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THE URBAN CATALYSTS

WE2: She Moves on Electric Two-Wheels

Understanding the barriers and opportunities for uptake and use of electric two-wheelers amongst women in India

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List of Abbreviations/Acronyms

ANEW	Association for Non-Traditional Employment for Women
ARAI	Automotive Research Association of India
BEE	Bureau of Energy Efficiency
CAGR	Compound Annual Growth Rate
CCTV	Closed Circuit Television
CEA	Central Electricity Authority
CIBIL	Credit Information Bureau (India) Limited
CMVA	Central Motor Vehicles Act
CMVR	Central Motor Vehicles Rules
CNA	Central Nodal Agency
CP	Charging Point
CPO	Charging Point Operator
CSCL	Chennai Smart City Limited
DERC	Delhi Electrical Regulatory Commission
DTL	Delhi Transco Limited
DTTE	Directorate of Training and Technical Education
E- AMRIT	Accelerated e-Mobility Revolution for India's Transportation
E2W	Electric Two-Wheeler
E3W	Electric Three-Wheeler
E4W	Electric Four-Wheeler
EESL	Energy Efficiency Services Limited
EFL	Engine & fuel tank location
EMI	Equated Monthly Instalments
EMPS	Electric Mobility Promotion Scheme
EVs	Electric Vehicles
EVSE	Electric Vehicle Supply Equipment

EWEE	Empowering Women and Enhancing their Business through E-Mobility
FAME	Faster Adoption and Manufacturing of Electric Vehicles
FCDO	Foreign, Commonwealth & Development Office
FGD	Focus Group Discussion
GCC	Greater Chennai Corporation
GNCTD	Government of National Capital Territory of Delhi
GPL	Gender and Policy Lab
GPS	Global Positioning System
GST	Goods and Services Tax
HVT	High Volume Transport
ICE	Internal Combustion Engine
ITI	Industrial Training Institutes
IVR	Interactive Voice Response
KII	Key informant interviews
LMIC	Low- and Middle-Income Countries
LTV	Loan to Value
MHI	Ministry of Heavy Industries
MoEFCC	Ministry of Environment, Forest and Climate Change
MoHUA	Ministry of Housing and Urban Affairs
MoP	Ministry of Power
MORTH	Ministry of Road Transport and Highways
MOWO	Moving Women
MP	Motor Power
MRTS	Mass Rapid Transit System
MS	Maximum Speed
MSME	Micro, Small and Medium Enterprises
NBFC	Non-Banking Financial Corporation

NGO	Non-Governmental Organizations
NITI	National Institution for Transforming India
OEM	Original Equipment Manufacturer
PCS	Public Charging Stations
PLI	Production Linked Incentive
RTO	Regional Transport Office
SEWA	Self Employed Women's Association
SIAM	Society of Indian Automobile Manufacturers
SNA	State Nodal Agency
STEM	Science, technology, engineering, and mathematics
TANGEDCO	Tamil Nadu Generation and Distribution Corporation Limited
TCO	Total Cost of Ownership
TNERC	Tamil Nadu Electricity Regulatory Commission
TNSDC	Tamil Nadu Skill Development Corporation
URDPFI	Urban and Regional Development Plans Formulation and Implementation
WS	Wheel Size

Executive Summary

The transition to electric two-wheelers (E2Ws) is a critical step toward achieving low-carbon transport in India. The road transport sector contributes 12% of the country's energy-related emissions (280 million tonnes), with two- and three-wheelers accounting for 20% of these emissions. As of September 2024, two-wheelers make up 73% of the registered vehicle fleet and represent 62% of electric vehicle (EV) sales between September 2023 and 2024. Despite this growth, E2W penetration remains below 6%.

Women are underrepresented as drivers, and delivery workers in India. The gig economy, particularly in last-mile delivery, is projected to grow by $165.6 billion between 2022 and 2027 (which could be driven by Internal Combustion Engine (ICE) or electric two-wheelers). However, women hold only 6.3% of the total driving licenses issued as of March 2020. The number of licenses issued to women has grown at a compound annual growth rate of 9.3%, with women receiving 12% of all licenses in 2019–20. This growth signals a rising demand for personal mobility among women. Despite this, there is limited research on the gendered use and ownership of E2Ws. This study aims to understand the gendered differences in the adoption and use of E2Ws in India, using Chennai and Delhi as case studies.

Research Methodology

The research focuses on five key factors affecting the uptake of E2Ws: driving license processes, vehicle design, financing, charging infrastructure, and institutional support. A mixed methods approach was adopted and data was collected through surveys, focus group discussions (FGDs), and key informant interviews with stakeholders in the electric mobility ecosystem. The users for primary survey are categorized as commercial (delivery workers and service providers) or personal (individuals with fixed-place employment) users.

A gendered analysis of state EV policies was conducted using a graded framework that categorized policies from gender-discriminatory to gender-transformative. Institutional analysis was also undertaken to identify relevant stakeholders and their roles within the policy and regulatory context.

The research was guided by a multi-stakeholder advisory group comprising government representatives, development finance institutions, cooperation agencies, and private sector.

Key Findings

The primary survey revealed that commercial users are mainly involved in food delivery (45%), grocery delivery (16%), and home services (14%), with women distributed across food delivery, home services, and the delivery of other products such as cosmetics, medicines, and Yakult. A significant portion (92%) of personal users are engaged in the service sector.

Commercial male users travel approximately 1.7 times more than their female counterparts (M:79 km; F: 46km). Personal male users with fixed employment locations also travel longer distances than female workers (M: 28km; F: 20km). However, personal users, in general, travel shorter distances than commercial users. The travel distances between ICE and EV commercial users do not show significant differences.

Female commercial workers work 95 to 167 minutes less than male workers, likely due to care responsibilities. While male workers earn 1.1 times more than female workers, this is primarily due to working longer hours. However, women earn a higher hourly income (INR 115) compared to men (INR 104), as they generally take shorter-distance orders, enabling them to complete more deliveries in less time. The Total Cost of Ownership (TCO) for female E2W users is found to be 1.2 to 1.7 times higher than for male users due to differences in vehicle utilisation.

Driving licence process and regulations. The findings reveal that women often rely on family members to learn driving, while men predominantly rely on friends or self-learning. Formal driving classes are rare for both genders, with only 8% of women and 2% of men using them. Respondents reported paying 2.5 to 2.7 times the prescribed fees to obtain a license, largely due to reliance on agents. Awareness of the recent shift to an online application process for driving licenses, implemented in 2023, is limited. Key challenges identified by respondents in the licensing process include administrative barriers at the Regional Transport Office (RTO), difficulties in passing the learner's test, and challenges in passing the practical driving test. To enhance the licensing process, respondents prioritised assistance with paperwork, reducing waiting times for tests, and minimizing overall delays at the RTO. Women emphasised the importance of polite and

respectful interactions with RTO officials and expressed a need for women-specific services to facilitate the licensing process.

Design of electric two-wheelers. The study found that women show a stronger preference for e-scooters, while men are inclined to use both e-scooters and e-motorcycles. 72% of the respondents used five E2W models, which are (i) Ola Electric S1 Pro (22% of EV user respondents), (ii) Ather 450 (17%), (iii) Hero Electric Optima (14%), (iv) TVS iQube (12%), and (v) Honda Activa Electric (7%). Women demonstrated a higher tendency to use familiar and well-established models, with 74% of women choosing the top five ICE models compared to 48% of men.

E2W users identified key priorities such as vehicle range, battery safety, and charging safety. Women emphasized the importance of vehicle weight, reverse assist, and hill assist features. Focus group discussions revealed that men generally prefer heavier and wider vehicles, considering them more stable, particularly on slopes or in adverse weather conditions. Conversely, women favoured lightweight vehicles with a broader width to ensure they could be used by male family members without concerns about gendered perceptions of the vehicle's design.

Post-sales service emerged as a significant challenge, with limited access to skilled technicians, delays in servicing, and a lack of spare parts in local market affecting user experiences.

Financing of electric two- wheelers. The majority of respondents across gender, vehicle type, and usage opted for self-financing when purchasing their two-wheelers. On average, 29% of respondents chose to finance their two-wheelers through loans, regardless of gender, usage type, or fuel type. Among male loan users, the majority financed their vehicles in their own name. In contrast, 81% of female users obtained loans in their own name for ICE vehicles, while only 51% did so for E2Ws.

For male EV users, the down payment was typically 26% of the on-road price, while for female EV users, the down payment was 32%. This higher down payment requirement for women could present a barrier to the adoption of EVs. Loan approval times for EVs were generally shorter than for ICE vehicles. Key informants noted that while women borrowers exhibited better repayment profiles, they have less technical knowledge of vehicle specifications compared to male borrowers. Women represented approximately 10% to 20% of total borrowers.

Between 65% and 80% of respondents received financing information from agents at two-wheeler dealerships. Limited financial literacy, lack of experience-sharing, and low or no CIBIL scores were identified as key obstacles for women in accessing financing. Both male and female respondents indicated that reducing documentation requirements, improving information access, and facilitating experience-sharing could improve the financing process.

Charging infrastructure. The primary charging location for both commercial and personal E2W users is at home, regardless of the time of day. 25% of commercial users reported using public charging stations during the day, compared to just 7% of personal users. E2W users indicated that they typically restrict their two-wheeler use to within the city and prefer to keep it within a comfortable range of home. Public charging stations are considered primarily for emergency use. Women users expressed concerns about vehicle range and often limit their travel to avoid running out of charge.

In addition to the surveys and FGDs, public charging stations were audited using an assessment framework that evaluated four parameters: location accessibility, security, charging infrastructure, network connectivity, and amenities. It was found that 46% and 64% of the charging points in Delhi and Chennai, respectively, were operational. 65% of the audited charging points in Delhi are rated as "poor" or "very poor," on the assessment framework and 85% of the 46 audited charging stations across both cities received similar ratings.

The key issues identified include the lack of real-time, centralized information on the location and availability of charging points. Many stations are located in poorly lit, inactive areas, which raises safety concerns, particularly for women. There is also a shortage of fast-charging points, and basic amenities such as shaded spaces, seating, toilets, and drinking water are often unavailable, affecting the overall user experience.

To improve charging infrastructure, priorities vary between men and women. For men, the focus is on affordability and the availability of operational charging points. For women, key concerns include safety, accessibility, and the overall quality of the charging stations. Women expressed concerns about the ease

of using the charging points, the safety at charging stations, and longer waiting times, which could increase the risk of unwanted attention.

Institutional Support. Social enterprises and women-focused organizations are working to support resource-poor women in accessing electric vehicles by collaborating with government agencies, financial institutions, and driving schools. These organizations help women with tailored financial products, subsidies, financial literacy, and job training in roles like chauffeurs and delivery riders.

Findings from the primary survey reveal that EV users rely on family, friends, showrooms, and agents for various forms of support. However, users in both cities face challenges with post-sales support, such as a shortage of skilled technicians for electric two-wheelers, extended service turnaround times due to a limited network of service centres, and the unavailability of spare parts. Recurring issues, such as frequent shutdowns and failures to restart, require regular maintenance. Women users, in particular, have lower awareness of financial benefits like upfront subsidies, with only about 40% aware of road tax waivers for EVs.

Peer learning and knowledge-sharing were identified by E2W users as effective strategies for resolving daily operational issues. In contrast, users of ICE vehicles expressed a need for support in convincing their family members of the benefits of transitioning to EVs. Women users highlighted four key areas where they need support: access to information on TCO, financial products and processes, charging infrastructure locations, and assistance with obtaining a driving license. The availability of special deals and discounts emerged as a priority for female commercial workers

Recommendations

The recommendations aim address the identified challenges faced by women in adopting and using E2Ws. These are categorized at national and state levels, taking into account existing policies and processes.

At the national level, key actions include conducting research on gendered differences in E2W usage, developing a roadmap for a gender-just transition to electric mobility, implementing gender-sensitive guidelines for charging infrastructure, and publishing annual data on EV registrations by gender. The Ministry of Heavy Industries, Ministry of Road Transport and Highways, and the Bureau of Energy Efficiency are identified as responsible agencies.

At the state and city levels, recommendations emphasize the revision of state EV policies to include gender-responsive strategies, such as targeted purchase subsidies and improved charging infrastructure. State nodal agencies are urged to incorporate gender experts in their EV Cell/Taskforce. Other recommendations include providing institutional support to women commercial users through driver training, financial literacy programs, and post-sales support, in collaboration with EV aggregators and women-focused organizations. Additionally, the licensing process should be strengthened by increasing awareness of online application procedures and pilot testing women-priority services at select RTOs.

The focus is on reducing the financial burden on women, improving access to supportive infrastructure, and developing strategies to overcome socio-cultural barriers that impede E2W adoption.

1. Introduction

Context

In India, the internal combustion engine (ICE) two-wheelers constitute 72% of all vehicles with 274 million ICE two-wheelers registered at present; necessitating the transition to electric two-wheelers (E2Ws) as an essential step for a transition to low carbon mobility. However, women are estimated to constitute only 12% of all driving license holders.

There is limited data, understanding and awareness of the gendered nuances, similarities and differences in the use and ownership of E2Ws for personal and commercial use. This hinders the framing of electric two-wheeler policies and schemes to increase women's uptake. This research fills this gap by identifying the opportunities and barriers to increase women's ownership and use of electric two-wheelers for a just transition to low carbon mobility.

A shift towards E2Ws is essential for moving towards low-carbon transport in India.
Globally, road transport is a significant contributor to emissions. In India, road transport contributes 280 million tonnes or 12% of energy-related CO_2 emissions (1). As of September 2024, two-wheelers constituted 73% of all vehicles in the country (2). Two- and three-wheelers account for 20% of CO_2 emissions from road transport (1). Thus, a shift towards electric two-wheelers is an essential step for low-carbon transport in India.

E2Ws constituted 5.6% of sales of all two-wheelers in the country from September 23-24.
While electric two-wheelers have higher upfront costs, their operational costs are lower than their ICE counterparts. On an average daily travel distance of 50 kms, the total cost of ownership[1] per kilometre for low-cost electric two-wheelers using lithium-ion batteries is approximately 57% less, and for high-cost electric two-wheelers using lithium-ion batteries, it's approximately 27% less than petrol-powered two-wheelers (3).

India is one of the world's largest two-wheeler markets with 277 million two-wheelers registered as of September 2024 (2). Two-wheelers are used for both personal and commercial use. For commercial purposes, they are used as last-mile deliveries and bike taxis. Electric two-wheelers are leading the electric vehicle (EVs) market in India, and constituted 62% of all EV sales between Sept 2023-24. Yet, electric two-wheelers constituted only 5.6% of all two-wheeler sales in the country during this period (4).

Women are underrepresented as drivers, delivery partners and as two-wheeler owners.
Women, in India, form a small fraction of drivers constituting only 6.3% of the total driving licences issued as of March 2020 (5). However, the share of driving licences issued to women has increased at a Compound Annual Growth Rate (CAGR) of 9.3%. In 2019-20, 12% of all driving licences were issued to women. In India, the last-mile delivery market is estimated to be between $6.0-7.0 billion in 2024 and is projected to grow at a CAGR of 15.6% annually with an increase of $165.6 billion between the years 2022 to 2027 (6). Two-wheelers are used as bike taxis and as the most preferred mode for hyperlocal deliveries, including e-commerce, courier services and food deliveries (3). Many gig workers also use electric mopeds/cycles which do not need driving licences. In 2021, women were estimated to constitute 4-7% of delivery drivers in India (7).

There is some research on women's preference for (ICE) two-wheelers. In Calicut in 2017, women preferred to buy two-wheelers that are comfortable and easy to use (8). Amsaveni and Kokila (2014) observed that working women in Coimbatore expected performance, cost-effectiveness, aesthetics, and resale value (9). Research aiming to understand the preferences of working women, homemakers and female students in Pondicherry in 2018 revealed that efficient brake control, mileage, comfortable riding, light weight and high speed and good wheel alignment were the five major factors in the selection of (ICE) two-wheelers. The

[1] The total cost of ownership of a vehicle refers to the complete cost incurred over the entire period of ownership, including purchase price, maintenance, fuel or energy costs, insurance, taxes and any other relevant expenses.

five additional services preferred by them were vehicle registration service, financial assistance, driving license services, insurance claims and settlement services, and helping women customers learn two-wheeler driving from female trainers (10).

There is limited research and understanding of the gendered use and purchase of E2Ws.
There are numerous factors influencing consumer behaviour towards E2Ws. Studies have noted that purchasing decisions of E2W users are based on several factors such as: comfort, mileage, design, style, optimum speed, maintenance cost, reliability, brand image, advertising, spare parts availability, after-sale service and resale value. Bhatia, Chauhan and Kumar in their research have noted that cost efficiency, environment-friendliness and low maintenance were some of the key factors that influenced purchase intention of E2Ws in the state of Gujarat (11). The study further notes the importance of considering the impact of demographic variables such as age and gender on uptake of E2Ws (11).

> *"Brand reliability is crucial, especially considering the influx of new E2W brands in India. It's essential to ensure that post-purchase services and spare parts availability are guaranteed. Over the past seven years, numerous brands have emerged, but many have also shut down".*
>
> *- A male ICE commercial user (Delhi)*

In particular, Bhat and Verma in Bengaluru found that gender has a statistically significant positive impact on adoption behaviour implying that men are more open to the idea of buying E2Ws (12). However, another study by Jayasingh, Girija, and Arunkumar observed that women exhibit a higher inclination towards E2Ws when compared to ICE vehicles (13). This study theorised that this inclination could be due to factors including women's tendency to travel shorter distances on an average, their preference for low-speed models, and the convenience, cost-effectiveness, safety and comfort offered by low-speed vehicles.

1.1 Project aim and objectives

As India urbanizes with an estimated 60% of its population residing in cities by 2030, creating gender-responsive walking, cycling, and electric mobility systems could accelerate the transition to low carbon mobility. Therefore, our research aims to understand the gendered differences in the use of electric two-wheelers in India and formulate recommendations to create an enabling environment for women to own and use electric two-wheelers. Simultaneously, we aim to increase awareness on our research amongst policy makers, policy influencers, private sector partners to enable a gender-just transition to electric mobility systems.

1.2 Structure of the report

The first chapter introduces the need for the study and the aim of the project. The second chapter provides a detailed account of the research methodology, geographic scope, and analytical framework employed. It describes the five key entry points identified through a comprehensive literature review and outlines the mixed-methods approach used for data collection. This includes surveys, focus group discussions, and key informant interviews.

The third chapter presents the research findings derived from both secondary and primary data analyses. The secondary data analysis focuses on the institutional framework for electric mobility in the two states studied, including a gendered analysis of electric vehicle policies. The primary data analysis explores gender-based differences in travel behaviour among users of ICE and electric two-wheelers. It also evaluates the total cost of ownership for personal and commercial two-wheeler users, and identified key barriers faced by women across each entry point in the uptake of E2Ws. These findings highlight the systemic enablers and barriers, providing a nuanced understanding of the adoption and use of E2Ws from gender and policy perspectives.

The final chapter outlines recommendations to promote a just and inclusive transition to electric mobility. It begins with national-level recommendations, followed by state-level recommendations. The state-level

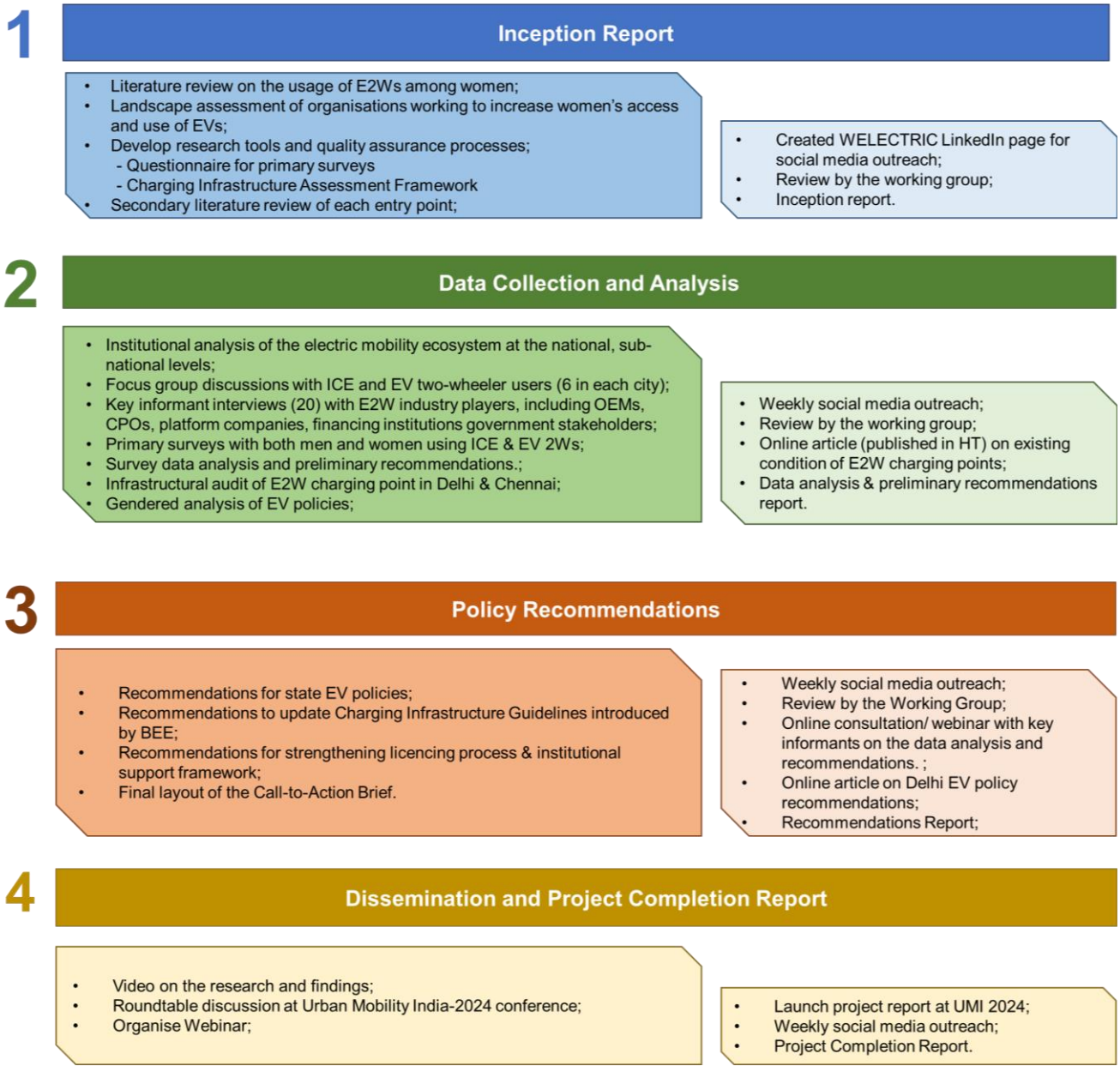
recommendations are broad-based, with contextual adaptations for implementation in the case cities. Recommendations related to institutional support are not state-specific and focus on measures EV industry can take to facilitate the uptake and use of E2Ws for commercial purposes by women. Throughout the chapter, relevant case examples are highlighted in grey boxes to illustrate key points and best practices effectively.

Picture source: Azad Foundation

2. Research methodology

The mixed methods, action-oriented research is structured in four stages: inception, data collection and analysis, policy recommendations and dissemination (Figure 1). The research employs quantitative and qualitative methods of data collection including surveys and focus group discussions with ICE and electric two-wheeler users, along with key informant interviews with stakeholders in the electric mobility ecosystem.

Figure 1: Research methodology



A. Research preparation

Research preparatory activities were commenced during and prior to the inception stage to guide the team, improve overall quality and ensure its relevance to multiple stakeholders. Drawing on the literature of policy adoption and transfer, our research is guided by a multi-stakeholder working group from our target audience. Research uptake and dissemination are an integral part of the process; and the details of research uptake are included with a description of key activities in each stage (Figure 1).

The working group includes government representatives, national and international experts and from the private sector (Table 1). The process of co-creation ensures that our methodology responds to real world experiences, challenges and proposes strategic recommendations that can result in implementation. The members understand and appreciate the importance of gender-responsive mobility systems and are in leadership positions within their organisations.

Table 1: Members of the working group

Working group member	Type of stakeholder
Sudhendu J. Sinha Adviser (Infrastructure Connectivity & Electric Mobility), NITI Aayog, Government of India	Policy think tank of the national government.
Laghu Parashar Senior Transport Specialist, World Bank	Multi-lateral development bank.
Abhinav Soman Policy Manager, Gogoro	Original Equipment Manufacturer (OEM) of electric two-wheelers and battery swapping network.
Rohan Modi Asia Lead, Transformative Urban Mobility Initiative, GIZ	International development corporation organisation supporting the national government and multiple states in India on electrification.
Kirsty Rowan Marcus Senior Transport Specialist, India Resident Mission, Asian Development Bank	Multi-lateral development bank.
Monika Saxena Chief Strategy Officer, RevFin	Non-Banking Financial Corporation (NBFC)

B. Study locations

There are different patterns of mobility corresponding to regional socio-cultural, economic and environmental contexts in India. The research covers two mega cities in the south and north of the country - Chennai and Delhi - to provide a comparative perspective.

Chennai

- **Progressive policies towards gender equality**: Greater Chennai Corporation has established a Gender and Policy Lab (GPL), and the city has implemented a fare-free bus transport for women in July 2021 (14). The state government also adopted the Tamil Nadu State New Policy for Women in 2024 (15) .
- **Electric vehicle manufacturing ecosystem:** The state of Tamil Nadu, where Chennai is located, accounts for 40% of India's EV production in 2023 (16).
- **Vehicle registration:** Since 2021 two-wheelers constitute 70% of vehicle registrations in Chennai. Further, EV registrations constituted 6.2% of all vehicles registered, with electric two wheelers contributing to 72% of all EVs sold as of March 2024 (2).

Delhi

- **Continued engagement:** This is to build on the continued engagement of the research team with the Delhi Government as a part of an ongoing High-Volume Transport (HVT) research to implementation project (17).
- **Progressive policies for EVs and women's mobility:** Delhi has led the way towards electric vehicles with the erstwhile Delhi Electric Vehicles Policy, 2020. It is working towards increasing women's employment in the transport sector with several schemes including fare-free bus transport for women. The Delhi Transport Department has also notified the Delhi Motor Vehicle Aggregator and Delivery Service Provider Scheme, 2023 which mandates all cab aggregators and delivery service providers to switch their fleet entirely to electric by 2030 (18).

- **Vehicle registration:** Since 2021, the two-wheelers constitute 60% of vehicle registrations in Delhi. Further, as of March 2024, EV registrations constitute 6% of all vehicles registered, with electric two wheelers contributing to 54% of all EVs sold (2).

The four stages of the research (Figure 1) are described below along with the research uptake activities highlighted separately for each stage.

2.1 Inception stage and research uptake

The inception stage included a preliminary literature review on factors affecting the adoption of E2Ws in India. A desk review of research papers was conducted through Research Gate, Google Scholar. Additionally, desktop research on electric vehicle design, financing, driving licence process and regulations, charging models and institutional support was conducted through websites of respective organizations and institutions. This was an ongoing activity through the course of the project

Additionally, a rapid desk review was undertaken to understand existing research on gender and E2Ws, and to assess the existing landscape of organisations working to increase women's access and use of electric vehicles (either as drivers, delivery partners or gig workers). A call was also issued via social media, inviting individuals and organisations to share relevant literature on gender and electric two and three wheelers.

Research uptake: The proposed methodology was presented to the working group. Inputs from the working group were used in the development of research tools and quality assurance processes. Additionally, a LinkedIn page was created to launch the WELECTRIC program by The Urban Catalysts. The objective of this program is to conduct research, convene multi-stakeholder dialogues, address industry and procurement gaps for a gender equitable just transition to electric mobility systems. The WELECTRIC Program page (19) was used to share weekly updates on the on-going research throughout the project timeline.

2.1.1 Identification of five entry points

A literature review was conducted through which five key entry points were identified concerning the uptake of E2Ws in India. This was also informed by preliminary interviews with key stakeholders in the electric mobility and two-wheeler ecosystem. The five entry points identified are vehicle design, financing, licensing, charging infrastructure and institutional support. The rationale and research questions for each are outlined below.

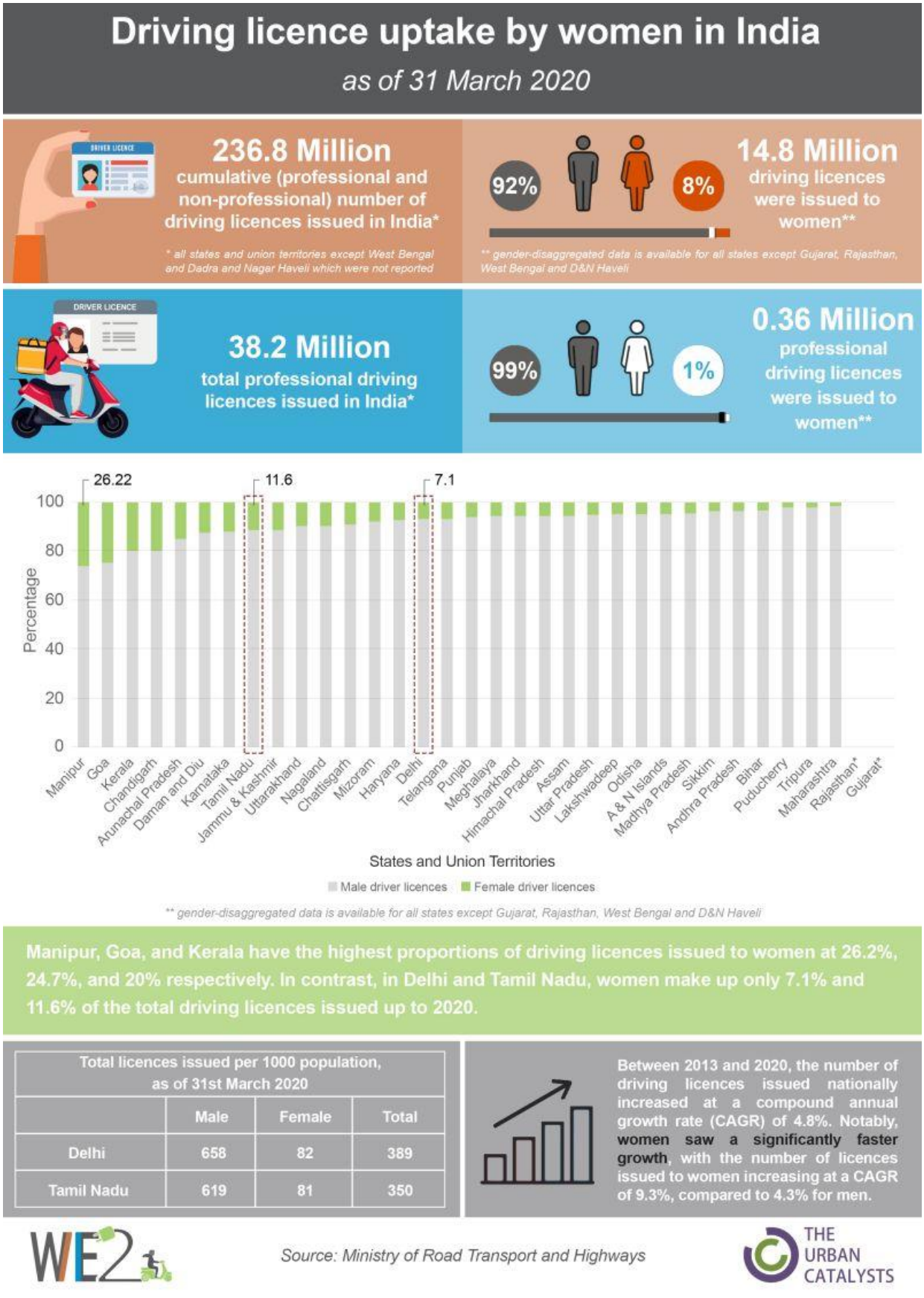
Driving licence process and regulations

The Motor Vehicles Act 1988 lays out the requirement of a licence to drive a motor vehicle in any public place. A driving licence can be obtained either from a Regional Transport Office (RTO) or by applying online through Parivahan portal with the states of Tamil Nadu and Delhi encouraging the latter.

Women in India constitute only 12% of issued driving licences in the year 2019-2020. Sex-disaggregated data on cumulative driving licences issued as of 31st March 2020 is available on the Sarathi portal for all Indian states and territories except for Gujarat, West Bengal and Dadra and Nagar Haveli. The data shows that men constituted 93% of all licences (Figure 2). The states with the highest share of female driving licences are Manipur (26.2%), Goa (24.7%) and Kerala (20%). Women constitute 10% and 11.6% of issued driving licences in Delhi and Tamil Nadu, respectively. Of the commercial licenses, 99% were issued to males and only 1% to females.

The growth in female driving licenses is increasing at a faster rate, indicating a demand for personal mobility. Between the years 2013 to 2020, the number of driving licences issued nationally increased at a CAGR of 4.8% with female driving licenses increasing at a CAGR of 9.3% compared to 4.3% for men. There is no data on licenses disaggregated by the type of vehicle.

Figure 2: Driving licenses in India



Graphic prepared by: The Urban Catalysts

While the official process for obtaining a driver's licence is gender neutral in India, women often encounter additional hurdles. The procedure and fees for obtaining a driving licence are consistent nationwide while there may be variations in coaching fees across different states due to private driving schools. Cultural and societal norms may also discourage women from pursuing a driving licence, leading to barriers like lack of family support or societal expectations (20).

Resource poor women face additional barriers in obtaining driving licenses. They may not be able to afford driving lessons and associated fees (21), and face additional difficulties obtaining the required documents, navigating at the RTO (21). They may be unaware of the online application process and require support.

The research questions that we addressed are below with a detailed analysis in section 3.3.6.

- What are the gender differences in obtaining a driving licence for two-wheelers in Tamil Nadu (using Chennai as a reference) and Delhi?
- How can the process of obtaining a driving licence become gender-responsive?[2]

Vehicle design

There is limited research on how electric two-wheeler designs can be responsive to women's needs. Early observations indicate that electric two-wheelers have certain factors which make them more conducive for women to use than ICE two-wheelers.

The electric two-wheeler market is primarily composed of electric gearless scooters with a limited number of motorcycle models. Scooters are preferred by women in cities like Chennai (22) and in India (23). Some electric scooter models are lighter than ICE scooters. For example, Honda Activa, an ICE scooter model in India, weighs 110kg. Electric scooters such as Yulu Wynn can weigh as low as 60 kg (24), making it easier for manoeuvring. Additionally, electric scooter models may include features to assist in navigation and manoeuvring such as Global Positioning System (GPS) tracking, easy reverse mode and hill assist modes. Further, there are low-speed electric two-wheeler models with maximum speeds up to 25kph. These vehicles require minimal maintenance as they lack mechanical components like gearboxes and clutches further reducing operational costs (25). Their adoption is predominantly seen for commercial purposes (26).

There is a limited understanding of how E2Ws can address women's comfort and risk of safety. As two-wheelers in India are also used for commercial purposes such as for local deliveries, the focus needs to be on the design of the two-wheelers to ensure comfort for long hours of usage. There is also limited exploration on how the design can address women's increased risk of unsafety due to vehicle breakdown or discharge, and considerations on the height and the design of seats of the two-wheelers.

The research questions with regard to the design of electric two-wheelers are described below and addressed in section 3.3.7.

- What are the gender preferences in the design of electric two-wheelers (scooters)?
- How can electric two-wheelers be designed to cater to women's needs?

[2] Vehicles with maximum speeds less than 25kph may be driven without a driving licence which significantly addresses the accessibility issue caused by barriers in the licensing process. Our research also included a question on the impact of low-speed (<25kmph) electric two-wheelers among women and men in India. However, none of our sample survey respondents rode low-speed scooters, due to which this question could not be addressed.

Financing

EVs face financing challenges on account of a new technology. EVs have higher up-front costs than ICE vehicles and thus the requirement for down-payment and credit limit increases. The secondary market for electric vehicles is not developed due to low penetration and limited battery life (27). If the battery is not replaced, the asset may become unusable.

In case the borrower defaults, the lender repossesses the secured asset and sells it to recover its outstanding debt. Most EV manufacturers are new in the market. Due to lack of track record of the makers/models of EVs, as well as lack of a secondary market, lending institutions find it difficult to assess residual value of the vehicle. Hence, they stipulate a higher down payment to reduce their risks.

Battery-as-a-service models where batteries can be exchanged at swapping stations reduce upfront investments for vehicle owners. However, the lower resale value of an electric vehicle that does not include a battery may be a deterrent (28).

Loan to Value[3] for EVs can range between 10% to 30% resulting in a higher initial down payment. In addition, the EMI burden is higher due to 1-9% inflated interest rates and six to 18 months shorter tenure offered for EVs as compared to ICE vehicles (29). In addition to ownership, leasing and rental models are available for electric two-wheelers, particularly for commercial use (30).

The mobilisation of capital for financing will play a critical role to actualise faster mobilisation of electric vehicles. According to NITI Aayog, the quantum of capital and finance required for India's EV future is considerable (31). Between 2020 to 2030, the estimated cumulative capital cost of the country's EV transition is INR 19.70 trillion (USD 240 billion at March 2024 prices) and the projected size of the annual loan market for all EVs is INR 3.70 trillion (USD 45 billion at March 2024 prices) in 2030.

In 2018, between 19% to 38% of women in various income groups across India preferred personal vehicles for their daily commute (32). The availability of financing for women to own E2Ws could play a critical role in faster transition to the zero-emission mode of personal transport.

The credit penetration and participation of women consumers has rapidly increased in India's credit market. There were about 63.5 million women borrowers in 2022 as compared to 31.3 million in 2017 increasing at a CAGR of 15% (33). The share of women borrowers to total borrowers is 28% as on 2022 increasing from 21% in September 2013. Credit access (as a percentage of the adult population) has increased from 7% in 2017 to 14% in 2022 (33), with Tamil Nadu having the highest number of women borrowers. These data points are for retail credit products including home loans, vehicle loans, education loans, personal loan, credit card and business loans.

Only 2% of all loans taken by women borrowers (with CIBIL score) were for two-wheelers and an additional 2% for auto loans (33).

There is empirical evidence to support that there are gender barriers women's participation in formal financial services (34,35)**.** The demand side barriers include women's poor experience of banking, a lack of awareness due to smaller and less divers networks to receive information from people, poor confidence and capability to use digital financial services, socio-cultural barriers, digital gender divide, a lack of access to resources and assets and a lack of official documents (35).

