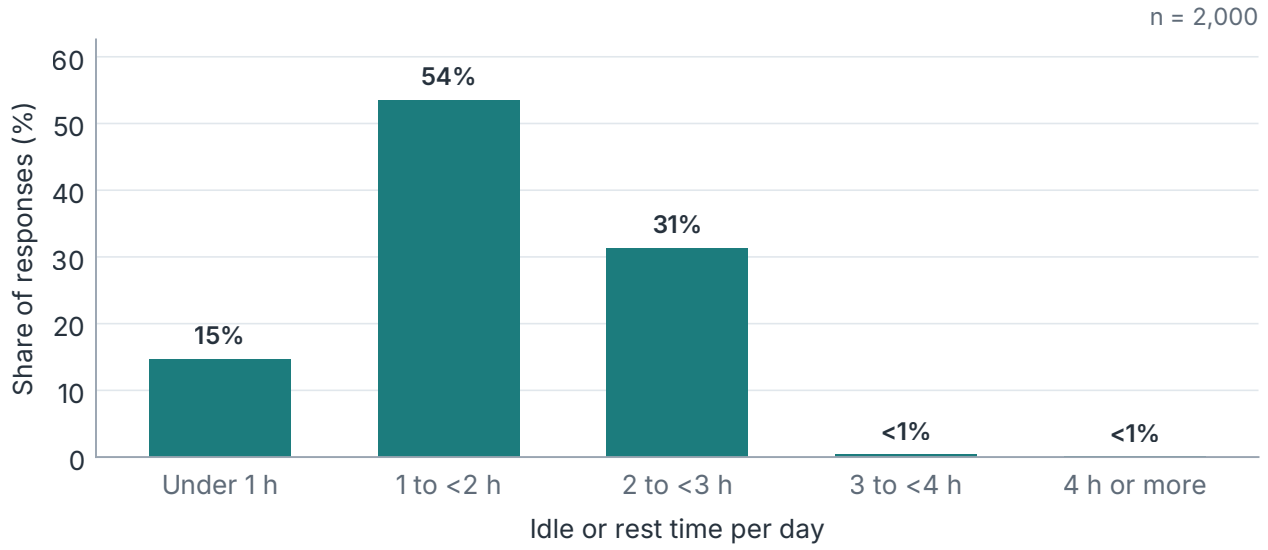


Figure 40 Idle and rest time per day

Source: Analysis of primary survey data

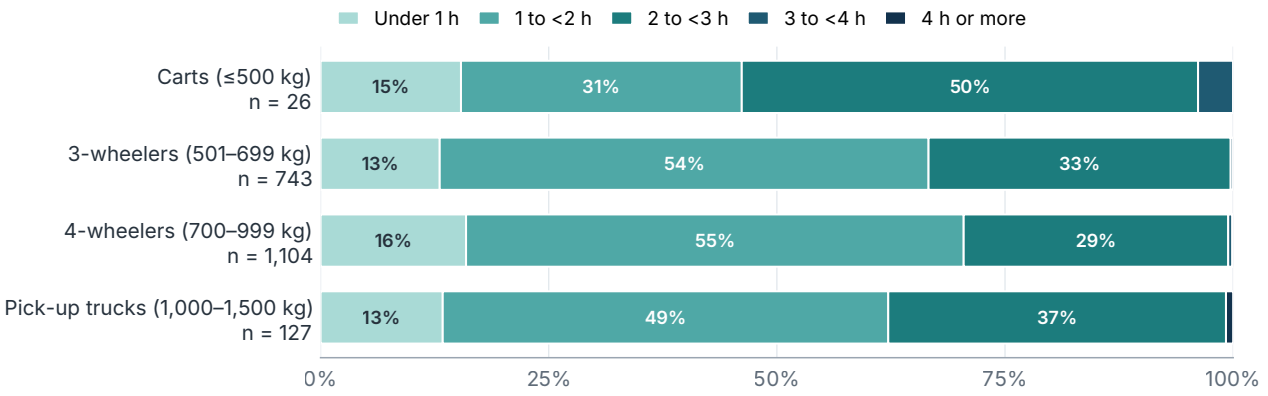


Figure 41 Idle and rest time per day, by vehicle payload capacity

Source: Analysis of primary survey data

Driving time

The distribution of driving time is presented in **Figure 42**. Almost no operators (one response) drive for less than two hours a day; 13% drive for two to under four hours, 27% for four to under six hours, and the rest for more than six hours (**Figure 43**).

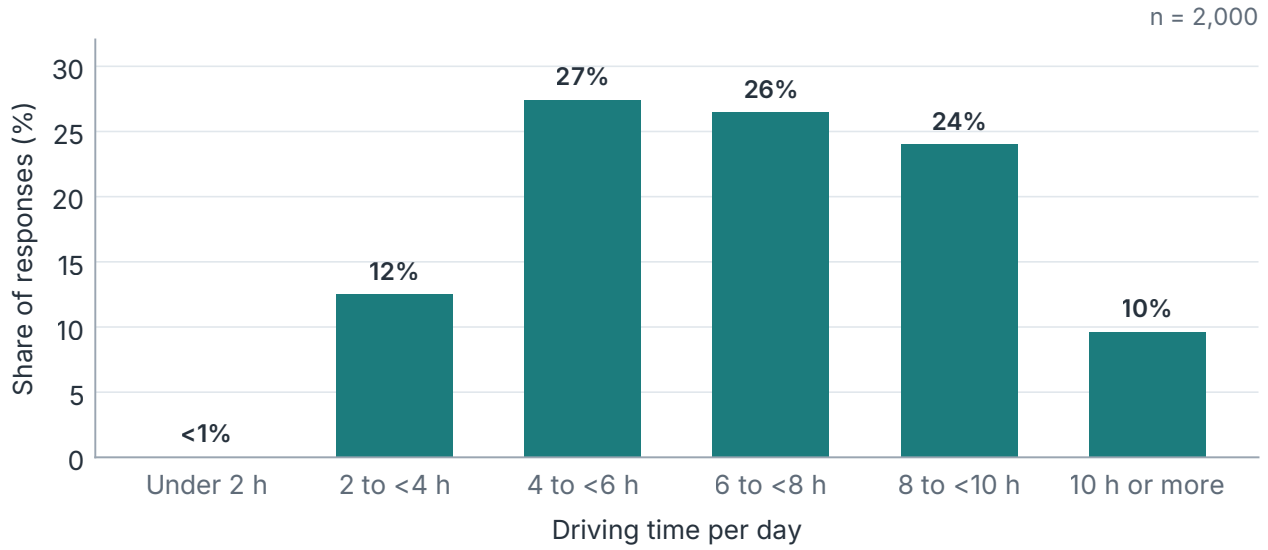


Figure 42 Driving time per day

Source: Analysis of primary survey data

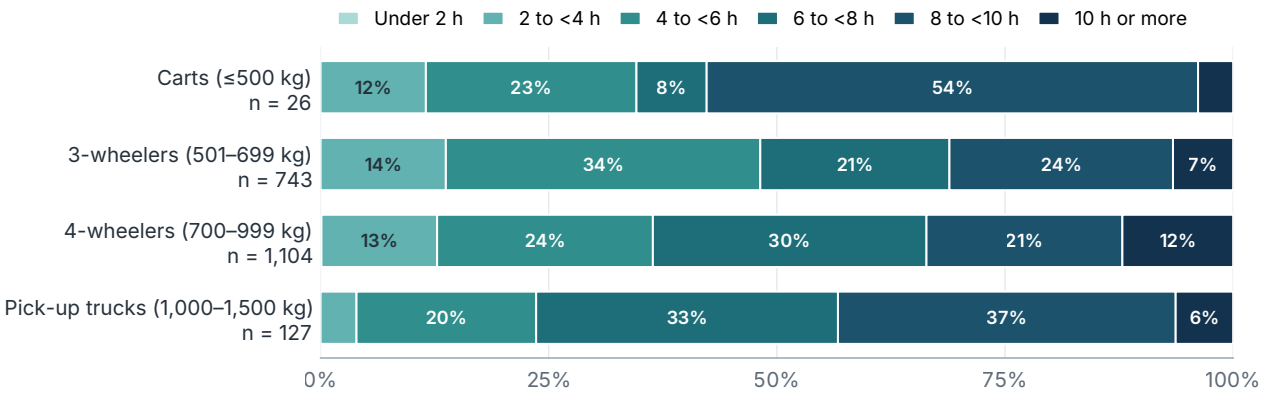


Figure 43 Driving time per day, by vehicle payload capacity

Source: Analysis of primary survey data

3.3 Part 3: Revenue and cost details

Three questions were asked in this part, one of them divided into five sub-parts. All responses were used directly in the analysis. The range, mean and standard deviation of responses are presented in **Table 13**; the findings from each question follow.

Table 13 Range, mean and standard deviation of responses on revenue and cost

Question	Minimum	Maximum	Mean	Standard deviation	Responses
Total earning per month (₹)	7,000	1,00,000	37,781.5	11,211.2	2,000
Total profit per month (₹)	0	60,000	17,248.5	6,061.3	2,000
Monthly cost of operation (₹)	3,317	1,35,750	20,818	9,086	1,999

Source: Analysis of primary survey data

3.3.1 Total earning per month

This question covered the monthly earnings (including profit and expenses) of freight vehicle owners, and all respondents answered. The analysis was done separately for single-vehicle and multiple-vehicle owners. On average, multiple-vehicle owners earn more than single-vehicle owners:

1. only 1.4% of single-vehicle and 0.5% of multiple-vehicle owners earn less than ₹20,000 a month;
2. 60% of single-vehicle and 44% of multiple-vehicle owners earn ₹20,000–40,000 a month;
3. 34% of single-vehicle and 44% of multiple-vehicle owners earn ₹40,000–60,000 a month; and
4. 4.4% of single-vehicle and 11.3% of multiple-vehicle owners earn more than ₹60,000 a month.

Analysis by vehicle type suggests that payload capacity does not influence earning per km (EPK). The average EPK is ₹16.4 for carts, ₹18.2 for three-wheelers, ₹18.6 for four-wheelers and ₹16.8 for pick-up trucks (**Table 14**, **Figure 44**, **Figure 45**, **Figure 46** and **Figure 47**).

Table 14 Total earning per month

Owner type	Under ₹20k	₹20k–40k	₹40k–60k	₹60k–80k	Over ₹80k	Total
Single-vehicle owners	26	1,092	617	66	14	1,815
Multiple-vehicle owners	1	82	81	18	3	185