Gender norms often influence formalised rules within financial systems such as the requirement of the husband's signature when opening a savings account, or applying for a loan, collateral requirements, and so on. Simultaneously, as per the National Health Survey 2019-21, less than 3 out of 10 women in rural India and 4 out of 10 women in urban India have ever used the Internet (36).

There may be a lack of products and services designed for women's lifecycle needs. The loan products maybe designed considering men as a default borrower (35). The requirements for collaterals can exclude many women who seek access to higher credit. Evidence shows that more men than women have land ownership—the most prominent form of collateral used widely. Many women do not have assets or properties in their name, and hence do not have the authority to mortgage or sell them for their business

[3] The Loan to Value (LTV) ratio is a financial metric used by lenders to represent the proportion of a loan compared to the value of the asset being purchased.

(37). Therefore, eligibility criteria may pose a major problem when applying for private finance or collateral loans. The gendered and asset-specific barriers need to be considered to understand the uptake of electric two-wheelers among women.

There is a gender gap in the representation of women on the supply side. The lack of women delivering financial services may also impact the gender gap in financial inclusion. The microfinance industry with more than 90% of women clients, employs only 12% of the total women workforce and 11% of women as field staff. An agent's gender plays a crucial role in increasing regular usage of accounts by women, yet women constitute less than 10% of business correspondents in India (35).

"When visiting the bank for loan inquiries and procedures, I often encounter numerous doubts. However, I feel hesitant to repeatedly ask male officers for clarification. Having a female officer would provide a more comfortable environment for seeking details and requesting explanations multiple times."

- *A Female EV Commercial user (Chennai)*

The research questions are described below and addressed in section 3.3.8 :

- What are the gender differences in accessing institutional financing for purchase of electric two-wheelers?
- How can gender responsive loan eligibility criteria, products and experience improve women's access to credit, while reducing their precarity?

Figure 3: Women's access to finance in India[4]

Graphic prepared by: The Urban Catalysts

Charging infrastructure and models

The availability of public charging infrastructure is a significant barrier in the adoption of EVs. Range anxiety which is a concern or fear of becoming stranded with a discharged battery away from charging infrastructure (38) is highlighted as a key factor that affects the adoption of electric vehicles in India (39). It is also noted worldwide that women have greater concerns about range anxiety (40), possibly due to gender-based safety concerns.

There is a correlation between safety concerns at public charging infrastructure and EV transition. Research in the United States of America (USA) and Canada established a correlation between safety concerns surrounding charging point locations and EV ownership. It revealed that 40% of women in the USA and nearly 50% of women in Canada would shift to electric vehicles with accessible and well-lit charging stations (41). In battery swapping models, challenges may also be faced if they are unmanned stations. A user may need to swap the batteries[5] by themselves.

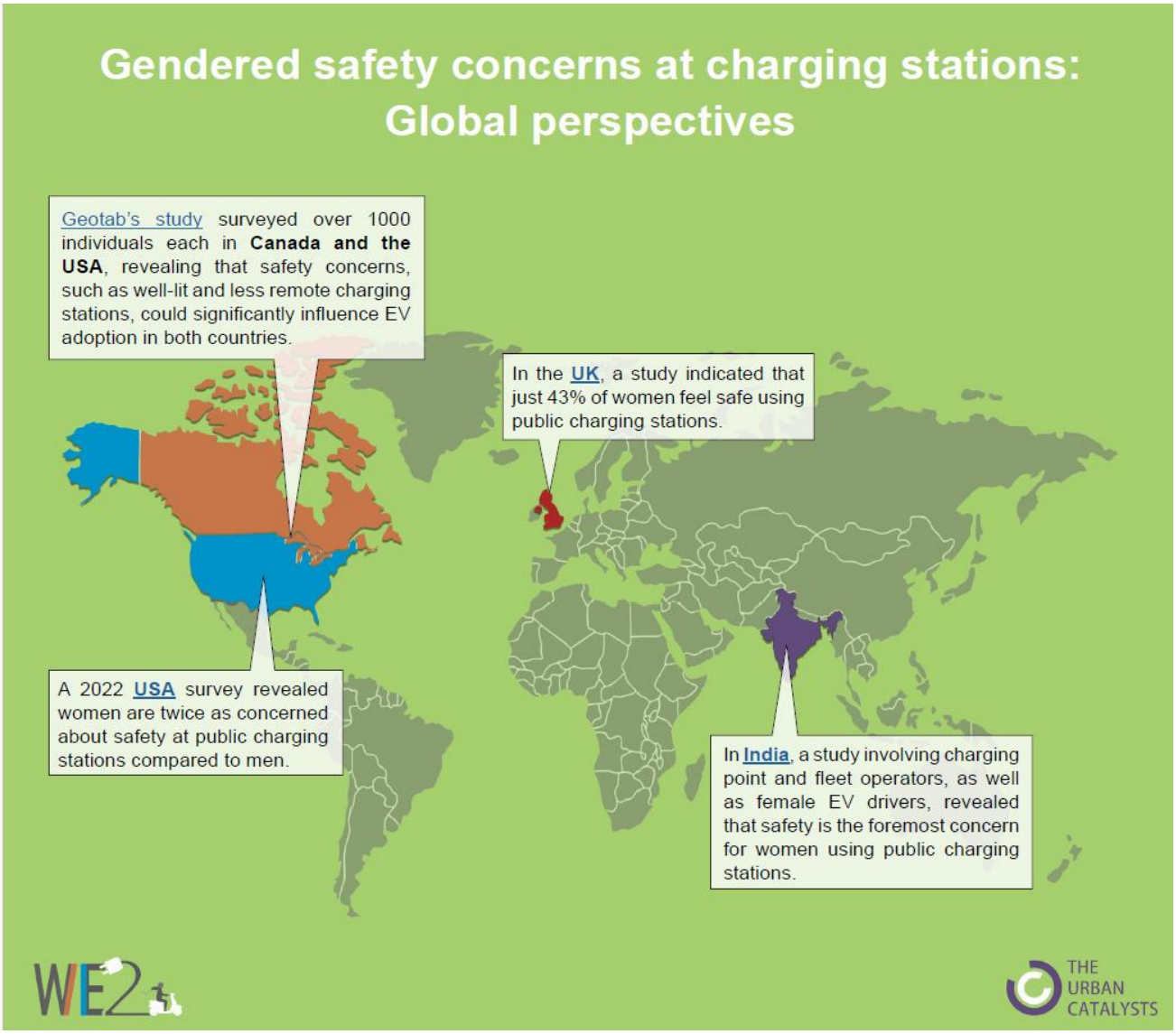
4 Access complete graphic here: WELECTRIC

5 A battery of 1-1.5 kWh may weigh between 10-12 kg and a 2-2.5 kWh battery may weigh between 12-15 kg.

The research questions that we aim to answer and are addressed in section 3.3.9[6] are:

- What are the gender differences in using public charging infrastructure?
- To what extent is existing charging infrastructure gender-responsive? (Refer to section 2.3.6)

Figure 4: Gendered safety concerns at charging stations at global level[7]



Graphic prepared by: The Urban Catalysts

Institutional support

Institutional support aims to understand the assistance provided by organisations in addressing the barriers that different groups of women experience in transitioning to electric two-wheelers. These include accessing and learning to operate vehicles, financing and skills training to decent paid employment. Logistics and delivery companies are taking steps towards increasing the participation of women. The documentation of the learnings from these and other organisations can provide insights on how existing gendered barriers are being addressed. Pathways can be identified to scale-up these approaches to enable women to use and own electric two-wheelers.

6 The cost implications of gender-responsive public charging infrastructure is not delved into in this research.

7 Access complete graphic here: WELECTRIC

The research questions are outlined below and addressed in section 3.3.10:

- What are the learnings from existing practices to address and overcome gender barriers in women's access to electric two wheelers?
- What are the additional support mechanisms required from institutions across the electric mobility ecosystem to increase the uptake of electric two-wheelers among women?

2.2 Data collection and analyses

The research includes secondary and primary data analyses. The secondary data collection and review includes an analysis of the policies, institutions and schemes governing the electric mobility ecosystem in India, and in the states of Tamil Nadu and Delhi.

2.2.1 Secondary analyses

State electric vehicle policies

The states of Delhi and Tamil Nadu (where Chennai is located) formulated electric vehicle policies in 2020 and 2019 respectively[8]. State policies are instrumental in establishing the EV ecosystem at the sub-national and local levels. A graded analytical framework has been developed to evaluate the extent of gender-responsiveness of the EV policies. This ranges from gender discriminatory to gender transformative (Table 2) and a set of questions (Table 2). This framework includes identified entry points such as charging infrastructure, financing mechanisms, governance and institutional support, along with opportunities for employment and entrepreneurship within the EV sector.

Table 2: Gender scale for policy analysis

Scale	Description
Gender Discriminatory	A gender-discriminatory approach perpetuates gender inequality by reinforcing patriarchal norms, roles and relations. For example, an EV policy may aim to create jobs for women in roles traditionally associated with women's care-giving or if the EV policy prohibits women's employment from 8pm to 6am in the value chain rather than enabling safe access or workplace.
Gender-Blind	A gender-blind approach treats everyone the same ignoring the different practical and strategic needs of women, men, boys, girls and gender minorities. Such an approach ignores gendered customs, responsibilities and barriers that women face in accessing paid employment. An EV policy may have a gender agnostic purchase subsidy for electric vehicles or for skilling.
Gender Sensitive	A gender-sensitive approach recognizes different needs of women, men, girls, boys and gender minorities. It acknowledges the gendered structures and systems but it does not address them completely. For instance, making charging infrastructure safer through location and design aspects.
Gender Responsive	A gender-responsive approach aims to reduce the existing gender gaps. Some outcomes include: reducing gender gaps in employment and reducing inequality in asset ownership.
Gender Transformative	A gender transformative approach aims to address the root causes of gender inequality within society such as reducing gender-based disparities in leadership and decision-making positions. An EV policy may aim to create gender-balanced EV task forces or EV cells with women in decision-making positions.

Source: Gender scale adapted from (42) *and modified for current study by The Urban Catalysts*

[8] The state of Tamil Nadu revised its policy in 2023. The Government of the National Capital Territory of Delhi (GNCTD) extended the Delhi EV Policy till March 2025.

Table 3: Indicative questions for policy analysis

Background	• Are there any baselines (gender-disaggregated data) used in the policy to set targets? • Are gender-based issues identified by the policy in the process of transition to electric mobility?
Vision	• Does the vision statement acknowledge the need for gender equity in the transition to electric vehicles?
Goal/Objectives	• Do the goals include gender-disaggregated targets for EV adoption, employment and entrepreneurship in EV value chain?
Financing	• Are there specific measures to enable financial inclusion for women and enable them to purchase EV assets? • Are there financial measures to encourage women's skilling and employment in the EV value chain?
Charging Infrastructure	• Are there considerations (such as guidelines or incentives) for the security and convenience of women in the design and location of EV charging points? • Does the policy outline measures to encourage women-led Charging Point operators (CPOs)?
Skilling and Employment	• Are there specific courses and/ or incentives to skill and employ women at different levels in the EV value chain (manufacturing and maintenance)? • Are there specific courses and/ or incentives to skill and employ women in the electric vehicle supply equipment (EVSE) value chain? • Are there specific courses and/ or incentives to train and employ women as drivers[9] or driver trainers?
Entrepreneurship	• Are there incentives to promote entrepreneurship for women in micro, small and medium enterprises (MSMEs)?
Institutional Support	• Is there institutional support to increase women's employment in the EV and EVSE value chain? • Is there any institutional support to increase women's entrepreneurship in the EV and EVSE value chain? • Is there institutional support to increase women's use and ownership of electric vehicles?
Governance	• Is the EV cell or EV task force gender-balanced? • Does the EV cell and/ or EV task force include women in decision-making positions? • Are there gender experts[10] to advise on the EV policy and its implementation?

Institutional framework and coordination for electric mobility

The institutional analysis of electric mobility in India aims to identify the ministries involved at the national level along with respective departments in the states of Tamil Nadu and Delhi and at local levels. It will identify nodal agencies and pathways on how gender equality can be institutionalised across scales and departments.

9 Electric two-wheelers, three-wheelers and four-wheelers such as e-trucks and e-buses.

10 Gender and mobility, communications and partnerships.

2.2.2 Primary data collection and analysis

Primary data collection was conducted through three tools: key informant interviews. focus group discussions, and user surveys.

Key informant interviews (KIIs)

The key informant interviews were conducted with 20 ecosystem stakeholders[11] to understand their perspectives on gendered influences and barriers on the purchase and use of E2Ws (Table 4). The key informants were sourced based on their scale of operation and willingness to be interviewed. They were consulted with at the inception stage of the research and after the data analysis and preliminary recommendations were developed to share our findings and obtain feedback.

Table 4: Categories for key informant interviews

Category	Number interviewed (Outreach to relevant stakeholder)	Key questions addressed
Original equipment manufacturers (OEMs)	1 (2)	• Socio-economic demographic of the users; • Gendered use of electric two wheelers; • Gender-responsive vehicle design; • Recommendations and references to dealerships.
Financing organizations (non-banking financing companies[12])	4 (7)	• Gendered differences in accessing financial products; • Internal processes or government policies to address the gender gap in accessing credit for vehicle loans.
Commercial two-wheeler delivery operators/ aggregators	5 (7)	• Gendered differences in experiences with delivery partners or workers affiliated with their platforms.
Charging point operators/ Battery swapping station operators	3 (4)	• Gendered use of charging stations and battery swapping stations; • Gender-responsive charging points and battery swapping stations.
Think-tanks	3 (3)	• Understand their research on electric two-wheelers and uptake; • Perspectives on gendered considerations in electric mobility and/ or electric two-wheelers.
Government agencies	4 (4)	• Ministry of Heavy Industries • Transport Department, Government of the National Capital Territory of Delhi (GNCTD) • Gender and Policy Lab, Chennai • Guidance Tamil Nadu

Focus Group Discussions (FGDs)

The insights from the key informant interviews and preliminary literature review were used to identify main themes and formulate the questionnaires for FGDs and user surveys. The purpose of FGDs were to provide insights into people's behaviour, test initial hypotheses and guide the design of the survey questionnaires. The questions focused on understanding the motivation of buying and/or using a two-wheeler, details on usage, perspectives on two-wheeler design, financing, the process of obtaining a driving licence, charging infrastructure and institutional support; and the comparison between an ICE and an E2W. 6 FGDs were conducted in each city with a total of 36 participants in each city. FGDs for men and women were conducted separately (Table 5). A survey was administered to the FGD participants to collect an initial sample of 72 responses. The responses were used to test and update the survey questions, where required.

[11] Original equipment manufacturers, financing institutions, commercial two-wheeler operators or delivery aggregators, charging point operators and battery swapping stations operators and think tanks.

[12] The team reached out to multiple scheduled commercial banks; and did not receive any response.

The FGDs were conducted with both men and women to understand the similarities and dissimilarities in use, due to the sparse data on gender and electric mobility in India. The FGDs were conducted for the following groups of six members in each city.

Table 5: Focus group discussion participants in each city

	Personal use[13]	Commercial use[14]
Women	ICE two-wheeler users -6	ICE two-wheeler users & EV two-wheeler users – 6
	EV two-wheeler users – 6	
Men	ICE two-wheeler users – 6	ICE two-wheeler users & EV two-wheeler users – 6
	EV two-wheeler users – 6	
Total focus group participants in each city	**24**	**12**

13 Individuals who have a fixed place of employment and travel from home to their workplace are considered as personal users.

14 Individuals without a fixed place of employment who make multiple trips throughout the day are classified as commercial users. For example, a Swiggy delivery personnel falls under this category.

Primary Surveys

Surveys were conducted to achieve a minimum number of 240 samples in each city[15], with 30 respondents in each category (Table 6). While a small sample, a statistically sound conclusion is expected for each group (43).

Table 6: User groups and number of samples for questionnaire surveys in each city

	Personal use		Commercial use
Women	ICE two-wheeler users -30		ICE two-wheeler users – 30
	EV two-wheeler users – 30		EV two-wheeler users – 30
Men	ICE two-wheeler users – 30		ICE two-wheeler users – 30
	EV two-wheeler users – 30		EV two-wheeler users - 30
Total samples in each city[16]	120		120

Data collection plan

A detailed plan was formulated for data collection over a period of two months in consultation with the survey agency. The two cities were divided into zones to ensure a geographic spread. Congregation points were identified (Table 7) where user group members could be mobilised for the focus group discussions and surveys.

Purposive and snowball sampling methods were used to recruit respondents as the research involved surveys with specified target groups such as ICE/electric two-wheeler users categorised by gender and nature of use.

Table 7: Congregation points for sample identification

Predominant personal use	Predominant commercial use
Parking areas of mass transit stations, office complexes, business centres, malls and markets. Fuel stations for ICE users, charging stations or battery swapping stations for EV users.	Dark stores, warehouses, cloud kitchens and service centres of food delivery and e-commerce platforms. Fuel stations for ICE users, charging stations or battery swapping stations for EV users.

Data collection team and methodology

A team of five mobilisers were engaged in each city to identify participants for the FGDs at the congregation points. Snowball sampling method was used to identify the participants, particularly in the case of women commercial users as they are significantly low in number.

The FGDs were co-facilitated by the core project team and the survey agency. For surveys, one team of five interviewers and one supervisor were engaged in each city. Team members had prior experience of at least two years in administrating surveys.

The survey questionnaires were translated to the local languages (Hindi and Tamil) of the study cities; and pilot surveys of two to three users in each city were conducted to test the survey tool.

Quality assurance

Quality control methods were used to ensure the accuracy and reliability of the survey data. This included training the interviewers in person with support from the project team. Additionally, the supervisor performed a minimum of 10% accompaniments or spot checks and 20% back checks for each interviewer. Back checks occurred either on-site following the interview or through telephone inquiries.

[15] This includes the 72 surveys conducted as a part of the focus group discussions.

[16] This includes the participants in the focus group discussions, with whom surveys were conducted.

Charging infrastructure assessments

A gender-responsive analytical and scoring framework is developed to assess charging stations and points in the cities of Chennai and Delhi. The framework was pilot tested in both cities, shared with the working group and reviewed by multiple key informants including charging point operators, think tanks and gender specialists.

Methodology for auditing the charging station

The charging infrastructure audits were conducted in both case cities under this project- Chennai, Tamil Nadu and Delhi. According to the Bureau of Energy Efficiency (BEE) by May 2024, there are 151 charging stations in Chennai (44). As of August 2024, Delhi has 2,452 charging points distributed across 1,919 charging stations, along with 232 battery swapping stations (45).

45 charging stations were audited in each city considering the project timelines and to ensure a sufficient sample size for quantitative analysis. Both charging stations and battery swapping stations were audited that are publicly accessible.

Each city was divided into different zones according to existing administrative boundaries, with an equal number of charging stations audited in each zone to ensure the adequate spatial distribution across the city. Delhi was divided into five zones—north, central, south, east, and west—each targeted with six charging stations. Chennai, in contrast, is divided into three zones, with each zone targeted for 10 charging stations.

The methodology prioritised stations located in high-pedestrian footfall public areas such as malls, metro-rail stations, outside showrooms, on-road locations, petrol pumps and markets. Since not all charging stations are listed on Google Maps, multiple applications provided by different CPOs were used alongside Google Maps to locate the charging stations. In Delhi, these applications included One Delhi, BOLT, Kazam, Statiq, Charge Karo, Ather and Ola. For Chennai, the applications were by BOLT and Kazam.

"The charging station infrastructure currently lacks adequate space for vehicles compared to traditional petrol pumps. While petrol pumps offer proper space for vehicles, charging stations often fall short in this aspect. Additionally, charging an E2W can be time-consuming. Therefore, if demand increases, it is essential for charging stations to accommodate this surge by providing sufficient space. Ideally, charging stations should be equipped to handle the simultaneous charging of 15-20 vehicles to meet growing demand effectively."

- *A Male ICE personal user (Delhi)*

Methodology for analysis

The assessment framework is structured around 4 indicators with 23 associated attributes. These indicators and attributes were selected and weighed based on the responses by the survey respondents. The four indicators include (i) ease of locating the charging stations; (ii) security; (iii) charging infrastructure and network connectivity; and (iv) amenities. Each attribute is scored on a scale of 0-3, where 0 indicates the absence of that particular factor and 3 indicates the highest level of quality.

Each attribute was weighed with respect to the other on a scale of 0, 1, 2 depending on whether it was less important, as important or more important. The summation of the row for each attribute was divided by the summation of the column for each attribute. This was rounded off to the closest decimal of 0.5, 1, 1.5, 2, 2.5, 3 to obtain the weight for each attribute. The scores for each attribute obtained from the audits were multiplied by the weight to obtain a total score for the charging point.

The assessment framework provides a total score (out of 99), which is the summation of the weighted scores for all attributes. This is the overall performance of a charging station. It also provides an indicator-wise performance, which is calculated as the percentage of the score from the audits to the maximum possible score for that indicator (Table 8).

Table 8: Rating scale

Total score	Indicator-wise performance (%)[17]	Rating
0-33	0-33%	Very poor
33.01 - 66	33-67%	Poor
66.01- 99	67-100%	Satisfactory

Data analysis and preliminary recommendations

The primary data was cleaned in SPSS using consistency checks, outlier detection, and missing data. The frequencies and descriptives functions were applied to identify and resolve missing values, outliers, and data inconsistencies across all variables. The data sets were then analysed by checking the similarities and dissimilarities in responses across the following three factors: gender, user type and fuel type. Later this analysis was further disaggregated at the city level for a comparative analysis between Chennai and Delhi.

The data analysis was done to understand the following key aspects: survey respondent demographics, travel behaviour, total cost of ownership and the five entry points. The insights from data analysis assisted us to formulate preliminary recommendations on each entry point.

Research uptake – Stage two

Review by the working group
The data analysis and preliminary recommendations were presented to the working group for their feedback. Additionally, an online roundtable was organized with all key informant interviewees to share the research findings and initial recommendations. These engagements facilitated the refinement and further detailing of the recommendations.

Social media outreach
Regular social media outreach was conducted through the WELECTRIC page on LinkedIn.

Roundtable at Urban Mobility Conference 2024
A roundtable session was conducted at the national-level Urban Mobility India (UMI) Conference & Expo 2024 on October 27th. During the session, key findings from the WE2 research were presented.

[17] Scores are converted into percentages for the four indicators, as each indicator has a different total score based on the assigned weightage.

3. Research findings

3.1 Institutional framework for electric mobility

The Government of India aims to achieve net-zero emissions by 2070 and is actively promoting the electrification of road transport. Several initiatives have been launched by the central government, including FAME-I (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles-I)[18] and FAME-II, which provide purchase incentives for electric vehicles and support the development of charging infrastructure. FAME-II concluded in March 2024. In 2018, the Ministry of Power (MoP) de-licensed the establishment of public charging stations for electric vehicles, allowing any entity to set up such facilities (46).

During the project period, the Electric Mobility Promotion Scheme (EMPS)[19] was operational with a focus on E2Ws and electric three-wheelers (E3Ws). Under the EMPS, the central government offered subsidies of up to Rs 10,000 for electric two-wheelers (47).

The EMPS was subsequently integrated into the Prime Minister's E-DRIVE Scheme, introduced at the end of September 2024. This scheme aims to further accelerate the adoption of electric vehicles, establish charging infrastructure, and develop an electric vehicle manufacturing ecosystem in India. The PM E-DRIVE Scheme will be implemented from October 1, 2024, to March 31, 2026.

The institutional analysis in this section includes ministries and departments at the national, subnational and local levels responsible for different parts of the electric mobility system, and the policy, regulatory and legislative context.

3.1.1 Organisations responsible for electric mobility

The national and sub-national agencies, ministries and departments are mapped to understand their role in electric mobility. The table below looks at the institutions at the national level and their role with respect to the entry points of design, charging infrastructure, financing and licensing. The institutions and their key roles and responsibilities were identified through secondary research including a review of the policies or acts under which they were set up and their websites.

Table 9: Key national level institutions and their roles

National Level					
Institutions	**Design of electric vehicles**	**Charging infrastructure [20]**	**Financing schemes to promote electric mobility[21]**	**Licensing process and procedures**	**Other [22]**
NITI Aayog					
Ministry of Heavy Industries					
Ministry of Power[23]					
Ministry of Road Transport and Highways					
Testing Agencies[24]					
Ministry of Finance					

18 FAME-I was operational from 1st April 2015- 31st March, 2019.

19 EMPS was operation from April 1, 2024 to September 30, 2024.

20 This includes framing guidelines, rules and regulations around the licensing of charging infrastructure, grid connectivity.

21 This includes direct financing for electric vehicles and charging infrastructure, and indirect financing support through waiver of road taxes, reduced GST on lithium-ion batteries, income tax deduction for purchase of EVs.

22 Includes but is not limited to skills development, recycling, employment in the value chain of electric vehicles and support equipment.

23 This includes activities undertaken by the Bureau of Energy Efficiency and Central Electricity Authority.

24 Automotive Research Association of India, International Centre for Automotive Technology.

National Level					
Institutions	**Design of electric vehicles**	**Charging infrastructure [20]**	**Financing schemes to promote electric mobility[21]**	**Licensing process and procedures**	**Other [22]**
Ministry of Housing and Urban Affairs					
Bureau of Indian Standards					
Ministry of Environment, Forest and Climate Change					

Source: (48) *and the website of respective ministries.*

Table 10: Roles and responsibilities of national-level institutions in electric mobility

National Level	
Institution	**Roles and responsibilities in electric mobility**
NITI Aayog	NITI Aayog is the public policy think-tank of the Government of India. ***Roles and responsibilities in electric mobility:*** ● To spearhead the formulation of strategic plans and policies to accelerate the adoption of electric mobility (49); ● To provide insights about electric vehicle technologies, types of electric vehicles, insurance options, and financing options.
Ministry of Heavy Industries	The Ministry of Heavy Industries (MHI) is responsible for the development and promotion of the heavy industries sector, including the automotive industry (50). ***Roles and responsibilities in electric mobility*:** ● Coordination for manufacturing, sale and adoption of electric vehicles (51); ● Promotion of EVs through schemes like FAME which includes subsidies for electric vehicles (52); ● Support to automotive manufacturing industries in transitioning to electric mobility: MHI has launched other schemes such as the Phased Manufacturing Programme to promote indigenous manufacturing of electric vehicles, Production Linked Incentive (PLI) scheme for Advanced Chemistry Cell which aims to strengthen the ecosystem for electric mobility and battery storage, PLI for Automobiles and Auto Components which is focused on Zero Emission Vehicles; ● The ministry has also sanctioned 2,877 EV charging stations under FAME scheme (2019-24) in 68 cities across 25 states and union territories (53). However, out of these only 148 have been constructed and are operational (54).
Ministry of Power	The MoP is responsible for general policy in the electric power sector and issues relating to energy policy and coordination. MoP oversees the central and state nodal agencies which enable implementation of charging infrastructure (55). ***Roles and responsibilities in electric mobility:*** ● Responsible for issuing the charging infrastructure guidelines and standards for public charging infrastructure; ● In its capacity as a legislative authority, the MoP clarified that operating EV charging services does not require a licence under the provisions of the Electricity Act 2003, which mandates a licence only for the activities of transmission, distribution or trading of electricity. (56)
Bureau of Energy Efficiency	The BEE is an agency of the Government of India under the Ministry of Power. The agency's main function is to encourage the efficient use of energy by developing programs to support it. ***Roles and responsibilities in electric mobility*** ● Appointed as Central Nodal Agency for rollout of public charging infrastructure. As part of this role, BEE ensures that state nodal agencies share the data of charging stations in prescribed formats for a national online database of public charging stations (48); ● The BEE operates and maintains the EV Yatra web portal and a mobile application to promote electric mobility. EV Yatra offers a directory of electric vehicles, tools for vehicle comparison, total cost of ownership calculations, a charging station locator information on government schemes and policies for electric mobility; ● Organising various awareness campaigns, workshops and seminars for the promotion of electric mobility;

National Level	
Institution	**Roles and responsibilities in electric mobility**
Central Electricity Authority (CEA)	The Central Electricity Authority (CEA) is an organisation operating under the Ministry of Power, Government of India. It is tasked with the functions of advising the central government on matters relating to national electricity policy, specify technical standards, safety requirements for electrical plants, lines and connectivity to the grid (57). ***Roles and responsibilities in electric mobility*** ● A committee under the CEA is responsible for periodically recommending the ceiling limit of service charges for public charging stations; ● The CEA specified standards for charging stations seeking connectivity to the electricity system and regulations for safety requirements at electric vehicle charging stations in 2019, covering provisions for electrical safety, fire safety and periodic inspection of charging stations (58);
Ministry of Road Transport and Highways	The Ministry of Road Transport and Highways (MoRTH) is the apex body for formulation and administration of the rules, regulations and laws relating to road transport, transport research and also to increase the mobility and efficiency of the road transport system in India (59). MoRTH maintains online databases of registration of vehicles, including EVs (VAHAN) and driving licences (SARATHI). ***Roles and responsibilities in electric mobility*** ● MoRTH has constituted committees to deliberate and advise on technical aspects related to the Central Motor Vehicle Rules (CMVR), 1989. The committees include the CMVR-Technical Standing Committee (CMVR-TSC) and the Automotive Industry Standards Committee (AISC) (60). These include technical standards for electric vehicles; ● Formulate policies, regulations and guidelines related to driving licences; ● MoRTH has taken a number of initiatives to promote the use of electric vehicles including green registration plate for EVs for a distinct identity and has requested states to waive road tax on EVs (5). It has also permitted the sale and registration of two- and three-wheeler vehicles without pre-installed batteries which reduces the upfront cost of EVs (61);
Automotive Research Association of India	Automotive Research Association of India (ARAI) is an autonomous body affiliated to the Ministry of Heavy Industries, Government of India. ARAI provides technical expertise in automotive design, testing, and certification, and conducts research and development in the automotive sector. ***Roles and responsibilities in electric mobility*** • ARAI supports the central government by offering regulatory assistance. This includes providing technical secretariat services to the CMVR-TSC, advising MORTH on various technical aspects related to the CMVR (62). ARAI also offers technical advisory services to the AISC by facilitating the formulation and publication of standards for automotive vehicles and components. This encompasses procedures for type approval and certification of vehicles to comply with the Central Motor Vehicles Rules (63); • Conduct research on electric vehicle technologies (64).
Ministry of Finance	The Ministry of Finance (MoF) is responsible for managing the government's financial policies, economic regulations, fiscal management including the formulation and implementation of budgetary policies, taxation, financial services and economic affairs in India. ***Roles and responsibilities in electric mobility*** • **Fiscal incentives and subsidies**: - Reducing the Goods and Services Tax (GST) on electric vehicles from 12% to 5% to make EVs more affordable (65); - Offering income tax deductions on the interest paid on loans taken for the purchase of electric vehicles under Section 80EEB[25] of the Income Tax Act- Deduction in respect of interest paid on loan taken for the purchase of electric vehicle (66); • Reduced import duties on EVs and its components such as batteries and chargers.
Ministry of Housing and Urban Affairs	MoHUA (MoHUA) is the apex authority of the central government to formulate policies and coordinate the activities of various central ministries, state governments and other nodal authorities. In addition, it monitors the programmes concerning all the issues of housing and urban affairs in the country (67). ***Roles and responsibilities in electric mobility*** • The Model Building Byelaws 2016 and Urban and Regional Development Plans Formulation and Implementation (URDPFI) Guidelines have been amended to include provisions for EV charging (68).

[25] Under Section 80EEB, individuals can claim a deduction of up to ₹1,50,000 for interest paid on loans for electric vehicles. This benefit is available regardless of whether the electric vehicle is used for personal or commercial purposes.

National Level	
Institution	**Roles and responsibilities in electric mobility**
Bureau of Indian Standards (BIS)	BIS is the National Standards Body of India established under the BIS Act 2016 for standardisation, marking and quality certification of goods (69). ***Roles and responsibilities in electric mobility*** • Responsible for standards for EV charging infrastructure; • Standards for automotives are prepared by BIS, with standards prepared by AISC; • The Indian Standards for the automotive industry are prepared by BIS. Additionally, standards formulated by AISC are transformed into Indian Standards by BIS. Both BIS and AISC standards are considered by CMVR-TSC for implementation (60).
Ministry of Environment, Forest and Climate Change	Ministry of Environment, Forest and Climate Change (MoEFCC) is the nodal agency of the central government for the planning, promotion, coordination and overseeing the implementation of India's environmental and forestry policies and programmes. One of the core objectives of the ministry is prevention and control of pollution (70). ***Roles and responsibilities in electric mobility*** • Notified E-Waste (Management) Rules 2022, Battery Waste Management Rules 2022 (71) and Hazardous Waste Management Rules 2016.

The following tables assess the institutional landscape of electric mobility for the states of Tamil Nadu (Table 11, Table 12) and Delhi (Table 13, Table 14). The key authorities at the state levels are state transport authorities or departments, state nodal agencies for implementation of EV policies and electricity generation and distribution companies.

Table 11: State-level institutions in Tamil Nadu and their roles

State Level – Tamil Nadu					
Institutions	**Design of EVs**	**Charging infrastructure**	**Financing for electric mobility**	**Licensing process & procedures[26]**	**Other**
Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO)					
Tamil Nadu Electricity Regulatory Commission (TNERC)					
Transport Department					
Department of Industries, Investment Promotion & Commerce					
Guidance Tamil Nadu[27]					
EV Steering Committee					
Tamil Nadu Skill Development Corporation (TNSDC)					
City level departments in Chennai and other public entities					
Greater Chennai Corporation (GCC), Chennai Smart City Limited (CSCL), Chennai Metro-rail Limited					

Source: (72) *and the website of respective departments.*

[26] Driving training and licensing processes are not restricted to electric vehicles.

[27] Includes the EV Taks Force.

Table 12: Roles and responsibilities of state-level institutions of Tamil Nadu in electric mobility

State Level Departments – Tamil Nadu	
Department or Agency	**Roles and responsibilities in electric mobility**
TANGEDCO	TANGEDCO is responsible for electricity generation, transmission and distribution in Tamil Nadu. ***Roles and responsibilities in electric mobility*** • TANGEDCO serves as the State Nodal Agency (SNA) for facilitating the development of charging infrastructure (73) and e-vehicles awareness (74); • It is responsible for the integration of EV charging infrastructure with the power grid and the promotion of renewable energy sources for charging EVs.
TNERC	TNERC is an independent statutory body responsible for regulating the electricity sector in the Indian state of Tamil Nadu. ***Roles and responsibilities in electric mobility*** ● The commission is responsible for determining the tariff for electricity and fixes the tariff for EV charging stations in the state (73).
Transport Department	The Transport Department is responsible for the regulation and management of transportation in Tamil Nadu ***Roles and responsibilities in electric mobility*** ● Facilitating the registration and incentive schemes for electric vehicles and licensing processes; ● nodal department for issuance of guidelines to achieve electrification of public transport & exemptions for EVs (72)
Department of Industries, Investment Promotion & Commerce	It is the nodal department for the implementation of manufacturing related incentives for large industries and special demand side incentives. ***Roles and responsibilities in electric mobility*** ● The Tamil Nadu Electric Vehicles Policy 2023 was prepared by the Department of Industries, Investment Promotion & Commerce; ● The department also facilitates the manufacturing related investment of EV OEMs in the state (73)
Guidance Tamil Nadu	Guidance is the Government of Tamil Nadu's nodal agency for investment promotion and single window facilitation. Nodal agency under Industries, Investment promotion & Commerce Department for investment promotion. ***Roles and responsibilities in electric mobility*** ● All investment proposals in the electric mobility sector will be facilitated with handholding services by Guidance or FAME TN (organisation to promote trade, investments and exports in the MSME) (73)
EV Steering Committee	A steering committee was constituted in Tamil Nadu in 2019 under the 2019 EV policy (75). It is headed by the Chief Secretary, Government of Tamil Nadu as the Chairman and includes the secretaries of the Industries, Investment Promotion and Commerce Department, Finance Department, Home Department, Housing and Urban Development Department, Municipal Administration and Water Supply Department, Transport Department, Micro, Small and Medium Enterprises Department, the Chairman and Managing Director of TANGEDCO and the MD and CEO of Guidance. ***Roles and responsibilities in electric mobility*** ● The EV steering committee shall be responsible for monitoring the implementation of the policy.

State Level Departments – Tamil Nadu	
Department or Agency	**Roles and responsibilities in electric mobility**
Tamil Nadu EV Taskforce	Under the EV Policy 2023, an EV task force was established under the Guidance in April 2024 (76). ***Roles and responsibilities in electric mobility*** ● Facilitate investment in EV manufacturing units; ● Develop and maintain a dedicated EV portal with information on policies, guidelines and charging station locations; ● Coordinate and support in identification of sites for public charging stations in government offices and other public places; Organise EV conclaves comprising different EV stakeholders – government agencies, industry associations, manufacturers, research associations and think tanks (73).
Tamil Nadu Skill Development Corporation (TNSDC)	TNSDC is a not-for-profit company that was established in 2013 to provide skill training to required industries. **Roles and responsibilities in electric mobility** ● This initiative aims to offer short-term training on electric vehicles (EVs) to personnel based on the skill qualifications approved by the National Skill Development Corporation (NSDC). These qualifications include roles such as mechatronics technician, battery technician and EV technician (73).
City level departments – Chennai	
Greater Chennai Corporation (GCC) and Chennai Smart City Limited (CSCL)	GCC is the urban local body for the city of Chennai. CSCL is a special purpose vehicle established to implement the Smart City Mission in Chennai. **Roles and responsibilities in electric mobility** • The Tamil Nadu EV policy designates Chennai as one of six EV cities in Tamil Nadu, with the Smart City Commissioner appointed as nodal officer; • The Smart City Commissioner will be the nodal officer to coordinate and drive EV adoption; • The Smart City Mission will design a smart mobility program to prepare a roadmap for EVs, including electrification of auto rickshaws and buses within 10 years in a phased manner (73);

Table 13: State-level institutions in Delhi and their roles

State Level – Delhi					
Institutions	**Design of electric vehicles**	**Charging infrastructure**	**Financing schemes for electric mobility**	**Licensing process & procedures**	**Other**
Transport Department, Government of NCT of Delhi					
Power Department and DISCOMs					
Delhi Transco Limited					
Delhi Electrical Regulatory Commission					
Working Group on Accelerated Rollout of Charging Infrastructure in Delhi					
Directorate of Training and Technical Education					
City level agencies and other public entities					
Municipal Corporation of Delhi, Delhi Metro Rail Corporation					

Source: (77) *and the website of respective departments*

Table 14: Roles and responsibilities of state-level institutions of Tamil Nadu in electric mobility

State Level Departments – Delhi	
Institutions	**Roles and responsibilities in electric mobility**
Transport Department, Government of NCT of Delhi	The Transport Department is responsible for the regulation and management of transportation in Delhi. ***Roles and responsibilities in electric mobility:*** ● Formulating policies and regulations to promote the adoption of electric vehicles; ● The Transport Department is the nodal agency for the implementation of the Delhi EV Policy (77); ● Facilitating the registration and incentive schemes for electric vehicles and licensing processes (78); ● Overseeing the implementation of electric vehicle policies and initiatives.
EV Cell	An EV cell was established in March 2022 by the Delhi Transport Infrastructure Development Corporation (79). The EV Cell is responsible for the implementation of Delhi EV policy under the Transport Department.
Power Department and DISCOMs	The Power Department and DISCOMs are responsible for electricity distribution in Delhi. Delhi has the following distribution companies: Tata Power Delhi Distribution Limited, BSES Rajdhani Power Limited, BSES Yamuna Power Limited, New Delhi Municipal Corporation and Military Engineering Services. ***Roles and responsibilities in electric mobility:*** ● Supporting the integration of EV charging infrastructure with the power grid (77); ● Providing reliable electricity supply for EV charging stations.
Delhi Transco Limited (DTL)	DTL is the state transmission utility for the NCT of Delhi. The distribution of electricity is with private companies while the generation and transmission are under DTL. ***Roles and responsibilities in electric mobility:*** ● DTL has been assigned as the State Nodal Agency for charging infrastructure in Delhi.
Delhi Electrical Regulatory Commission (DERC)	DERC is responsible for regulating the electricity sector for the NCT of Delhi. ***Roles and responsibilities in electric mobility:*** ● DERC is responsible for setting the EV tariff and other regulations concerning electricity supply for EV charging (77).
Working Group on Accelerated Rollout of Charging Infrastructure in Delhi	● The Delhi Government constituted the Working Group in 2020 to develop a strategy to create a network of charging stations (80). It includes representatives from the Power Department, Transport Department, Municipal Corporation of Delhi, New Delhi Municipal Council, Delhi Transco Limited, all DISCOMs and Energy Efficiency Services Limited (EESL). As of July 2022, five meetings had been conducted.
Directorate of Training and Technical Education (DTTE)	The DTTE is an agency under the Government of Delhi with a mandate to regulate, monitor and provide technical and vocational education (81). ***Roles and responsibilities in electric mobility:*** ● As per the Delhi EV policy, training related to new jobs in the electric mobility ecosystem will be prioritised; ● EV policy also recommends that vocational courses shall be designed to train EV drivers, mechanics and charging station staff through the World Class Skill Centres (WCSCs) set up by the GNCTD.