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

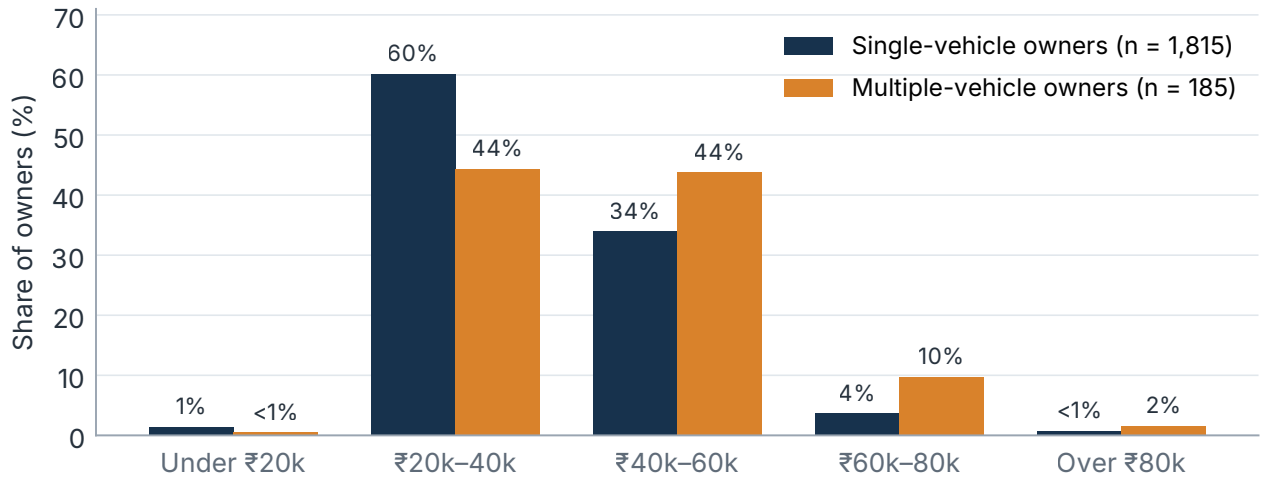


Figure 44 Monthly earning of single- and multiple-vehicle owners

Source: Analysis of primary survey data

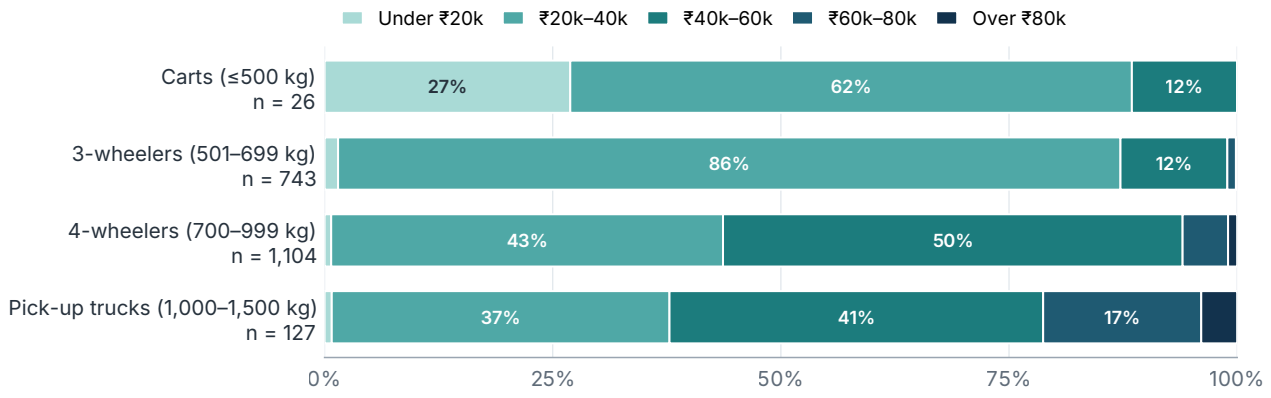


Figure 45 Monthly earning, by vehicle payload capacity

Source: Analysis of primary survey data

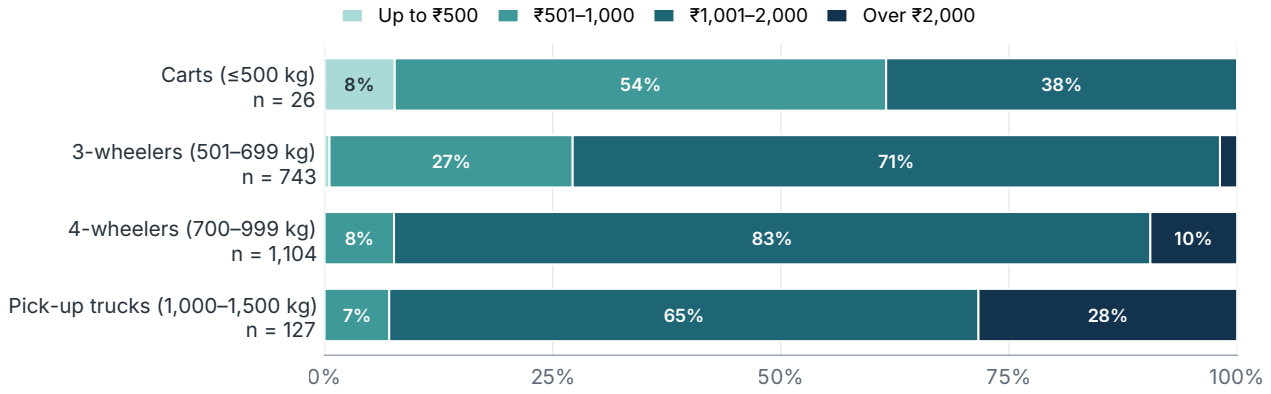


Figure 46 Daily earning, by vehicle payload capacity

Source: Analysis of primary survey data



Figure 47 Average earning per kg-km, by commodity

Source: Analysis of primary survey data

3.3.2 Total profit per month

Respondents were asked their total monthly profit after all expenses, and all responded. The analysis is presented separately for single-vehicle and multiple-vehicle fleets:

1. only 0.3% of single-vehicle operators make a loss;
2. 4.4% of single-vehicle and 6.4% of multiple-vehicle operators make a profit of less than ₹10,000 a month;
3. 59% of single-vehicle and 52% of multiple-vehicle operators make ₹10,000–20,000 a month;
4. 33% of single-vehicle and 34% of multiple-vehicle operators make ₹20,000–30,000 a month; and
5. 3.9% of single-vehicle and 7.6% of multiple-vehicle operators make more than ₹30,000 a month.

By vehicle type, profit per month and per day increases with payload capacity, but profit per km falls as payload capacity rises (because utilisation is lower for low-payload vehicles). The average profit per km is ₹9.5 for carts, ₹9.4 for three-wheelers, ₹8.2 for four-wheelers and ₹6.6 for pick-up trucks (**Table 15**, **Figure 48**, **Figure 49** and **Figure 50**).

Table 15 Total profit per month

Owner type	Loss or nil	Under ₹10k	₹10k–20k	₹20k–30k	₹30k–40k	Over ₹40k	Total
Single-vehicle owners	5	79	1,068	593	49	21	1,815
Multiple-vehicle owners	0	13	96	62	12	2	185

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

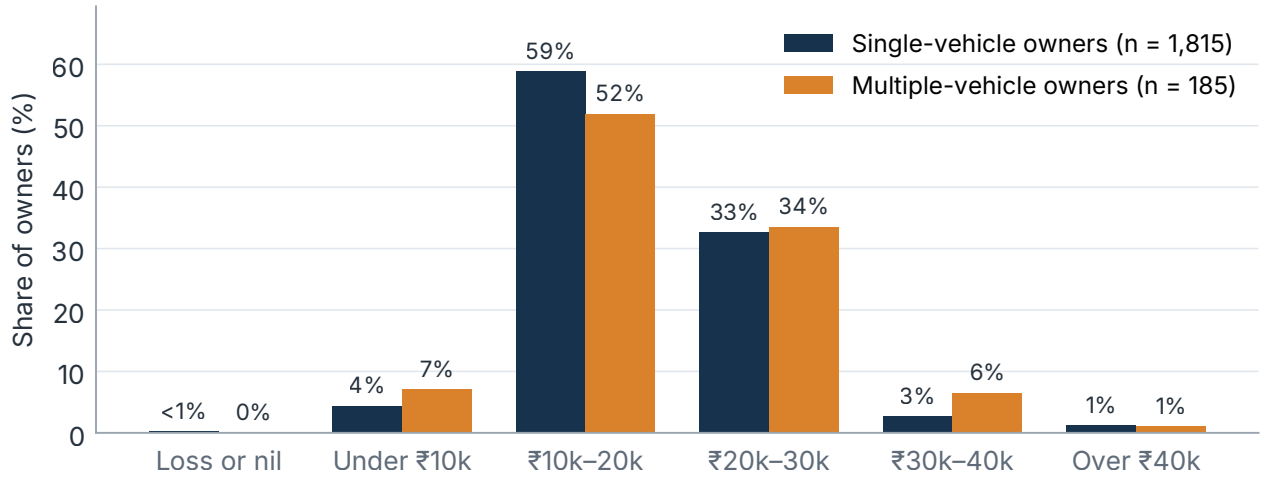


Figure 48 Monthly profit of single- and multiple-vehicle owners

Source: Analysis of primary survey data

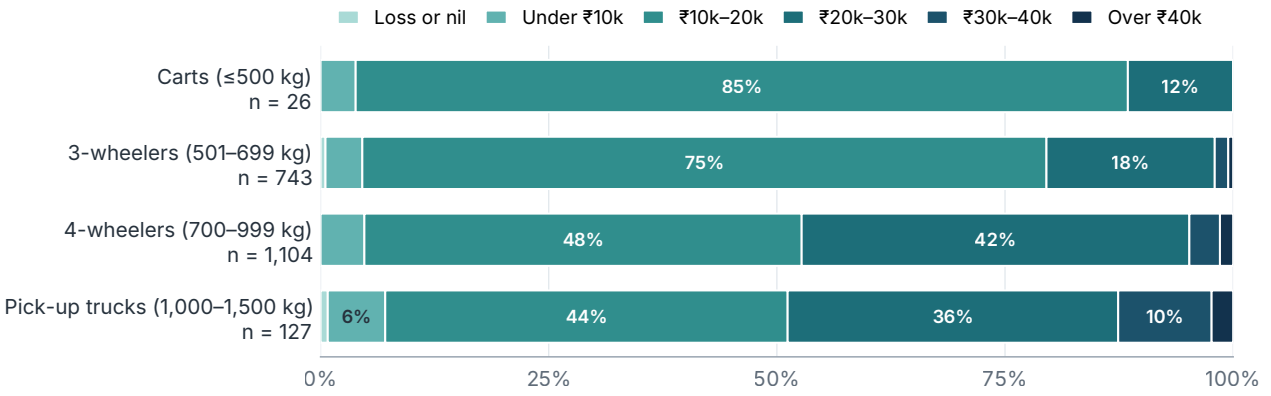


Figure 49 Monthly profit, by vehicle payload capacity

Source: Analysis of primary survey data

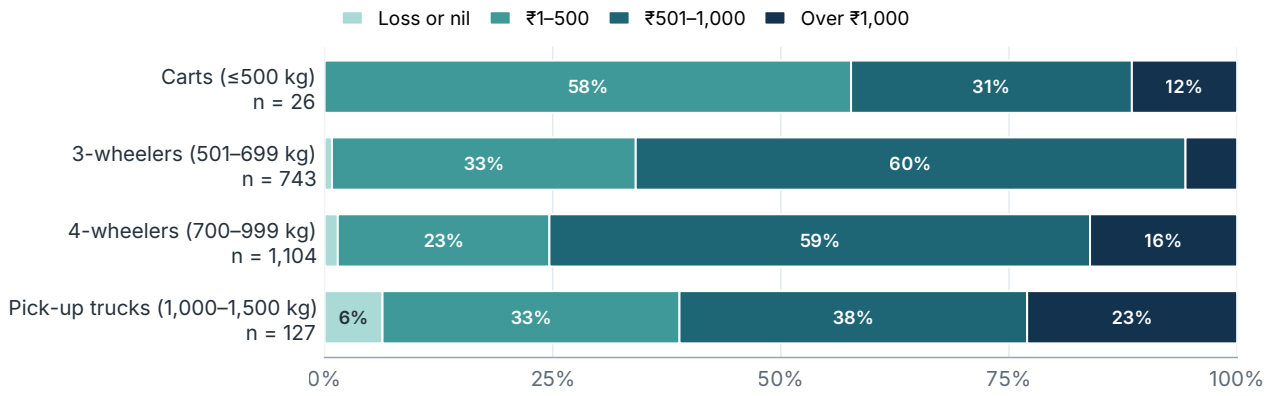


Figure 50 Daily profit, by vehicle payload capacity

Source: Analysis of primary survey data

3.3.3 Cost of operation

Respondents were asked about the monthly or annual cost of operating their vehicles, broken down into five categories: monthly rent or loan instalment (EMI), monthly fuel or charging cost, monthly maintenance cost, monthly parking and other charges (permit, licence, road tax etc.) and annual insurance. The cost per kilometre (CPK) was derived from these details. CPK increases with payload capacity:

1. CPK is ₹1–10 for 68% of single-vehicle and 61% of multiple-vehicle owners;
2. ₹11–20 for 27% of single-vehicle and 34% of multiple-vehicle owners;
3. ₹21–30 for 4% of single-vehicle and 5% of multiple-vehicle owners; and
4. more than ₹30 for only 1.4% of single-vehicle and 1.1% of multiple-vehicle owners.

The average CPK is ₹5.8 for carts, ₹9 for three-wheelers, ₹10 for four-wheelers and ₹10.6 for pick-up trucks (**Table 16**, **Figure 51**, **Figure 52**, **Figure 53** and **Figure 54**).

Table 16 Cost of operation per kilometre

Owner type	₹1–10	₹11–20	₹21–30	₹31–40	₹41–50	Over ₹50
Single-vehicle owners (stated)	1,231	481	77	16	4	6
Multiple-vehicle owners (stated)	112	62	9	2	0	0

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

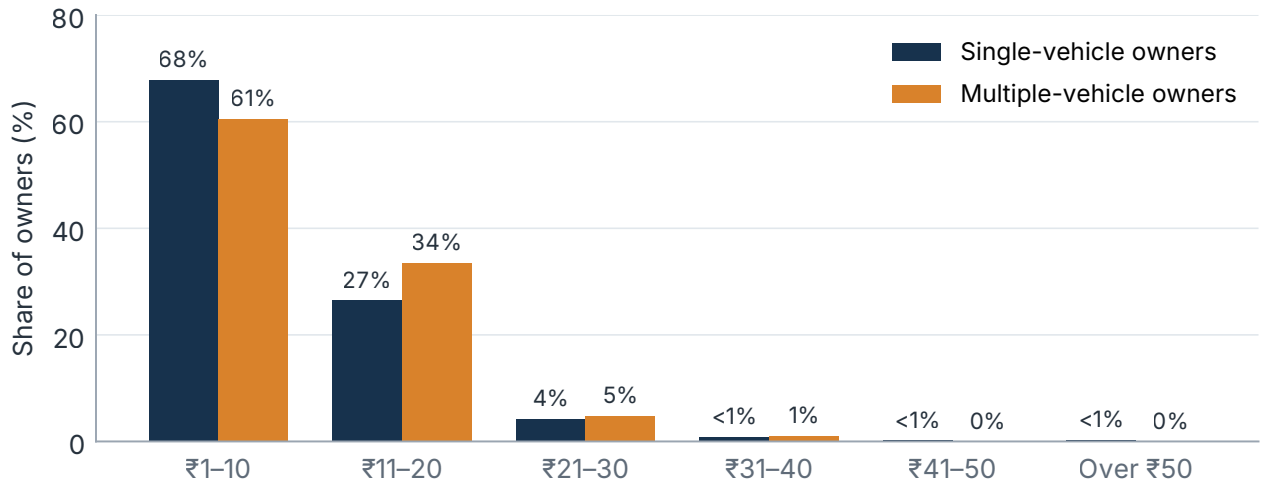


Figure 51 Cost per km of single- and multiple-vehicle owners

Source: Analysis of primary survey data

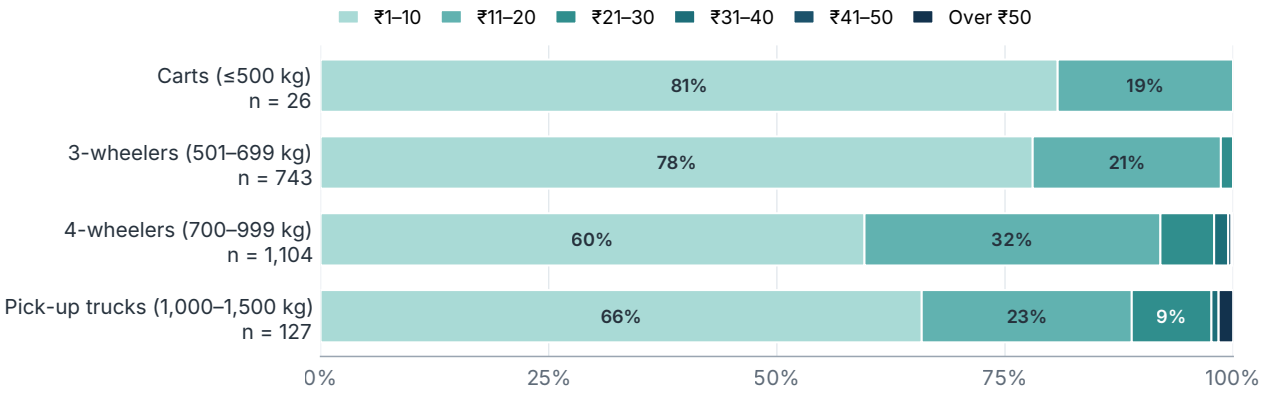


Figure 52 Cost per km, by vehicle payload capacity

Source: Analysis of primary survey data

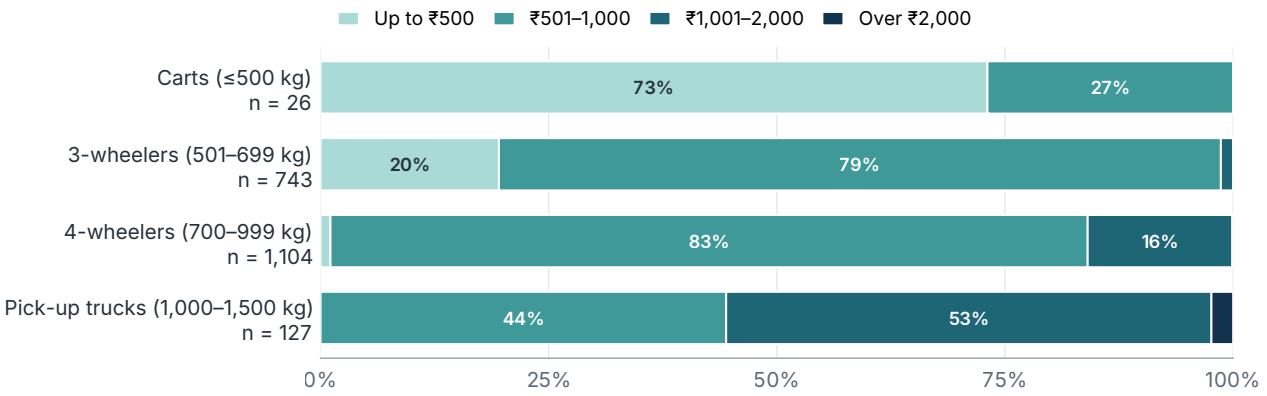


Figure 53 Daily cost of operation, by vehicle payload capacity

Source: Analysis of primary survey data

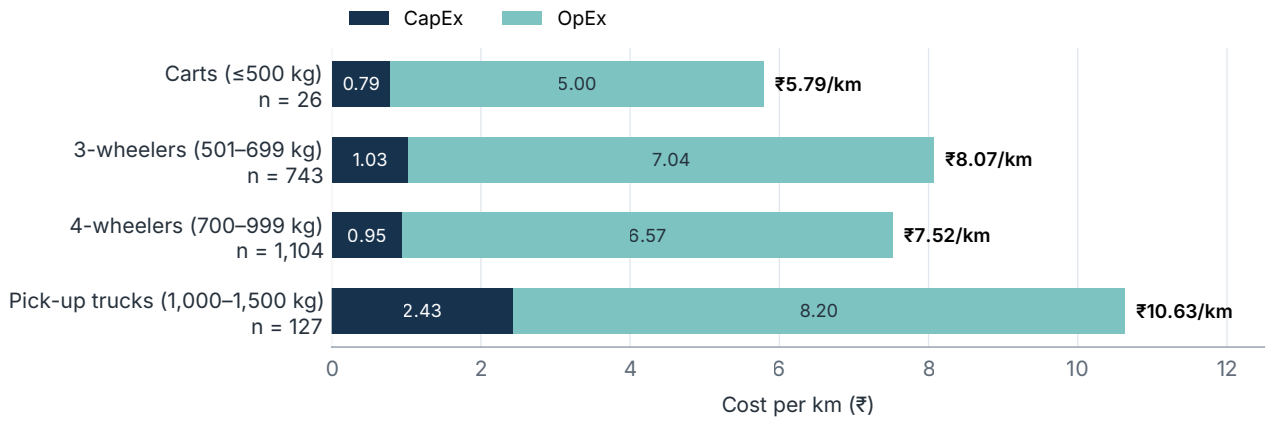


Figure 54 Average cost of operation per km (CapEx and OpEx), by vehicle payload capacity

Source: Analysis of primary survey data

3.4 Part 4: User (owner) perception

Nine questions were put to respondents in this part, all used directly to derive the findings. The questions and responses follow.

3.4.1 Plans to replace or add a vehicle

> **When do you plan to replace your current vehicle or add a new vehicle to your fleet?**

All respondents answered. Almost three-quarters of existing owners will buy a new vehicle within the next five years (**Figure 55**):

1. about 5.7% (114) will replace or add a vehicle after ten years;
2. 14.5% (289) will do so in six to ten years;
3. 36% (720) in four to five years;
4. 37.5% (755) in one to three years; and
5. only 6.1% (122) within the next year.

By vehicle type, owners of larger-payload vehicles are less likely to replace or buy a vehicle within three years: 53% of three-wheeler operators will buy a new vehicle in under three years, against 37% of four-wheeler operators (**Figure 56**).

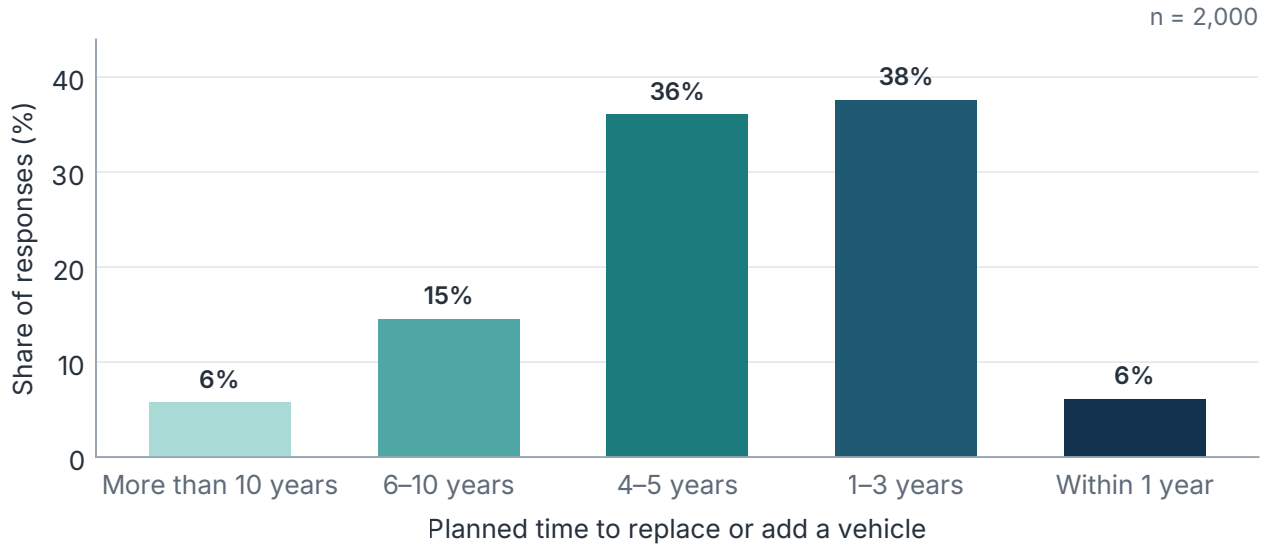


Figure 55 Planned timing for replacing or adding a vehicle

Source: Analysis of primary survey data

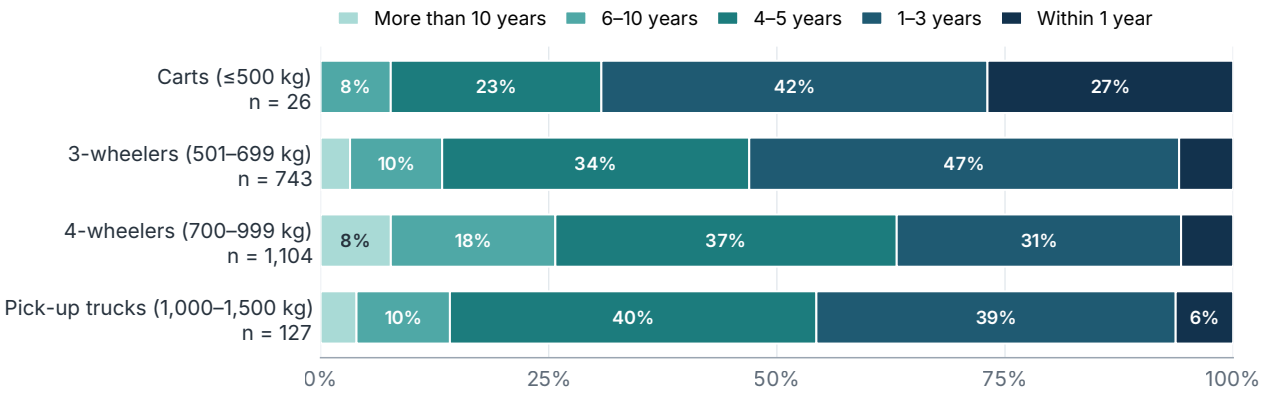


Figure 56 Planned timing for replacing or adding a vehicle, by vehicle payload capacity

Source: Analysis of primary survey data

3.4.2 Likelihood of buying an electric LGV next

> **In the current circumstances and with the subsidies available, how likely is it that your next purchase will be an electric light goods vehicle?**

All respondents answered. About two-thirds of owners said their next purchase was unlikely to be an EV, and just 1% were sure it would be (**Table 17** and **Figure 57**). Operators of smaller-payload vehicles are slightly more confident that their next purchase will be electric than operators of larger vehicles, though the difference is not significant (**Figure 58**).