3.2 Gendered analysis of electric vehicle policies

In addition to national-level schemes and policies, the state governments have implemented EV policies designed to increase EV adoption and stimulate the manufacturing of EVs and their components. These policies are instrumental in establishing the electric vehicle ecosystem within the states. As of July 2024, 28 Indian states and territories, including Delhi and Tamil Nadu, have notified EV policies (82).

Tamil Nadu introduced its EV policy in 2019 and revised it in 2023, whereas Delhi's EV policy was introduced in 2020[28] for a period of three years and was later extended. The nodal department for the implementation of EV policy in Delhi is Transport Department of the Government of National Capital Territory of Delhi, whereas in Chennai, it is Guidance, set up under Industries, Investment Promotion & Commerce Department, Government of Tamil Nadu. Table 15 shows a comparison of the key aspects of the EV policies of Delhi and Tamil Nadu.

Table 15: Comparison of state level EV Policies of Delhi and Tamil Nadu

Features	Delhi EV Policy 2020	Tamil Nadu EV Policy 2023
Timeline	Three years (2020 -2023) extended till March 2025	10 years (2019-2030)
Purchase subsidy	Rs.5,000/kWh, up to Rs. 30,000	Rs.10,000/kWh, up to Rs. 30,000
Other consumer demand incentives	Scrapping incentive of up to Rs. 5,000 per vehicle is provided for ICE 2Ws	Retrofitting incentives of Rs.10,000/kWh, subject to maximum of Rs. 30,000
Tax incentives	100% road tax exemption for electric vehicles[29]	100% road tax exemption will be provided till 31st December 2025
Charging infrastructure	• Target of installation of 18,000 public and semi-public EV charging points and battery swapping stations. • Target of one charging point for every 15 EVs sold.	• Target of charging stations on national and state highways at 25 km intervals on both sides. • Slow and fast charging stations to be provided in government offices and public places.
Skilling incentives	• Vocational courses to train EV drivers, mechanics and charging station staff in partnership with automobile OEMs and energy operators to make workers industry-ready. • Set up centres of excellence focused on electric mobility.	• Provide a stipend or reskilling allowance for the training of employees by companies. • Set up centres of excellence focused on electric mobility.

Source: (73)*;* (77)

State EV policies offer a range of industry incentives, including fiscal and legal support, capital and infrastructure subsidies, skill development, employment generation, research and development by, providing holistic support to the ecosystem. However, most state policies lack explicit pro-gender references, with only five state EV policies introducing provisions for women so far (83).

To assess how effectively the State EV policies- Delhi and Tamil Nadu- consider gender disparities within the EV sector, a gendered framework (Table 3) has been developed to assess electric vehicle policies and programs. This framework evaluates gender inclusion across multiple dimensions, including vision and goals, EV financing, charging infrastructure, employment and skill development, entrepreneurship, governance and institutional support. The gendered analysis of EV policies (Table 16) revealed that they are largely gender-blind treating everyone same and ignoring the different practical and strategic needs of women, men, boys, girls and gender minorities.

[28] The Delhi EV Policy, initially introduced in August 2020 and was extended and remained in effect until June 2024 (150). The policy was not operational from July to October 2024. However, the Delhi EV Policy 2020 was subsequently extended in November 2024 until March 2025, reinstating subsidies and road tax exemptions for EVs purchased on or after January 1, 2024 (122).

[29] Ibid.

Table 16: Gendered analysis of State EV policies

	Tamil Nadu Electric Vehicles Policy, 2023	Delhi Electric Vehicles Policy, 2020
Background	Tamil Nadu's updated EV policy was launched in 2023 after the 2019 version. It aims to increase the state's EV adoption rate, which reached 3.9% in 2022 after three years of implementation. A gap assessment highlighted the absence of upfront capital subsidies as a primary factor behind the low adoption rate (84). However, no gender-specific analysis was conducted to understand challenges women face in adopting EVs or to establish a baseline to understand whether there is need of different subsidies for women. This data is also not reported at the national-level Vahan dashboard.	Delhi's EV policy was initiated in 2020. It acknowledges the prominence of two-wheelers, comprising two-thirds of new vehicle registrations. However, the policy does not utilise gender-based data. It incentivises 2W owners to facilitate the adoption of E2Ws, especially among delivery providers, aiming for a 50% transition by 2023 and full adoption by 2025. However, the policy lacks data such as the number of women in delivery services and the rationale for these targets. It overlooks gendered issues women might face such as access to finance in its implementation strategy.
Vision	The vision of the policy is to attract investments in EV manufacturing and creation of 150,000 jobs during the policy period. As per the Annual Industries Survey 2018-2019, a 40% of total workers directly employed in manufacturing are women (85). But the policy's vision does not have a gender-disaggregated target for the employment of women.	The policy aims to increase the adoption rate of EVs in the state, targeting 25% of all new vehicle registrations to be electric vehicles by 2025. However, there is no baseline data or target based on gender. Information on the sex of the individual is not collected at the time of vehicle registration. It is implied[30] and not disaggregated at the national (or state level), through the Vahan portal which provides vehicle registration details. The policy also aims to create more jobs in the EV ecosystem, particularly in driving, sales, financing, servicing, and charging. However, there are no baseline or targets have been established for these objectives.
Goal/Objectives	The objectives of the policy are to develop infrastructure to attract manufacturing units in the state, increase adoption of EVs through demand incentives and charging infrastructure, develop industry-academia linkage and promote electrification of commercial and public transport fleets. There are no targets (gender-disaggregated) or baseline on the adoption rate of EVs, availability and quality (safe and accessible) of charging infrastructure and the employment of women in EV and EVSE value chain. Also, there is no attempt to ensure that the transition of commercial and public transport to electric is just.	The policy does not set specific targets in its objectives and instead focuses on EV adoption through financial incentives, development of charging infrastructure, and job creation in the ecosystem by promoting skills. Although the policy aims to transition 50% of the fleet of delivery service providers to EVs by 2025, it does not consider the impact on buyers since the vehicle is owned or leased by the delivery personnel, particularly women with limited knowledge and access to credit.
Financing for EV adoption	The policy provides purchase incentives only for commercial vehicles, including commercial two-wheelers[31], without any gender-based incentives. It fails to consider gender-based differences in working hours and travel distances, which impact women's earnings and the total cost of ownership of an electric vehicle. According to	The policy aims to increase EV adoption through purchase incentives, interest subventions, and waivers of road tax and registration fees. However, it considers all EV users as a single group, disregarding gender-specific issues faced by women. For example, the total cost of ownership of an E2W for women in delivery services in Delhi is

30 Through details such as *son of, daughter of or wife of* in the form.

31 On-ground verification revealed that incentives under the EV policy are currently not being disbursed, as two-wheelers are not registered under the commercial vehicle category.

	the 2024 survey by The Urban Catalysts, the total cost of ownership for women using E2Ws in Chennai is 1.25 to 1.67 times higher than for men. This disparity is due to women working fewer hours (7 hours) compared to men (9.8 hours), possibly due to household and caregiving responsibilities. Women also face challenges in securing financing, primarily due to a lack of financial literacy, limited experience sharing by other users, and low or non-existent CIBIL scores. Only 33% of women using E2Ws have taken loans in their own names, compared to 91% of men in Chennai (**Error! Reference source not found.**). The loan-to-value ratio, indicated by the percentage share of the down payment, is higher for women (33%) than for men (26%). Additionally, women face higher average interest rates compared to men and ICE vehicle loans. The policy does not address these issues, despite its goal to increase the adoption of EVs.	found to be 1.2-1.4 times higher than for men. Women also face difficulties in obtaining driving licences due to limited access to information and procedural challenges, often relying on agents, which increases the cost of a 2W driving licence to 2.7 times the government-prescribed rate in Delhi. Additionally, women face issues such as low CIBIL scores and lack of financial literacy, hindering their access to finance for EV ownership.
Charging Infrastructure	The policy primarily focuses on developing charging infrastructure but lacks detailed considerations such as the location of charging points, the availability of fast chargers, and real-time operational information on charging points. Audits carried out as part of this project found that only 43% of the total audited charging stations in Chennai were operational. The locations of charging stations in Chennai are poorly planned, as they are often located on deserted or narrow roads, obstructed by parked vehicles, situated at lower heights (below four feet) than recommended by national guidelines, or located in poorly maintained areas, which not only create issues in locating the infrastructure, but also safety concerns for women. During FGDs, the availability of information on locations of charging stations was raised as a significant issue by both male and female EV users. Additionally, mandates for EV parking and charging at office buildings do not incorporate guidelines for the location and design of charging infrastructure, signage, and information requirements, potentially creating safety issues for women. The policy also does not consider the provision of basic amenities such as shaded waiting areas, seating space and personal safety measures near the charging infrastructure.	The policy promotes home and workplace charging for private EV owners and advocates for changes in building bye-laws to ensure charging infrastructure availability. However, it lacks locational guidelines, leading to charging stations being placed in isolated and deserted basement corners, raising safety concerns for women. The policy aims for comprehensive coverage of charging infrastructure, with a goal of having a charging point within 3 km of any location in Delhi. While this ensures spatial availability, only about 64% of the audited charging stations were found to be operational during audits carried out as part of this project. Charging audits have highlighted issues with the placement of public charging stations. The policy requires a public database managed by the Transport Department for charging locations and real-time information. Though the One Delhi application[32] provides information on charging infrastructure, it does not include the location of all charging stations, locations are not consistently updated, and real-time information is not available. Multiple charging point operators provide charging infrastructure, each with their own platforms for information. Women reported avoiding public charging infrastructure due to longer charging periods and a lack of shaded waiting areas and seating. Due to the lack of information and concerns about charging infrastructure, women tend to adjust their travel distances based on their vehicle's charge. Men using their two-wheelers for commercial work (delivery or home services)

[32] The Delhi Transport Department launched the One Delhi mobile application in 2019 and revamped it in 2022. The updated application allows users to purchase bus tickets online, access real-time information, provide feedback, and locate electric vehicle charging points and battery swapping stations.

		reported earning 10% more than of women workers.
Employment and skilling	The primary goal of the policy is to create 150,000 jobs in manufacturing with no gender-based targets, despite Tamil Nadu already having 40% of women directly employed in the manufacturing sector (85). Subsidies, such as the investment promotion subsidy based on turnover and employment incentives for Employment Provident Fund contributions, are provided for new job creation, but there are no specific considerations to attract more women. However, the policy provides for transition support for ICE manufacturing companies that wish to transition to EV manufacturing. For this, the policy provides a training subsidy for up-skilling of existing workers. An additional INR 2,000[33] per worker per month (in addition to INR 4,000 per worker) is provided for 6 months to automotive industries for women and transgender employees. The policy does not ensure women's participation in managerial or senior-level positions. Tamil Nadu has established WorkLabs, a cell to facilitate partnerships between industries and academic institutions - under the EV policy which will aim to equip graduates with EV sector skills. While there are efforts to improve students' knowledge and experience in the EV sector through internships, curriculum reforms, and memorandum of understanding with international organisations for more work and education opportunities, the policy does not specifically focus on these initiatives for women. Apprenticeship programs targeting women are necessary as data from 2021-22 indicates that women accounted for 42.5% of STEM enrolments in India (86). However, this participation has not translated into equitable representation in STEM employment.	The policy aims to create new jobs in the EV sector, including roles as drivers, charging station operators, EV mechanics, and positions with OEMs and energy operators, by developing more vocational training programs. In 2022, the Delhi government signed an MoU with EV manufacturers and think tanks to introduce an EV mechanics program as part of the automobile engineering diploma at Delhi Skill and Entrepreneurship University (87). However, there is no attempt to raise awareness of these programs or to ensure inclusion of women in these courses. Dedicated efforts are required to attract women to these job roles as enrolment in STEM courses in India is not translating to paid work roles among women. In 2023, the Delhi government reserved 33% (1,406) of e-auto permits for women (88).
Entrepreneurship	The policy offers an additional capital subsidy of 3-6% to MSMEs engaged in EV or EVSE manufacturing. However, it does not extend any additional subsidies or set targets to support women-owned Micro, Small and Medium Enterprises (MSMEs). 23% of MSMEs registered in 2020-22 in Tamil Nadu were owned by women (89). The lower CIBIL scores and financial awareness of women may impact their access to finance for establishing an MSME in the EV ecosystem. The policy does not address these issues by providing additional support through enhanced capital subsidies or interest subvention to women.	There are no specific provisions or incentives targeting women entrepreneurs in the context of higher capital incentives or gender-based targets for MSME enterprises in the EV sector.

[33] This amounts to a total of INR 36,000 per female worker distributed over a period of 6 months.

Governance and Institutional Support	Tamil Nadu's EV policy mandates the creation of a steering committee for monitoring the implementation of the EV policy and an EV Cell, to be set up at Guidance, a nodal agency under the Department of Industries and Commerce of Tamil Nadu for investment promotion and single window facilitation. There is no gender expert mandated to be a part of the EV cell. EV Taskforce is established in Tamil Nadu in April 2024 (76). However, there is no information available on the members of the task force. The policy identifies the different departments that would be part of the EV steering committee. Further, the Social Welfare and Women Empowerment Department is not represented. Surveys from this project revealed that 28% of women with ICE vehicles are unaware of any benefits associated with owning an electric vehicle. This highlights the need for a targeted awareness campaign to enhance knowledge and awareness of electric vehicles among women. However, the current policy does not acknowledge this need.	The policy mandates the establishment of an EV cell for its implementation, but it does not designate a nodal person, a department or experts to ensure gender considerations are integrated into the policy's document and implementation. An EV cell was established in March 2022 by the Delhi Transport Infrastructure Development Corporation Limited. The Women and Child Development department is not part of this EV cell. The policy includes plans for public outreach and communication campaigns to spread awareness about the benefits of adopting EVs. However, surveys showed that around 15% of women in Delhi are unaware of any financial benefits associated with the ownership of an EV. Therefore, a targeted approach is necessary to disseminate information among women, which the policy does not address. Additionally, there is no effort to involve civil society organisations or non-governmental organizations (NGOs) working with women in the EV ecosystem to ensure gender aspects are considered.

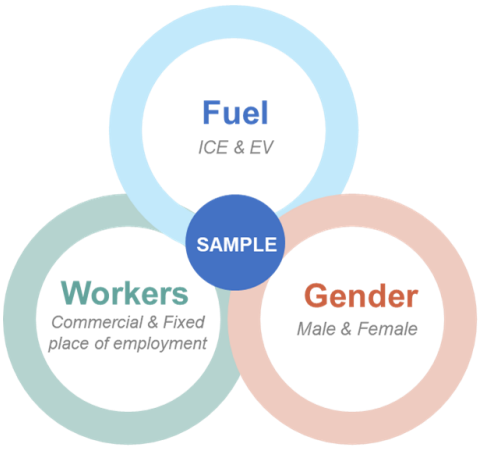
3.3 Primary Data Analysis

This section outlines the analysis of primary survey conducted with both men and women who use ICE/EV two-wheelers for either their personal use of for commercial purposes. It also includes the findings of FGD, KIIs and charging infrastructural audits. The first part of this section covers the demographics and travel behaviors of the survey respondents, followed by an analysis distributed across each entry point.

3.3.1 Type of users and sample size

The study sample from the two cities were selected based on the following three criteria: fuel type, nature of use and gender. The vehicles included in the study are both electric two-wheelers and ICE two-wheelers. Based on the nature of their use, the users were categorised as commercial users and personal users. Commercial users included individuals who used their two-wheelers for commercial activities such as delivery and home services which require travel to multiple locations during work hours. Personal users are those with one fixed place of employment. Based on these parameters, the sample was further divided into eight categories, as illustrated in Figure 5. A total of 496 surveys were conducted in both cities with at least 30 samples for each category in both cities.

Figure 5: Categorisation of respondents and the sample size



			Chennai + Delhi
EV	Commercial Workers	Men	62
		Women	62
	Fixed Place of Employment	Men	61
		Women	63
ICE	Commercial Workers	Men	62
		Women	62
	Fixed Place of Employment	Men	62
		Women	62
			496

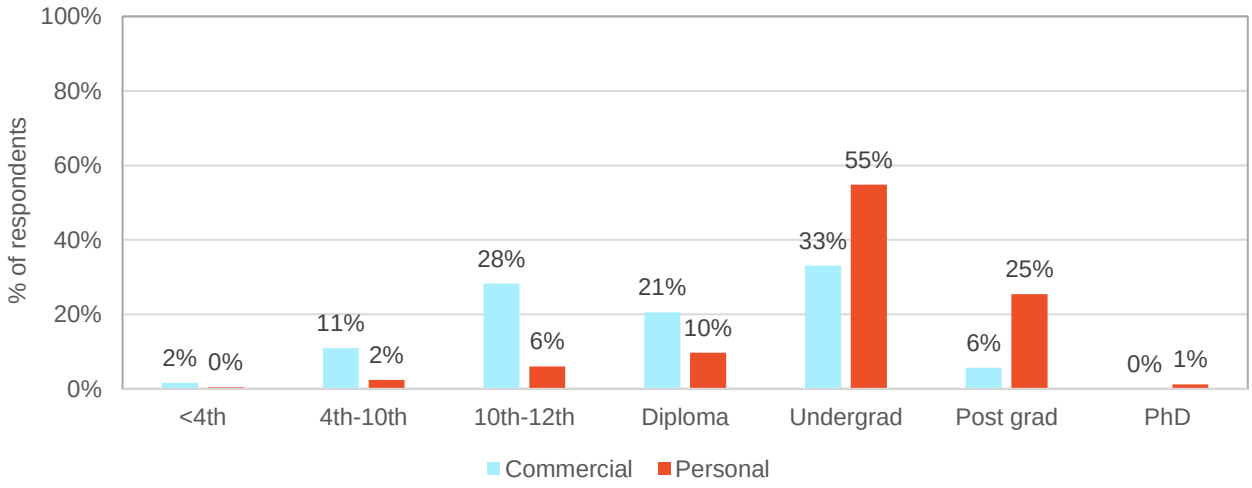
3.3.2 Age, marital status, and education

The average age of the sample is 29 years in Delhi and 34 years in Chennai. Among commercial workers, the average age is 28 years in Delhi and 33 years in Chennai. This suggests that the commercial worker population is predominantly urban youth (18-29) in Delhi, whereas in Chennai, it skews towards an older demographic.

The education level of commercial users is lower than that of personal users (fixed place of employment). 82% of personal users hold at least a bachelor's degree as compared to only 39% of commercial users (Figure 6).

Also, all surveyed respondents, both men and women have access to smartphone and a bank account.

Figure 6: Education level of personal and commercial workers



N: C- 249, P- 247

3.3.3 Analysis of type of work

This study categorizes workers using E2Ws for employment purposes into two groups: personal and commercial users. Personal users are those with a fixed place of employment who typically make two home-office trips. In contrast, commercial users do not have a fixed employment location and make multiple trips throughout the day. This group includes users engaged with online platforms such as Zomato, Swiggy, and Urban Company, as well as non-platform users who deliver products like medicines and cosmetics. Platform workers in the transportation industry, such as bike taxi providers, are not included in this study.

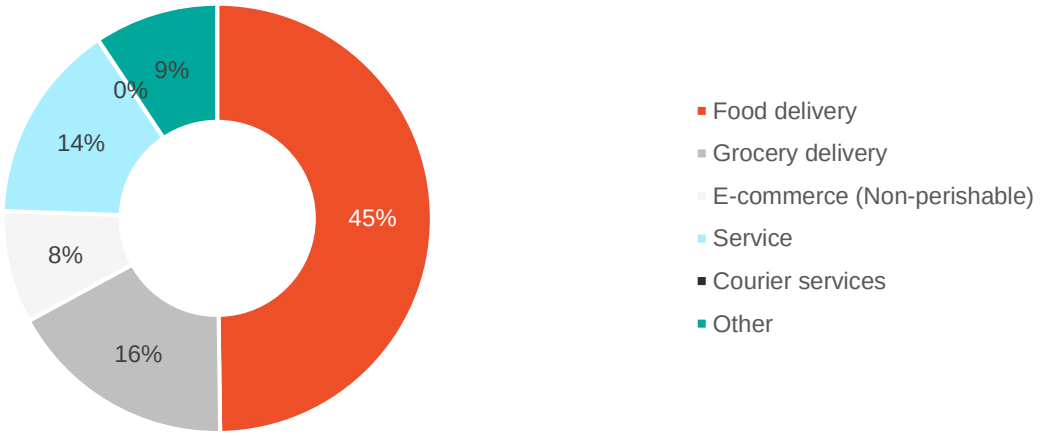
Type of work

Commercial users

Commercial users are primarily engaged in food delivery (45%), grocery delivery (16%) and home services (14%) (Figure 7).

The top five companies with which these users work are: Swiggy (food and grocery delivery), Zomato (food delivery), Urban Company (home services), Yakult and Blinkit (grocery delivery).

Figure 7: Type of work of commercial users



N: 496

Women are distributed across food delivery, home services and delivery of other products such as cosmetics and medicines

Furthermore, the gender analysis (Figure 8 and Figure 9Figure 60) indicates that men are engaged in food (51%) and grocery delivery (20%), whereas women are involved in food delivery (39%), and home services (21%). Women also participate in the delivery of cosmetic products, medicines and specific items such as Yakult (17%). The chi-squared test indicates that the gender difference observed in the type of work is statistically significant (χ^2 (6) = 46.029, p < .001).

Figure 8: Commercial workers: Women

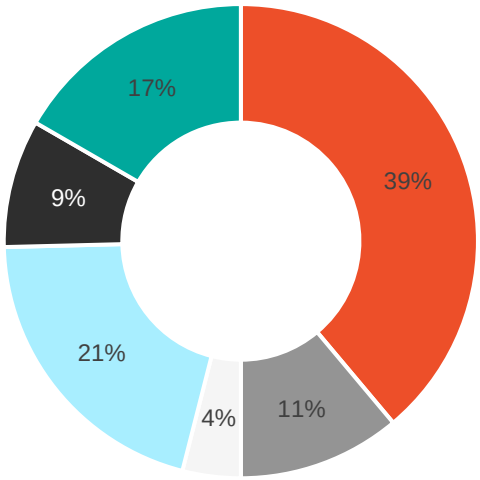
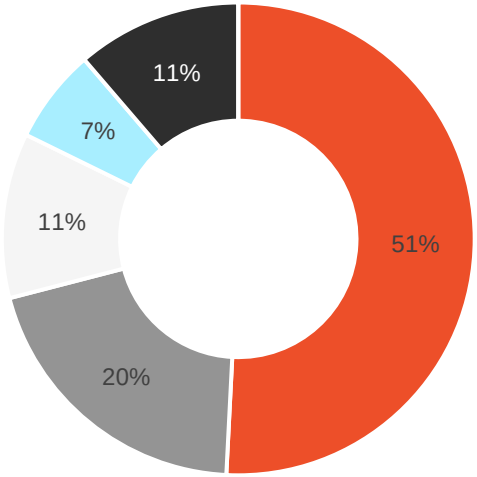


Figure 9: Commercial workers: Men



F-125; M-123

Personal users

92% of personal users are engaged in the service sector.
The data shows us that 92% of workers with fixed places of employment are in the service sector. There is not much variation seen across gender.

Working times

Commercial users

It is observed that men typically begin their work earlier than women and work till later hours into the evening. On an average, men start their work day 8:45 am and continue until 7:45 pm. On the other hand, it was observed that women start their work day at or after 10:00 am and finish by 6:45 pm/07:00 pm (Table 17). These differences are likely seen due to women being responsible for care work and household responsibilities along with gendered safety concerns.

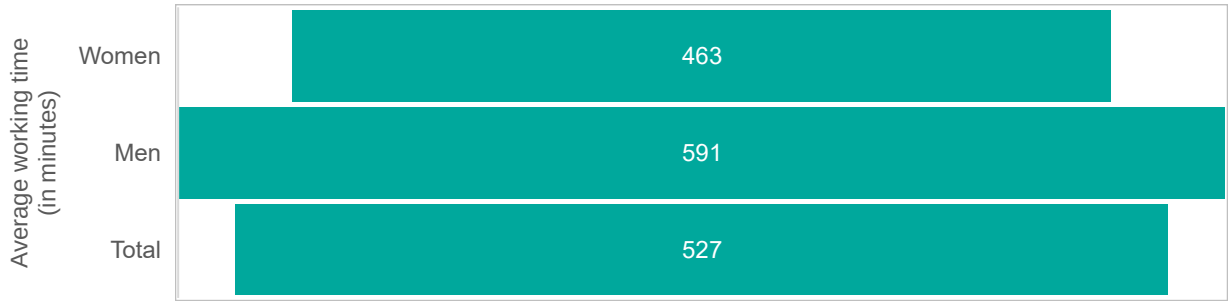
Table 17: Work start and end time for commercial workers

	Women	Men
Average Start Time	10:00 am	08.46 am
Average End time	06:43 pm	07:43 pm

Female commercial workers work for approximately 95 to 167 minutes less than their male counterparts, which could be attributed to care work.
On an average, commercial workers work approximately 527 minutes per day. Men work longer hours than women with the gender difference in working hours being 128 minutes (Figure 10). These differences are

statistically significant at a significance level of <0.05 based on independent t-test. The results correspond with the 2019 Time Use Survey, which reported a gender difference of 139 minutes in time spent on employment-related activities in urban areas in India (90).

Figure 10: Average working time of commercial users by gender



N: F-125; M-123; Total- 248

3.3.4 Analysis of travel behaviour

Travel distances

Commercial users

Male commercial users travel around 1.7 times more than female commercial users.
On average, commercial users travel around 63 km a day with gender difference of 33 km (M:79 km; F: 46km) (Figure 11Figure 62). The observed gender difference in travel distances is statistically significant at $p < 0.05$.

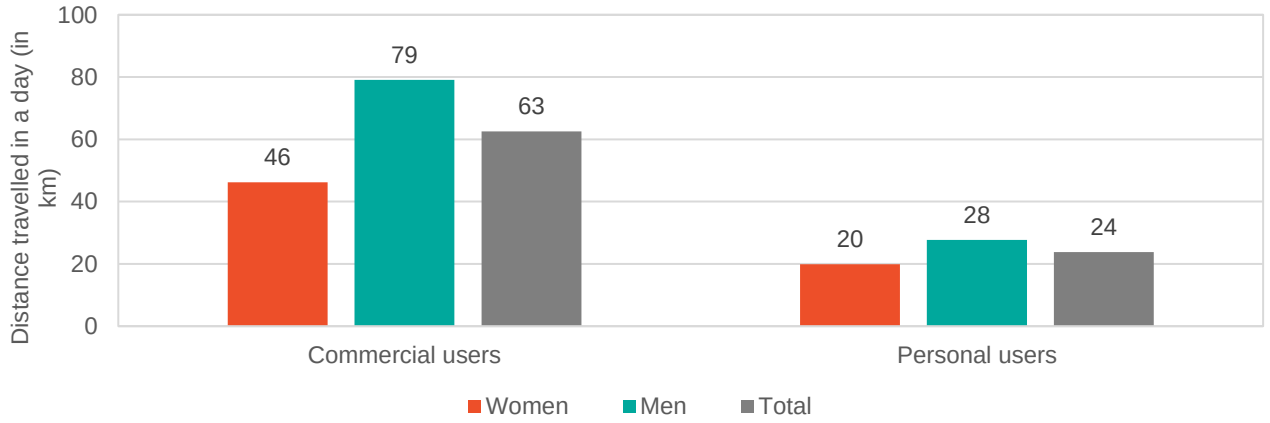
The differences in travel distances between ICE and EV commercial users are not statistically significant (**Error! Reference source not found.**).
A comparative analysis of travel distances by fuel type reveals no major difference overall. EV commercial users travel on an average of 3 km more than ICE users in both cities. However, this difference in travel distance between ICE and EV users is not statistically significant using a two-tailed t-test

Personal users

Male users with a fixed place of employment travel longer distances than female workers for work purposes.
On average, personal users travel approximately 24 km per day, with gender difference of around 8 km (M: 28km; F: 20km) (Figure 11Figure 62). The observed gender difference in travel distances is statistically significant at $p < 0.05$.

The gender-based analysis indicates that men travel 1.6 times farther away than women in Chennai and 1.3 times in Delhi. These observed gender differences in both Chennai ($t(121) = -3.532$, $p=<0.001$) and Delhi ($t(127)= -2.218$, $p=0.028$) are statistically significant as determined by a two-tailed t-test.

Figure 11: Travel distance, by gender and user type



N: Commercial: W-125; M-123; Personal: Total: 248; M: 125; F: 123

The differences in travel distances between ICE and EV personal users are not statistically significant

There is no substantial difference observed in the distances travelled by ICE users and EV users. In Chennai, EV users travel an average of 3.3 km more than ICE users, whereas in Delhi, EV users travel 1.2 km less than ICE users. However, these differences in travel distances are not statistically significant. The gender-based difference observed is not substantial and is not statistically significant.

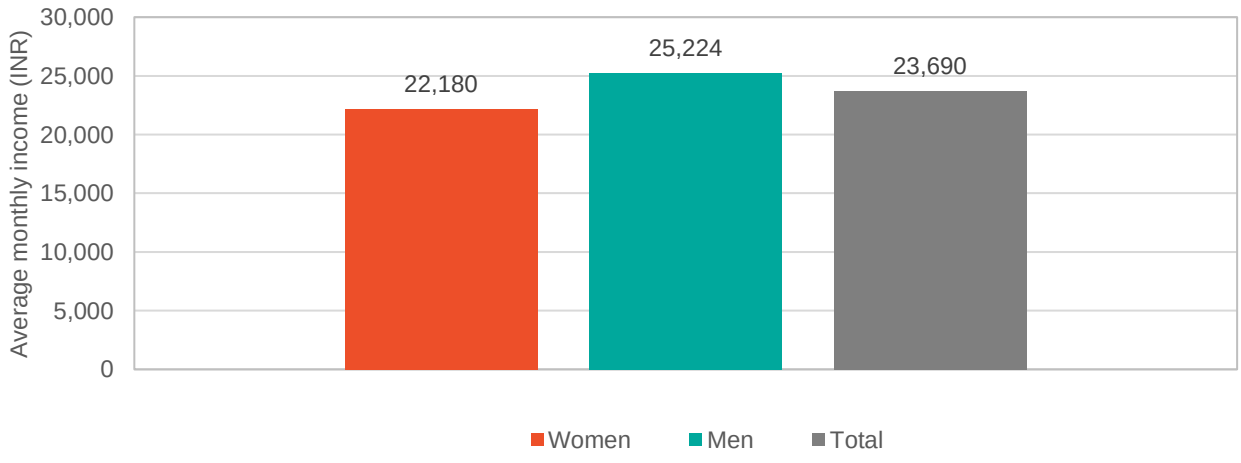
Analysis of reported incomes

Commercial users

Male commercial workers earn 1.1 times more than female commercial workers, primarily because they work longer hours.

The average income of commercial users is higher in around INR 23,690. The gender-based analysis indicate that men earn around INR 3,044. The observed gender difference in income is statistically significant on the two-tailed t-test. However, it is observed that women earn a higher hourly income (INR 115) compared to men (INR 104). This is because women typically take shorter-distance orders[34], allowing them to complete more deliveries within a shorter working period.

Figure 12: Average Individual monthly income of commercial workers



N: Chennai: W- 60, M- 61; Delhi: W- 65, M- 62; Total: W-125; M-123

[34] On average, women travel 3.9 km per order, compared to 5.8 km per order for men.

3.3.5 Total cost of ownership (TCO)

The total cost of ownership of a vehicle refers to the complete cost incurred over the entire period of ownership, including purchase price, maintenance, fuel or energy costs, insurance, taxes and any other relevant expenses. For electric two-wheelers, TCO also includes costs related to charging infrastructure and battery maintenance.

The TCO varies based on the distances travelled. As seen in the travel behaviour analysis, the distance travelled varies by gender, city and nature of use. Thus, the TCO for electric and ICE two-wheelers by gender (male and female) and usage types (personal and commercial) in Delhi and Chennai is evaluated.

For the TCO analysis, the top three most commonly used models in Chennai and Delhi were selected based on the survey data. For electric two-wheelers, Ola S1 Pro and Ather 450X were considered. For ICE two-wheeler, Honda Activa 6G model was considered. The average distance travelled by nature of use, gender and city is obtained from the travel behaviour analysis and is used here for the TCO calculations. As the difference in average travel distance between ICE and electric two-wheelers is not significant, the overall average daily distance travelled is considered.

Table 18:Average distance travelled

Type of user	Distance travelled in a day (in km)			
	Delhi		Chennai	
	Women	Men	Women	Men
Personal user (fixed place of employment)	24.15	30.85	15.5	24.2
Commercial user	61.05	105.1	30.15	52.85

N: Commercial users: Chennai: W- 60, M- 61; Delhi: W- 65, M- 62;
Personal users: Chennai- M:61; W: 60; Delhi- M:64; W:63

The TCO is calculated for an ownership period of 10 years, including battery replacement after 5 years. The other factors considered in the calculation of TCO includes: (i) initial cost; (ii) operational cost; and (iii) depreciation cost.

Initial cost: The purchase price of the vehicle includes ex-showroom price, registration charges and RTO fees. For E2Ws, state incentives for electric vehicles are factored into the purchase cost. To maintain consistency, the BEE portal was kept as the baseline reference for values. The selected vehicle models and their key specifications such as mileage, ex-showroom price etc were obtained from the BEE TCO calculator portal. Taxes and fees considered include the one-time vehicle registration fee and GST applicable on vehicle purchases. The incentives provided by the state EV policies such exemption of road tax, upfront purchase subsidies are considered for EVs. Registration fee is different for ICE 2-wheelers in Chennai and Delhi (91).

Operational Cost: Ongoing expenses during the vehicle's use include fuelling (electricity for EVs and fuel costs for ICE vehicles), insurance and maintenance expenses. Fuelling cost for the ICE two-wheeler is based on current values, which differs in Chennai and Delhi (92). Residential electricity rates are considered for both Chennai and Delhi in determining home-charging costs. In Delhi, it is INR8 per unit, and in Chennai, it is INR 4.5 per unit (93). Different electric two-wheeler models claim various ranges; however, the fuel cost is based on the actual distance travelled per charge by the user as reported in the survey. Vehicle maintenance cost insurance costs are referred from the BEE Portal.

Depreciation Cost: Vehicles are assumed to be amortized over a 5-year ownership period with depreciation calculated based on residual value (94).

The TCO for female EV users in both cities is approximately 1.2 to 1.7 times higher than that of their male counterparts.
Based on the observed costs and distances, the TCO was calculated, as shown in the table below. Findings indicate that the TCO for E2Ws is lower than for ICE vehicles across both cities and for both commercial and personal users. However, a gender disparity was observed, with the TCO for women being 1.2 to 1.7

times higher than that for men in both cities. In Chennai, the TCO for women operating Ather E2Ws exceeds that of ICE two-wheelers and only becomes cost-effective if daily travel exceeds 18 km.

Table 19:TCO analysis

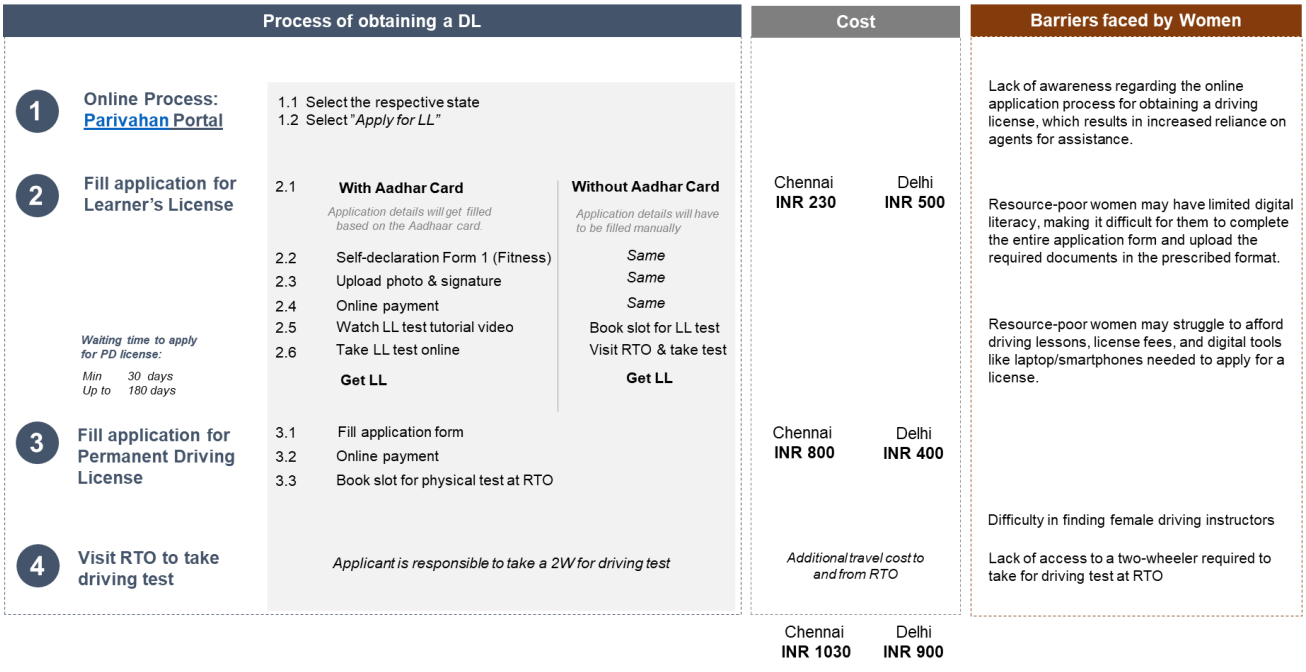
Total cost in INR[35] per km			Personal		Commercial	
			Men	Women	Men	Women
			INR/km	INR/km	INR/km	INR/km
Chennai	EV	Ola S1 Pro	3.42	5.28	1.61	2.76
		Ather 450X	4.07	6.28	1.94	3.29
	ICE	Honda Activa 6G	4.09	5.57	2.66	3.57
Delhi	EV	Ola s1	2.47	3.11	0.84	1.33
		Ather	3.03	3.80	1.06	1.65
	ICE	Honda Activa 6G	6.21	7.12	3.87	4.57

Note: The TCO calculation includes EMPS and state EV policy incentives. In Delhi, a subsidy of ₹5,000/kWh is applied. In Tamil Nadu, a commercial EV subsidy of ₹10,000/kWh (up to ₹30,000 per vehicle) is available but is not currently provided, as E2Ws are not registered as commercial vehicles.

3.3.6 Driving licence process and regulations

The requirement for a driving licence at the local level is administered by RTOs. Applicants can also apply for a driving licence online through the Parivahan Sarathi portal. Although the procedure for obtaining a driving licence is standardised nationwide by the Ministry of Road Transport and Highways, the fees differ across states. The Commissionerate of Transport and Road Safety (95) issues licences in Tamil Nadu, while the Transport Department, Government of NCT (96) of Delhi, handles licensing in Delhi. The process, cost and potential barriers in the licensing process are summarised. The barriers faced by women in the licensing process were identified through the FGDs and during the desk review.

Figure 13: Issues faced by women in obtaining a driving license



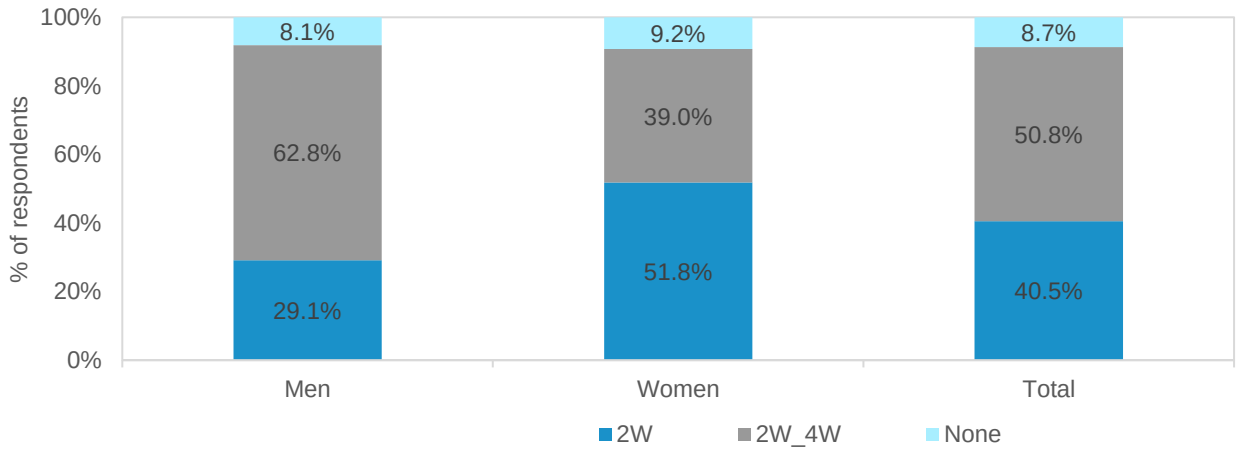
[35] The currency exchange rate at the time of this calculation was 1 GBP = INR 111.86.

Findings from the surveys, focus group discussions and key informant interviews

Female respondents primarily hold driving licenses for only two-wheelers, whereas male respondents have licenses for both two-wheelers and four-wheelers.
According to the survey, 91% of respondents hold a driving licence, with 51% having licences for both two-wheelers and four-wheelers The gender-based analysis indicates that women predominantly hold a two-wheeler driving licence, whereas men generally possess a combined licence for both two- and four-wheelers in both Chennai and Delhi (Figure 14).

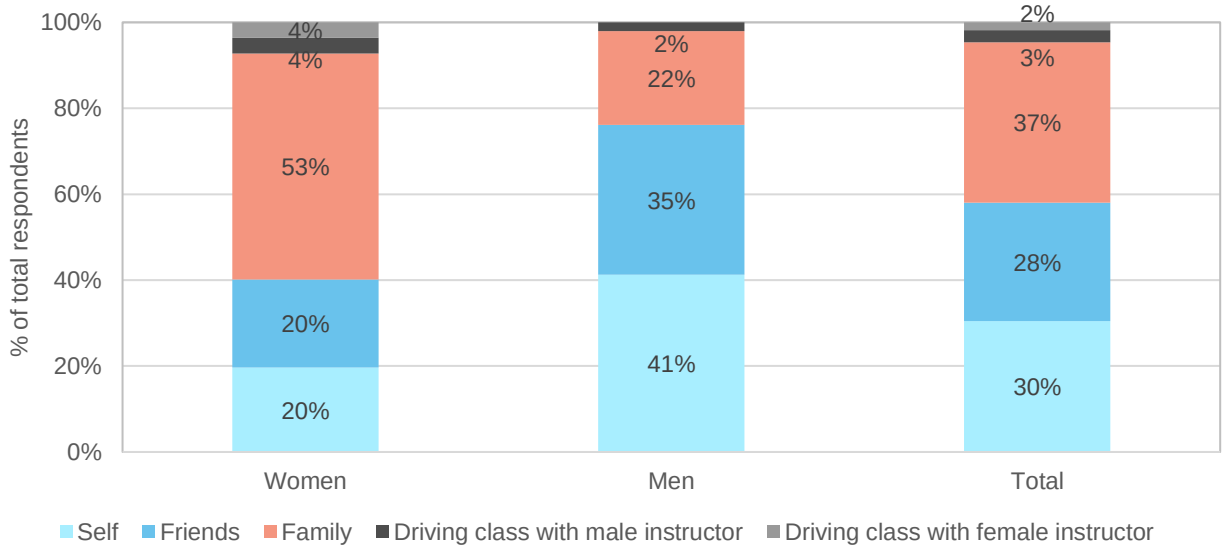
The respondents primarily learned to drive a two-wheeler by informal methods such as from their family members, friends or self-learning. A gendered analysis indicates that more than half of the women in learned from their family members, while men typically learned from their friends, followed by family members. A small minority of respondents learnt to drive a two-wheeler through formal driving classes. This includes 2% of men and 8% of women (Figure 15).

Figure 14: Driving licences by gender



N= M: 247; W: 249, T: 496

Figure 15: Driver training by gender



N= M: 247; W: 249, T: 496

Respondents paid approximately 2.5 to 2.7 times more than the government-prescribed fee to obtain a driving license.

The average cost incurred by individuals in Delhi to obtain a two-wheeler driving licence is INR 2,427, which is 2.7 times the fee as per government regulations. In contrast, the average cost in Chennai is INR 2,567, equivalent to 2.5 times the stipulated fee (Figure 16). This is primarily due to the involvement of agents in the process. The FGD participants mentioned that the entire process of obtaining a driving licence was cumbersome and time-consuming, leading most people to seek assistance from agents who help applicants navigate the driving licence process and charge higher fees.

Figure 16: Cost of obtaining a driving licence

N: Delhi: 254; Chennai: 242

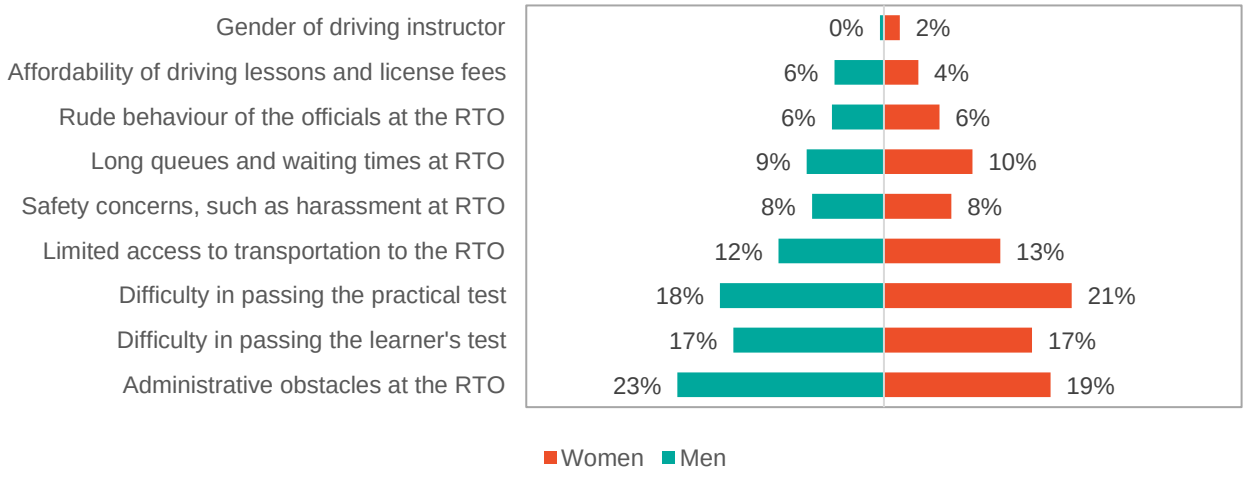
It is noted that the respondents in the primary survey obtained their licenses 6–9 years ago. The application process for driving licenses has transitioned online in all states in India since 2023 (Figure 13) (97), but primary survey indicates a lack of awareness regarding this change amongst the participants, including women.

Some of the issues mentioned by the primary users may no longer be relevant, as the process has transitioned online. These changes will be highlighted in the relevant sections.

Respondents across user groups ranked three major challenges: administrative obstacles at the RTO, difficulty in passing the learner's test and in passing the practical test.

Respondents were asked to select the top three obstacles they faced in learning to drive and obtaining a driving licence (Figure 17). These challenges are based on the experiences of respondents who obtained their licenses before the process transitioned to an online system. At present, applicants are only required to visit the RTO to complete the driving test for obtaining a permanent driving license.

Figure 17: Obstacles faced in obtaining a driving licence



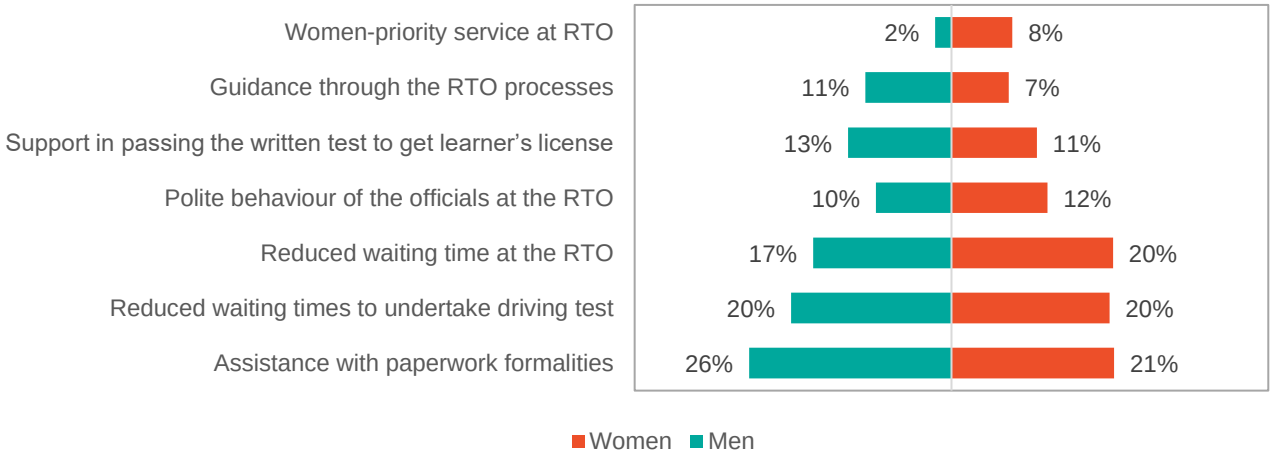
N = 453, M=227, W=226

To improve the licensing process, the respondents ranked the priorities and assistance required as follows: guidance with paperwork formalities, reduced waiting times to undertake the driving test and a reduced waiting time at the RTO. Women prioritised polite behaviour of RTO officials while conversing with them and need for women-priority services at the RTO. (Figure 18).

"In the licensing process, there are different queues for various procedures, such as one queue for paper verification and another for taking pictures. It would be more efficient to have a single queue with different counters for same procedure. Additionally, providing tokens could also streamline the process."

- *A female personal EV user (Chennai)*

Figure 18: Factors prioritised to improve the licence process



N = 453, M=227, W=226

3.3.7 Design of electric two-wheelers

In India, the classification of two-wheelers is defined by the Central Motor Vehicles Act (CMVA) and the Society of Indian Automobile Manufacturers (SIAM). The CMVA categorises two-wheelers into L1 and L2 based on maximum speed and motor power (Table 20). SIAM classification is based on design attributes of the vehicle, including wheel size and the location of the fuel tank. As per Central Motor Vehicle Rules, electric two-wheelers with speed <25 km/h and weight <60kg (excluding battery weight) are considered a non-motorised vehicle (98). These vehicles are exempted from registration at RTOs and users do not require a driving licence.

Table 20: Categories of two-wheelers in India

As per	Criteria	Category	
Central Motor vehicles Act (99)	• Maximum speed (MS); • Motor Power (MP)	L1	MS <45 km/hr; MP <0.5 kW
		L2	MS >45km/hr MP >0.5 kW
Society of Indian Automobile Manufacturers (100).	• Wheel Size (WS) • Engine & fuel tank location (EFL)	Motorcycle	WS >12 inches; EFL: Located in front of the rider and above the engine
		Scooter	WS <12 inches; EFL: Located under the driver's seat and have legroom in the form of a foot-platform between the seat and the handlebar

Preferences amongst electric two-wheeler users

Women demonstrate a higher preference towards e-scooters whereas men ride e-motorcycles and e-scooters. As per the primary survey (section 2.2.2), 72% of the respondents used five E2W models, which are (i) Ola Electric S1 Pro (22% of EV user respondents), (ii) Ather 450 (17%), (iii) Hero Electric Optima (14%), (iv) TVS iQube (12%), and (v) Honda Activa Electric (7%). All these vehicles come under the L2 category with speeds over 45 km/hr and are also gearless scooters. Around two-thirds of the respondents used five models of ICE two-wheelers: (i) Honda Activa (30% of ICE user respondents), (ii) TVS Jupiter (13%), (iii) Hero Honda Splendor (8%), (iv) TVS Scooty Pep Plus (6%) and (v) Honda Dio (4%) and Hero Passion (4%). A significant gender difference is seen in the choice of ICE two-wheeler models. Female users show higher preference towards scooter models while male users use both motorcycles and scooters. Among the top five models, Hero Honda Splendor and Hero Passion are motorcycles and only used by male respondents. There is a greater diversity of electric two-wheeler models among respondents in Delhi (32 unique models) whereas respondents in Chennai reported using 15 different models.

Women exhibit a higher propensity to use familiar and established models

74% of women use the top five ICE models as compared to 48% of men. 78% of female EV users use one of the top five models as compared to 70% of male EV users. Men may exhibit a higher propensity to adopt a wider range of models including motorcycles. There may be a lower risk tolerance among female users, potentially indicating a preference for established and proven models over fewer familiar options.

EV users prioritise vehicle range, battery safety and charging safety. Women users prioritise weight of the vehicle, reverse and hill assist (Figure 19).

The FGDs revealed that the men generally prefer heavier and wider vehicles. They also believe that heavier vehicles offer greater stability, particularly on slopes and in bad weather conditions. Women favoured light-weight vehicles with broader width so that the male family members can also use the vehicle without perceiving it as "feminine". For example, many men considered the TVS Scooty Pep (ICE) to be a feminine two-wheeler model, which they would not prefer using. Additional perceived risks include concerns around vehicle stability at higher speeds and battery safety during monsoons. EV users in Chennai raised concerns about the potential safety risks associated with electric vehicle batteries during the monsoon season. Given the city's susceptibility to urban flooding, there are apprehensions about the impact of waterlogging on

battery integrity. Some users, particularly those with dual-battery E2Ws, reported that storage space is often insufficient for helmets or other items.

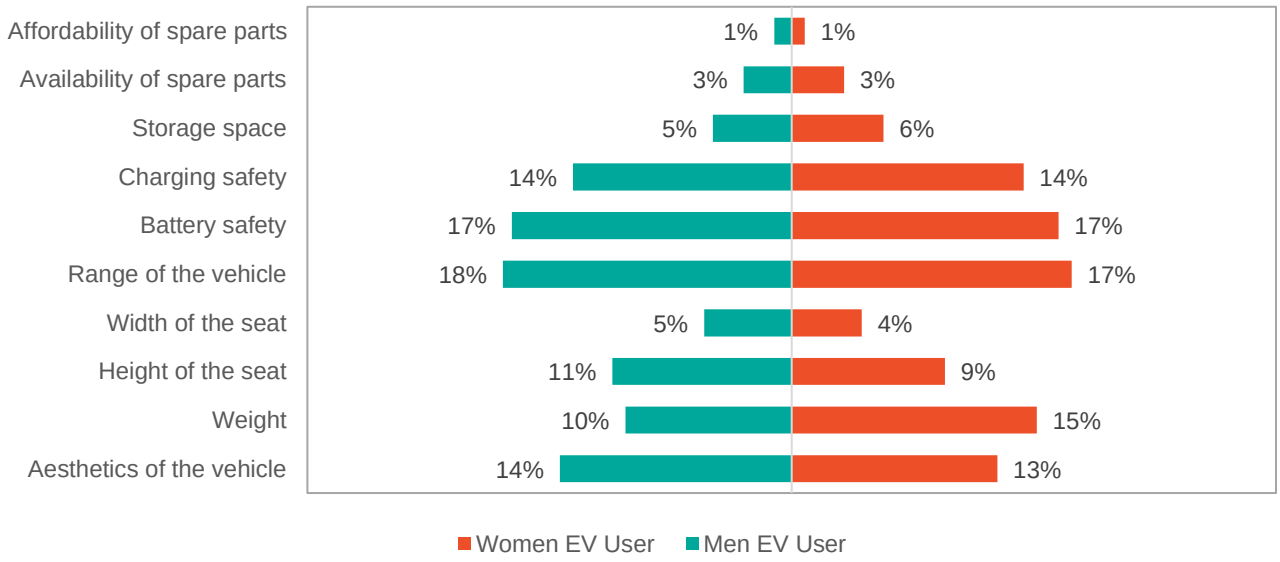
I'm unable to store my helmet under the seat since the space is occupied by the battery compartment for the electric vehicle (EV). At best, I can only fit my purse inside."

- *A female personal EV user (Chennai)*

Post-sales service emerged as a major concern for EV users

During the FGDs, participants emphasised the challenges they face in getting their E2Ws serviced at OEM service centres, especially fewer authorised service centres with trained mechanics and available spare parts. This results in long waiting times for repairs and services, which negatively impacts their experience.

Figure 19: Parameters prioritised in the design of a two-wheeler – E2W users



N = 248, M= 123, W=125

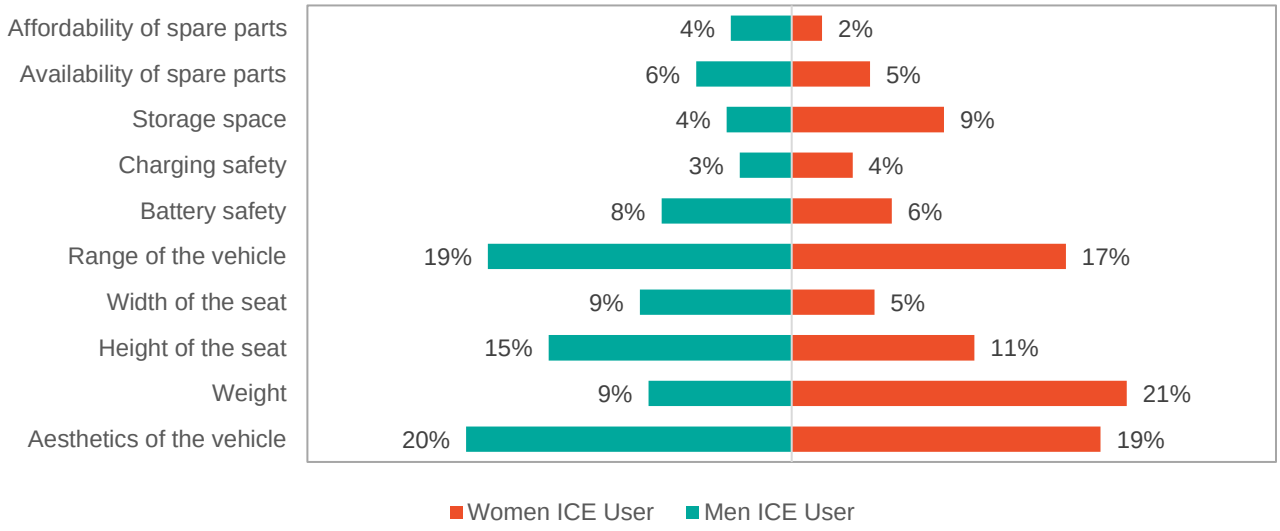
Preferences amongst ICE two-wheelers users

ICE users prioritise aesthetics and vehicle range. Women ICE users give a high priority to the weight of the vehicle

Women ICE users rank weight, aesthetics and the range of the vehicle as their top three parameters, whereas men ICE users rank aesthetics, range and seat height as their top three criterion (Figure 20). Women give slightly higher importance to storage space in comparison to men. This is in contrast to EV users who give high priority to battery and charging safety. ICE vehicle users expressed concerns about the long-distance durability of E2Ws and the availability of trained mechanics locally. The issue of availability and affordability of spare parts is also highlighted by all EV users in FGDs.

During the FGDs, it was highlighted that features of E2Ws, such as assisted reverse mode are particularly beneficial for women in maneuvering the vehicle. However, manufacturers are currently focusing on gender-neutral approach, with no plans for women-specific models at this time.

Figure 20: Parameters prioritised in the design of a two-wheeler - ICE users

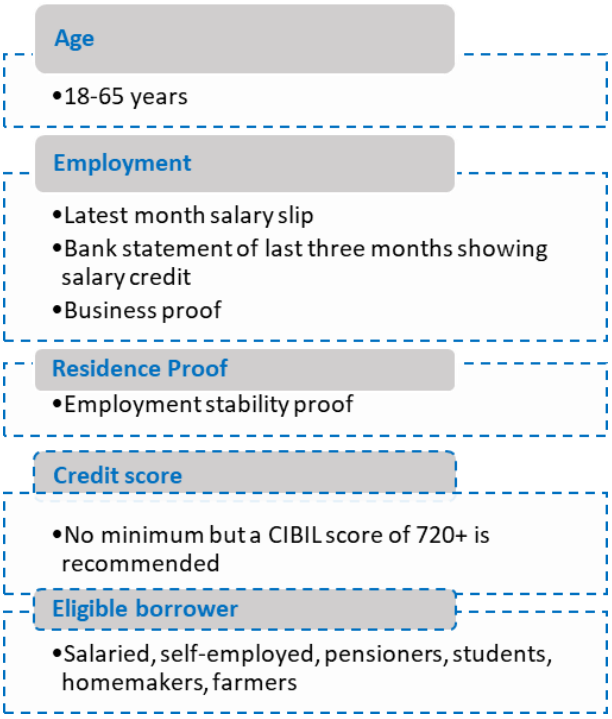


N = 248, M= 124, W=124

3.3.8 Financing of electric two- wheelers

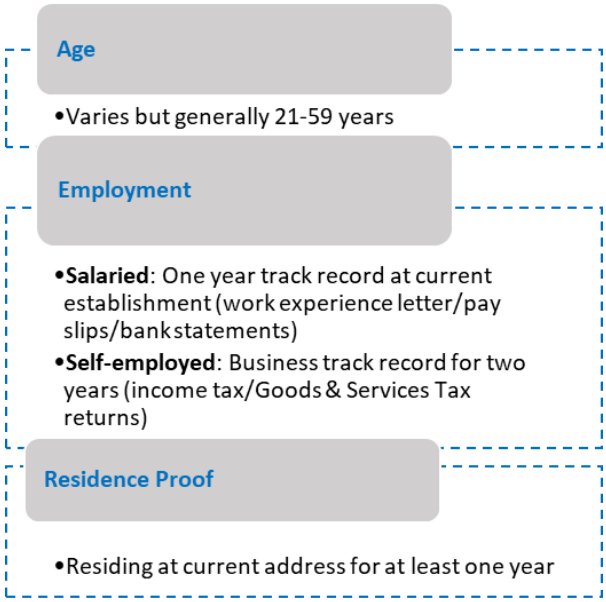
Electric vehicles have higher up-front costs than ICE vehicles and thus the requirement for down-payment and credit limit increases. NBFCs are the primary lenders for E2Ws in India, financing approximately 64% of the market compared to 30% by private commercial banks (101). Thus, the eligibility criteria for obtaining a two-wheeler loan from two NBFCs are illustrated in the Figure 21and Figure 22. Both Bajaj Finance and Shriram Finance are NBFCs that provide loans for E2Ws.

Figure 21: Two-wheeler loan eligibility for Bajaj Finance



Source: (102)

Figure 22: Two-wheeler loan eligibility for Shriram Finance



Source: (103)

It is observed that the eligibility criteria for obtaining a loan restrict borrowers to those between the age groups of 18 and 65 years, as loans are not available to individuals under 18 (the minimum age for obtaining a driving license) or to senior citizens.

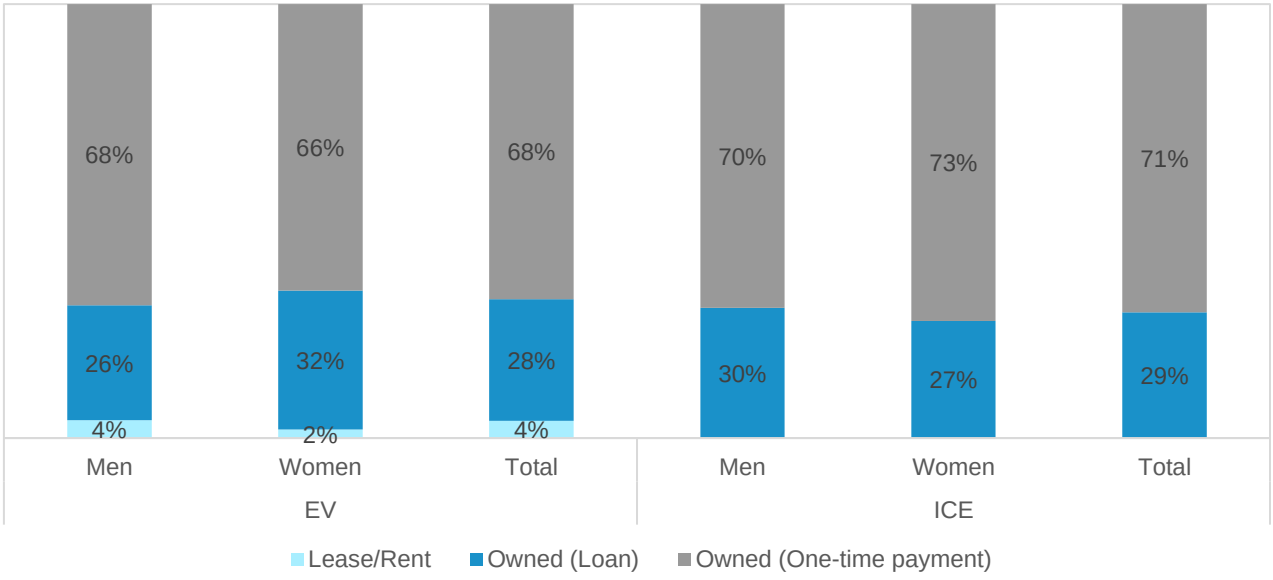
Eligibility criteria may impede women's access to formal credit
Generally, no collateral is required for a two-wheeler loan. However, gender bias in the perception of the stable earning member of the household or in whose name movable or immovable assets are registered, results in male family members or an earning parent to apply for the loan or co-sign the loan application.

Obtaining a loan becomes more difficult for those working in the informal economy, as they do not have salary slips, employment stability certificates, or are self-employed. This may disproportionately impact women in India whose labour force participation rate was only 37% in 2022-23 (104). Additionally, many women often have limited access to credit products such as credit cards, housing loans, or car loans, hindering their ability to establish a CIBIL score.

Peer networks are desired as a useful resource to obtain real-world experiences (as compared to business correspondents).
Borrowers often face challenges in obtaining reliable information about specific banks or loan products. Many seek insights from peers regarding their experiences for informed decision-making.

The majority of respondents had opted for self-financing for their two-wheeler across gender, vehicle type and the nature of usage.
There isn't a noticeable difference in the financing pattern between commercial users and personal users of two-wheelers for either gender. On an average, about 29% of respondents have opted for loans to finance their two-wheelers across gender, nature of use and fuel type (Figure 23).

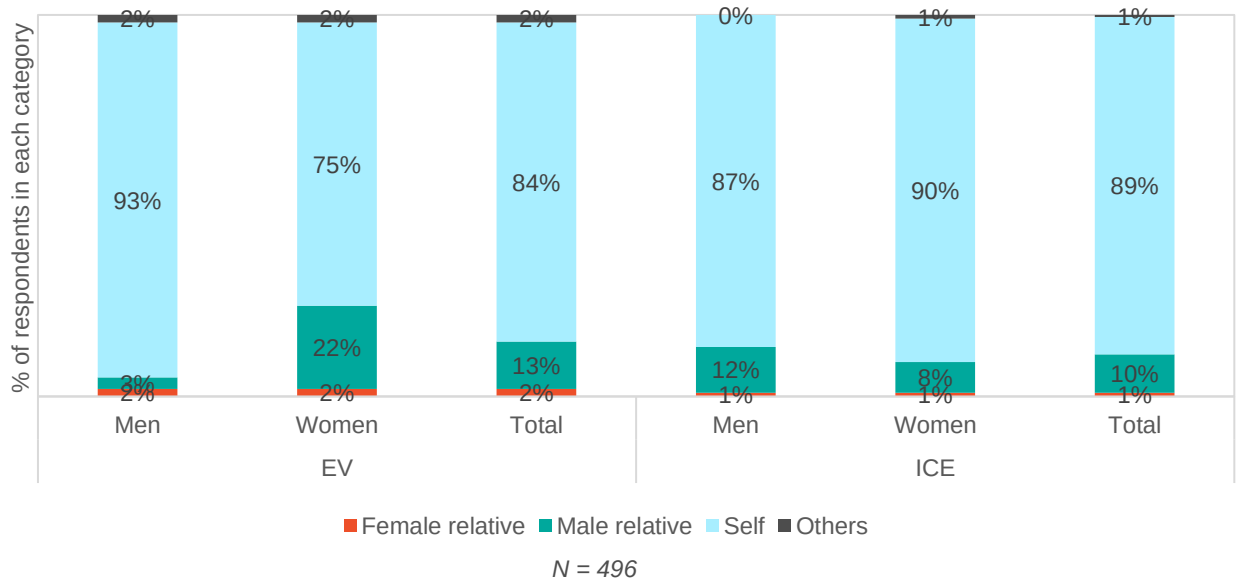
Figure 23: Mode of financing two-wheeler by fuel type and gender



N = 496

22% of the female EV owners registered their vehicles in the name of a male relative
Though majority if the respondents have registered the vehicle in their own, it is noted that this proportion drops slightly for women EV users. Only 75% of women EV users had the vehicle registered in their own name as compared to 90% of women ICE users (Figure 24). In most cases where the vehicle is not registered in their own name, it is registered in the name of male relatives (11%). Similar patterns are observed in both cities.

Figure 24: Vehicle registration name by gender and fuel type

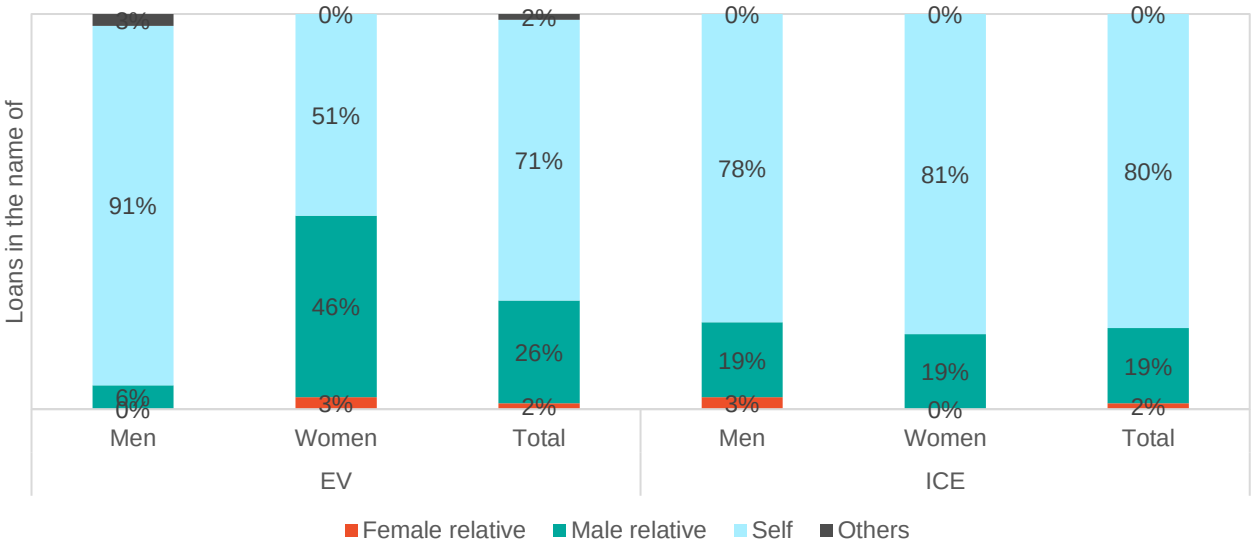


N = 496

More men obtain loans in their name than women

Among male users who took a loan to finance their two-wheeler, the majority obtained the loan in their own name. Among female users, 81% obtained the loan in their own name for ICE vehicles, while only 51% did so for EVs (Figure 25).

Figure 25: Loan registration name by gender and vehicle fuel type



N=142, M=70, W=72; ICE: N=71, M=38, W=33; EV: N=71, M=32, W=39

Downpayment[36] is higher for female EV users as compared to male EV users in both cities.

For male EV users, the down payment proportion is about 26% of the on-road price of the vehicles. However, in the case of women EV users, the down payment proportion is higher at 32% (Table 21). This difference is significant at a 95% confidence level. Considering the higher cost of acquisition of the EV, a

[36] The down payment is the amount that the user or vehicle owner is required to pay from their own sources when acquiring a vehicle, while the remaining amount is financed through a loan.

higher down payment means that the total amount that needs to be arranged upfront is significantly high than the up-front amount needed to acquire an ICE vehicle. This could be a significant deterrent in increasing the uptake of EVs by women.

The Equated Monthly Instalments (EMI) for EVs is comparatively higher than ICE two-wheelers. It is seen that on an average, the EVs have higher EMIs than ICE vehicles and women also pay higher EMIs as compared to their male counterparts (Table 22), although this difference is not statistically significant at 90% confidence level.

Table 21: Down payment as a percentage of vehicle value

Loan registered in the name of	Overall
Men	26%
Women	30%
Grand Total	28%

N=139 (W:70)

Table 22: Loan tenure, rate of Interest and EMI

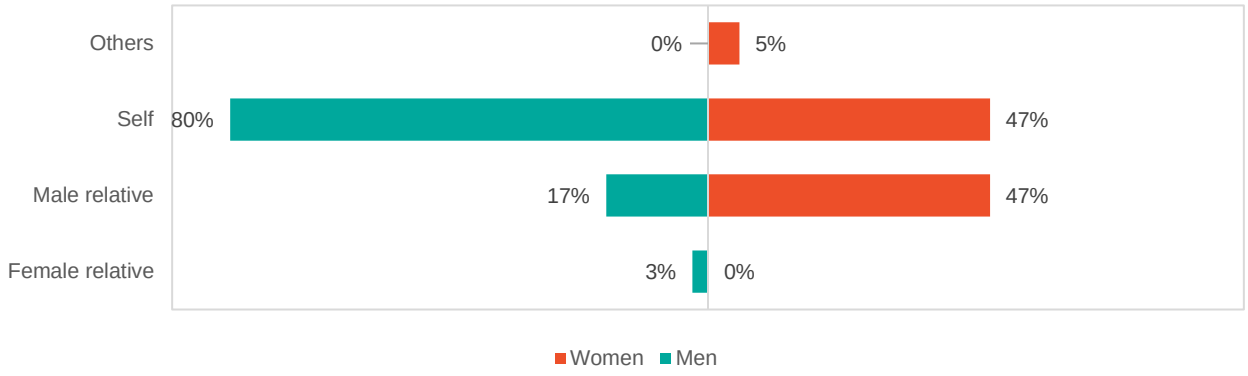
	Average loan tenure (months)	Average interest rate (%)	Average EMI (INR)
EVs			
Men	33	10.2	₹ 4,058
Women	25	11.5	₹ 4,658
Grand Total	28	10.9	₹ 4,384
ICE			
Men	29	9.6	₹ 4,026
Women	26	9.6	₹ 4,099
Total	27	9.6	₹ 4,060

N=140 (Women:70) for loan tenure & EMI and N=117 (Women:57) for interest rate

Roughly half of the borrowers of two-wheeler loans require co-signatories irrespective of gender. In most cases male family members are the co-signatories. Men not only handle banking/ leasing procedures for themselves but also for half of the female users (Figure 26**)**
Co-signatories are often required for loans when borrowers lack sufficient credentials or credit scores. It is observed that co-signatories are predominantly male for both male and female borrowers. This trend reflects the socioeconomic structure of many Indian families, where the male head of the household is typically viewed as the primary breadwinner. Additionally, assets such as houses, property, and land are often registered in the name of male family members. Moreover, a higher proportion of men are engaged in formal employment, which provides them with access to bank accounts and credit cards, resulting in improved credit scores. This is further supported by the fact that the banking or leasing procedures for most men and women is completed by male members of the family.