Table 17 Likelihood that the next purchase will be an electric LGV

Response	Very unlikely	Somewhat unlikely	May or may not be	Somewhat likely	Very likely	Total
Responses (no.)	261	1,066	346	302	25	2,000
Share (%)	13.1%	53.3%	17.3%	15.1%	1.2%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

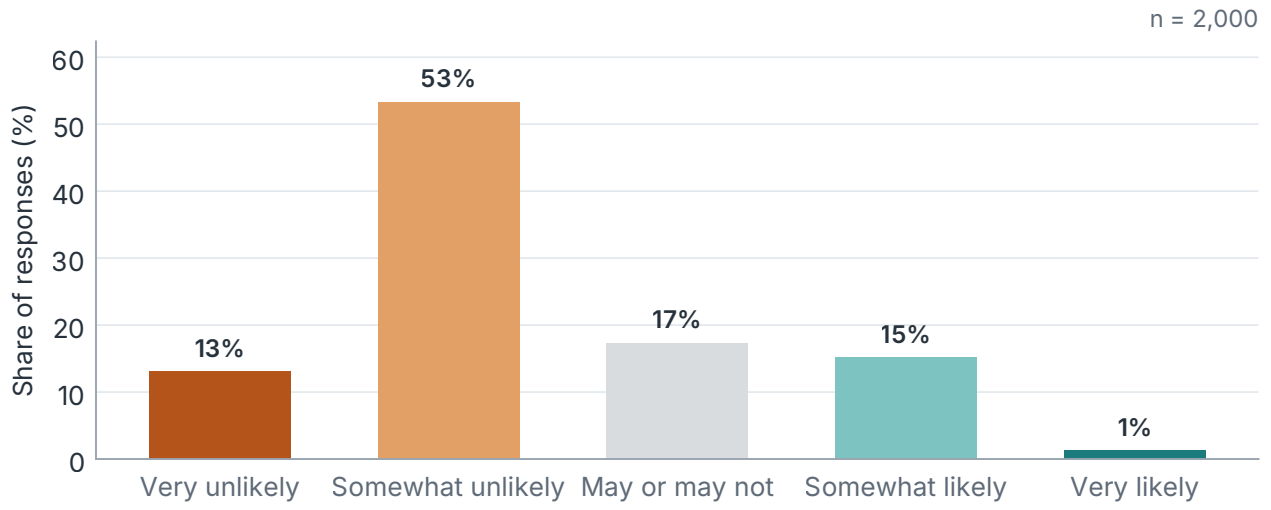


Figure 57 Likelihood that the next purchase will be an electric LGV

Source: Analysis of primary survey data

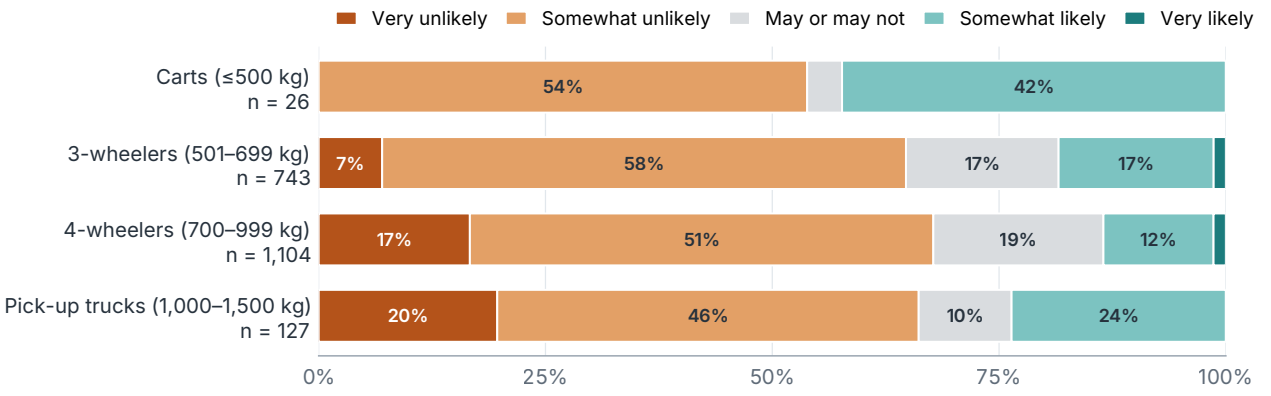


Figure 58 Likelihood that the next purchase will be an electric LGV, by vehicle payload capacity

Source: Analysis of primary survey data

3.4.3 Knowledge of subsidies and benefits

> **Do you know of the subsidies and benefits offered by the central and state governments for buying and operating electric goods vehicles in Delhi?**

All respondents answered. Just 31% (627) of owners are aware of the subsidies and benefits, while 69% (1,373) are unaware of government incentives for buying and operating electric goods vehicles in Delhi. Operators of carts and three-wheelers know more about the subsidies than operators of four-wheelers and pick-up trucks (**Figure 59**).

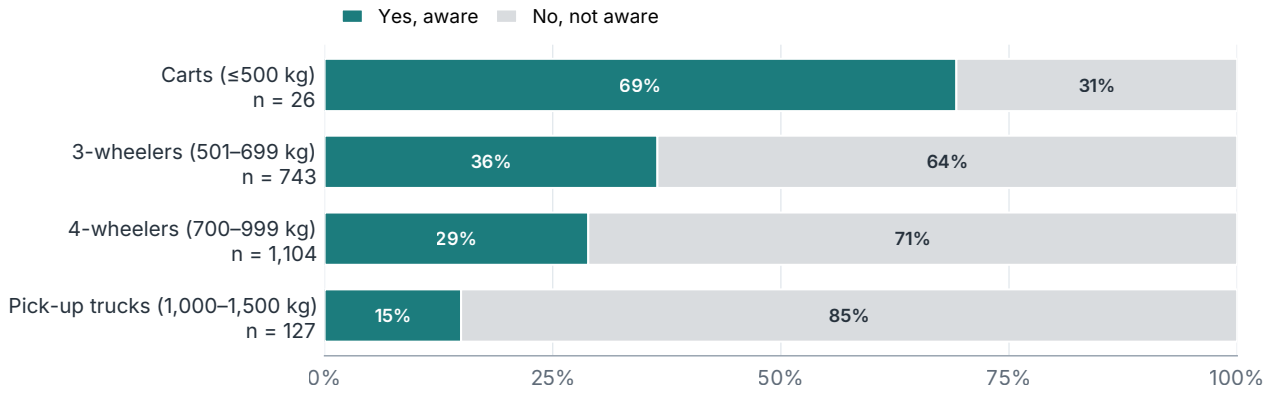


Figure 59 Knowledge of EV subsidies and benefits, by vehicle payload capacity

Source: Analysis of primary survey data

3.4.4 Perceived cost of owning an electric vehicle

> **In your opinion (with current subsidies and benefits), how expensive or cheap is it to buy or own (vehicle cost, insurance, tax etc.) a similar electric model compared with your current petrol, diesel or CNG vehicle?**

All respondents answered. Almost 92% consider electric vehicles broadly comparable in price to a similar ICE freight vehicle: about 35% (696) said a similar electric model is somewhat more expensive to buy, 33% said the cost is almost equal and 24% said it is somewhat cheaper. Just 1% said it is very cheap to own a similar electric vehicle (**Table 18** and **Figure 60**). Relatively more operators of smaller-payload vehicles (than of larger vehicles) perceive electric versions to be cheaper to own (**Figure 61**).

Table 18 Perceived cost of buying or owning a similar electric model

Response	Very expensive	Somewhat expensive	Almost equal	Somewhat cheaper	Very cheap	Total
Responses (no.)	135	696	670	488	11	2,000
Share (%)	6.8%	34.8%	33.5%	24.4%	0.5%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

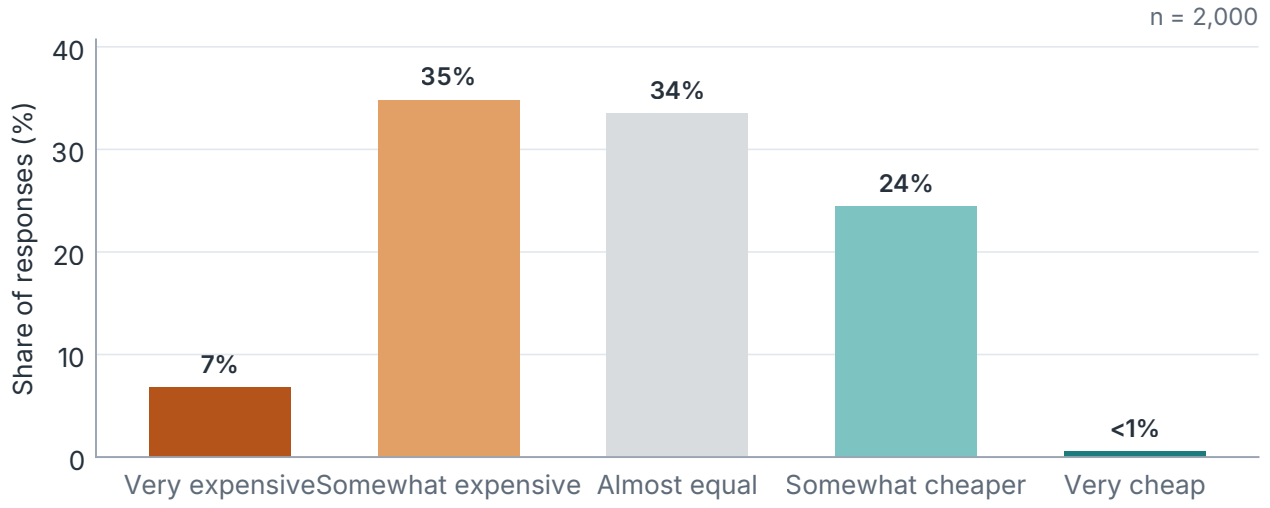


Figure 60 Perceived cost of buying or owning a similar electric model

Source: Analysis of primary survey data

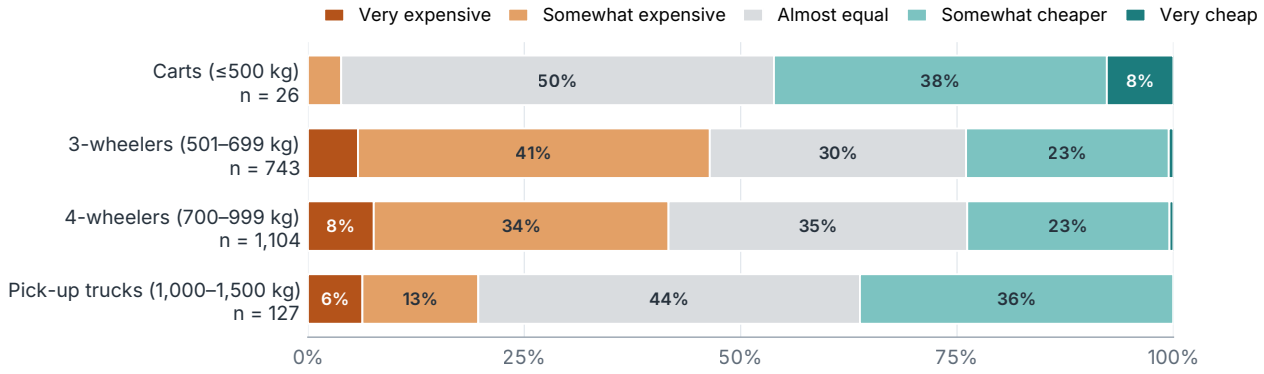


Figure 61 Perceived cost of buying or owning a similar electric model, by vehicle payload capacity

Source: Analysis of primary survey data

3.4.5 Perceived daily operating cost of an electric vehicle

> **In your opinion (with current subsidies and benefits), how much more or less is the daily operating cost (fuel and daily maintenance) of a similar electric model compared with your current petrol, diesel or CNG vehicle?**

This question was answered by 99.9% of respondents (1,999). About 47% (940) said the daily operating cost of a similar electric model is somewhat lower than that of their current vehicle, and 39% said it is almost equal. Just 1% said it is very cheap (**Table 19** and **Figure 62**). Relatively more owners of larger-payload vehicles perceive electric versions to be cheaper to operate than their current CNG vehicles (**Figure 63**).

Table 19 Perceived daily operating cost of a similar electric model

Response	Very expensive	Somewhat expensive	Almost equal	Somewhat cheaper	Very cheap	Total
Responses (no.)	33	220	782	940	24	1,999
Share (%)	1.7%	11.0%	39.1%	47.0%	1.2%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

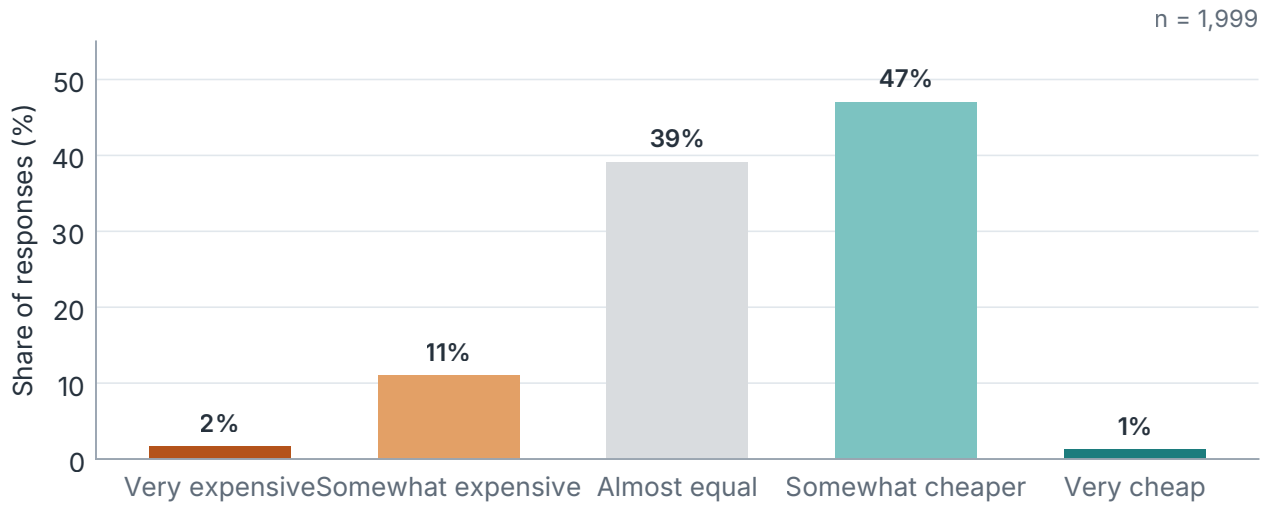


Figure 62 Perceived daily operating cost of a similar electric model

Source: Analysis of primary survey data

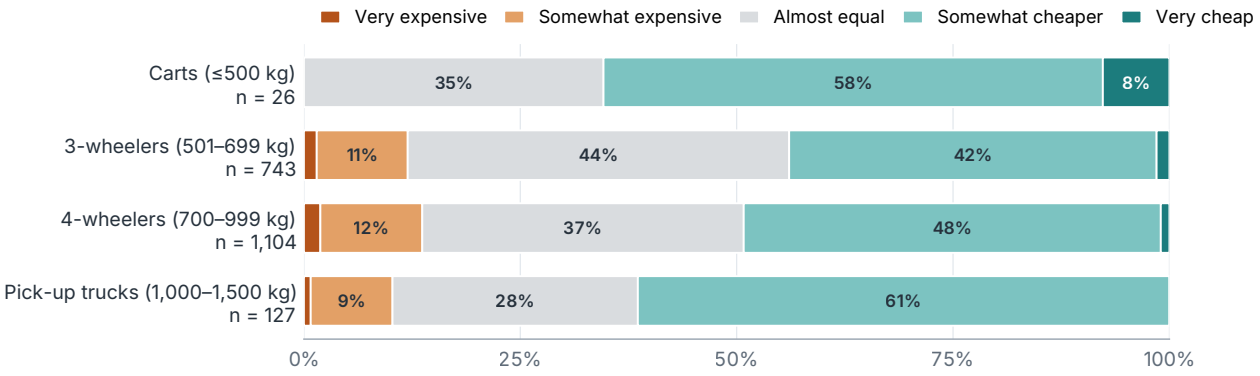


Figure 63 Perceived daily operating cost of a similar electric model, by vehicle payload capacity