Reported loan processing times are shorter for shorter for EV users and for women on average.
In most cases it was observed that the loan approval time for EVs is lower than for ICE vehicles. Also loan approval time for women in lower (Table 23). This could be attributed to the fact that most EV financing is being done by new-age fintech companies who have set up systems for easier and faster application, and approval of loans through automated and streamlined processes as compared to traditional asset financing companies.

Figure 26: Banking procedures handled by



N=152 (Women:76)

Table 23: Average loan approval time (in days)

Gender	User	Grand Total
Men	Overall	4.3
	EV	4.0
	ICE	4.5
Women	Overall	4.1
	EV	2.9
	ICE	5.5

N= 141 (women:71)

Most users get information on financing at two-wheeler dealerships.
Between 65 to 80% of users of different groups reported obtaining information on financing from bank or finance institution agents at two-wheeler dealerships. The key criteria that borrowers look at while selecting a financing institution for loan is the reputation and trustworthiness of the lender, lower interest and recommendation by dealerships.

Lack of financial literacy, experience sharing by other users and low/no CIBIL scores appear to be the biggest barriers for women in accessing financing (Figure 27)
Users were asked to rank top three barriers that they experienced while accessing financing for two-wheelers. The top barriers are as follows: a limited network of peers to understand financial processes, low or no CIBIL score and lack of financial literacy. Some FGD participants highlighted that they faced issues in obtaining a loan in their own names due to their low credit score and difficulties with the documentation.

Despite needing a two-wheeler for my job, I faced challenges obtaining a loan due to a low CIBIL Score, which is difficult to improve without employment. However, my sister with her strong CIBIL Score from employment, extended her support by taking loan for me."

- *A female EV Commercial user (Chennai)*

Men and women respondents ranked reduced documentation requirements, increased access to information and sharing of experience by other borrowers as key to improving the experience of accessing finance (Figure 28).

Users rank the two top factors for improving access to financial products as reduced documentation requirements and access to information on financial products and processes. Additionally, a network of peers for sharing experiences and information on financial products & processes from the existing users ranks among the top three factors for improvement.

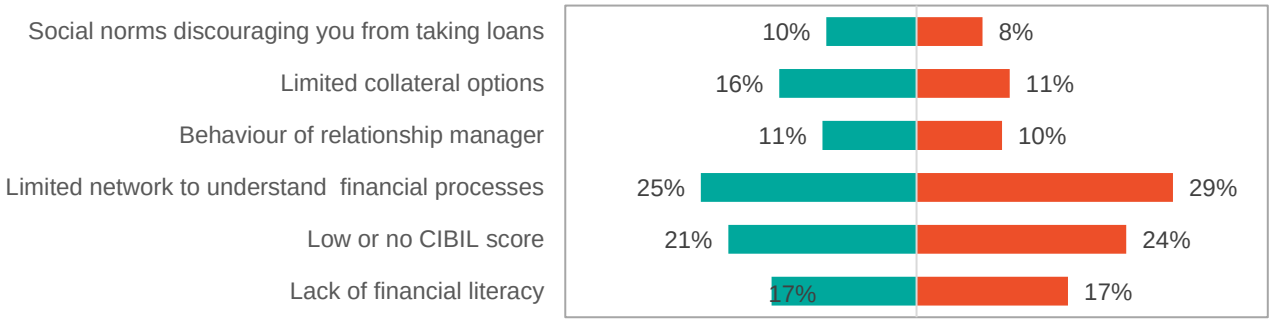
The key informant interviews with financing institutions confirmed that there is reluctance among the traditional asset financing companies to finance EVs except to salaried individuals who have better credit profile and who are likely to pay off their loan irrespective of the vehicle performance. For commercial users, very few financing options are available and that too at a high cost and the interest rate can be 24% or more. The said entities seek guarantees/co-applicants from house owning relatives or acquaintances of the borrower.

The key informants highlighted that women borrowers had a better repayment profile as compared to their male counterparts, but were less aware of the technical specifications of vehicles as compared to men. Yet, they constituted only about 10-20% of the total borrowers.

It was also noted that male users sometimes borrowed in the name of their female family members to benefit from schemes[37] targeted towards women.

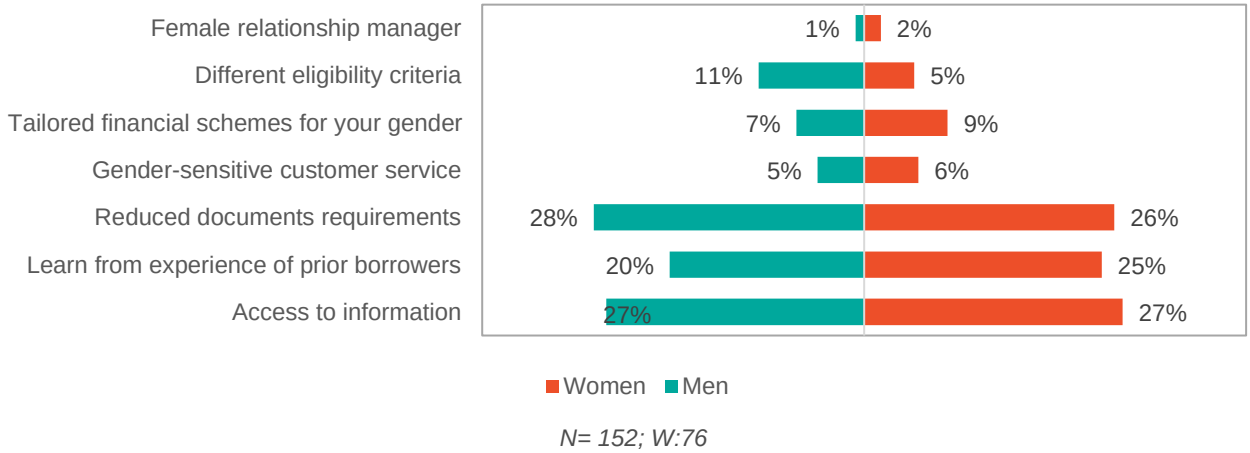
Due to higher acquisition cost of electric vehicles more users require financing in comparison to ICE vehicle users. The typical loan duration is of two to three years depending on the vehicle type and battery warranty. Generally, the loan is processed quickly with users receive their funding within three to four days.

Figure 27: Proportion of users who ranked the following as one of top 3 barriers to access finance



N= 152; W:76

Figure 28: Proportion of users who ranked the following as one of top 3 factors to improve loan process



N= 152; W:76

[37] PNB Power Ride – A scheme for financing two-wheelers for women. Under this scheme, the net income requirement for female applicants has been reduced from INR 10,000, after all deductions including the proposed two-wheeler loan instalment, to INR 8,000.

3.3.9 Charging infrastructure

The charging infrastructure for E2Ws are of two types:

E2W charging stations: E2Ws have both slow and fast chargers. Slow chargers use two types of connectors[38]: Bharat AC-001, with power capacities of 10 kW and Bharat DC-001 with 15 kW power capacity (105). For fast charging, they use Type 2 AC chargers with a minimum power output of 22 kW (106). The Bharat AC001 charger standard typically uses a 3-pin socket for charging, designed primarily for slow charging of electric vehicles. Some E2W OEMs have their own proprietary, fast chargers that are not inter-operable with other two-wheeler models (107). These fast chargers can provide a range of 20-50 km in 15 minutes (108,109).

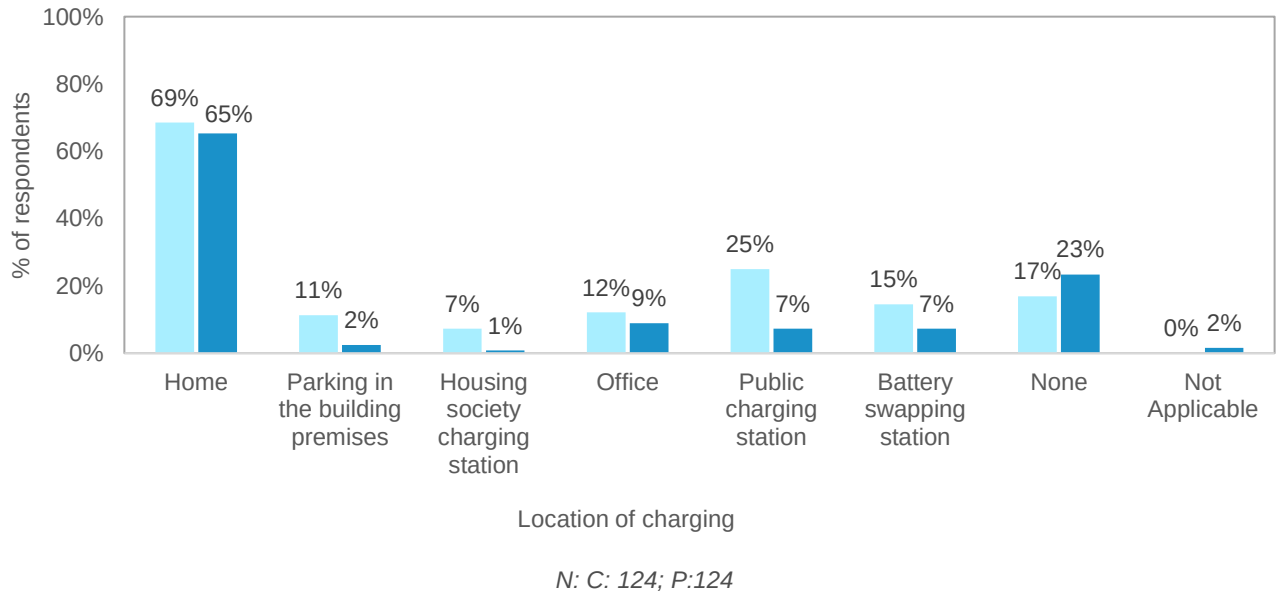
Battery swapping stations: Drained batteries can be replaced with a fully charged one from a battery swapping station. Battery swapping is advantageous as the recharging time becomes comparable to the fuelling time for ICE vehicles (28). The swapping process may take up to five minutes and offer a range of 40 to 60 km. Battery swapping of electric two/three wheelers is gaining momentum with over ten different battery swapping companies in the Indian market (28).

Findings from the surveys, focus group discussions and key informant interviews

The primary location for charging EVs for both commercial and personal users is at home, regardless of time of the day.
On an average, commercial users charge their vehicles six days per week, whereas personal users only charge their vehicles four days per week. This is in line with the greater distances travelled by commercial users.

Commercial users are the main users of public charging stations (PCS).
During the day (Figure 29), 25% of commercial users reported charging at PCS, compared to just 7% of personal users. At night, 9% of commercial users used PCS as compared to 2% of personal users (Figure 29). Additionally, commercial workers also report a higher usage of battery swapping stations. Personal and commercials users preferred charging at home or within building/housing society premises at night.

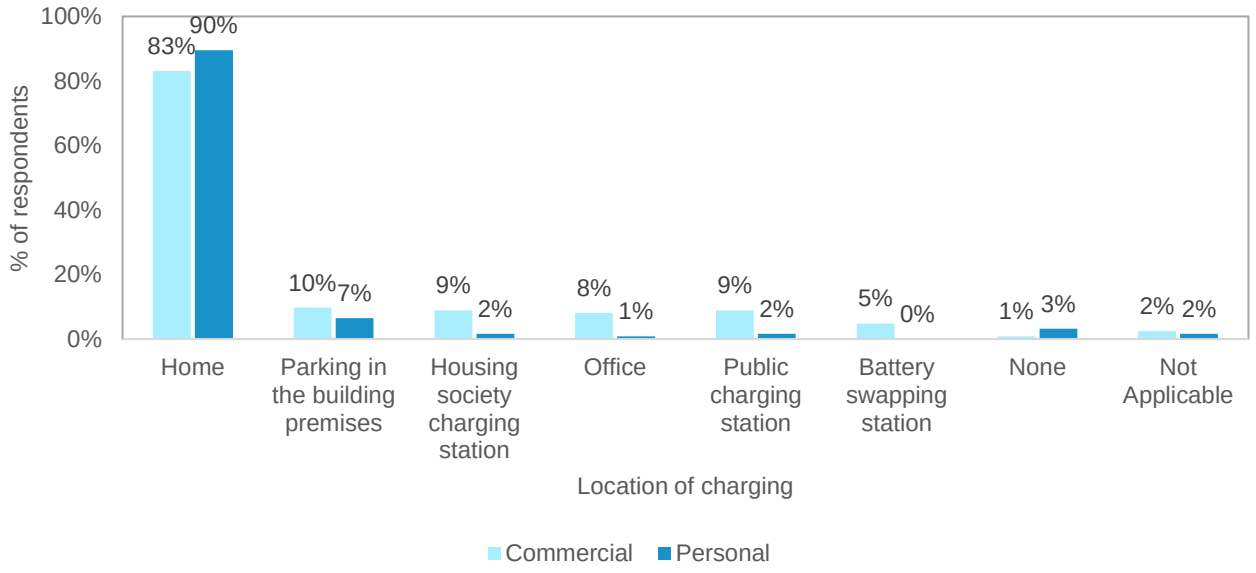
Figure 29: Charging locations during the day



N: C: 124; P:124

[38] The Bureau of Indian Standards (BIS) has standardized the charger specifications provided by the Department of Heavy Industry (DHI) as Bharat AC001 and Bharat DC001.

Figure 30: Charging locations during the night



N: C: 124; P:124

FGDs corroborate the preference for charging at home. EV users highlighted challenges with using PCS such as the lack of awareness of PCS locations, perceived lack of safety, and long waiting times

EV users stated that they ensure to use their two-wheelers only within the city and prefer to take it within a comfortable range of home. Public charging stations are primarily seen as an option to use for charging in case of emergencies. However, commercial users do report using PCS due to their longer distances travelled in a day.

Women in Chennai reported their discomfort with using PCS as they are often located in secluded areas which were perceived to be unsafe and this information was corroborated from the audits of charging stations. Concerns are raised by users about the lack of a single reliable source to locate PCS. Additionally, women reported concerns about vehicle range and often limit their travel due to the fear of running out of charge.

Men stated that the public charging infrastructure in Chennai is insufficient. Some stations are non-operational at times, resulting longer travel and long waiting times. Therefore, an extensive planning is required for E2W users intending to travel longer distances.

In Delhi, women EV users highlighted concerns about long waiting times at charging stations, as only slow chargers are available, requiring them to stay at stations for approximately two to three hours. This is particularly problematic when they are accompanied by children, as there are no shaded spaces or waiting areas.

"Getting petrol is convenient. Even if it's crowded, it does not take more than 15 minutes to refuel the vehicle. However, it takes 3 hours to charge the battery. It is difficult for a woman to wait for such a long time."

- *A female EV personal user (Delhi)*

Men in Delhi reported issues with non-operational charging points at stations, leading to long waiting times and crowds. Female EV users highlighted their lack of understanding of how to use the charging infrastructure, noting the absence of information at stations. All participants emphasised the need for better information on the availability of charging stations.

In addition, the EV users shared challenges of using PCS which are located in secluded areas and do not have waiting areas. Users recommended integrating PCS within fuel stations which are typically easy to locate, and are present in active areas as well as well-lit.

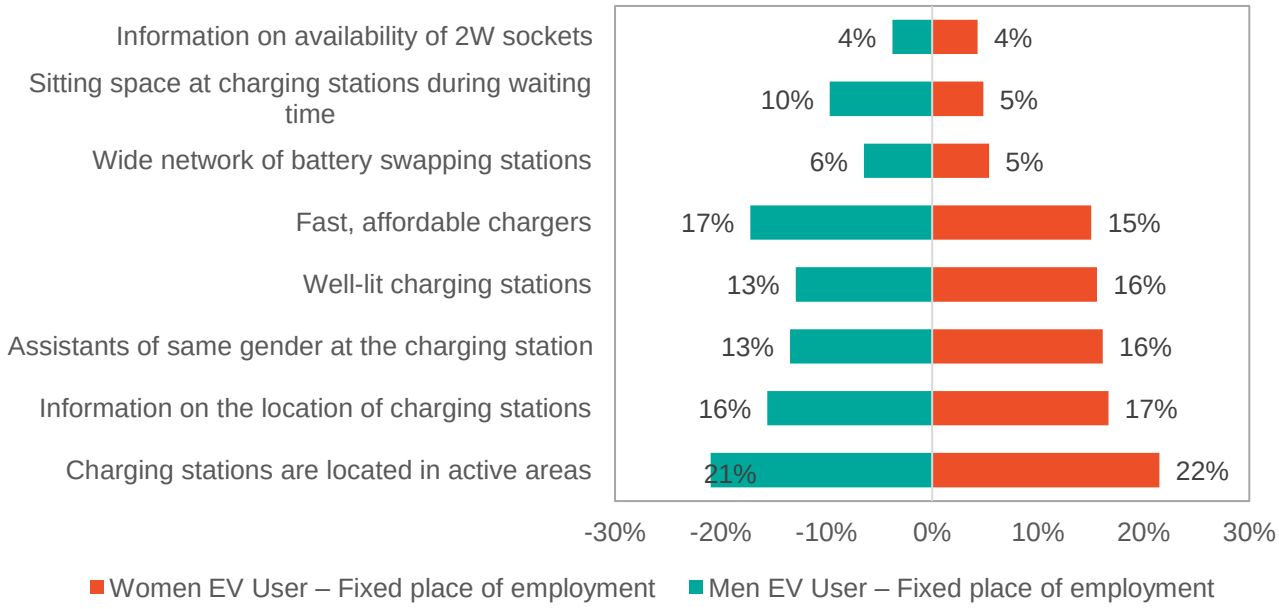
Current users of ICE two-wheelers frequently express concerns about the availability and reliability of charging infrastructure. These issues influence their perception and their willingness to adopt electric two-wheelers in the future.

> *"One day, my two-wheeler charge was very low, so I decided to take my two-wheeler to a nearby mall, planning to charge it while I roamed around. However, upon arrival, I realised that the charging port did not suit my vehicle. I became really scared as my two-wheeler started blinking due to the low battery. Somehow, I managed to make it back home, but it was a nightmare for me."*
>
> - *A female personal EV user (Chennai)*

EV users prioritised the availability of fast chargers, the strategic placement of charging stations in high-traffic areas, and access to updated information regarding the locations of charging points
Additionally, due to frequent encounters with non-operational charging sockets, EV users emphasized the need for functional charging sockets at all stations.

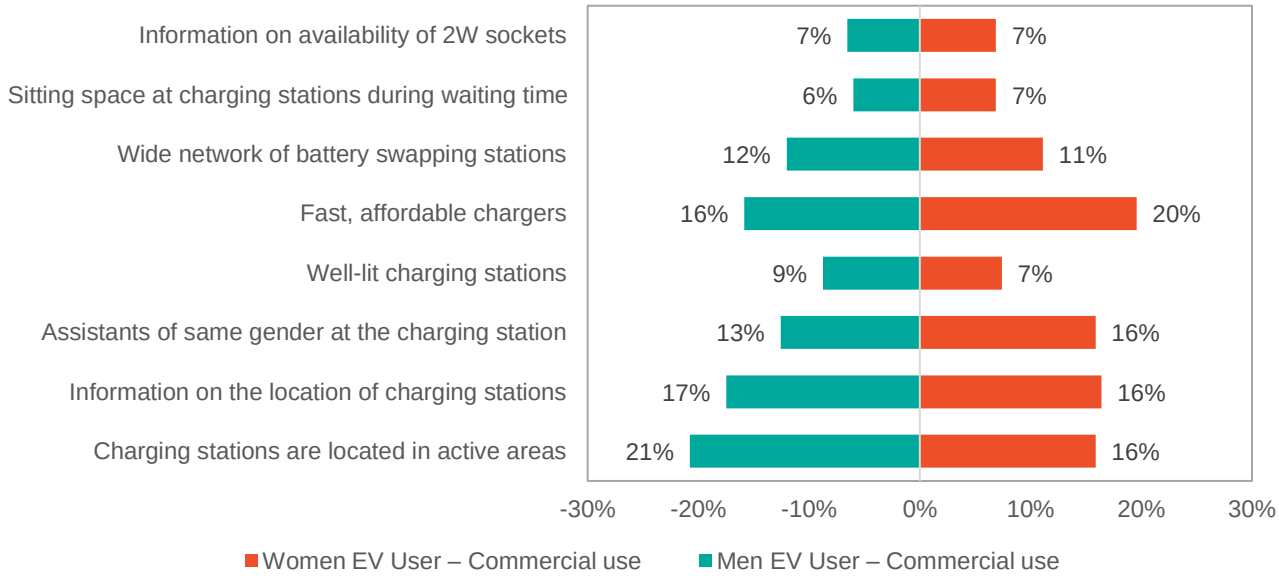
Furthermore, both commercial and personal users prioritise a network of battery swapping stations, fast and affordable charging stations and charging stations located in active areas. A gender-disaggregated analysis showed that both men and women have similar priorities (Figure 31 and Figure 32). However, women prefer to have assistants of same gender at charging stations.

Figure 31: Priorities to improve charging infrastructure- personal users by gender



N: 248

Figure 32: Priorities to improve charging infrastructure- commercial users by gender



N: 248

Findings from charging infrastructure audits

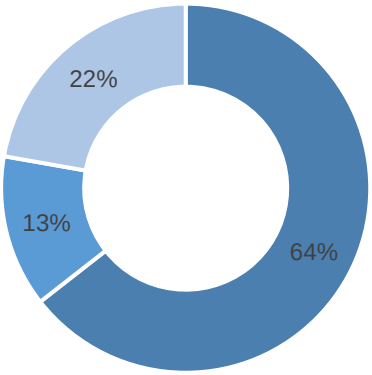
In addition to the FGDs and surveys with two-wheeler users, public charging stations were audited based on the assessment framework created (Annexure 3). This section presents the analysis of the infrastructure audits of E2W charging points conducted in Chennai and Delhi. An overview of the charging infrastructure audits conducted in the cities is presented and is followed by a city-wise analysis.

Operational charging infrastructure: Around 45 charging stations or battery swapping stations were audited in each city. As of August 2024, Chennai has 151 public charging points (Bureau of Energy Efficiency), whereas Delhi has 2452 charging points (Switch Delhi). Based on our sample survey, 46% and 64% of the charging points are operational respectively (Figure 33 and Figure 34). This translates to one charging point for every 103 EVs in Delhi and one charging point for every 455 EVs in Chennai, in comparison to 6-20 EVs for one public charger globally (110).

The comparative assessment shows that the data on charging station availability is more accurate in Delhi. This indicates that the reported number of charging stations on the government websites such as BEE, Switch Delhi or Google Maps in each city may not represent the true picture, as field observations indicate significant discrepancies.

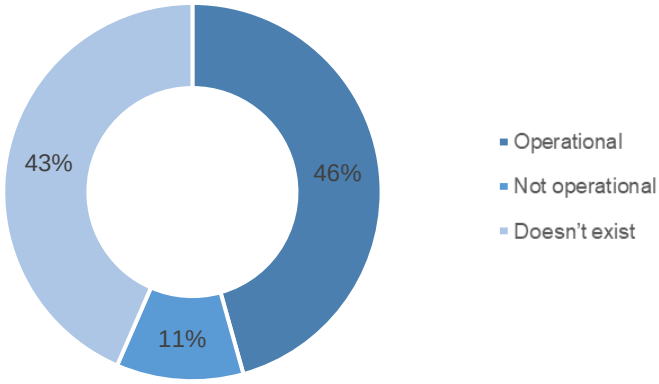
Informal discussions with people at these locations indicate that although charging stations were initially available, they were removed over time for various reasons, including low usage. However, this information has not been updated on the online platforms.

Figure 33: Total PCS audited- Delhi



N: 45

Figure 34: Total PCS audited: Chennai



N: 46

Charging Operators: The audited charging stations were under a range of different operators. In Delhi, the audited charging stations or battery swapping stations are operated by around 17 different CPOs. The top three operators – Bolt Earth (22%), Sun Mobility (13%) and CharjKaro (11%) - operate around 46% of the audited charging stations. Following closely are Ather, Ola and Kazam with a comparable number of stations (9% each).

In Chennai, around 12 operators operate the audited charging points. The top three operators - Bolt Earth (33%), Ather (20%) and EESL (15%) - account for 68% of the total audited charging stations. Besides around 11% of the audited stations are operated by the Municipal Corporation in Chennai.

Type of chargers: In Delhi, among the total operational charging stations (29) only 21% (6 stations) have fast chargers and 21% (six stations) are battery swapping stations. The fast-charging stations are operated by certain OEMs and are exclusively compatible with their two-wheeler models only.

In Chennai, 38% (8 stations) of the audited charging stations have fast chargers. All the fast-charging stations audited in Chennai are operated by Ather.

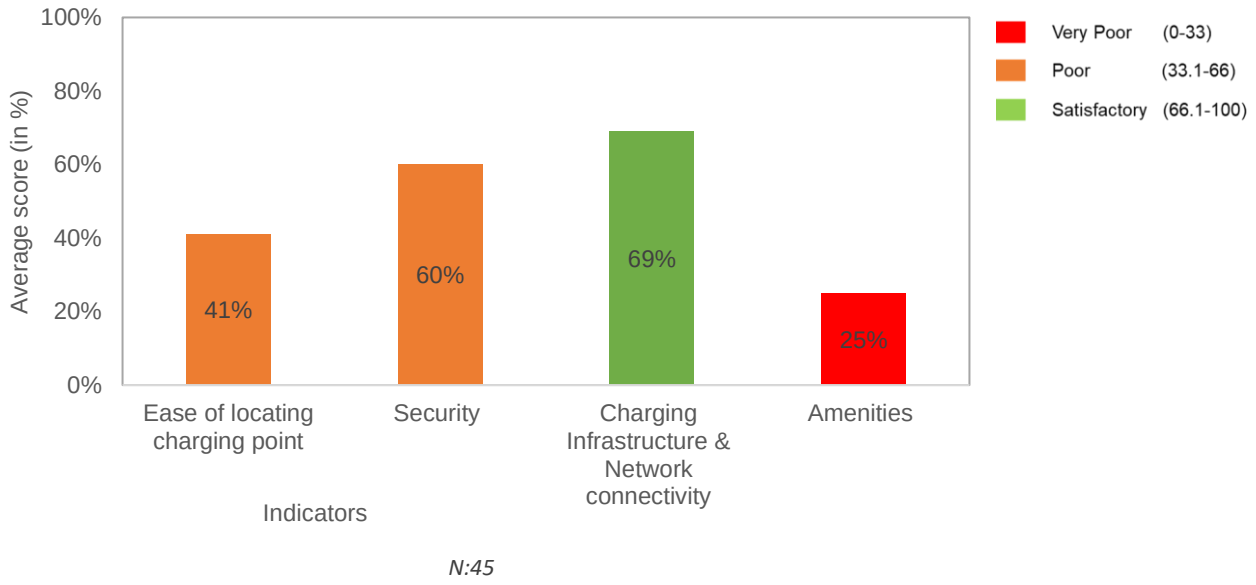
Analysis of charging infrastructure audits: Delhi

The charging stations audited have been rated as 'very poor', 'poor' and 'satisfactory', based on the total score arrived at from the four indicators.

Based on the total score, 65% (of 45) of the audited charging stations in Delhi fall into the 'poor' and 'very poor' categories (Figure 35). At the indicator level, the charging points in Delhi were rated 'satisfactory' on average for only the charging infrastructure and network connectivity indicator. They are rated 'poor' for ease of locating and security, and 'very poor' for amenities. The details of the charging audits are provided in the annex.

The attributes rated as very poor include real-time information on the availability of charging points, signage for locating charging stations, and the availability of seating areas (Figure 36).

Figure 35: Average score of audited charging stations by indicator in Delhi



N:45

Figure 36: Average score of attributes of audited charging stations in Delhi

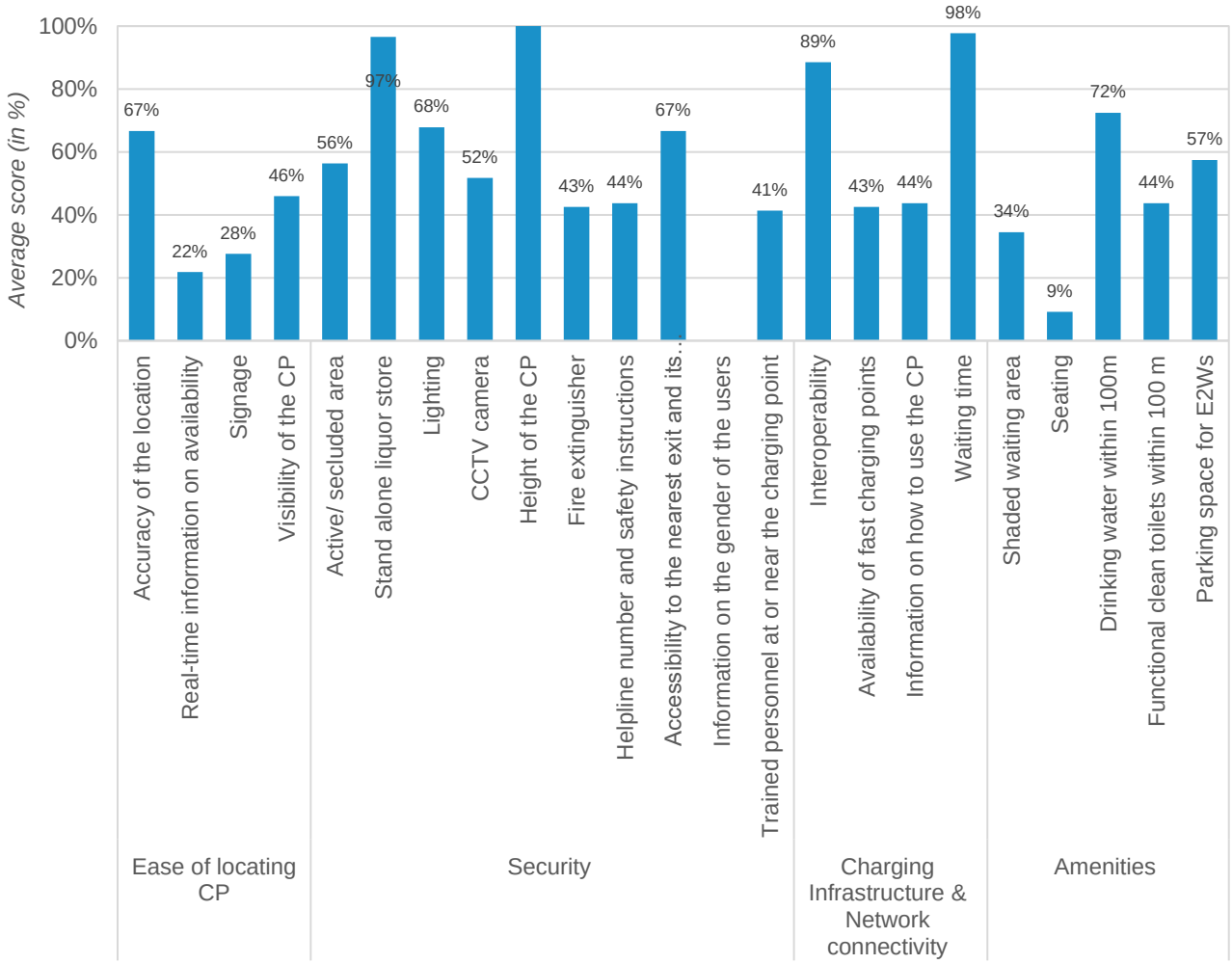


Figure 37: Charging point located behind an advertisement board, Karol Bagh

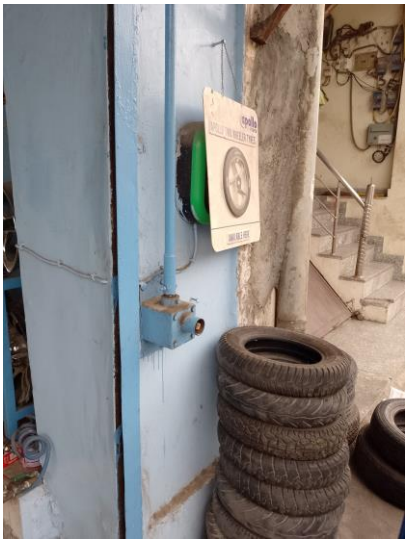


Figure 38: Charging point hidden among pipelines, Chandni Chowk

Figure 39: Charging point positioned amidst electricity meters

Source: The Urban Catalysts

Figure 40: Charging point covered with a protective box to prevent vandalism (Rajiv Chowk)

Figure 41: Charging gun and digital screen missing due to vandalism (Rajiv Chowk)

Source: The Urban Catalysts

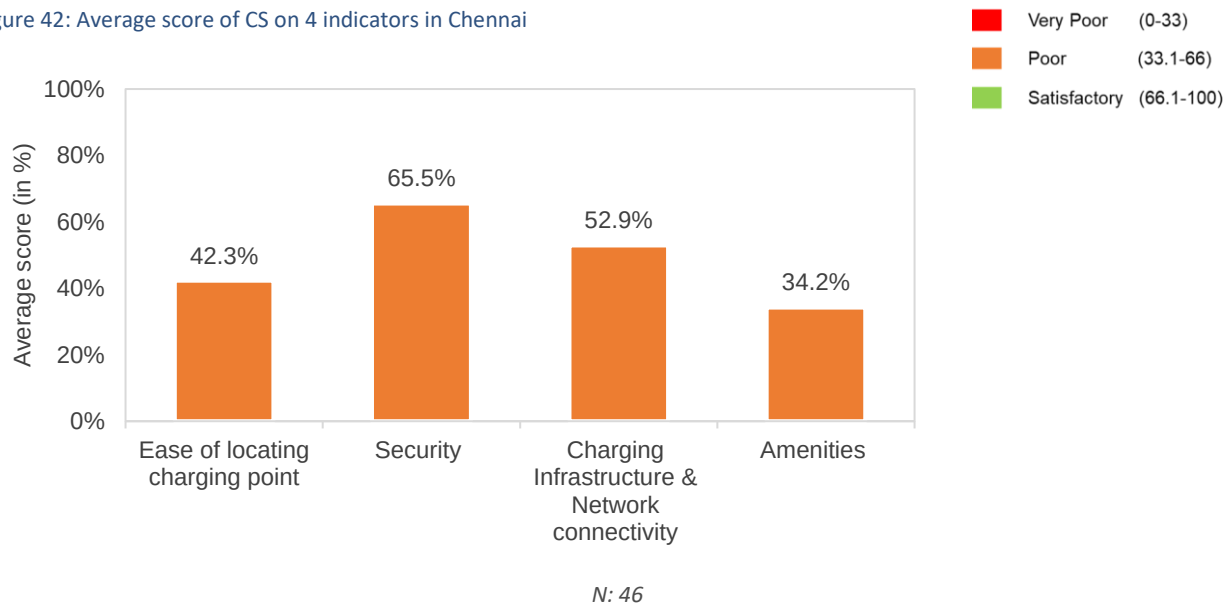
Analysis of charging infrastructure audit – Chennai

The density of charging stations in Chennai is comparatively lower than Delhi. Based on the total score, 85% (of 46) of audited charging stations are rated as poor or very poor. Overall, Chennai's charging stations perform poorer than those in Delhi on this assessment framework. The average score for Chennai's charging stations falls within the 'poor' range across all categories: ease of locations, security, charging infrastructure, network connectivity and amenities (Figure 42). Among the indicators, security concerns are higher in Chennai with an average score of 65.5%.

In Chennai, the attributes rated as very poor include real-time information on the availability of charging points, signage for locating charging stations, availability of fire extinguishers, presence of trained personnel

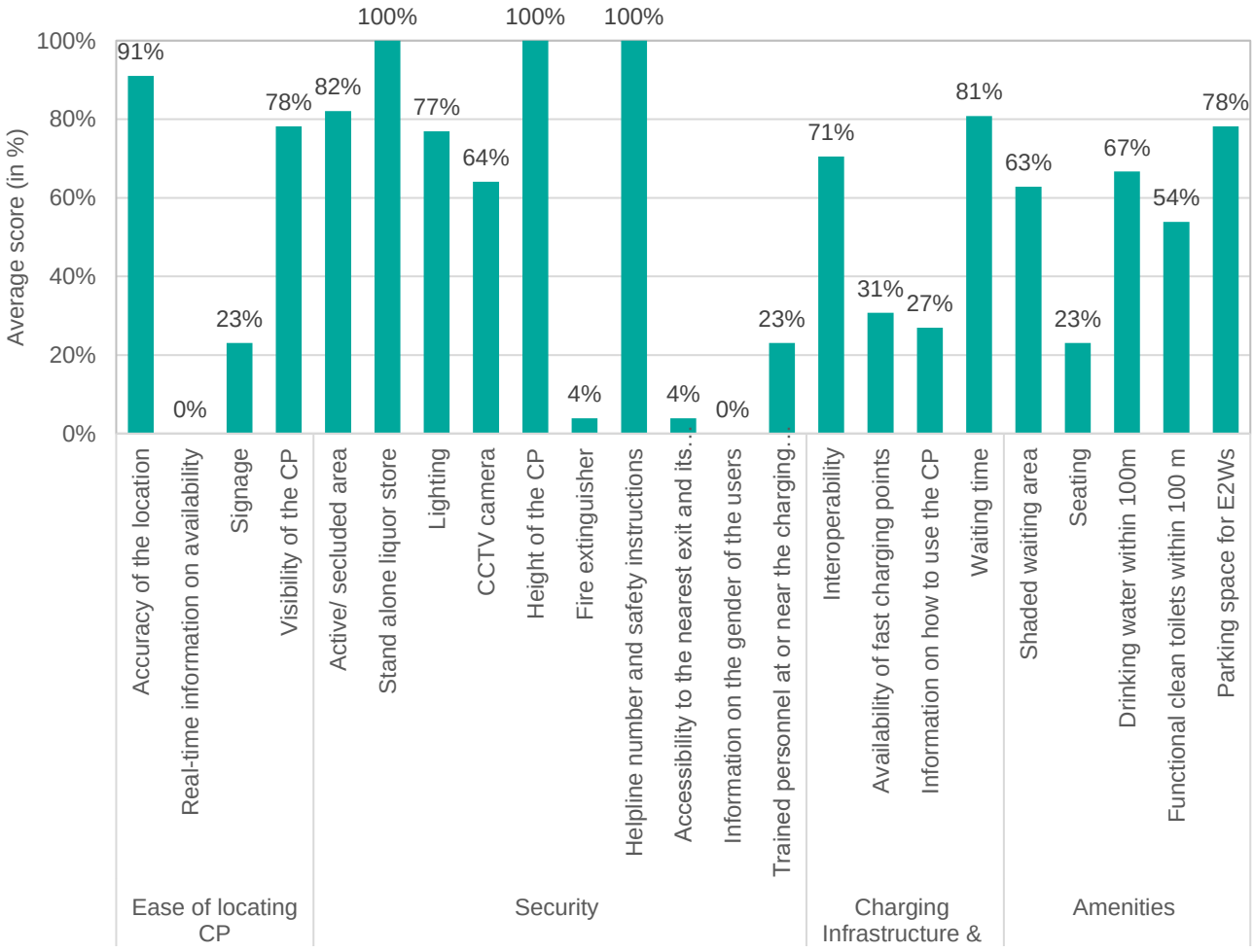
at charging stations for assistance, clear instructions on how to use the charging points, and the availability of seating areas (Figure 43).