Source: Analysis of primary survey data

3.4.6 Knowing people who have bought electric vehicles

> **Do you know anyone who has bought an electric vehicle?**

All respondents answered. About 53% (1,057) know very few people who have bought electric vehicles, and almost none (5 respondents) said that everyone they know has done so (**Table 20** and **Figure 64**). By vehicle type, ownership of larger electric freight vehicles is less common than that of smaller ones, which the VAHAN database also confirms (**Figure 65**).

Table 20 Knowing people who have bought electric vehicles

Response	None	Very few	Half of the people I know	Most of them	Everyone I know	Total
Responses (no.)	674	1,057	202	62	5	2,000
Share (%)	33.7%	52.8%	10.1%	3.1%	0.2%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

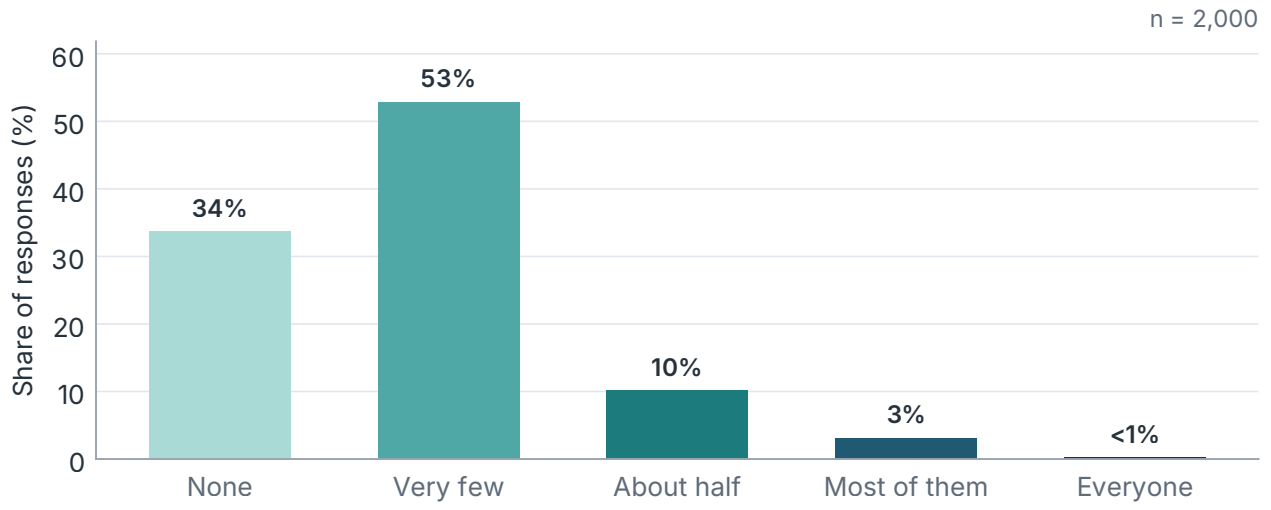


Figure 64 Knowing people who have bought electric vehicles

Source: Analysis of primary survey data

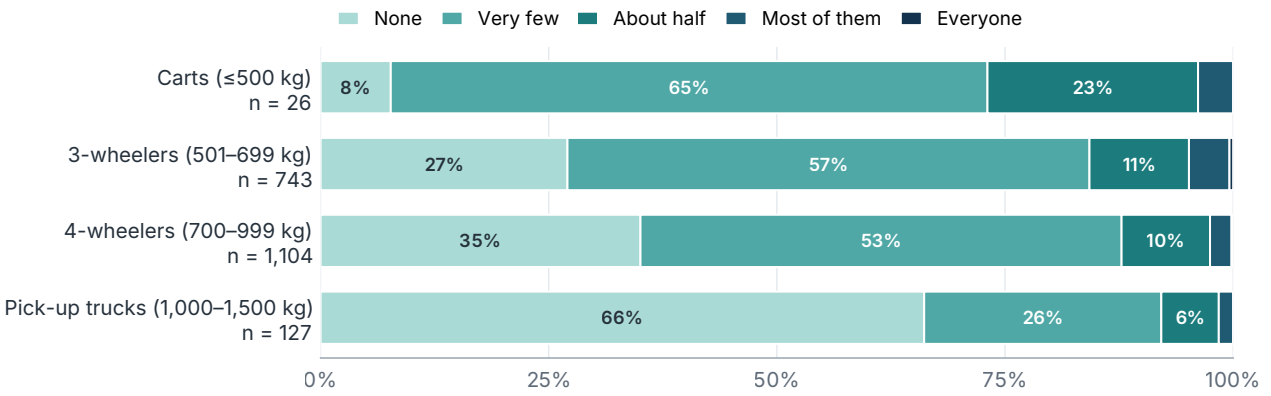


Figure 65 Knowing people who have bought electric vehicles, by vehicle payload capacity

Source: Analysis of primary survey data

3.4.7 Awareness of owners who have availed EV benefits

> **Are you aware of any owners who have availed of any electric vehicle-related government benefits or schemes?**

All respondents answered. About 40% (789) know very few people who have availed of EV-related government benefits or schemes, and almost none (2 respondents) said that everyone they know has done so (**Table 21** and **Figure 66**). By vehicle capacity, owners of larger vehicles appear less likely to avail of subsidy benefits (**Figure 67**).

Table 21 Awareness of owners who have availed of EV benefits

Response	None got it	Very few got it	About half got it	Most got it	All got it	Total
Responses (no.)	645	789	462	102	2	2,000
Share (%)	32.2%	39.5%	23.1%	5.1%	0.1%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

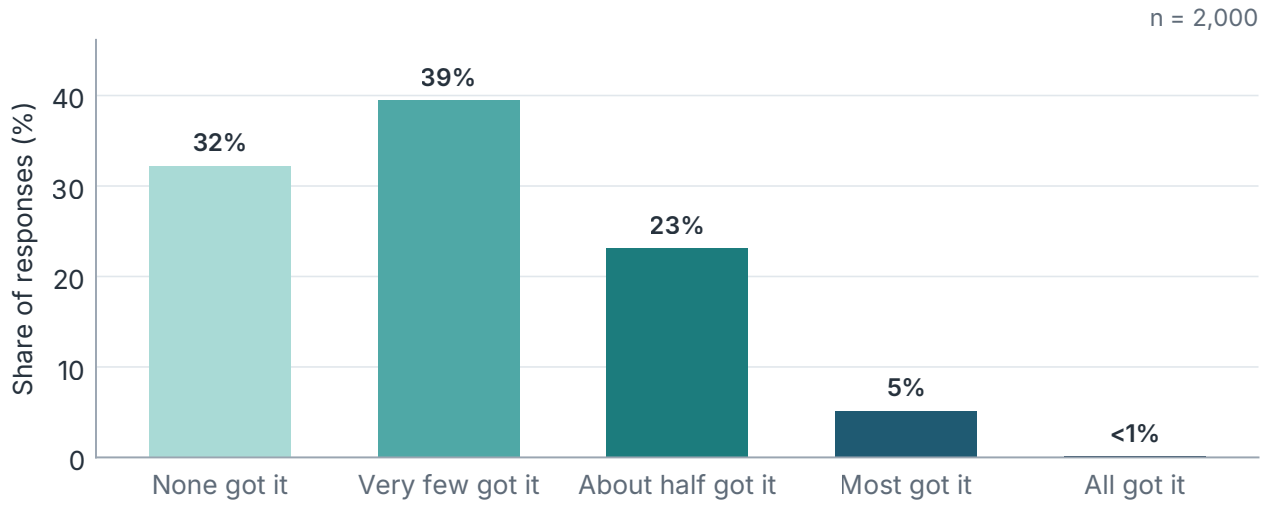


Figure 66 Awareness of owners who have availed of EV benefits

Source: Analysis of primary survey data

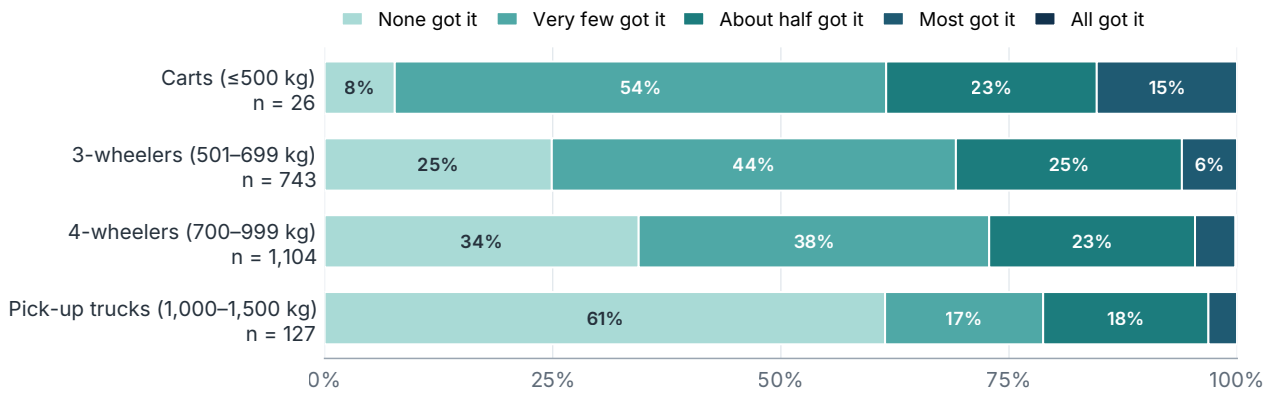


Figure 67 Awareness of owners who have availed of EV benefits, by vehicle payload capacity

Source: Analysis of primary survey data

3.4.8 Ease of availing benefits

> **How easy or difficult do you think it will be to avail of these benefits or subsidies for buying an electric light goods vehicle?**

All respondents answered. About 58% (1,162) said it would be moderate — neither difficult nor easy — to avail of these benefits, and almost 1% (10) said it would be extremely easy (**Table 22** and **Figure 68**). By vehicle type, there is no clear relationship between vehicle capacity and the perceived ease of availing of EV subsidies (**Figure 69**).