Figure 42: Average score of CS on 4 indicators in Chennai



N: 46

Figure 43: Average score of attributes of audited charging stations in Delhi



"High temperatures and heat in Chennai elevate the risk of battery explosions in electric vehicles. As a Swiggy staff member, my job often requires me to be outdoors, which heightens my concerns about potential battery explosions."

- *A male EV commercial user (Chennai)*

Figure 44: Charging point located between a tree and utility pole (Koyambedu)

Figure 45: Charging point among the advertisement boards (Adyar)

Source: The Urban Catalysts

Figure 46: Charging points at MRTS station (Mandaveli)

Figure 47: Charging point at Basin bridge railway station in North Chennai

Source: The Urban Catalysts

3.3.10 Institutional support

Social enterprises, membership-based organisations and women-oriented organisations are working to address the barriers that resource-poor women face in accessing electric vehicles. Self Employed Women's Association (SEWA) Bharat has supported its members in purchasing electric three-wheelers. Their Shri Mahila SEWA Cooperative Bank provides support in availing EV subsidies and issues loan to its members. SEWA Bharat partnered with SMV Green Solutions to support their members in obtaining driving licences and maintaining their vehicles. It encourages members to open bank accounts and deposit savings on a monthly basis (111).

All-women last-mile delivery companies such as Even Cargo, train women to operate two-wheelers and create a team of female driving instructors. This is conducted with self-help groups, colleges and NGOs to assist trainees in obtaining their learner's licences. They also incorporate electric two-wheelers in their training fleet and provide it to those who do not have access to their personal vehicle (112). Learnings from the experiences of organizations (Table 24) that support women in asset ownership, licensing and financing are summarized below, based on insights gathered from key informant interviews.

Collaboration and partnerships: Organisations such as SEWA, MOWO, ANEW and Azad Foundation have formed partnerships with government agencies, financial institutions and driving schools to address barriers in obtaining a driving license and accessing formal finance.

Financial inclusion: Women require tailored financial products, and organizations such as SEWA and Even Cargo facilitate access to financing through their cooperatives or partnerships with NBFCs respectively, while also assisting them in obtaining subsidies for vehicle purchases and/ or with training fees. In addition to financial support, these organizations offer financial literacy training to help women effectively manage their finances.

Driver training: MOWO, Azad Foundation and ANEW conduct programs to train women in driving and provide support in obtaining driving licences and employment opportunities. They offer practical driving lessons, classroom instruction on traffic rules and safety, and soft skills training to enhance employability. Azad Foundation goes a step further to focus on gender roles, rights and self-empowerment, MOWO also trains women to become driving instructors addressing the shortage of female instructors in the industry.

MOWO in Telangana uses a women-managed motor training site and women's mobility-centric ecosystem aided by the government. It offers two and three-wheeler training for women above 18 years of age facilitated by driving schools.

Employment opportunities: Azad Foundation, Even Cargo, Amazon India and Mahindra Logistics create employment opportunities for women in transportation and logistics. They provide training and job placement for roles such as chauffeurs, cab drivers and delivery riders.

Table 24: Selected organisations in India supporting the uptake of two-wheelers by women

Organisation	Nature of support	Key features
MOWO (Moving Women) – Telangana	• Two- and three-wheeler training; • Support to obtain licences.	• Fully women-managed training site with female instructors; • Programs are conducted with self-help groups and colleges • Vehicles are provided to those who do not have their own vehicle, with electric vehicles also being incorporated in training fleet; • Opportunities for graduates to undergo instructor training (112).
ANEW (Association for Non-Traditional Employment for Women) – Chennai	• Three- and four-wheeler training; • Support to obtain licences.	• Training is undertaken in partnership with licenced driving schools, with ANEW funding the journey to getting a licence (113).
Azad Foundation – Delhi, Chennai Jaipur, Kolkata,	• Two-wheeler and four-wheeler training;	• Women on Wheels Program targets young women aged 18-35 in slums and resettlement colonies;

Organisation	Nature of support	Key features
Ahmadabad, Bangalore and Indore	• Support to obtain licences; • Support to find employment as chauffeurs, cab drivers and with delivery companies.	• Azad Foundation provides driving, technical, self-empowerment and self-development training (114).
Initiatives by logistics and delivery companies		
Even Cargo – Delhi	• Two-wheeler training for resource-poor women; • Support to find employment with e-commerce companies for delivery jobs.	• Mobilisation of women from resource-poor communities with support for driving training.
Mahindra Logistics Limited (MLL)	• Two-wheeler training	• Women electric two-wheeler riders for last-mile deliveries; • Training is provided to women candidates for safe riding, last-mile delivery operations, and soft skills development (115).

Source: Key informant interviews, online newspapers and websites.

Findings from the surveys, focus group discussions and key informant interviews

Primary survey findings indicate that EV users rely on family, friends, showrooms and agents for different types of support (Figure 48 and Figure 49).

Respondents relied on family and friends for information on operational costs, range, available discounts or deals when purchasing electric two-wheelers. Some users (predominantly male) also conducted online research using websites such as Bike Dekho to understand the TCO and available financial products (116).

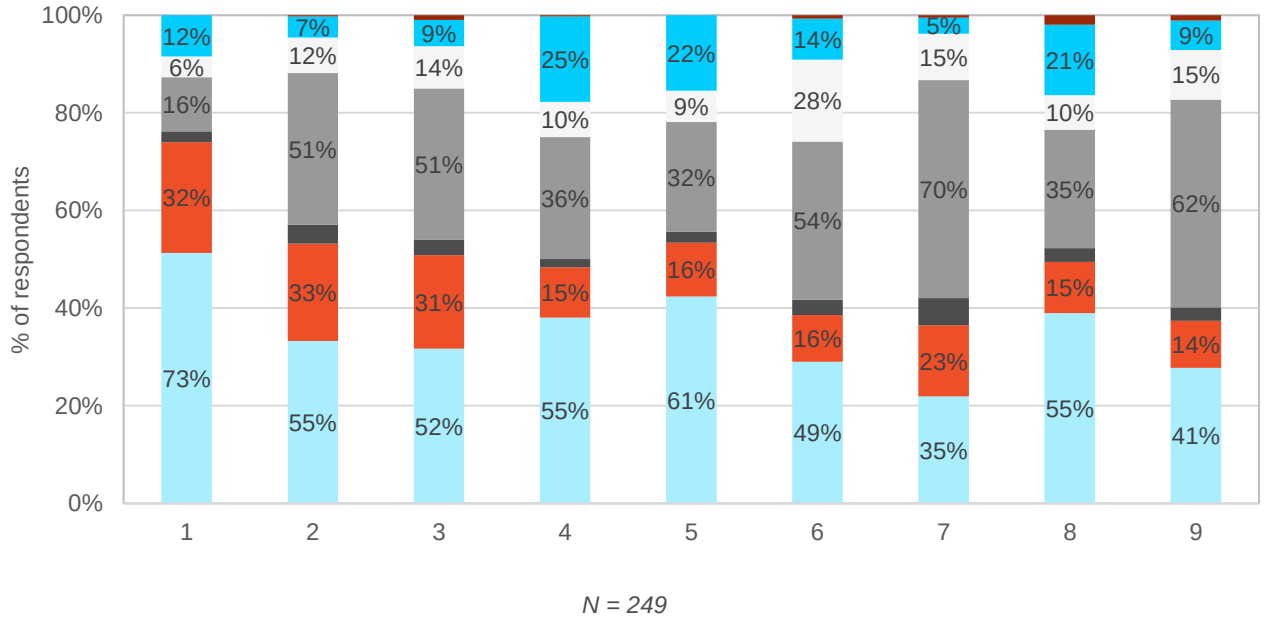
EV users in both the cities reported significant challenges with post-sales support.
This included a limited number of skilled electric two-wheeler technicians, extended vehicle service turnaround times due to a limited network of service centres, and the unavailability of spare parts. Recurring display issues such as frequent shutdowns and failure to restart required regular attention and maintenance. In Delhi, EV users have reported having limited information about the vehicle's functionalities with some users concerned about the vehicle shutting down midway in a trip.

> *"Six months have passed since I handed over my vehicle for servicing, yet I have not received it back. Despite notifying them via email of my intention to file a complaint with the consumer court, I have not received any response. Perhaps this lack of response is indicative of the service quality associated with lesser-known brands. Established brands prioritise service to maintain their reputation, whereas lesser-known brands may not. Despite sending nearly 60 emails, I have not received any acknowledgment or resolution."*
>
> - *A female personal EV user (Chennai)*

Women have lower level of awareness of the existing financial benefits such as upfront subsidies.
In Delhi, 59% of female respondents report awareness of the EV purchase subsidy, compared to 69% of male respondents. In Chennai, awareness levels drop, with only 33% of female respondents and 53% of male respondents aware of the subsidy. Awareness of the road tax waiver for EVs is comparatively low, with only about 40% of respondents aware of this benefit.

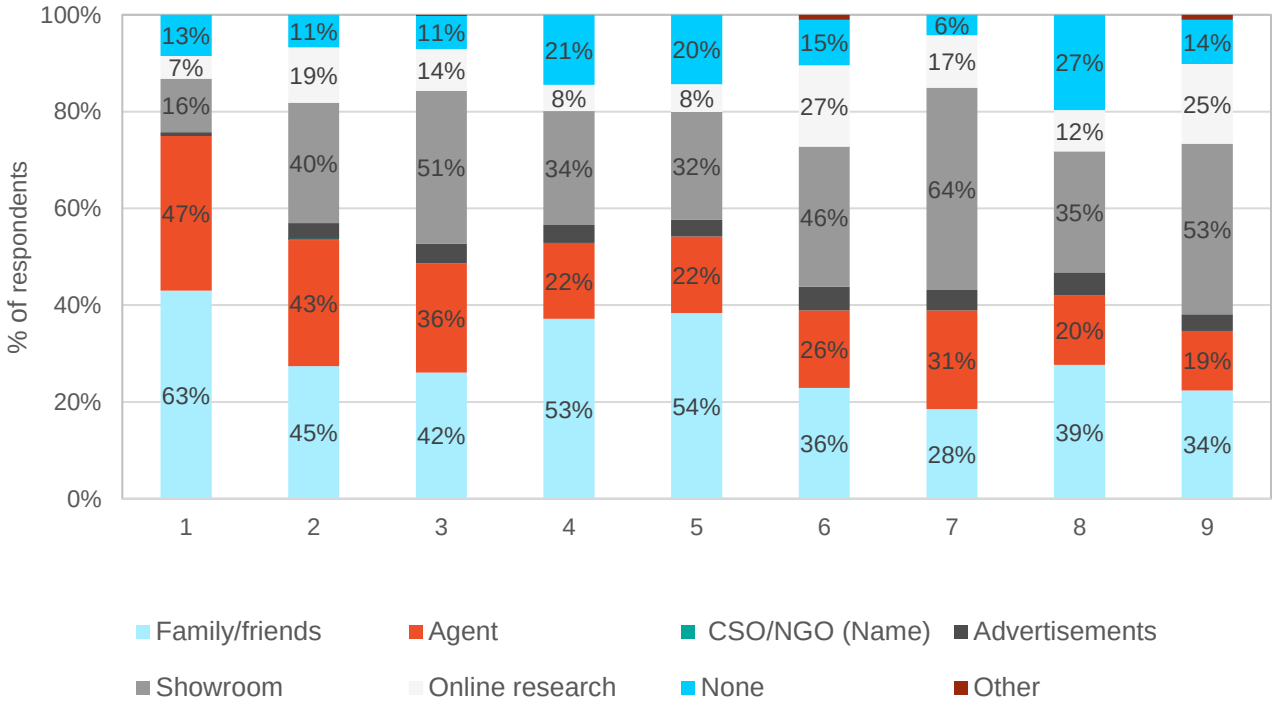
Users also reported discrepancies between the advertised vehicle range and the actual range with a general expectation that the actual mileage will be 20-25% lesser than claimed by the OEMs.

Figure 48: Type of support received by female 2W users



N = 249

Figure 49: Type of support received by male 2W users



N = 247

1	Support in obtaining driving licence	6	Information on charging infrastructure in the city
2	Information on TCO	7	Information on special deals or discounts on the purchase of E2Ws
3	Information on financial products	8	Convince household members on the model and type of the vehicle
4	Connect with other E2W/ ICE 2W users	9	Training on digital services
5	Connect with 2W users of the same gender		

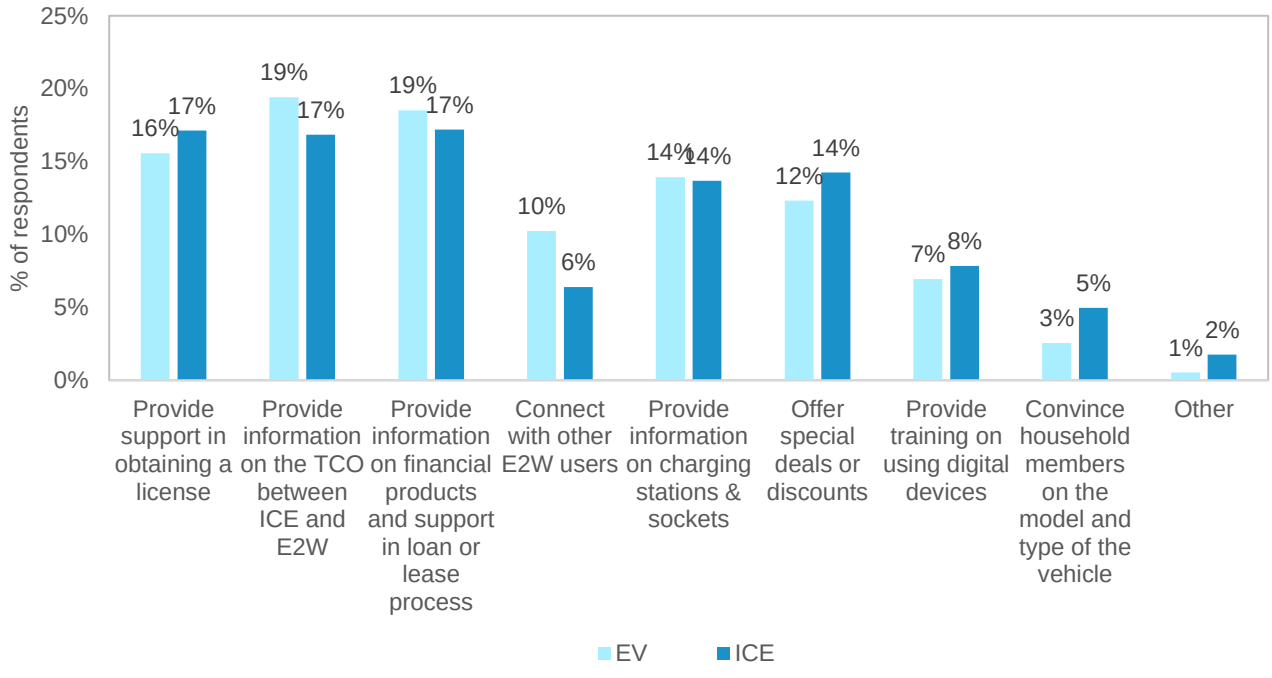
E2W users reported that peer learning and sharing may help them in addressing daily operational issues faced with E2Ws.
E2W users reported that post-purchase support and timely resolution of service issues to reduce turnaround times was important. They recommended that the video reviews of the E2Ws on social media platforms such as YouTube might help existing E2W user and ICE users. These reviews should provide detailed explanations about charging, range, battery life and day-to-day maintenance of EVs to assist existing and potential buyers in making informed decisions when choosing a two-wheeler brand. Comparably, more women reported requiring support in using digital devices related to EVs.

ICE vehicle users have expressed a need for additional support in convincing their household members about the merits of transitioning to electric vehicles.
User reported that TV advertisements primarily feature ICE two-wheelers, with very few promoting E2Ws. Increasing TV advertisements for E2Ws would raise awareness about them. These advertisements should highlight the benefits of E2Ws, such as cost-effectiveness compared to ICE vehicles, lightweight design and silent operation.

Women E2W users highlighted four key areas for support
These included access to information on TCO, financial products and processes, location of charging infrastructure, and assistance in obtaining a driving license (Figure 51). The support in obtaining a driving licence is prioritised by commercial users more than personal users (workers who have a fixed place of employment).

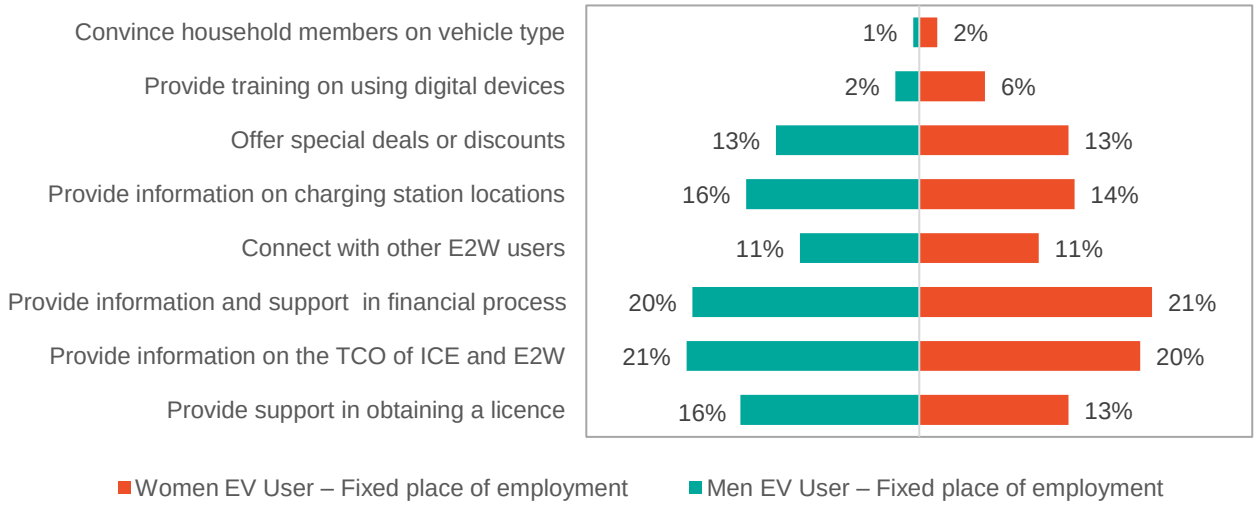
Women ICE commercial workers are more price sensitive than their male counterparts (Figure 52).
The availability of special deals and discounts emerged as a second highest priority for female ICE commercial workers.

Figure 50: Support required to increase uptake of EV



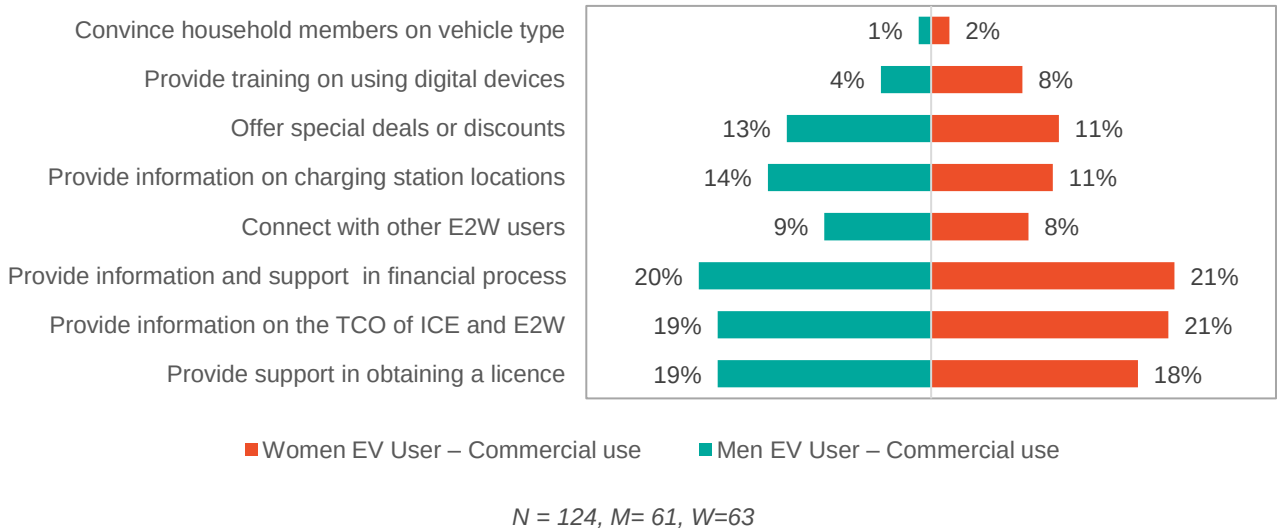
N = EV: 248; ICE: 248

Figure 51: Major areas where support Is required to Increase the uptake of electric two-wheelers - Personal E2W users



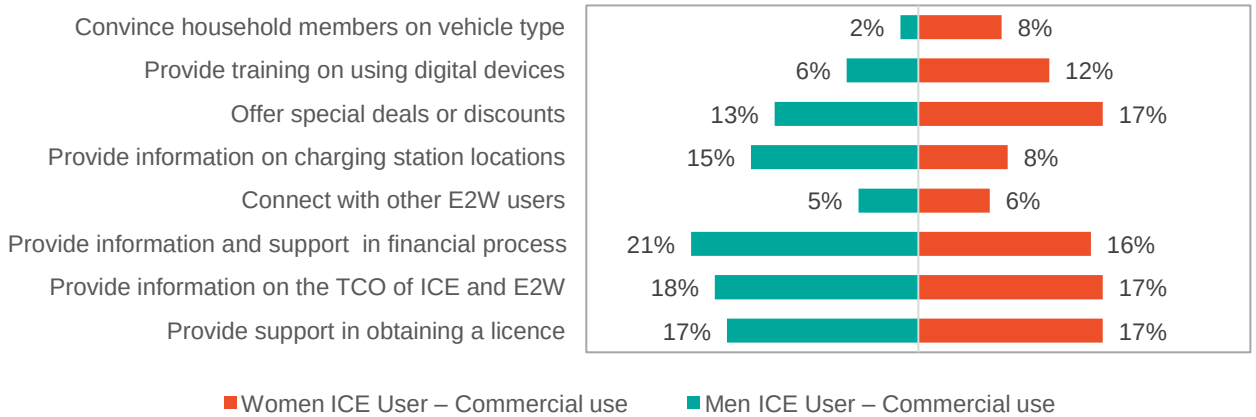
N = 124, M= 62, W=62

Figure 52: Major areas where support is required to Increase the uptake of electric two-wheelers - Commercial E2W users



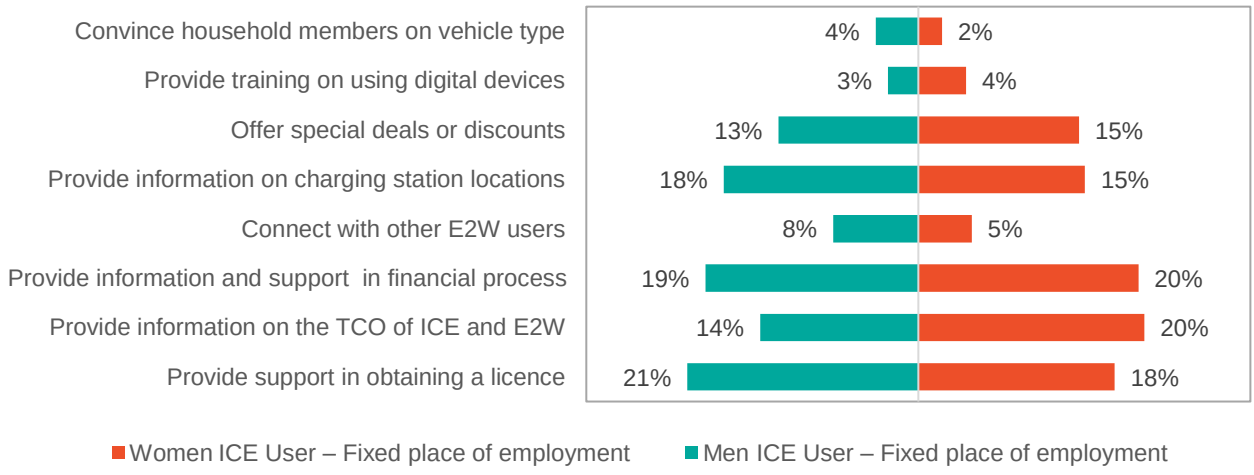
N = 124, M= 61, W=63

Figure 53: Major areas where support is required to Increase the uptake of electric two-wheelers - Commercial ICE users



N = 124, M= 62, W=62

Figure 54: Major areas where support is required to Increase the uptake of electric two-wheelers - Personal ICE users



N = 124, M= 62, W=62

4. Recommendations

This research identifies key challenges faced by women in the adoption and utilization of E2Ws, based on desk-based research, primary surveys, and engagement with stakeholders within the electric mobility ecosystem, including CPOs and OEMs in the metropolitan areas of Delhi and Chennai.

Driving training & licencing. In the context of obtaining driving training and securing a two-wheeler license, women face several obstacles. These include limited awareness of the online licensing process and restricted access to digital tools necessary for completing online learner's license tests. System vulnerabilities that allow for impersonation also pose significant challenges from a road safety perspective.

Design of E2W. Women exhibit a limited understanding of the advantages of E2Ws compared to ICE two-wheelers. They also express concerns regarding vehicle stability and skidding at higher speeds, insufficient knowledge of the integrated digital tools available in E2Ws, battery safety issues during monsoon seasons, long vehicle service times at OEM service centres, the absence of local mechanics, and limited availability of spare parts in local market.

Financing. Despite their participation in commercial activities, women face higher total ownership costs for E2Ws, largely due to usage patterns influenced by household and caregiving responsibilities. Access to financing remains a significant barrier, characterized by limited awareness of available financial products and processes, low CIBIL scores, the requirement for male co-signatories, and low levels of financial literacy.

Charging Infrastructure. While home charging is the primary method for two-wheelers, women often restrict their travel due to concerns about the perceived charging range of E2Ws. Furthermore, challenges associated with charging infrastructure—such as outdated information on charging points, unsafe locations, a limited number of fast charging options, and insufficient basic amenities during wait times—restricts women's access to charging infrastructure.

This chapter outlines the recommendations to address these four key challenges. The recommendations are categorized at two different levels—national and state—based on the existing policies and processes. They focus on reducing the financial burden on women, enhancing access to supportive infrastructure, and identifying strategies to navigate the socio-cultural factors that hinder their adoption of E2Ws.

This chapter is structured to first present national-level recommendations, followed by state-level recommendations. The state-level recommendations are broad-based, with contextual adaptations provided for implementation in the case cities of Chennai and Delhi. Recommendations pertaining to institutional support are not state specific and are illustrated on what institutional support could be provided to ease the process of uptake and usage of E2W for commercial purposes among women. Throughout the chapter, relevant case examples are highlighted in grey boxes to effectively illustrate key points and best practices.

Table 25: Summary of recommendations to increase uptake and usage of E2ws among women

	Recommendations	Responsible agencies
1	**National**	
1.1	Undertake research on the gendered differences in the uptake and usage of E2Ws in India.	Niti Aayog, Ministry of Heavy Industries
1.2	Create a road map for a gender-just transition to electric mobility, starting with electric-two wheelers.	Ministry of Heavy Industries
1.3	Develop and implement gender-sensitive guidelines for charging infrastructure.	Bureau of Energy Efficiency Ministry of Power. State nodal agencies and electricity regulatory commissions, public land-owning agencies

1.4	Track and publish annual data on registration of EV vehicles by gender	Ministry of Road Transport and Highways
2	**State and City-levels**	
2.1	Review and revise state EV policies to be gender-responsive • Include gender lens in the vision, objectives and targets. • Provide targeted purchase subsidies for women. • Improve quality of charging infrastructure by focusing on location accuracy, security, charging network and interoperability and amenities. • Include gender experts within state EV cells for policy formulation and implementation support.	State Nodal Agencies ***Tamil Nadu***: Guidance Department in the Industries, Investment Promotion and Commerce Department ***Delhi***: Transport Department
2.2	Provide institutional support to women commercial users • Provide driver training and support in the licensing process. • Increase awareness on the TCO of E2Ws and maintenance and improve financial literacy. • Facilitate access to formal credit at affordable rates and terms. • Provide post-sales support. • Provide a SOS button on the E2W, grievance and emergency support.	EV aggregators and platform companies in collaboration with OEMs, financing organisations, E2W leasing companies and women-oriented organisations
2.3	Strengthen the licensing process and promote awareness of the online application procedures for licensing • Pilot-test women priority services at select RTOs. • Increase awareness on the online process of license application, update the tutorials along with video proctoring.	State Transport Department

4.1 National-level recommendations

Our recommendations aim to generate evidence, share knowledge on the gendered differences in the uptake of electric two-wheelers, based on which a gender equitable road map for electric two-wheelers (and electric vehicles more broadly) can be formulated.

4.1.1 Conduct research on the gender differences and similarities in the ownership and use of E2Ws in India

This research has aimed to fill a gap in the gendered analysis of the use and purchase of E2Ws in two mega cities in India. It has created an analytical framework for a gendered analysis of state EV policies, assessment of charging infrastructure with targeted interventions to improve utilization and a gendered analysis of the TCO of an E2W. This framework will serve as a relevant resource and starting point for future research across small and medium-size cities in India to develop gender-responsive state EV policies and schemes to increase women's uptake of E2Ws.

Numerous studies have examined how vehicle specifications—such as speed, range, maintenance, reliability, and cost—affect consumer behaviour regarding the adoption of E2Ws (11), there is limited research on the gendered differences in the use and purchase of E2Ws at the pan-India level. This

Niti Aayog[39] can lead research to understand women's ownership[40] of E2Ws, the gendered regional differences impacting the uptake of E2Ws and how the ecosystem could address the barriers faced by women. This could be in partnership with the Ministry of Heavy Industries, Ministry of Power and Ministry of Road Transport and Highways. This could provide insights on how state EV policies could become

39 Public policy think tank of the Government of India.

40 Gender-disaggregated data on the ownership of vehicles is not reported on the Vahan dashboard.

gender-responsive, the necessity and quantum of women-focused national E2W purchase subsidies, schemes to improve women's access to credit for E2W, the quality of charging infrastructure and driving training as well as reforms in the licensing processes.

Our research has demonstrated and highlighted the gender differences in travel behaviour and the use of E2Ws, financial literacy and access to finance, perception and quality of charging infrastructure, and the need for institutional support (especially for female commercial workers).

Driving training and licensing processes are not specific to electric vehicles. Since women constitute only 14% of all driving licenses with less than 1% of professional driving licenses, targeted support will be required for driving training and licensing support.

4.1.2 Create a road map for a gender-just transition to electric mobility systems

In 2023, the Ministry of Heavy Industries (MHI) was identified as the nodal agency for formulating business rules related to electric mobility. It created a multistakeholder EV Taskforce to address different aspects of the transition to electric mobility (117). It is recommended that MHI convene a Working Group focused on a gender-just transition to electric vehicles with a focus on employment in the EV and EVSE value chain and increasing women's uptake of electric vehicles.

4.1.3 Develop and implement gender-sensitive guidelines for charging infrastructure

Through the course of this research, we created a framework and questionnaire for assessing the quality of charging points and guidelines to improve the user experience, with a focus on women. We submitted recommendations to the Ministry of Power as they were in the course of the revision of charging infrastructure guidelines. The Ministry of Power issued the final Guidelines for Installation and Operation of EV Charging Infrastructure (GIOEVCI)- 2024 on September 17, 2024 (118) . It includes recommendations provided by us in ***Functionality and User Experience checklist***[41] for CPOs and in Section 11 (4), which focuses on placement of charging stations. However, we have also identified additional areas of improvement based on our surveys and audits.

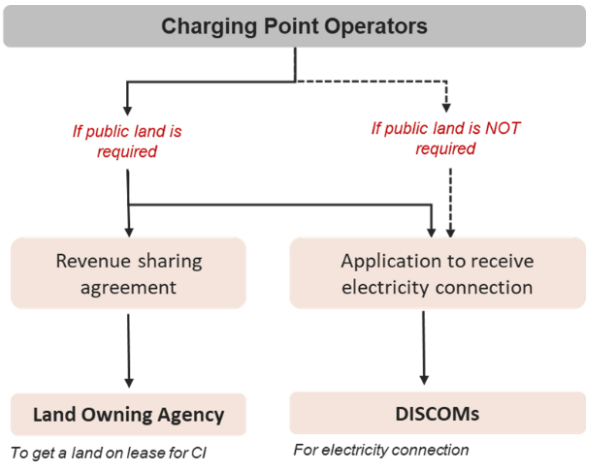
CPOs should self-certify that their proposed charging stations follow the safety, location, amenities, and network connectivity guidelines (Annexure 2) when applying for electricity connections.

According to BEE guidelines, setting up a charging point is de-licensed, provided the guidelines are adhered to. However, CPOs are required to obtain an electricity connection from the relevant DISCOM. We recommend that CPOs self-certify that their charging stations comply with safety, location, amenities, and network connectivity standards as outlined in the Annexure 1 and provide a site plan (scale of 1:500) and a layout plan on a scale of 1:50 with dimensions at the time of submitting their applications (Figure 55). The State Nodal Agencies will grant approval following an assessment of the layout plan based on the self-certified checklist provided.

The BEE guidelines also recommend that DISCOMs implement a single-window system for processing and approving electricity connection requests for CPOs. This step may be included as part of the online electricity connection application.

[41] The Urban Catalysts team submitted recommendations for CI guidelines during the public opinion phase, based on the project's initial findings. The ***Functionality and User Experience Checklist*** - **(Checklist B- Annex II)** includes the recommendations provided, along with the introduction of signage at petrol stations to indicate the availability of charging points (Section 11(4)) and placement of charging stations near entrances, exits, or elevators to optimize accessibility (Section 11(4)).

Figure 55: Approvals required before installation of a charging station



Source: (119)

State Nodal Agencies with support from Municipal Commissioners should conduct charging station audits based on the Charging Infrastructure Assessment Framework (Annexure 3), focusing on functionality and user experience.

The GIOEVCI guidelines mandate that state nodal agencies and Municipal Commissioners perform an annual assessment of EV charging demand to determine capacity requirements and optimize the placement of charging stations.

In conjunction with this assessment, audits of a sample of geographically distributed charging points/stations should be conducted based on the Charging Infrastructure Assessment Framework[42] to evaluate the quality of existing infrastructure. These audits will provide insights into the state of charging infrastructure, aiding in future planning and requirements.

CPOs should share the following data with the State Nodal Agencies on a monthly basis for each charging point- (i) Battery capacity of the EV charger; (ii) Gender-wise average hourly electricity consumption (kWh) by type of EV over a 24-hour cycle for weekdays and weekends.

The current BEE guidelines (GIOEVCI) require CPOs to report annual data on energy sold per EV charger. This data does not provide SNAs with insights into the utilisation of existing charging points or changes in electricity demand. Additionally, annual data reporting may provide delayed insights on usage trends, inaccuracies in demand forecasting, difficulties in resource allocation, missed maintenance needs, and challenges in making timely policy adjustments. More frequent data updates would enhance the ability to address these issues and improve overall infrastructure management.

4.1.4 Track and publish annual data on registration of EV vehicles by gender

There is no gender-disaggregated data on the registration of vehicles, both ICE and EV. The Vahan database offers information on the total number of registered vehicles categorized by fuel type at both the state and RTO levels. Access to gender-disaggregated data is essential for understanding vehicle-asset ownership rates among women and for implementing evidence-based measures to enhance the gender responsiveness of the EV ecosystem. Stockholm (Sweden) is one such example which collects and publishes gender-disaggregated vehicle registration data since 2010 (120) .

Therefore, Form 20- filled at the time of vehicle registration[43], should be updated to collect gender information of vehicle owners. Since Form 20 is standardized across all states in India, the Ministry of Road

42 The Charging Infrastructure Assessment Framework was developed by The Urban Catalysts team to conduct charging infrastructure audits as part of this study.

43 The vehicle registration process, including the completion of Form 20, is typically handled by the dealer.

Transport and Highways will have to update the form. The state transport department is responsible to ensure that Regional Transport Offices (RTOs) adopt the updated form. The gender-disaggregated data should be collected at the time of registration for the following types of vehicles, as specified by MoRTH:

Table 26: Type of motor vehicles as per MoRTH

Non-Transport Vehicles	Transport Vehicles
Motor cycle with or without side car for personal use	Motor cycle use for hire
Moped and motorized cycle	3-wheelers Public/ Private Service Vehicle
Motor Car	Public Service Vehicles

Source: (121)

4.2 State and City-level recommendations

The state level recommendations are focused on how the state EV policies can become gender-responsive.

4.2.1 Review and revise state EV policies to be gender-responsive

The Delhi EV Policy was formulated in August 2020 and got extended till March 2025 (122). The Delhi Transport Department, which is the nodal agency for the EV policy, is in the process of revising it. The Tamil Nadu Department of Industries revised its EV policy in 2023, with Guidance- EV taskforce designated as the nodal agency for implementation (123).