Table 22 Perceived ease of availing of benefits for buying an electric LGV

Response	Almost impossible	Very difficult	Moderate	Very easy	Extremely easy	Total
Responses (no.)	43	476	1,162	309	10	2,000
Share (%)	2.1%	23.8%	58.1%	15.4%	0.5%	100%

Source: Primary survey of LGV owners and operators in Delhi, January–February 2023 (n = 2,000)

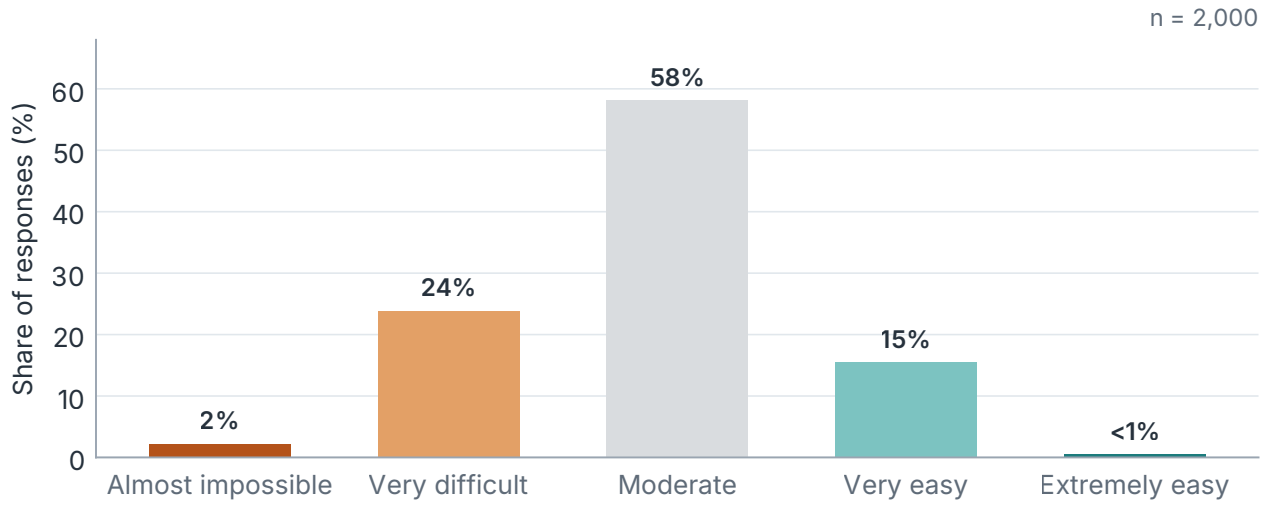


Figure 68 Perceived ease of availing of benefits for buying an electric LGV
Source: Analysis of primary survey data

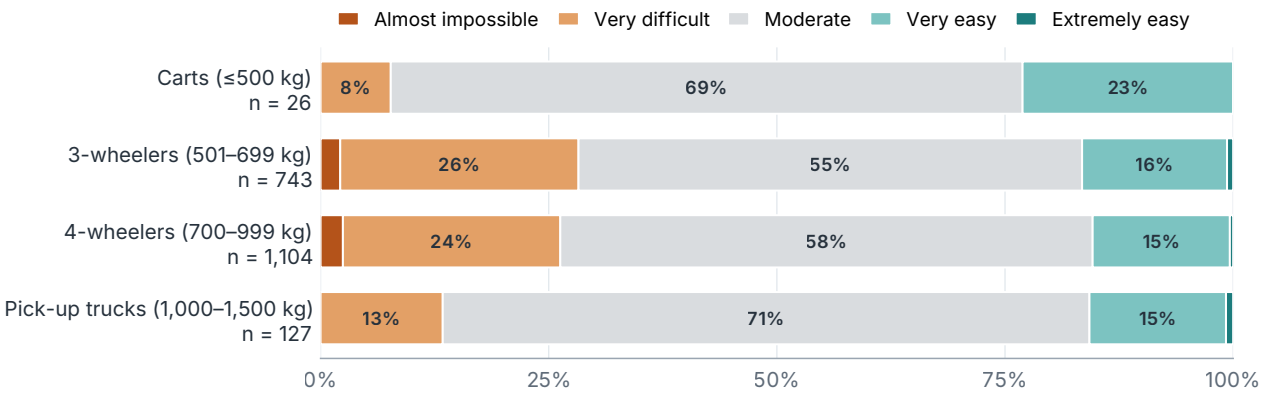


Figure 69 Perceived ease of availing of benefits, by vehicle payload capacity
Source: Analysis of primary survey data

3.4.9 Facilities that would support electrification

> **Which of these facilities or services would most help you meet your operational requirements for electrification? Please rank them in order of preference (1 to 5).**

All respondents answered. The rankings are summarised in **Figure 70** and described below.

Lower financing and interest rates. Some 35% ranked this second, 29% first, 13% each third and fourth, and 10% fifth. Most pick-up truck operators rank it first, while most other owners rank it second (**Figure 71**).

Cheaper electricity (below ₹5 per kWh). Some 33% ranked this first, 31% second, 15% third, 12% fourth and 9% fifth. Most pick-up truck operators rank it second, while most other owners rank it first (**Figure 72**).

More choice of vehicle models. Some 37% ranked this fifth, 21% fourth, 16% second, 15% third and 12% first. Most operators of every vehicle type rank it as the least important (**Figure 73**).

Parking and charging infrastructure. Some 42% ranked this third, 18% fourth, 14% each second and fifth, and 12% first. Most operators of all vehicle types rank it third (**Figure 74**).

Maintenance and service facilities. Some 37% ranked this fourth, 30% fifth, 15% third, 14% first and 5% second. Most operators of all vehicle types rank it fourth (**Figure 75**).

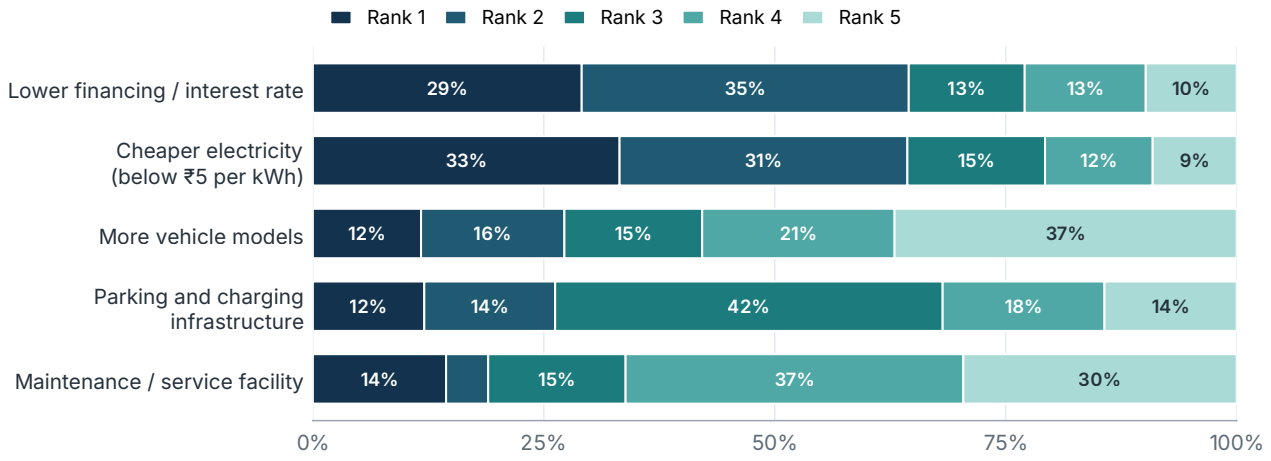


Figure 70 Ranking of facilities and services that would support electrification

Source: Analysis of primary survey data

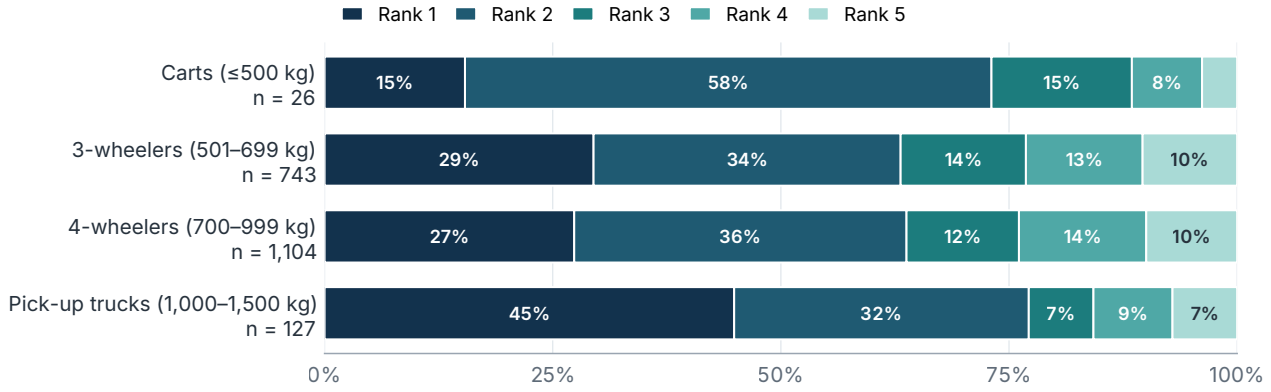


Figure 71 Ranking of lower financing and interest rates, by vehicle payload capacity

Source: Analysis of primary survey data

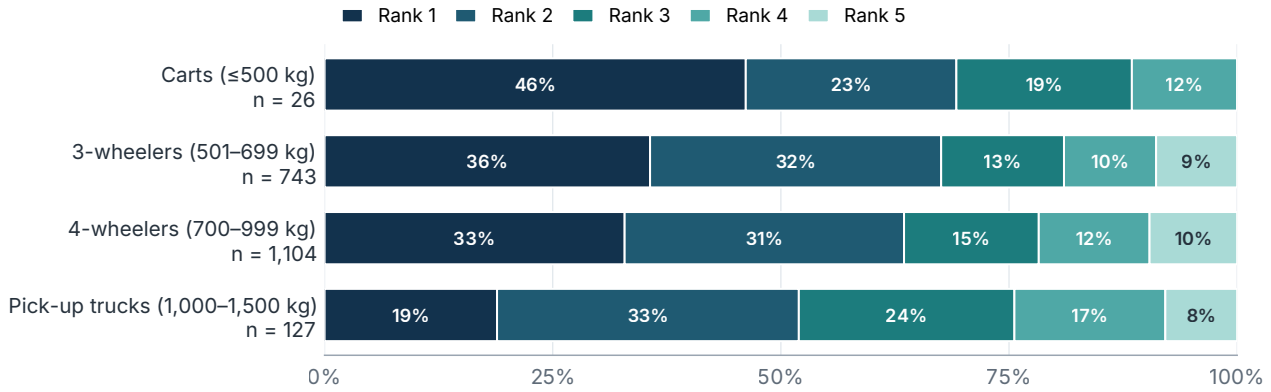


Figure 72 Ranking of cheaper electricity (below ₹5 per kWh), by vehicle payload capacity

Source: Analysis of primary survey data

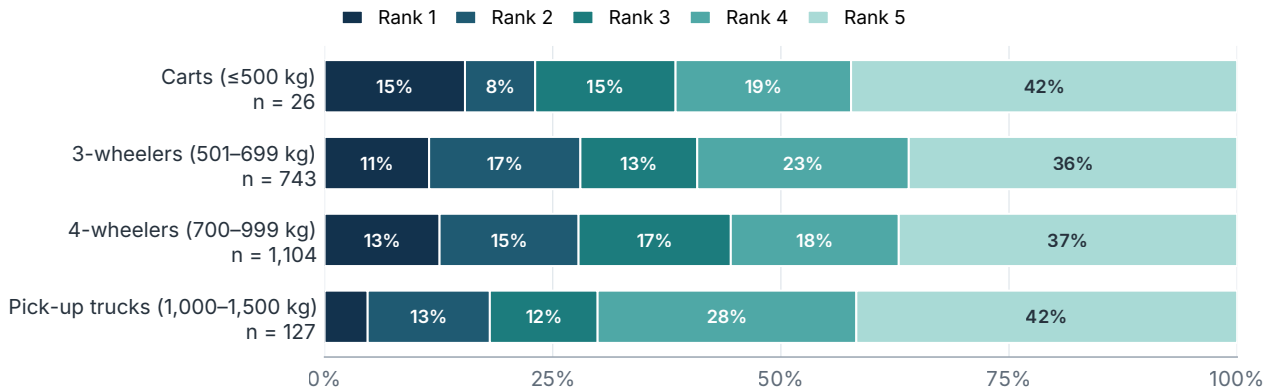


Figure 73 Ranking of more choice of vehicle models, by vehicle payload capacity

Source: Analysis of primary survey data

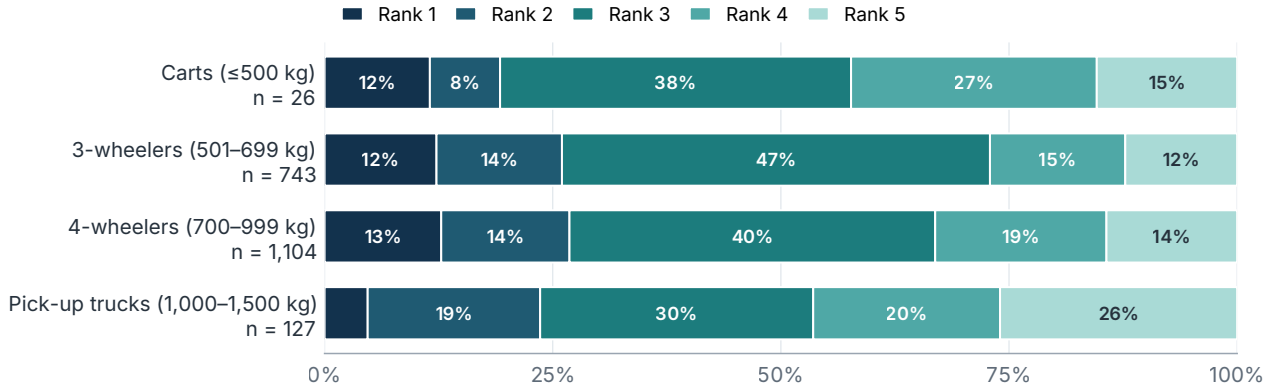


Figure 74 Ranking of parking and charging infrastructure, by vehicle payload capacity

Source: Analysis of primary survey data

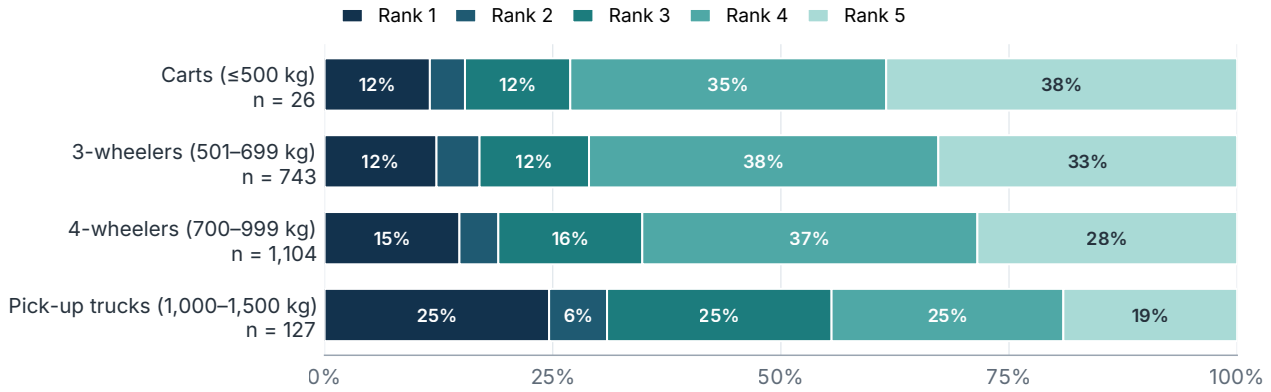


Figure 75 Ranking of maintenance and service facilities, by vehicle payload capacity

Source: Analysis of primary survey data

04

Survey Findings and Recommendations

This chapter presents the findings and recommendations of the survey, based on the data collected and its analysis.

4.1 Findings

The findings are presented in four parts: vehicle and trip characteristics of LGV-based urban freight in Delhi; commodities; the potential for and barriers to electrification; and cost and revenue.

4.1.1 Vehicle and trip characteristics

- Carts account for less than 1.5% of responses and are therefore excluded from most findings.
- Only 6% of responses are from pick-up truck operators; 92% of the sample is divided almost evenly between three-wheelers and four-wheelers.
- Smaller-payload vehicles make shorter but more frequent trips, while larger-payload vehicles make relatively longer but fewer trips a day.
- Because trips are shorter, trip duration is shorter for smaller-payload vehicles, and overall daily working hours are also lower (under eight hours for most operators) than for larger-payload vehicles (over eight hours for most operators).
- Total daily utilisation (kilometres operated per day) increases with payload capacity.
- Idle time per day is similar for all vehicle categories, probably because of the government-enforced restricted hours for commercial vehicles. For the same reason, loading and unloading time does not differ between categories, as it coincides with restricted hours for most operators. Overall driving time therefore increases with payload capacity.
- Idle time is not constant and falls as working, driving and loading/unloading hours increase. However, working and driving hours tend to be constant, and the working day lengthens as idle time increases. This suggests an employment profile similar to daily-wage work: a minimum daily earning must be achieved through a minimum number of working hours, even if the overall working day becomes longer.
- Although most freight trips are overloaded, the average degree of overloading is lower for smaller-payload vehicles than for larger ones.
- About 91% of trips are overloaded, and 32% carry more than twice the rated payload.

- Only 16% of three-wheelers and 11% of four-wheelers carry loads within their limits. This will be a barrier to electrifying these vehicles: excess weight reduces range, besides causing other damage to the vehicle and the environment.
- About 76% of freight vehicles travel less than 100 km a day. This is promising for the adoption of electric freight vehicles, as it removes the need for opportunity charging.
- Most operators have flexible routes because they do not have regular customers.

4.1.2 Commodities

- Three-wheelers are more popular than other freight modes for three commodities — perishable food, FMCG, and clothes and accessories. For all other commodities, four-wheelers and pick-up trucks are more popular.
- Other commodities for which goods three-wheelers account for a significant share of trips (though less than four-wheelers) are food grain and pharmacy goods.
- The load per trip varies significantly by commodity. Among the lowest is liquor, at less than 500 kg per trip; among the highest is solid waste, at close to 1,500 kg per trip. Other commodities with a lower weight per trip (under 1,000 kg) are FMCG, perishable food, cash, and hotel and restaurant supplies (catering etc.).
- Commodities with higher earning potential (more than ₹0.025 per kg-km) are FMCG, cash, pharmacy goods, and construction and demolition material. Commodities with medium earning potential (₹0.020–0.025 per kg-km) include hotel and restaurant supplies, electronics, clothes and accessories, and printing and publishing. Solid waste has the lowest earning potential, at less than ₹0.015 per kg-km.

4.1.3 Potential for and barriers to electrification of LGVs

- Only 1% of respondents currently own an electric vehicle, while 31% know of the subsidies and benefits offered by the central and state governments for buying and operating electric goods vehicles.
- About 44% of goods vehicle owners intend to replace or add vehicles within the next three years, and three-quarters within the next five years. This is an opportunity to influence their decision in favour of an electric goods vehicle.
- To enable them to buy and operate electric goods vehicles, most owners seek cheaper electricity and lower financing costs and interest rates.
- Pick-up truck operators rank lower financing costs and interest rates first, while other operators rank cheaper electricity first.
- Three-wheeler operators are more aware of EV-related incentives, and more inclined to buy an electric freight vehicle next, than operators of other vehicle types.
- Four-wheeler operators are largely unaware of the subsidies available for buying and operating electric vehicles. They show little interest in electric vehicles because few four-wheeled electric freight models are available and their initial purchase cost is high (compared with electric three-wheelers).
- Three- and four-wheeled freight vehicles have comparable market shares in the ICE/CNG category. In 2023, over 15,000 goods three-wheelers were registered, compared with around 9,500 goods four-wheelers and pick-up trucks combined.

- However, sales of electric goods three-wheelers far exceed those of electric goods four-wheelers (**Table 23**), even though similar subsidies apply to both.
- Since subsidies on electric goods three- and four-wheelers were introduced in August 2021, the share of electric three-wheelers in total goods three-wheeler sales has risen to 73% (in 2023). Over the same period, the share of electric four-wheelers similar to ICE models is only 1.5%.
- The average age of current CNG goods three-wheelers is 8.6 years, compared with 5.6 years for goods four-wheelers. About 37% of CNG goods three-wheelers are more than ten years old, against only about 16% of goods four-wheelers.
- This may be another reason for the lower registrations of electric goods four-wheelers compared with electric goods three-wheelers, and explains why significantly fewer four-wheeler operators are looking to replace their vehicles than three-wheeler operators (**Figure 56**).
- Delhi has significant opportunity-charging infrastructure, including in areas where freight vehicles gather during idle time. However, the charging tariff is not conducive for commercial vehicles, especially electric freight vehicles in the LGV category.
- Public charging stations also need better layouts. Current designs require vehicles either to park on the footpath or on the (high-speed) carriageway, with cables stretched across the footpath, creating unsafe conditions for pedestrians and vehicles alike (**Figure 76**).
- For example, at Barar Square on the Ring Road in Delhi, poorly planned charging stations lie within 700 m of locations that would allow a well-planned and safe charging station. This highlights the need for greater oversight and better planning in locating and designing charging infrastructure in Delhi.
- A significant number of LGV operators cannot charge at home, because of a lack of access to, or parking at, their residence. This implies a high dependence on public charging infrastructure, especially for four-wheeled freight vehicles.
- Smaller batteries in electric LGVs, coupled with a lack of DC chargers, limit how much these vehicles can be used. Electric freight vehicles are exempt from restrictions on operating hours and can run at any time of day. This could mean higher utilisation and profitability for owners and operators, and could also reduce the need to overload. It should have been a key factor in accelerating the adoption of electric LGVs, but it could not be capitalised on, because doing so requires either a longer operating range or faster, cheaper and more accessible opportunity charging — and neither is available.



Figure 76 Current placement of a public charger at Barar Square on the Ring Road, Delhi
Source: SGArchitects

4.1.4 Cost and revenue

- Stated responses suggest that, with current ICE vehicles, the average earning per km (EPK) is ₹18.3, the average cost per km (CPK) ₹10 and the average profit per km ₹8.3.
- Respondents gave an overall perception of cost, combining capital expenditure (CapEx) and operating expenditure (OpEx). They believe that the TCO of an electric vehicle is lower than or comparable to that of current CNG vehicles.
- The estimated TCO per km (averaged over a 15-year service life) is ₹4.31 for electric goods three-wheelers and ₹5.41 for electric goods four-wheelers.[3] In comparison, the TCO of ICE/CNG versions in these categories is ₹8.07 and ₹7.52 per km respectively. **Figure 77** compares the CapEx and OpEx of ICE and electric three- and four-wheelers.
- During the loan tenure (the first five years), the TCO is estimated at ₹7.92 per km for an electric three-wheeler and ₹9.83 per km for an electric four-wheeler. In comparison, the average estimated TCO of current CNG freight vehicles during the loan tenure is ₹10.17 and ₹9.44 per km for three- and four-wheelers respectively.
- Electric four-wheelers offer similar or less range than currently available electric three-wheeler models, while their required daily utilisation is higher. More operators of electric four-wheelers will therefore depend on public charging infrastructure than operators of electric three-wheelers (**Table 23**).

[3] Based on a total energy cost of ₹9.0 per kWh.

Table 23 Currently available models of electric freight vehicles

No.	Vehicle model	Battery capacity (kWh)	Payload (kg)	Purchase cost (₹ lakh)	Operating cost (₹ per km)	Range (km)
1	Tata Ace EV (4W)	17.2	600	9.50	0.90–2.00	154
2	Mahindra Treo Zor (3W)	7.37	578	3.48	0.50–1.00	80
3	Piaggio Ape E-Xtra (3W)	8.0	506	3.12	0.50–1.00	90
4	Omega Seiki Rage+ (3W)	10.8	500	3.61	0.50–1.25	120
5	Euler HiLoad (3W)	13.0	688	3.78	0.50–1.20	120
6	Kinetic Safar Jumbo (3W)	8.2	500	3.45	0.50–1.00	120

Source: Manufacturers' websites (Tata Motors; Mahindra Last Mile Mobility; Piaggio Vehicles; Omega Seiki Mobility; Euler Motors; Kinetic Green), accessed 2023

- The relatively slow uptake of four-wheeled electric freight vehicles in the sub-one-tonne category, compared with electric three-wheelers, needs to be investigated.
- As operators are mostly single-vehicle owners working on low profit margins, they are very sensitive to operating costs and TCO. Even if the average TCO of an electric vehicle over its service life is lower than that of the CNG version, what matters to them is the cost during the loan tenure. A lower TCO for electric vehicles than for similar CNG versions during the loan tenure is therefore critical to create the desire to switch, especially among first-time buyers of commercial EVs.
- Electric three-wheelers are more profitable than their CNG equivalents even during the loan tenure (at an electricity rate of ₹9 per kWh), but the TCO of an electric four-wheeler during the loan tenure is slightly higher than that of a similar CNG model. Accounting for overloading in both vehicles, operating costs are expected to rise by up to ₹0.4 per km for electric three-wheelers and ₹0.7 per km for electric four-wheelers.[4]
- On this basis, the cost of electricity for electric four-wheelers needs to be below ₹6 per kWh for the TCO during the loan tenure to equal that of a similar CNG model. For electric three-wheelers, however, electricity costs as high as ₹22 per kWh (accounting for the extra energy needed because of overloading) to ₹34 per kWh (not accounting for it) would still keep them more profitable than similar CNG models.
- Public charging tariffs vary significantly across Delhi. Tariffs documented on 22 June 2023 at three locations used by LGVs (based on the survey locations) — Azadpur, Okhla and Old Delhi — ranged from ₹10 to ₹100 per kWh for AC fast and slow charging (GNCTD, 2023). The average tariff at these locations was ₹24–45 per kWh. These rates are clearly unattractive to freight vehicle operators and will hurt their profitability, especially for electric four-wheelers, which depend more on public chargers.
- This is probably also why light freight vehicle operators see cheaper electricity as the main motivator for switching to electric.

[4] Based on an assumption of 50% higher energy use for three-wheelers and 70% higher energy use for four-wheelers.