Our gendered analysis of the state EV policies of Delhi and Tamil Nadu indicates that these policies have not included gendered considerations in their objectives, goals, targets and provisions[44]. They are largely gender blind (Table 16). As these policies play a crucial role in establishing the EV ecosystem, it is essential for them to become gender-responsive. The following recommendations outline potential revisions for these EV policies:

Develop gender-responsive vision, goals and set targets for adoption of E2Ws amongst women in state EV policies

The analysis of Delhi and Tamil Nadu EV policies indicate that both policies did not account the differential risks, vulnerabilities, and barriers women face in electric mobility systems as users, service providers (such as drivers, mechanics, etc.), and decision-makers, including the socio-cultural and economic realities and power relations that exist.

Box 1: Illustrations of gender-responsive vision and goals

In 2021, the Delhi government reserved 33% of electric auto permits for women, demonstrating a gender-sensitive approach by setting specific targets for women (124). This enables better monitoring and tracking of progress. However, the policy should further explore the challenges women face, including technology-related risks that restrict their access. For instance, women have reported barriers such as difficulties with the documentation process and high interest rates, which have hindered the uptake of e-autos. As a result, only 14 out of 743 applicants have registered their electric autos (125).

The Tamil Nadu EV policy aims to position the state as an EV manufacturing hub and create approximately 1.5 lakh jobs. While there is no direct data available to assess women's inclusion in the EV ecosystem, existing data can be utilized to inform policy and establish gender-responsive targets. The Annual Industries Survey 2018-19, reports that 40% of the total workforce directly employed in manufacturing in Tamil Nadu are women (85). This data can guide efforts to ensure a gender-responsive vision for the policy.

[44] Though the TN EV Policy included a higher provision for skills training for women.

The existing EV policy provides an additional subsidy of INR 2,000 per female worker per month for 6 months to industries to skill and train women. Currently, there are no targets or baseline on the adoption rate of EVs, availability and quality (safe and accessible) of charging infrastructure. The EV Policy could be revised to include segregated targets based on vehicle types[45], incorporating specific targets of uptake of EVs among women.

Existing vision of Tamil Nadu EV policy:
The Government of Tamil Nadu has a vision of attracting Rs. 50,000 crores worth of investments in EV manufacturing, creation of 1.5 lakh new jobs during the policy period.

Indicative example of gender-responsive vision:
"The Government of Tamil Nadu seeks to attract ₹50,000 crore worth of investments in EV manufacturing and create 1.5 lakhs new jobs during the policy period, with at least 40%[46] women in these jobs."

Provide an additional purchase subsidy to women for electric two-wheelers

The purchase subsidies are aimed at providing a parity in the acquisition costs for electric two-wheelers amongst men and women. In Delhi, the **TCO[47] for E2Ws is 29% to 58% higher for women** as compared to men, largely due to differences in vehicle utilization. Men travel 1.3 to 1.7 times more than their female counterparts, depending on whether the use is commercial[48] or personal[49] purposes (Table 34). The difference in per kilometre costs becomes significant as compared to the acquisition cost of the E2W when considered on annual and life time basis (Annex Table 35).

Similarly, due to the distance travelled the TCO of E2Ws is 58% to 71% higher for women in Tamil Nadu (Chennai) as compared to men. The gendered difference in the distance travelled indicated that men travel 1.6-1.7 times of women in Chennai and other cities across Tamil Nadu[50].

Our analysis reveals that with an additional purchase subsidy for women in Delhi and Tamil Nadu (with a focus on Chennai), the TCO reduces by 15% to 39% (Refer to Annexure 4). This, along with institutional support in driving training and licensing processes, financing and charging infrastructure could result in higher use of E2Ws.

Box 2: Case examples of financing options adopted by states

Amma Two-Wheeler Scheme for Working Women- Tamil Nadu
Tamil Nadu's Department of Social Welfare and Women Empowerment implemented the ***"****Amma Two-Wheeler Scheme for Working Women"* in 2018 to support 100,000 women in purchasing two-wheelers[51] by offering a 50% subsidy, up to INR 25,000. To be eligible, applicants must be residents of Tamil Nadu, aged 18 to 40, possess a valid two-wheeler driving licence or learner's permit, have an annual income not exceeding INR 2.5 lakhs, and have completed at least the 8th grade (126).

This scheme was designed to support working women in their commute to the workplace. The subsidy was provided to beneficiaries after the purchase of the vehicle, upon submission of required documentation, including a valid driving license, proof of employment issued by the employer, the vehicle invoice, or loan

45 The EV adoption rate in Tamil Nadu in March 2023: E2Ws- 9.0% (EV Ready India Dashboard).
46 As per the Annual Industries Survey 2018-2019, a 40% of total workers directly employed in manufacturing in Tamil Nadu are women (85).
47 TCO is calculated over a 10-year ownership period and includes the cost of battery replacement. Additionally, it factors in the Delhi state subsidy of INR 5,000 per kWh and an INR 10,000 subsidy for Electric Mobility Promotion Scheme 2024.
48 Users who are involved in commercial activities, requiring multiple daily trips, are either registered on delivery platforms or employed by organizations for parcel and order distribution.
49 Users who use their E2W to commute to a fixed employment location without the need for multiple daily trips.
50 The data from the Census of India (2011) on travel to the workplace was used and extrapolated for 2024. The findings indicate similar results for urban areas in Tamil Nadu. Men travel approximately 1.6 times more than women to their fixed places of employment, as observed in Chennai.
51 Maximum engine capacity of 125cc.

details if financed. Women employed in informal sectors, such as those working in shops or establishments, NGOs, banking correspondents, and ASHA workers, were also eligible for this scheme (126).

Mission Shakti Scooter Yojna- Odisha
In 2023, the Government of Odisha launched the "*Mission Shakti Scooter Yojna*" for a duration of one year. The scheme, implemented by the Department of Mission Shakti, offers an interest-free loan of up to INR 1 lakh to women working as Mission Shakti Federation Leaders[52] and Community Support Staff (123).

To eliminate financial barriers, the scheme allows women to access loans without a down payment for the total amount of the two-wheelers at a zero interest rate for a duration of four years. All banks that have previously collaborated with the Odisha government on other Mission Shakti financial schemes are eligible to participate. These banks will receive the interest portion of the loan from the state government upon submission of the required documentation.

To further assist women in accessing loans, the government has established implementation modalities that include handholding support for eligible beneficiaries in the loan application documentation process. Additionally, the scheme aims to conduct orientation programs for beneficiaries, bankers, and other stakeholders to disseminate information about the scheme.

Provide a training-to-job subsidy for women EV technicians in private empanelled skilling institutes

The primary survey with users underlined the need for local mechanics for EV repairs and maintenance (Section 3.3.9). Courses for EV technicians offered by private institutes[53] in Delhi have a duration of 1 to 2 months and have a training fee of INR 20,000 and 25,000 per participant. The curriculum covers key topics such as the fundamentals of electric vehicle systems, servicing and maintenance of E2Ws and E3Ws, including fault diagnosis and troubleshooting, battery management systems, EV wiring, lithium-ion battery testing, battery fitting, and replacement procedures. Typically, these short-term courses do not offer placement guarantee but instead provide information on job vacancies. Based on secondary information, few women typically participate in these courses and these institutions do not specifically target women as students for this program. The proposed subsidy[54] aims to encourage skilling institutes to forge partnerships with OEMs to offer learning to earning courses for EV technicians and attract women to these roles.

Box 3: Case examples of skilling for the EV value chain

Government initiative- Tamil Nadu
Under its EV policy, Tamil Nadu offers an upskilling allowance to automotive manufacturing companies transitioning from ICE to EV production, aimed at engaging their existing workforce in EV manufacturing. The policy provides transition support in the form of a training subsidy of ₹4,000 per worker per month for six months. For women, transgender employees, individuals with benchmarked disabilities, and persons from SC/ST communities, the training subsidy increases to ₹6,000 per worker per month for the same duration.

Private Initiatives- Don Bosco Training Centre, Pune
Don Bosco Training Centre collaborated with Schaeffler India through its CSR initiative to provide a 6-month EVs- including 2Ws, 3Ws and 4Ws- maintenance course for 180 underprivileged individuals (of aged 18-24) in Pune, Maharashtra (127). The National Skill Development Corporation accredit the program. Female students receive free training, uniforms, and essential accessories.

Private Initiatives- Tata Indian Institute of Skills, Ahmedabad

[52] A Federation is a network of SHGs consisting of representatives from different geographical setting & levels- block & district levels. Its functions include providing support through need-based products and services, facilitating training and capacity building, conducting regular evaluations of SHG activities, and engaging in lobbying and advocacy (148). All SHGs are required to register or affiliate with a local federation in accordance with the Society Registration Act, 1860.

[53] DG Institute of E-Mobility (accredited by Automotive Skill Development Council), Care Skill Academy

[54] The amount of which would need to be finalized.

Tata Indian Institute of Skills (TIIS) has partnered with Ather Energy to provide a course for E2Ws technicians (128). Under this collaboration, Ather Energy will develop detailed training modules focused on technical areas, including battery systems, electric motors, power electronics, charging infrastructure, and vehicle safety protocols. The curriculum will incorporate practical training on EV maintenance, repair, diagnostics, and include soft skills development in communication, teamwork, and problem-solving.

As part of the initiative, Ather Energy will provide vehicles, motors, batteries, and other key hardware to EV laboratories at Tata IIS facilities. Furthermore, Ather Energy will conduct training sessions for Tata IIS instructors at its own manufacturing plants and R&D centres.

Include E2Ws technician courses in Industrial Training Institutes (ITIs) and collaborate with OEMs for placement support

There are 20 government ITIs in Delhi (129). The courses offered at ITIs have a duration of 1-2 years, a comparatively lower fee structure than private institutions; and female students are required to pay only half of the admission fee, with no subsequent fees charged thereafter (130). However, ITIs do not offer courses[55] for E2W technicians. It is recommended that such a course be introduced by the Directorate of Training and Technical Education (DTTE) in collaboration with OEMs. The DTTE can further explore existing industrial collaborations (131) with companies like Hero MotoCorp Ltd. and TVS Motors Ltd. which have previously supported ITIs in Delhi by facilitating training programs in two-wheeler trades.

In Chennai, two ITIs—Guindy and North Chennai ITIs—offer a two-year course on EV mechanics (132). This course includes both practical and theoretical classes, along with a mandatory 150 days of on-the-job training. The curriculum covers key areas such as the tools required for EV maintenance, vehicle specifications, components of EVs and ICE vehicles, electronic systems, diagnosis, repair, and performance evaluation of EVs. It also focuses on troubleshooting electrical components, understanding battery pack components and monitoring, as well as testing and troubleshooting accessory and auxiliary components, including those for E2Ws, E3Ws, and E4Ws.The course fee information is not available online.

Ensure CPOs self-certify that their charging stations comply with safety, location, amenities, and network connectivity standards provided by BEE at the time of obtaining an electricity connection (for stations on private land) or as part of the revenue-sharing agreement with the land-owning agency.

The Transport Department in Delhi and Guidance in Tamil Nadu- as nodal agencies- should ensure the implementation of the self-certification process in coordination with DISCOMs and land-owning agencies. These include the urban local bodies, metro-rail agencies, universities in both the cities.

Include gender experts in the state EV cell

The role of the gender experts (with expertise in mobility, finance and community engagement) will be to support the state nodal agencies such as Transport Department in Delhi and the EV Task Force within Guidance in Tamil Nadu in increasing women's uptake of EV in the state, and increase women's employment in the EV value chain.

4.3 Institutional support for commercial workers by EV industry

Institutional support is a central component among the five entry points to increase the adoption and usage of E2Ws by women. Several challenges and gaps have been identified based on gender-disaggregated primary surveys conducted with E2W users, as well as women-oriented organizations. The existing institutional support framework is structured into two stages focusing on women commercial workers: (i) mobilization, driving training, and licensing; and (ii) asset ownership.

55 List of all the courses provided by ITIs in Delhi.

Mobilization, Driving Training, and Licensing: Organizations report difficulties in mobilizing and onboarding women as delivery partners due to a number of reasons. These include households' concerns around women's mobility and the perception of delivery work. There are high dropout rates during or after training, primarily due to limited family support. Additionally, the shortage of female driving instructors is a barrier, as some women are reluctant to train with male two-wheeler instructors. There is also a lack of clear information regarding the online licensing process, including the required documentation, and limited access to computers and/or internet for completing online applications.

Asset Ownership: This stage includes making informed decisions regarding an appropriate E2W and access to credit. Surveys indicate that women require support in several areas: understanding the available E2W models and their functionalities, the TCO difference between ICE and E2Ws, and the availability of financing options, financial products and processes. Women face challenges in accessing credit due to limited financial literacy, zero or low credit scores, requirement of male co-signatories, and extended loan approval times. Additionally, women may be hesitant to engage with male business correspondents, which limits their access to necessary banking information. In 2022, there were less than 10% female business correspondents in India (133).

Female and male E2W users highlighted the need for post-sales support, including the availability of spare parts, access to local mechanics, and timely resolution of technical issues to minimize vehicle downtime. They also expressed the need to connect with others to share experiences and learn from each other.

4.3.1 Proposed recommendations for institutional support

Institutional support to women is provided by women-oriented organizations and platform companies for employment such as cab drivers, delivery personnel and in wellness and beauty services.

Mobilization, Driving Training and Licensing

Gender-responsive mobilization strategies can be used to enrol women in driving training and the potential use of E2Ws. These strategies include deploying female mobilizers for outreach, communication and serve as a point of contact for women and their household members. They can provide information on the benefits of participating as platform partners, asset ownership, available support services and existing grievance redress mechanisms.

Women's membership-based organizations may serve as a channel to seek out potential participants. Male commercial workers can be encouraged to refer their female relatives, friends and family members. Women commercial workers can be celebrated as Sheroes and community champions. Simultaneously, their household members need to be recognized and felicitated as allies and supporters.

New participants can be twinned with experienced women workers in the initial period. A network could be created with regular community meetings between Sheroes, women and their household members to share experiences. This will enable peer learning and create role models who exemplify success (especially in non-traditional livelihoods). Engaging household members can also facilitate discussions around the benefits of E2Ws and the importance of women's economic empowerment.

Driving training

Currently, organizations engaged in providing driving training to women include the following: driving 2Ws[56], self-defence, soft skills along with any additional training required for employment such as digital literacy to use online platforms and for online transactions. Furthermore, some organizations emphasize gender rights[57] and legal rights, and English language proficiency. The driving training could also include E2Ws, understand and operating their digital tools[58], information on various financing options with their respective pros and cons, and repair and maintenance of E2Ws.

56 In some cases, an E2W in partnership with an OEM.
57 Gender roles, rights and empower women to assert their positions within the household and advocate for themselves.
58 Even Cargo trains women on E2Ws.

License for 2Ws

The primary surveys with women two-wheeler drivers and key informant interviews with supporting organizations revealed several challenges in obtaining a driver's license. These include understanding the required documents, accessing RTOs, and navigating the RTO processes. However, all surveyed respondents had obtained their licenses 6-9 years prior. The application process for driving licenses has transitioned online in all states in India since 2023 (97), but primary survey indicates a lack of information regarding this change amongst the participants, including women.

Women with lower education and limited access to devices such as smartphones or laptops may require support in accessing the online portal and completing the online test for the learner's license. According to the National Family Health Survey 2019-21, only 33% of women[59] in India have ever used internet as compared to 51% of men.

Women require support on multiple fronts, including assistance with applying for a licence, passing the online learner's licence test, and accessing E2Ws for the driving test. Furthermore, women from resource-constrained backgrounds may require targeted assistance to navigate the digital application processes effectively.

Box 4: Institutional support provided in E2W and E3W driving training and licenses for women

Even Cargo

Even Cargo, established in 2016, is a social enterprise that employs resource-poor women as last-mile logistics personnel. Even Cargo collaborates with organisations who mobilise and train women in 2-wheeler driving and OEMs to provide rental 2-wheelers for women who do not own their own vehicles.

To address high drop-out rates among women, Even Cargo is trying to build a community among women working with their logistics platform by organizing regular meetings, professional development sessions, and seminars on stress management and work-life balance (134). These initiatives aim to improve retention rates among participants. Even Cargo also provides a minimum wage to delivery personnel for the first two months to support them during the initial days of their work as logistics delivery personnel (135). Even Cargo places newly trained women with their existing workforce during the initial period to provide on-the-job training and help them build confidence (135).

A pilot test for Empowering Women and Enhancing their Business through E-Mobility (EWEE) scheme- SIDBI

Before implementing the EWEE[60] scheme, SIDBI conducted a pilot study with rural women of Rajasthan and Gujarat**.** For this pilot, the existing pool of women affiliated with SEWA was targeted. The participants were women who owned ICE 2Ws, travelled long distances (200-350 km per week), and spent 20-40% of their family income to fuel and maintenance costs (136). The objective was to reduce these expenses by transitioning to E2Ws. The pilot was a collaborative effort involving various stakeholders, including the National Resources Défense Council, SIDBI, OEMs, and NBFCs. As part of the pilot, women were given an extended demo of E2Ws for 6-7 months, allowing them to make an informed decision about purchasing an E2W. They were also provided with loans at affordable rates, reducing the acquisition cost of an E2W by 6%.

Namma Yatri- Bengaluru

Namma Yatri, an auto service aggregator, launched the Mahila Shakti program in collaboration with the Bengaluru City Police and the Dr. B R Ambedkar Health and Education Foundation (BRAHEF) to onboard 1,000 female auto drivers (137). The initiative seeks to promote economic independence for women aged 25-45 by providing opportunities for higher income and flexible working hours. The program offers one year of free training covering practical driving, traffic laws, safety, vehicle maintenance, smartphone usage, and customer service skills. BRAHEF assists participants in obtaining a learner's license. To facilitate access to vehicles, Namma Yatri provides electric autos on a daily rental basis and supports vehicle ownership

59 Delhi: 64% (W), 85%(M); Tamil Nadu: 47% (W), 70% (M).

60 In 2024, SIDBI launched the EWEE scheme with the aim of increasing EV adoption in rural areas and improving women's access to finance. The scheme provides a blended finance facility, supported by NBFCs, to help women transition to EVs and reduce operational costs.

through low-interest financing options. Currently, around 100 female electric auto drivers are onboarded on the Namma Yatri platform and are actively working in the city (138).

Asset Ownership

In the context of asset ownership, the institutional support required includes: (i) providing information to female users on available E2Ws and their functionalities; (ii) detailed information on various financial products, including eligibility criteria, required documentation and the process; and (iii) assisting users throughout the loan or lease application process. The key recommendation to provide support to women are outlined below.

Provide targeted information to female users on E2Ws and their functionalities

OEMs should create targeted campaigns that address the specific concerns of female users. These include the weight of the E2W, the ease of parking, seat width, storage capacity and how their digital tools ease the process of navigation in plains, driving on hilly terrain and slopes. The information on the number of charging points or battery swapping stations, interoperability and availability on a travel navigation application may address range anxiety. Finally, clearly outlining a responsive grievance redress mechanism may be beneficial and ease concerns around emergency situations. This will enable women to make informed decisions regarding E2W ownership and use.

Gender-inclusive advertising can include marketing campaigns that highlight women riders and emphasize key benefits of E2Ws for women, such as ease of use, safety, and environmental impact. Hero MotoCorp's "Ab Jaana Ho Jahan" campaign highlights its SOS button[61]. Further, OEMs can collaborate with women-oriented organizations to raise awareness about E2Ws. These partnerships can help build trust and encourage more women to explore E2W options. Additionally, facilitated women-only E2W user groups can create a safe environment to share experiences and serve as valuable networks for peer learning and support. Finally, programs that offer higher incentives (either in money or service) to existing users to refer E2Ws to women can be explored.

Increase women's financial literacy on credit access for purchasing electric two-wheelers

The primary survey and key informant interviews highlight a significant gap in women's financial literacy, particularly in areas such as credit assessment, customized financial products, loan and lease schemes, required documentation, and repayment terms. This knowledge gap limits their ability to make financial decisions regarding the purchase of an asset.

This information could be disseminated by bank business correspondents at E2W showrooms. Additionally, banks could deploy female representatives at the showrooms/retail shops of OEMs who are trained to understand and address the unique needs of women consumers.

Create women oriented financial products and support women throughout the loan application process

The primary lenders for E2Ws in India are NBFCs, which have funded approximately 64% of the E2W market, in contrast to the 30% provided by private commercial banks (139). Commercial banks primarily focus on lending to salaried borrowers, perceiving them as lower risk compared to gig workers. This distinction was highlighted by respondents in the primary survey as well, who noted the challenges they face as gig workers in securing financing.

Women receive credit for only 27% of the deposits they make, compared to 52% for men (133). Generally, the down payment required for E2Ws is higher (25%) than ICE two-wheelers (10%) (139). However, primary surveys conducted with E2W users in Delhi and Chennai reveal that women are making higher down payments (LTV: 32%) as compared to men (LTV: 26%).

Co-applicants are requested and higher interest rates are charged when applicants have a zero or low CIBIL score. These can be reviewed if a woman has a letter of employment or engagement and the E2W can serve as a collateral. Financial institutions could consider recruiting more female business correspondents to provide essential information and support throughout the process.

[61] It does not provide information on the support process.

Box 5: Institutional support in increasing access to credit for purchasing E2W amongst women

Mufin[62]

Mufin, a NBFC providing loans for E2Ws and E3Ws since 2016, currently has around 12% female borrowers. In an effort to promote financial inclusivity and expand the number of women borrowers in its portfolio, Mufin has developed a tailored financial product specifically for women seeking to finance E2Ws for commercial purposes.

In collaboration with NGO, Mufin identifies women interested in utilising E2Ws for commercial activities, such as delivery services for companies like Netmeds and Apollo. The NGO provides support to women by providing driving training and assisting in the licensing process. Mufin extends loans at a reduced interest rate of 9.9%, compared to its standard electric vehicle loan rates of 14-18%. Additional advantages include a waiver of processing fees, and borrowers without a CIBIL score also get a loan.

The loan approval process takes 1-2 days, with repayment terms ranging from 18 to 24 months. The vehicle itself serves as collateral, and it is required that either the borrower or the guarantor owns a home. The income-to-obligation[63] ratio is generally not assessed, as the vehicle is considered an income-generating asset.

Post-sales support

Post-sales support is a major area of improvement. Respondents mentioned waiting for 2-3 days to submit their vehicles for service with turnaround times ranging from 3 to 6 months. There is a shortage of skilled EV technicians for the repair and maintenance of E2Ws.

To further support users during the early months of ownership, OEMs should offer pickup services for E2Ws that fail to start due to battery drainage or any other issues. Although such services are typically chargeable, OEMs should consider offering them at a nominal fee to improve customer experience.

OEMs can also think of creating an Interactive Voice Response (IVR) system to assist users during vehicle breakdowns, offering guidance on resolving common issues. The IVR could provide troubleshooting guidance for common issues and offer escalation options for on-site repairs, towing, or battery replacement services when necessary. These services may be offered on a chargeable basis, depending on the nature of the issue and the customer's location.

Several E2W brands have incorporated SOS buttons into their mobile applications. However, integrating an SOS button directly on the E2W can enhance user safety. Some E2W models already include this feature in the vehicle itself, allowing users to send a pre-programmed SOS message to designated emergency contacts with a single press. This eliminates the need for users to download an additional application for emergency situations, streamlining the response process and ensuring quicker access to help when needed. The SOS button could be configured to send the vehicle's location to the OEM or aggregator with the option of including the user's emergency contacts to ensure prompt assistance in case of an emergency.

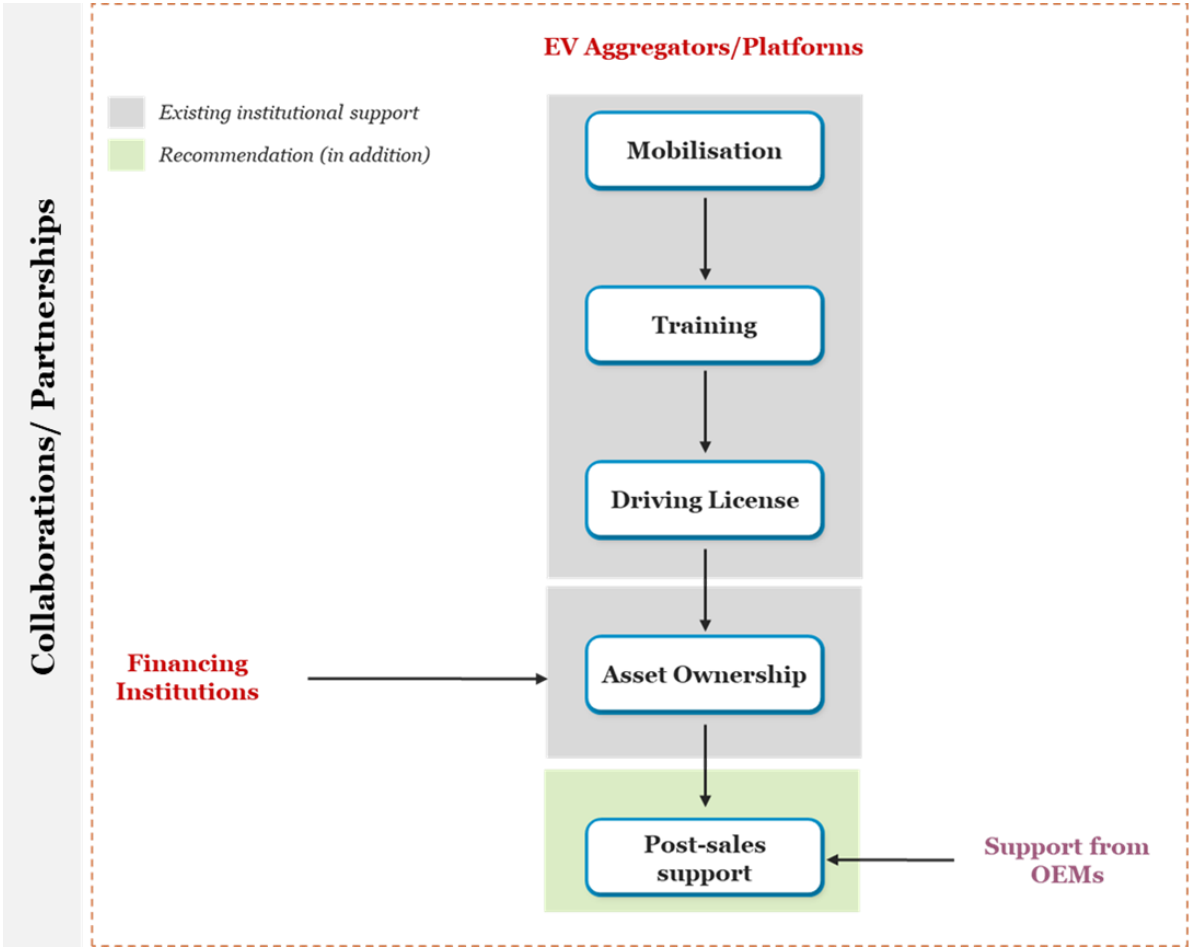
62 This information is obtained during the Key Informant Interview with the Mufin officials.

63 The income-to-obligation ratio is a metric used by lenders to assess a borrower's loan repayment capacity by comparing their income to fixed financial obligations. This ratio helps assess the borrower's financial capacity and risk level before approving a loan.

Figure 56: SOS button in the Hero Vida V1 E2W

Source: (140) (141)

Figure 57: Summary of proposed institutional support framework



Recommendations

Adopt gender-responsive approaches to mobilise women to use E2Ws for commercial use		
Trained female mobilisers		Community Champions
Driving an E2W	Traffic rules & signages	Vehicle digital tools/ Digital literacy
Repair & maintenance of an E2W		Women empowerment training
Support in online application process & test for LL		Facilitate access to an EV for driving test & travel to the RTO
Awareness on types of E2Ws & their functionality		Awareness on available financing options & eligibility criteria
Female business correspondents at banks/financial institutions		Financial products tailed to women's need & support in the processes to access finance
Improved post-sales service for repairs and maintenance		Assistance during emergency situations

Source: The Urban Catalysts

4.4 Strengthen the driving licensing process

Our primary surveys in Chennai and Delhi revealed that applicants paid 2.7 times the standard fee (Figure 16) to obtain a license via driving schools or agents. The process for obtaining a license was perceived to be a major barrier. Our recommendations aim to address multiple broken links in the process of obtaining a two-wheeler license.

Raise awareness on the online process of obtaining a licence

An online application process to apply for a driving licence has been created in multiple Indian states, including Delhi and Tamil Nadu. Applicants can submit the relevant documents, take the learner's test, and book a slot for the practical test through the online portal. However, there was limited awareness amongst our respondents on this process.

The Transport Departments in Tamil Nadu and Delhi could launch an awareness campaign through multimedia channels and targeted outreach in colleges through partnerships with industry such as platform aggregators, delivery companies, the Federation of Automobile Dealers Association and SIAM. The messages include step-by-step instructions on required documents, copies, expected time frames for obtaining and renewing a two-wheeler license and any measure to ease the process. These can be uploaded on the RTO website, at the offices and shared through community channels such as YouTube, as advertisements on television and at movie theatres.

Implement an automated video proctoring[64] during the online learner's license test

When applying for a learner's license, a photo verification is conducted prior to the online test to confirm the individual's identity. However, there is no video monitoring during the test, which could create opportunities for others to take the test on the applicant's behalf. Implementing video proctoring would enable real-time monitoring of applicants and reduce the instances of impersonation. This measure is also important for road safety, as two-wheelers were involved in 40% of vehicle collision accidents in Delhi and 62% in Tamil Nadu in 2022 (142).

Update the tutorial for learner's license

The current tutorial video for the learner's license in Delhi lacks information on road signage and traffic rules. It should be modified to include information on road crash deaths and their impact on households, traffic rules and signage in English and local languages. A prompt can be provided for learners to confirm having watched the video before taking the learner's license test.

Provide option to apply for and take the learner's licence test at the RTO

As per the National Family Health Survey 2019-21, only 19% of urban and 4% of rural households owned a computer. Selected RTOs in cities can provide computer systems and time slots at the office where an individual may apply for the learner's license and/ or take the online learner's licence test for a nominal fee.

Pilot-test women priority services

Women priority services maybe pilot tested to ease the process of obtaining licenses by women and to encourage them to handle the process (rather than their male family members, friends or relatives). This may include but is not limited to having a resource list of (legitimate driving schools with) female two-wheeler driving instructors, waiving the two-wheeler license fee for women and introducing women priority services. This includes addressing queries by women and men alternatively, irrespective of where a woman is in the queue, priority time slots for women to take the online learner's test at the RTO and the physical driving test.

64 Video proctoring is a use of technology to monitor and supervise online exams. It involves using cameras and software to record and analyse a test-takers' behaviour during an exam.

5. Conclusion

The government of India aims to transition 30% of its vehicles to electric vehicles by 2030. This research has created a framework through which the gendered barriers to E2Ws and EVs more broadly can be understood. This can be adopted by Niti Aayog along with Ministry of Heavy Industries, Ministry of Power and the Ministry of Road Transport and Highways to formulate a road map for a gender-equitable transition. Simultaneously, the data gap in the registration of vehicles needs to be addressed by including gender-disaggregated data during vehicle registration. At the state level, EV policies can provide the impetus through purchase subsidies, improving the quality of charging infrastructure and forging partnerships with industry and financial institutions to increase women commercial users' ownership and access to electric two-wheelers. Incentives can be created to increase the number of women EV technicians and driving instructors. OEMs can undertake targeted efforts to increase awareness amongst women on the benefit of electric two-wheelers for women, the total cost of ownership, and how to operate and maintain an E2W.

The call-to-action brief – *WE2: Path Forward to Increase Women's Use and Uptake of Electric Two-Wheelers* derived from this research outlines recommendations for action at each level of governance and for EV industry. Concerted and intentional action will be required by all stakeholders towards a gender-equitable electric mobility transition.

Annexure 1: Detailed city-wise findings of primary surveys and infrastructure audits

Demographics of the sample

A total of 496 surveys were conducted in both cities with at least 30 samples for each category-personal and commercial- in both cities. The average age of the sample is 29 years in Delhi and 34 years in Chennai. On average, commercial workers in both Chennai and Delhi have a higher level of education compared to the general urban population[65].

Education Levels

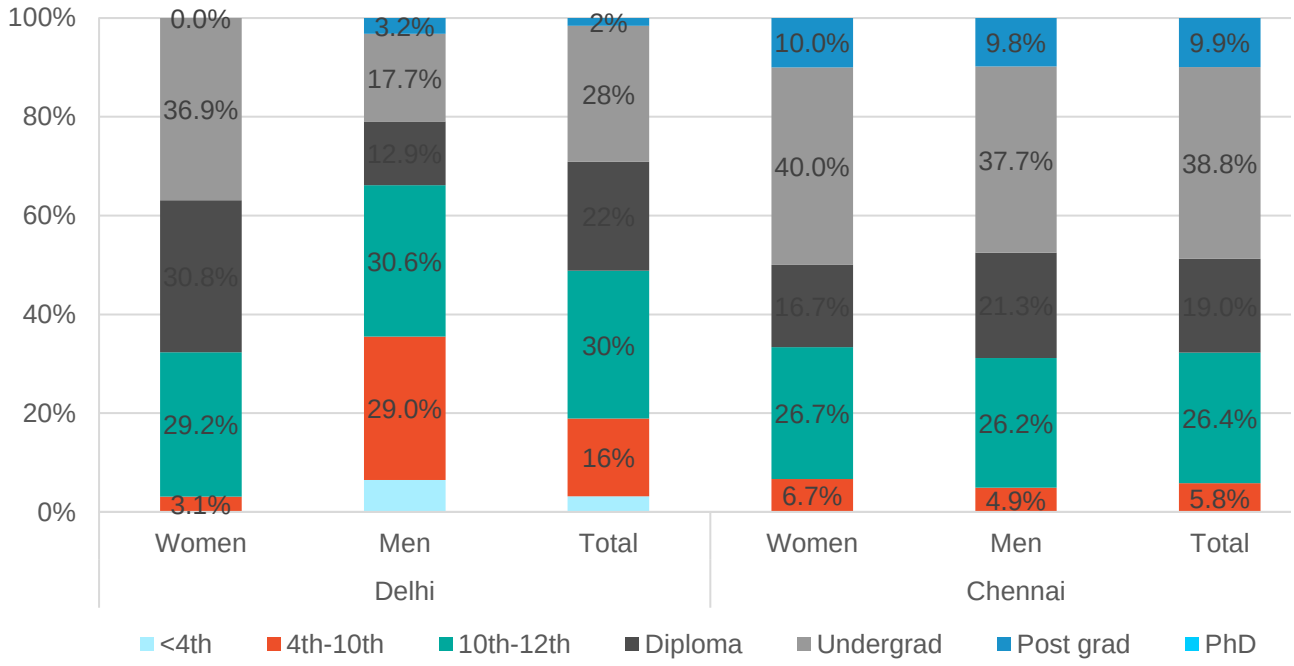
Commercial workers

In Delhi, 46% of commercial users and in Chennai, 51% have attained an education level up to senior secondary (12th standard). Among commercial users in Delhi, 68% of women hold a diploma or higher qualification, a proportion that exceeds that of their male counterparts (Figure 58). This variation in education levels between genders is not observed in Chennai.

Personal workers

89% of personal users in Delhi and 76% in Chennai have education level higher than Diploma (Figure 59).

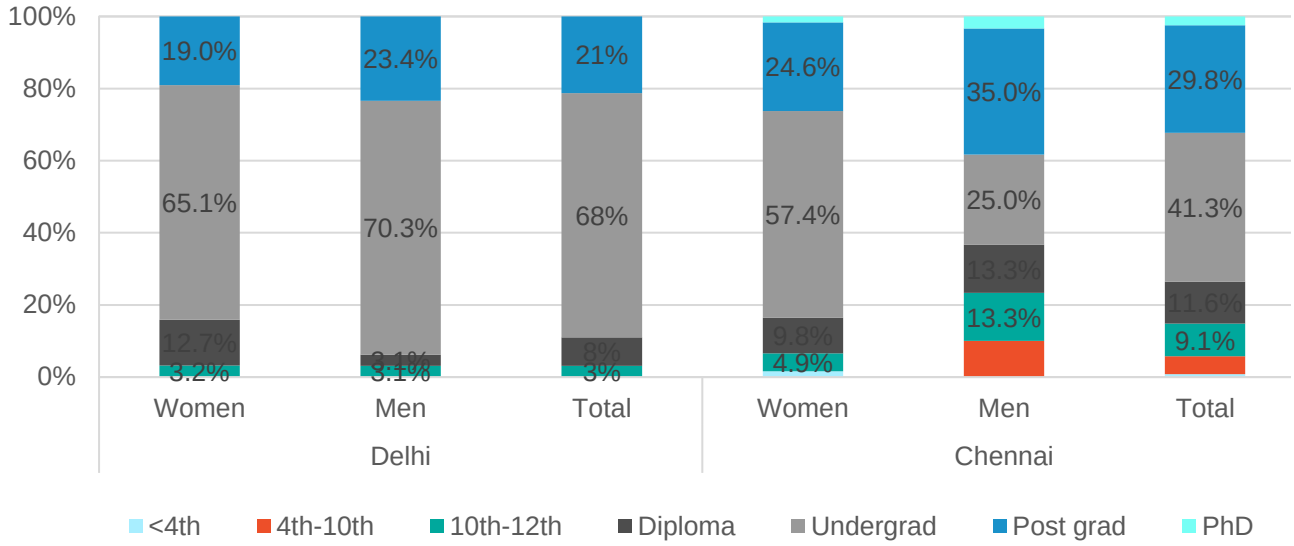
Figure 58: Education level of commercial users, by city



N: Chennai: W- 60, M- 61; Delhi: W- 65, M- 62; Total: W-125; M-123

[65] The median education level for individuals in urban areas of India is secondary education. In both Chennai and Delhi, the median education level for commercial workers is a diploma (151).