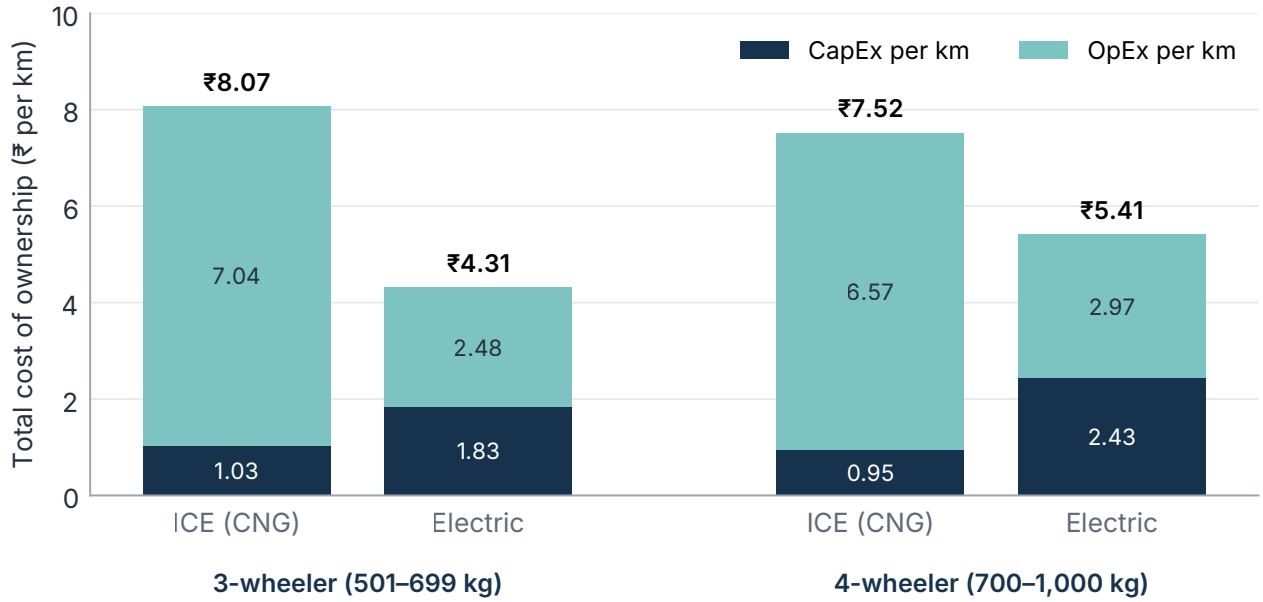


Figure 77 CapEx and OpEx per km of ICE and electric freight vehicles (15-year TCO)

Source: Analysis of primary survey data; electricity at ₹9 per kWh

4.2 Recommendations

4.2.1 Public charging ecosystem

- Charging tariffs at public chargers should not exceed ₹6–10 per kWh, for both AC fast and AC slow charging.
- Utilisation of each public charger is expected to rise as tariffs fall, making the investment viable even at reduced rates. To drive down costs further while attracting investment in charging infrastructure, GNCTD may consider tapering minimum demand guarantee models spread over ten years (the estimated life of a charger).
- Because freight vehicles with a payload under one tonne rely on slow AC charging, public depots with charging facilities are needed for overnight parking and charging. GNCTD should facilitate the development of such depots on a pay-and-use basis.
- The layout of charging stations should be corrected for both existing and proposed chargers, so that the environment is safe for pedestrians and vehicles and charging vehicles do not cause conflicts. For example, chargers can be placed near layover or breakdown bays, with ample space for pedestrians behind the chargers (**Figure 78**). GNCTD may develop design and development guidelines for charging infrastructure to achieve this.



Figure 78 Planned layover bays near Barar Square on the Ring Road, suitable for safely placed chargers

Source: SGArchitects

4.2.2 More models and better specifications for electric freight vehicles

- OEMs should introduce freight vehicle models with a lower capital cost, in the range of ₹6–8 lakh per unit, a higher payload (over 900 kg) and a better range (100–120 km). GNCTD may use demand aggregation to scale up demand, drive down prices and improve specifications in this category of electric freight vehicles.
- OEMs should add DC charging capability to electric freight vehicles, especially four-wheelers and pick-up trucks.
- GNCTD should set up DC charging stations combined with planned freight vehicle stands in commercial areas where these vehicles operate. If such infrastructure and vehicle specifications together can deliver up to 80% charge in under 30 minutes, without any premium on the tariff, this will greatly increase the attractiveness of electric freight vehicles to operators.

4.2.3 Outreach and communication

- GNCTD, in collaboration with OEMs, may run awareness campaigns to clear up misconceptions about range, cost and the charging ecosystem. Further engagement with associations of freight vehicle owners and operators may also help.

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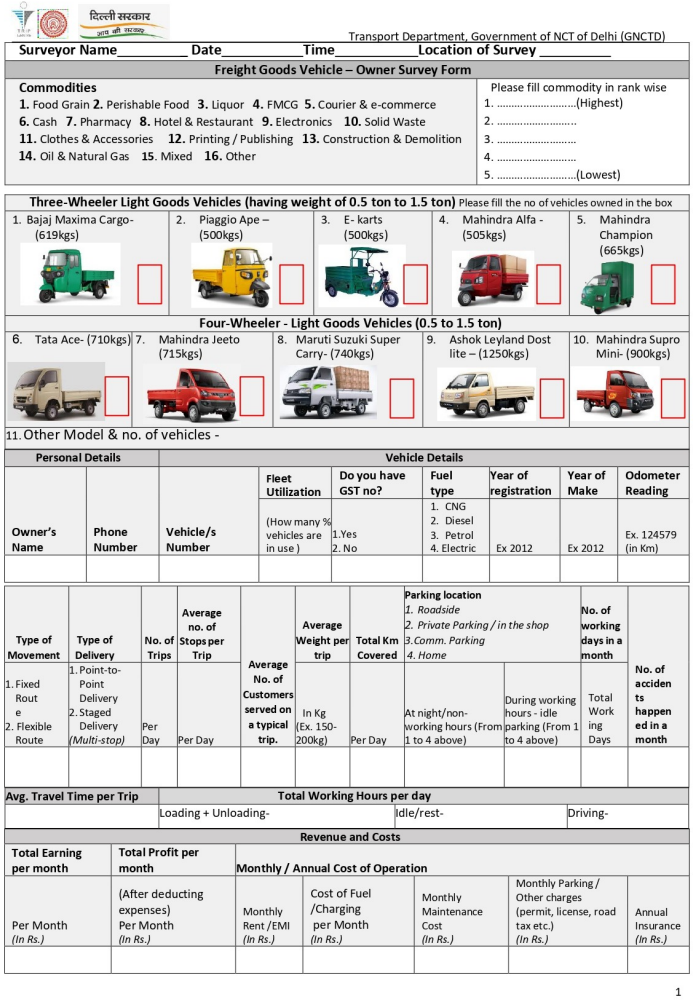
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A

Annexure 1: Survey Questionnaire

The questionnaire used for the survey of LGV owners and operators is reproduced on the following pages.



दिल्ली सरकार

Transport Department, Government of NCT of Delhi (GNCTD)

Surveyor Name_____ **Date**_____**Time**_____**Location of Survey** _____

Freight Goods Vehicle – Owner Survey Form

Commodities

1. Food Grain **2.** Perishable Food **3.** Liquor **4.** FMCG **5.** Courier & e-commerce
6. Cash **7.** Pharmacy **8.** Hotel & Restaurant **9.** Electronics **10.** Solid Waste
11. Clothes & Accessories **12.** Printing / Publishing **13.** Construction & Demolition
14. Oil & Natural Gas **15.** Mixed **16.** Other

Please fill commodity in rank wise
1. .....(Highest)
2. .....
3. .....
4. .....
5. .....(Lowest)

Three-Wheeler Light Goods Vehicles (having weight of 0.5 ton to 1.5 ton) Please fill the no of vehicles owned in the box

1. Bajaj Maxima Cargo- (619kgs)
2. Piaggio Ape – (500kgs)
3. E- karts (500kgs)
4. Mahindra Alfa - (505kgs)
5. Mahindra Champion (665kgs)

Four-Wheeler - Light Goods Vehicles (0.5 to 1.5 ton)

6. Tata Ace- (710kgs)
7. Mahindra Jeeto (715kgs)
8. Maruti Suzuki Super Carry- (740kgs)
9. Ashok Leyland Dost lite – (1250kgs)
10. Mahindra Supro Mini- (900kgs)

11. Other Model & no. of vehicles -

Personal Details		Vehicle Details						
Owner's Name	Phone Number	Vehicle/s Number	Fleet Utilization (How many % vehicles are in use)	Do you have GST no? 1.Yes 2. No	Fuel type 1. CNG 2. Diesel 3. Petrol 4. Electric	Year of registration	Year of Make	Odometer Reading
						Ex 2012	Ex 2012	Ex. 124579 (in Km)

Type of Movement	Type of Delivery	No. of Trips	Average no. of Stops per Trip	Average No. of Customers served on a typical trip.	Average Weight per trip	Total Km Covered	Parking location *1. Roadside 2. Private Parking / in the shop 3.Comm. Parking 4. Home*		No. of working days in a month	No. of accidents happened in a month
1. Fixed Route 2. Flexible Route	1. Point-to-Point Delivery 2. Staged Delivery *(Multi-stop)*	Per Day	Per Day		In Kg (Ex. 150-200kg)	Per Day	At night/non-working hours (From 1 to 4 above)	During working hours - idle parking (From 1 to 4 above)	Total Working Days	

Avg. Travel Time per Trip	Total Working Hours per day		
	Loading + Unloading-	Idle/rest-	Driving-

Revenue and Costs

Total Earning per month	Total Profit per month	Monthly / Annual Cost of Operation				
Per Month *(In Rs.)*	(After deducting expenses) Per Month *(In Rs.)*	Monthly Rent /EMI *(In Rs.)*	Cost of Fuel /Charging per Month *(In Rs.)*	Monthly Maintenance Cost *(In Rs.)*	Monthly Parking / Other charges (permit, license, road tax etc.) *(In Rs.)*	Annual Insurance *(In Rs.)*

1

Figure 79 Survey questionnaire, page 1

Q.1 When do you plan to replace the current vehicle or add a new vehicle in your fleet?

1	2	3	4	5
Not at all soon > 10 years	6 to 10 years	4 to 5 years	1 to 3 years	<1 year

Q.2 In the current circumstances and available subsidy levels, how likely is it that your next purchase will be an electric Light Goods Vehicle?

1	2	3	4	5
Very unlikely	Somewhat unlikely	May or may not be (Moderate)	Somewhat Likely	Very Likely

E- model	Tata Ace EV (4-wheeler)	Mahindra Treo Zor	Piaggio Ape Extra	Omega Seiki Rage+	Euler Hi-Load	Kinetic Safar Jumbo
						
Purchase Cost	6.6 Lakh	3.48 Lakh	3.12 Lakh	3.61 Lakh	3.55 Lakh	3.45 Lakh
Operational cost per km	0.9 Rs – 2 Rs	0.5 Rs – 1 Rs	0.5 Rs – 1 Rs	0.5 Rs – 1.25 Rs	0.5 Rs – 1.2 Rs	0.50 Rs – 1 Rs

Q.3 Do you have knowledge of subsidies and benefits offered by central and state government on buying and operating electric goods vehicles in Delhi. ○ Yes ○ No

Q.4 In your opinion (with current subsidies/benefits) how expensive or cheap is to buy or own (vehicle cost, insurance, tax, etc.), similar electric vehicle model when compared to your current petrol/diesel/CNG vehicle?

1	2	3	4	5
Very expensive	Somewhat expensive	Almost Equal	Somewhat cheaper	Very cheap

Q.5 In your opinion (with current subsidies/benefits) how much more or less is the daily operational (fuel and daily maintenance) cost of similar model of electric vehicle when compared to your current petrol/diesel/CNG vehicle?

1	2	3	4	5
Very expensive	Somewhat expensive	Almost Equal	Somewhat cheaper	Very cheap

Q.6 Do you know of any people who have purchased electric Vehicle?

1	2	3	4	5
None	Very few	Half of people I know	Most of them have	Everyone I know has

Q.7 Are you aware of any owners who have availed any electric vehicle related government benefits / schemes?

1	2	3	4	5
None got it	Very few got it	About half of people who bought got it	Most of them got it	All got it

Please mention (if any) the challenges/difficulties faced by the current electric vehicle owners.

_____

Q.8 How easy or difficult do you think it will be to avail these benefits/subsidies for purchasing an electric light goods vehicle?

1	2	3	4	5
Almost impossible	Very difficult	Moderate - Neither difficult nor easy	Very easy	Extremely easy

Q.9 Which one of these facilities/services will positively contribute to meet your operational requirements towards electrification? Please rank in the order of preference (1 to 5)

Lower Financing - Interest Rate	Cheaper Electricity Charges - lower than Rs 5/KW/h	Availability of more options of vehicle models	Parking & Charging infrastructure	Maintenance / Service Facility
Other -				

Travel Diary (previous day journey details)										
	Home to 1st loading point		1st loading point to drop point		Drop point to 2nd loading point		2nd loading point to drop point		Drop point to Home	
Time	Start Time	Stop Time	Start Time	Stop Time	Start Time	Stop Time	Start Time	Stop Time	Start Time	Stop Time
KM										

Figure 80 Survey questionnaire, page 2

SGA sustainable mobility solutions

Light goods vehicles carry most of Delhi’s urban freight, yet almost none are electric. Based on a survey of 2,000 owners and operators, this report profiles how these vehicles operate, what they earn and cost, and what owners think of electric vehicles — and recommends how charging tariffs, charger design, vehicle models and outreach can accelerate the switch.

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