Figure 59: Education level of personal users, by city



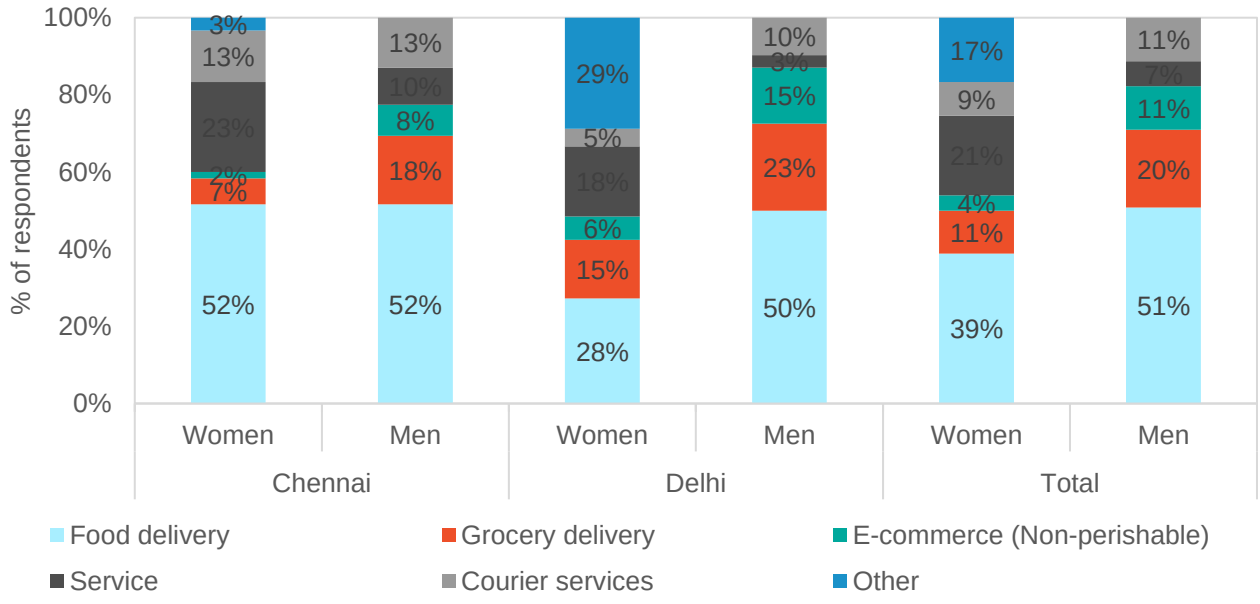
N: Delhi- M:64; W:63; T:127; Chennai- M:61; W: 60; T: 121

Analysis of type of work

Commercial users

Women in Chennai are more involved in the food delivery (53%) and home service (23%) categories as compared to their counterparts in Delhi (food delivery: 28%; home services: 18%) (Figure 60). In Delhi, women are more involved in ancillary non-platform services (29%) as compared to those in Chennai (3%). This observed variation in the type of work among women in the two cities is statistically significant according to the chi-squared test (χ^2 (6) = 29.9, p < .001). No substantive difference is observed in the type of work among men in both the cities.

Figure 60: Commercial users: Type of work by gender



N: Chennai: F- 60, M- 61; Delhi: F- 65, M- 62; Total: F-125; M-123

Personal users

In both Chennai and Delhi, the majority of personal workers are employed in the service sector, accounting for 90% and 94%, respectively.

Working times for commercial users

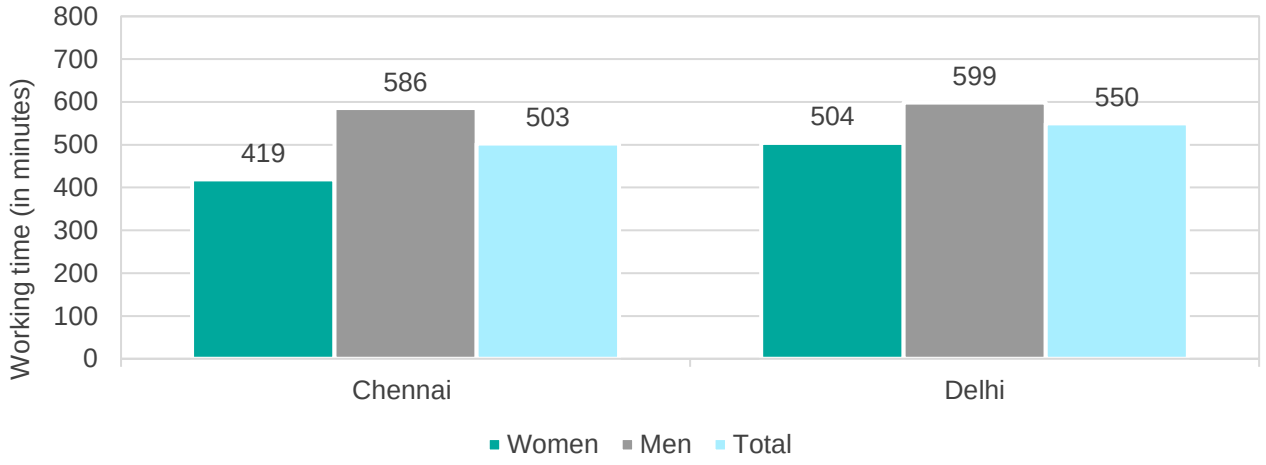
In Chennai, men start their work day nearly two hours (08:27 am) earlier than women (10:22 am) and work nearly one hour longer into the evening. In Delhi, men start about 34 minutes earlier than women but work until 8:20 pm, which is one hour and 15 minutes later than when women finish their day (Table 27).

Table 27: Work start and end time for commercial workers

	Chennai		Delhi	
	Women	Men	Women	Men
	Mean	*Mean*	*Mean*	*Mean*
Average Start Time	10.22	08.27	09.40	09.06
Average End time	18:19	19:06	19:05	20:20

Workers in Delhi reported working longer hours (550 minutes) than in Chennai (503 minutes). Men work longer hours than women with the gender difference in working hours being 167 minutes in Chennai and 95 minutes in Delhi (Figure 61). These differences are statistically significant at a significance level of <0.05 in both cities based on independent t-tests conducted for each city. The results correspond with the 2019 Time Use Survey, which reported a gender difference of 116 minutes in time spent on employment-related activities in urban areas of Tamil Nadu and 118 minutes in Delhi (urban area) (90).

Figure 61: Average working hours of commercial users by city and gender



N: Chennai-121; Delhi-127; Total- 248

Analysis of travel behaviour

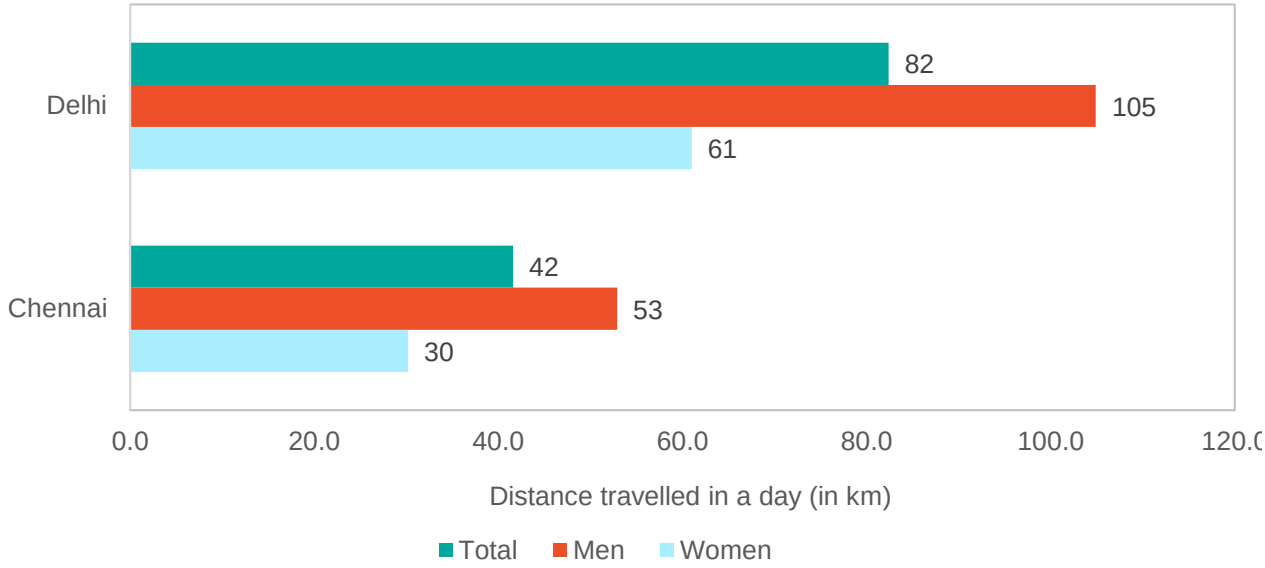
Travel distances

Commercial users

Commercial users in Delhi travel twice as much as their counterparts in Chennai.
Commercial users in Delhi travel 82.4 kilometres on a daily basis, which is close to twice the average daily distance of 41.6 kilometres travelled by workers in Chennai (Figure 62). The difference in travel distances between the two cities is statistically significant and demonstrated by a two-tailed t-test, $t(248) = 8.664$, $p < 0.001$.

Further, the gender-based analysis indicate that men travel 1.7 times more than women, both in Chennai (M: 53 km; W: 30 km) and Delhi (M: 105 km; W: 61 km). The observed gender differences in travel distances are statistically significant at p<0.05 in both Chennai (t(121)= -4.769, p <0.01) and Delhi (t(127)= -6.516, p <0.01), as determined by a two-tailed t-test.

Figure 62: Average daily distance travelled by commercial workers: by city and gender



N: Chennai: W- 60, M- 61; Delhi: W- 65, M- 62; Total: W-125; M-123

The differences in travel distances between ICE and EV commercial users are not statistically significant. Gender-based analysis indicates that men and women in Delhi using EVs travel longer distances compared to those using ICE vehicles. Conversely, women in Chennai using EVs travel 1.7 km less than those using ICE vehicles. These gender-based differences in travel distances between ICE and EV users are not statistically significant.

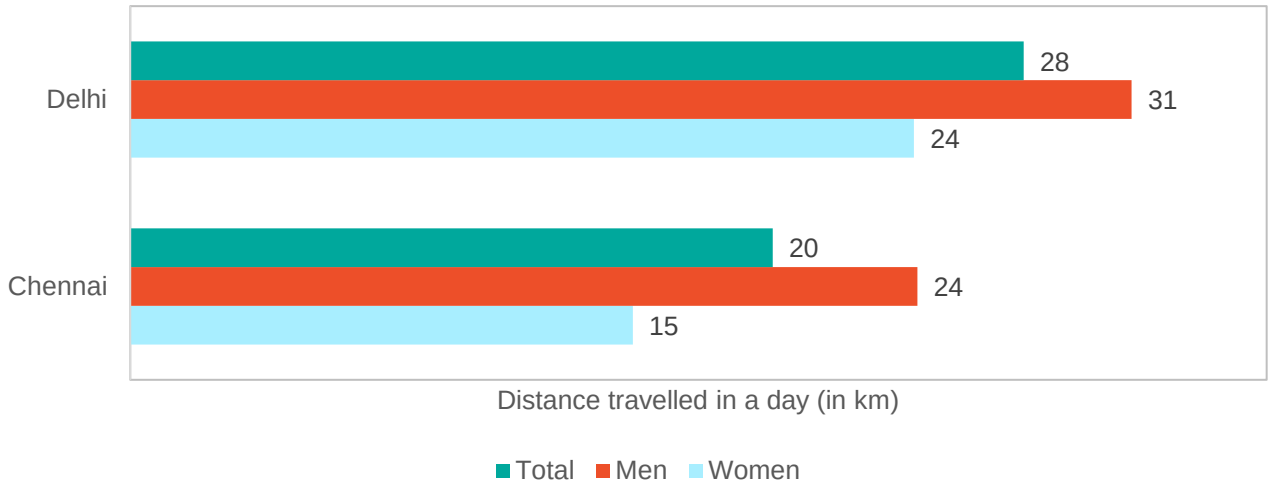
Travel distances by personal users

Personal users in Delhi travel 1.4 times of their counterparts in Chennai.

Personal users make an average of two trips per day for work purposes. There is no significant difference observed in the number of trips either by city or gender. The average distance travelled by personal users in a day in Delhi is around 27 km which is 1.4 times higher than the average distance travelled in Chennai (20 km) (Figure 63). The difference observed in the travel distance between the two cities is statistically significant (t (248) = 3.821, p=<0.001) as determined by a two-tailed t-test.

The gender-based analysis indicates that men travel 1.6 times farther away than women in Chennai and 1.3 times in Delhi. These observed gender differences in both Chennai (t(121)= -3.532, p=<0.001) and Delhi (t(127)= -2.218, p=0.028) are statistically significant as determined by a two-tailed t-test.

Figure 63: Average daily distance travelled by personal users, by city and gender



N: Delhi- M:64; W:63; T:127; Chennai- M:61; W: 60; T: 121

Analysis of reported incomes

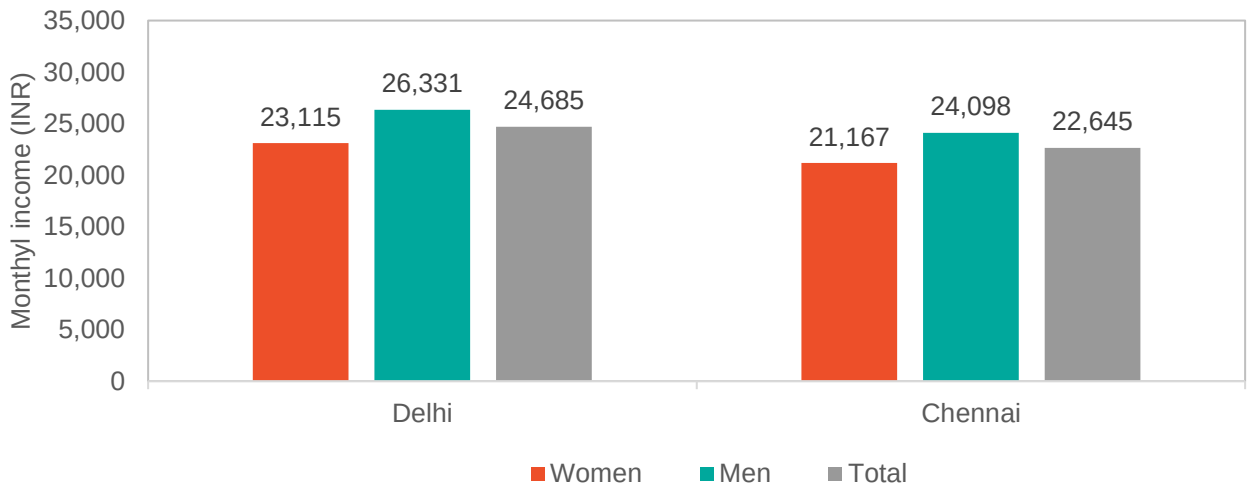
Commercial users

The average income of commercial users is higher in Delhi (₹24,685) as compared to Chennai (₹22,645) (Figure 64). However, the observed income difference between the two cities is not statistically significant. This disparity may be due to shorter working hours in Chennai relative to Delhi. The positive Spearman's rho correlation coefficient (rs = 0.232) indicates a weak yet significant positive association between the number of working hours and individual income.

In both Chennai and Delhi, the gender-based analysis reveals that men earn 1.1 times more than women, with an average gender income difference of INR 3,073. The observed gender difference in income in both cities- Delhi (t (127) = -3.130, p=0.002) and Chennai (t (121) = -2.851, p=0.005) - is statistically significant on the two-tailed t-test.

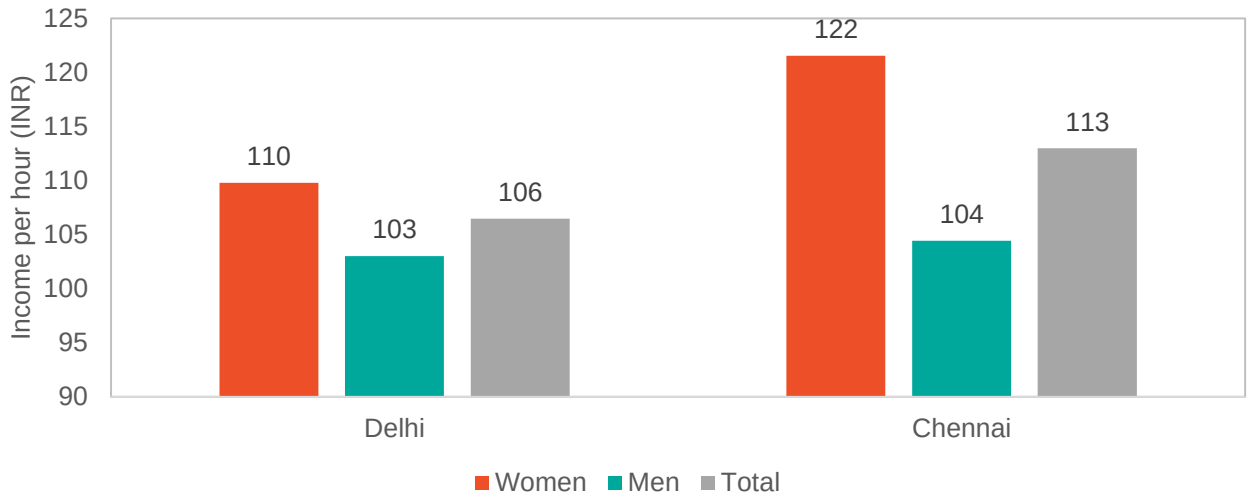
It was observed that in both Chennai and Delhi, women earn a higher hourly income—INR 122 and INR 110, respectively—compared to men, who earn INR 104 and INR 103, respectively (Figure 65). This disparity is primarily because women tend to complete more orders by accepting shorter-distance deliveries. The average distance traveled per order is 1.8 km and 5.8 km for women in Chennai and Delhi, respectively, compared to 5.6 km and 6.0 km for men.

Figure 64: Average Individual monthly income of commercial workers



N: Chennai: W- 60, M- 61; Delhi: W- 65, M- 62; Total: W-125; M-123

Figure 65: Per hour income of commercial users, by gender and city



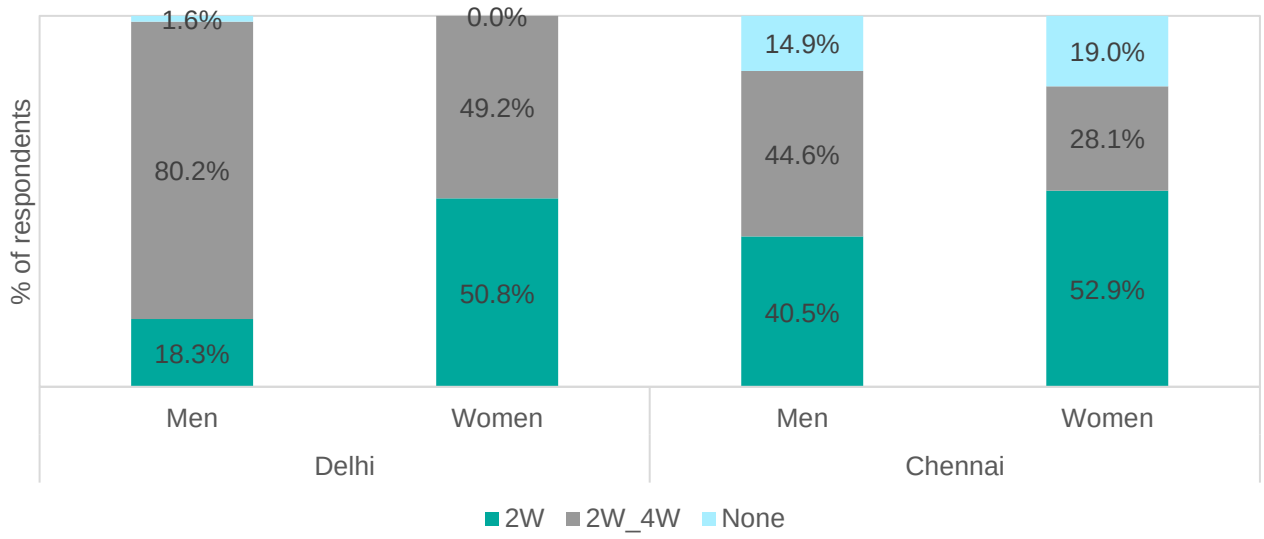
N: Chennai: W- 60, M- 61; Delhi: W- 65, M- 62; Total: W-125; M-123

Driving licence process and regulations

Female respondents in both- Chennai and Delhi- primarily hold driving licenses for only two-wheelers, whereas male respondents have licenses for both two-wheelers and four-wheelers. In Delhi, 64.6% of users have combined licences for both two- and four-wheelers, whereas in Chennai, users primarily hold licences for two-wheelers (36.4%). 17% of users in Chennai operate their two-wheelers without a valid driving licence as compared to 0.8% in Delhi.

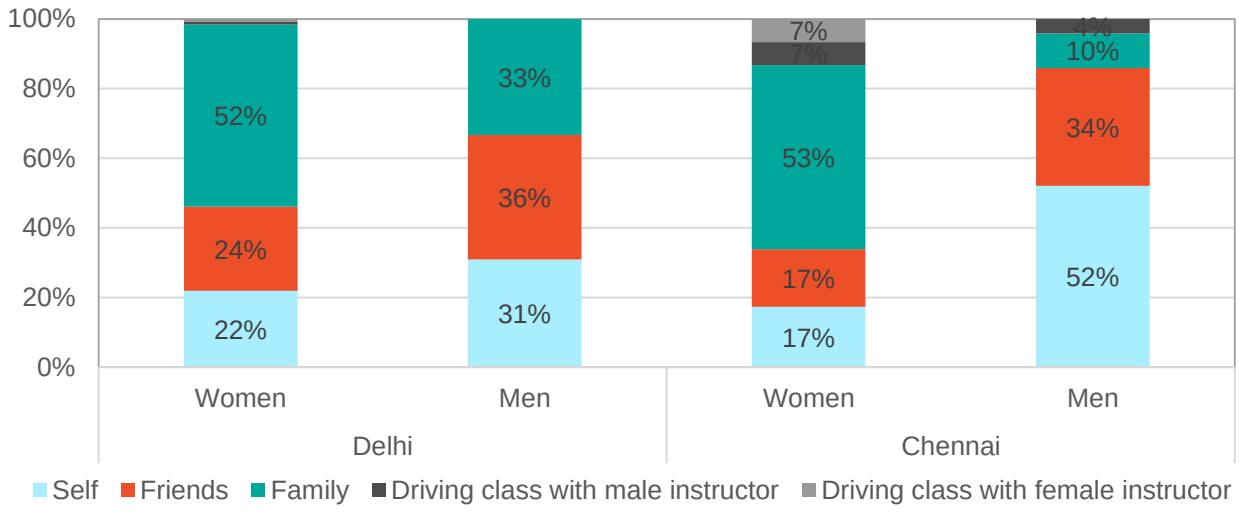
The respondents in both cities primarily learned to drive a two-wheeler by informal methods such as from their family members, friends or self-learning. Around 14% of women in Chennai took driving classes and 50% of those had a female instructor (Figure 67).

Figure 66: Driving licences by city and gender



N= Delhi: M:126; W: 128; Chennai: M:121; W: 151

Figure 67: Driving training by city and gender



N= Delhi: W:128; Men: 126; Chennai: W: 121; M: 121

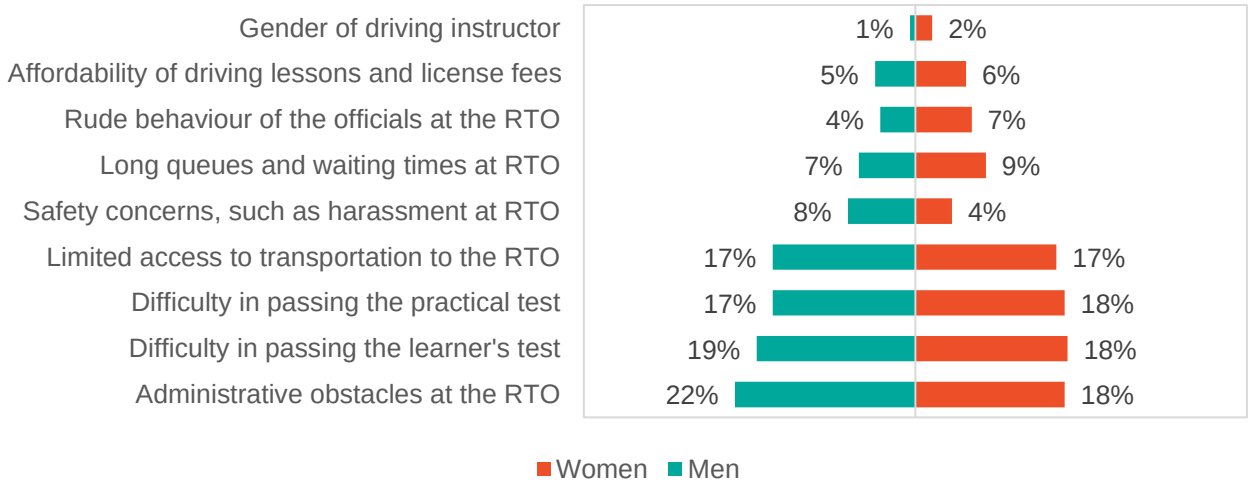
Obstacles faced in obtaining a driving licence

In Delhi, both men and women expressed concerns about the rude behaviour of RTO officials. While major obstacles are generally similar at the level of individual cities, more women in Chennai find driving licence fees expensive compared to those in Delhi. The survey findings shows that women often pay higher fees due to the involvement of agents acting as intermediaries. These agent fees are observed to be higher in Chennai than in Delhi.

In Chennai, major concerns raised by focus group participants include unclear documentation requirements for driving licences and necessitating multiple visits to the RTOs. There is also confusion about the documents required to obtain a licence. Respondents indicated that the complete list of required documents is often discovered only upon arriving at the RTO, despite the availability of online application processes.

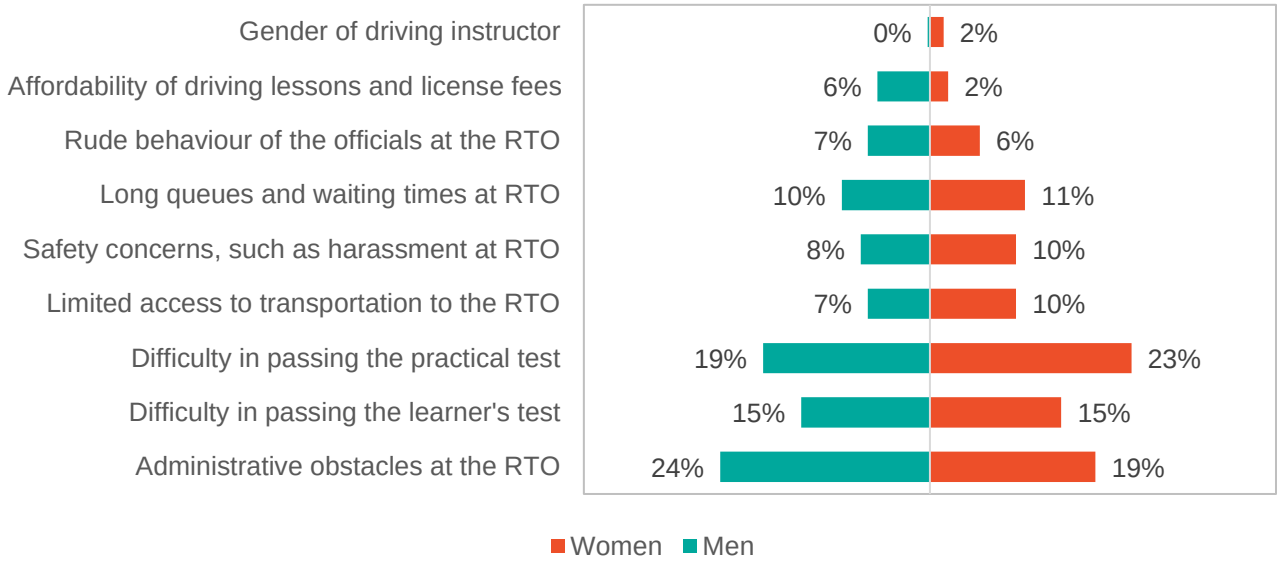
This issue is largely attributed to a lack of awareness about the online application system. During FGDs, women, especially those with children reported that they face challenges due to long wait times and inadequate facilities at the RTO. In Delhi, both men and women expressed concerns about the rude behaviour of RTO officials.

Figure 68: Obstacles faced in obtaining a driving licence - Chennai



N = 201, M=103, W=108

Figure 69: Obstacles faced in obtaining a driving licence - Delhi

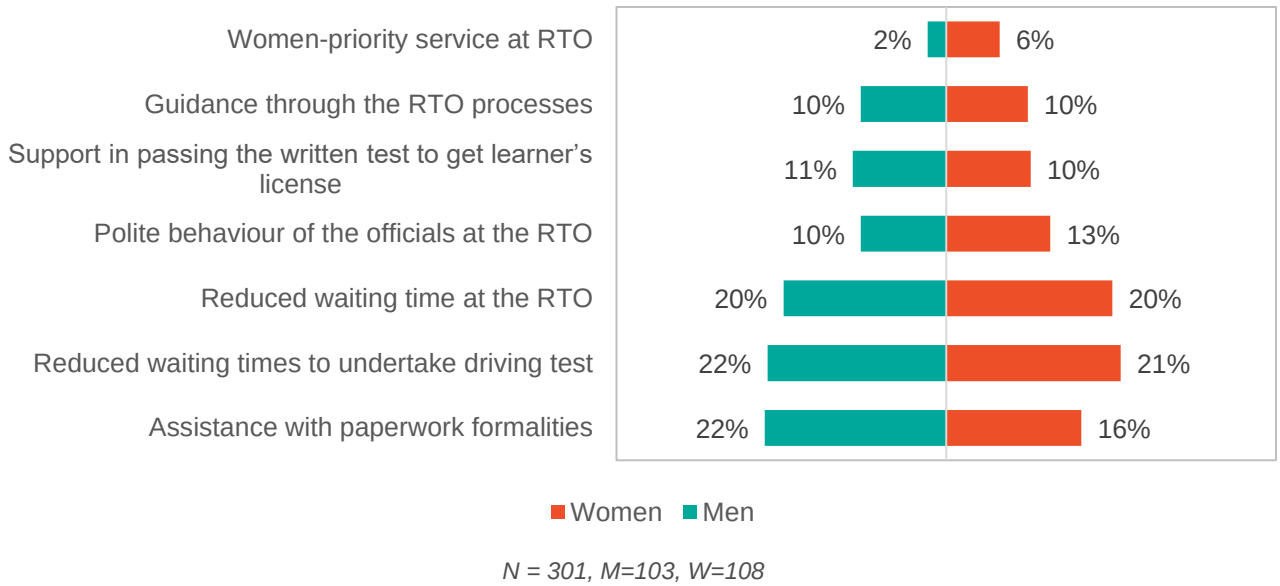


N = 252, M=124, W=128

Priorities to improve the licensing process

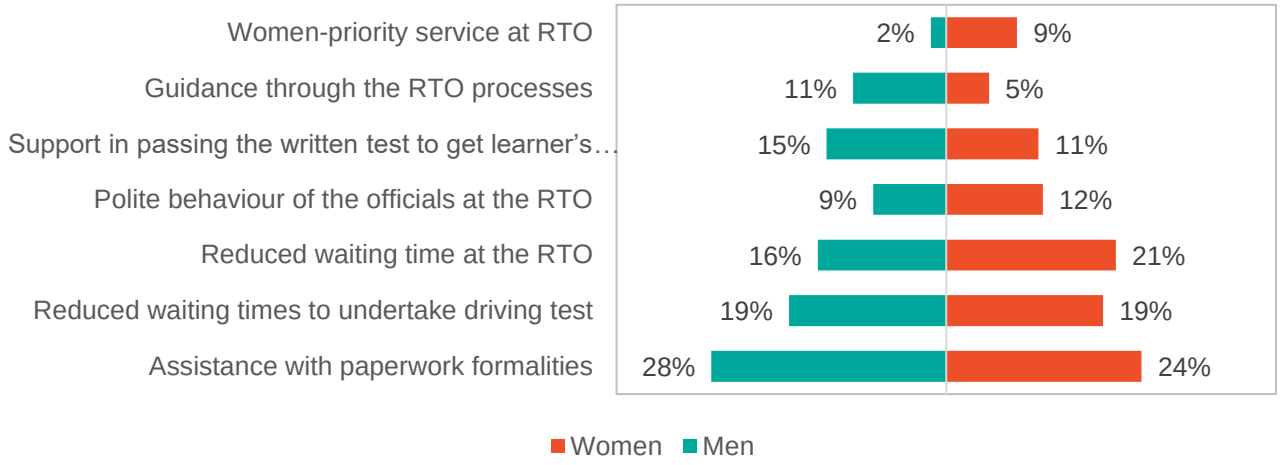
In both cities, women prioritised polite behaviour of RTO officials while conversing with them and need for women-priority services at the RTO. A higher proportion of respondents in Delhi highlighted the importance of assistance with paperwork formalities and women-priority services to improve the process of obtaining a licence.

Figure 70: Factors prioritised to improve the licence process - Chennai



N = 301, M=103, W=108

Figure 71: Factors prioritised to improve the licence process - Delhi



N = 252, M=124, W=128

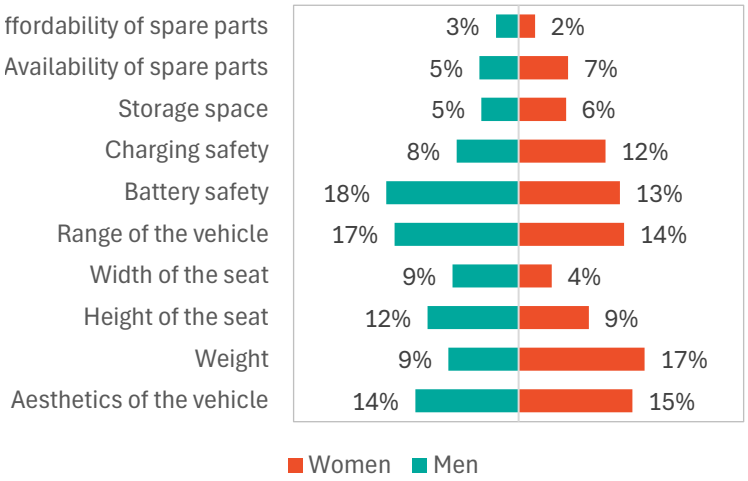
Design of electric two-wheelers

The use of EVs in Chennai and Delhi appears to be relatively new, with respondents having used an EV for 1 to 2 years. There is a greater diversity of electric two-wheeler models among respondents in Delhi (32 unique models) whereas respondents in Chennai reported using 15 different models. The top five E2W models in both cities are similar, which are (i) Ola Electric S1 Pro, (ii) Ather 450, (iii) Hero Electric Optima, (iv) TVS iQube, and (v) Honda Activa Electric. Ather shows a stronger presence in Chennai whereas Ola S1 Pro in Delhi.

Preferences amongst users

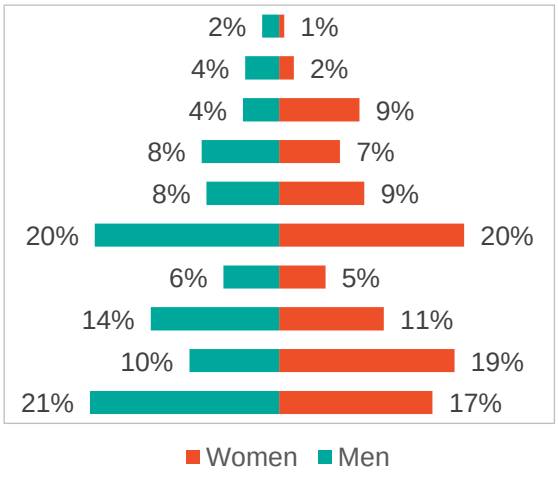
In Chennai, users prioritize vehicle range and battery safety, while in Delhi, users focus on range and the vehicle's aesthetics. In both cities, women place greater emphasis on the weight of the vehicle compared to men. Conversely, men prioritize the width and height of the seat more than women.

Figure 72: Parameters prioritised in the design of a two-wheeler - Chennai



N = 242, M= 121, W=121

Figure 73: Parameters prioritised in the design of a two-wheeler - Delhi



N = 254, M= 126, W=128

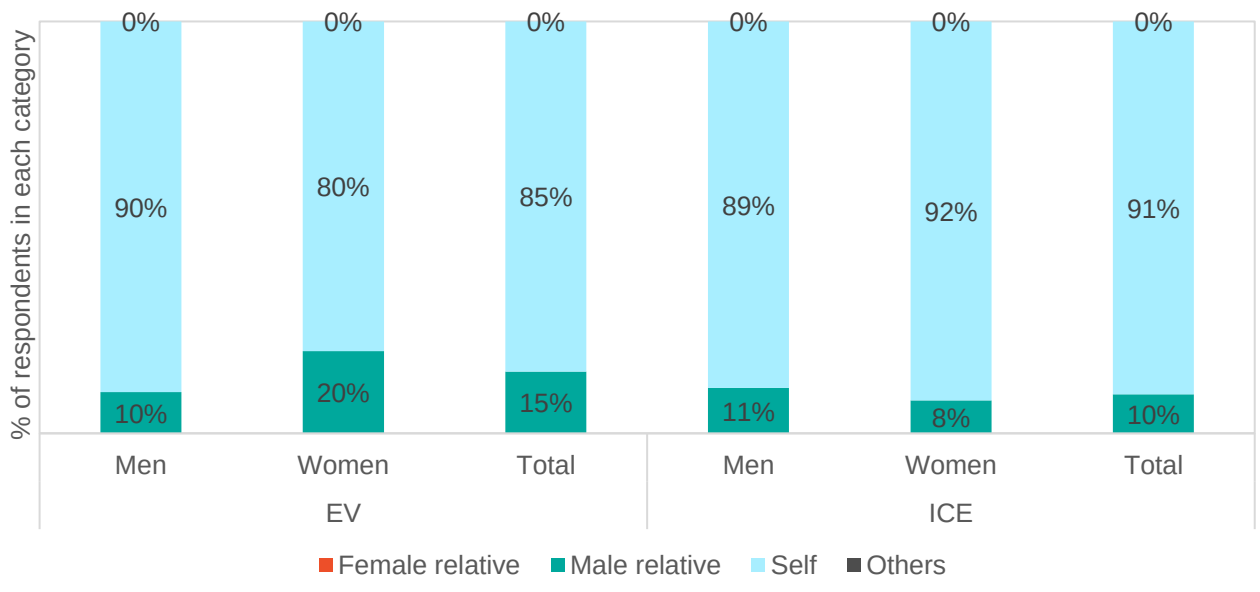
Financing of electric two- wheelers

The proportion of respondents who financed their two-wheelers through loans is comparable in Chennai and Delhi, with approximately 14% in both cities opting for this mode of financing. However, a notable difference is observed in the registration loans among women. In Chennai, a higher proportion of women took loans registered under the name of a male relative compared to Delhi. Specifically, 80% of women E2W users in Delhi secured loans in their own names, compared to 92% of women ICE two-wheeler. In contrast, this figure drops significantly in Chennai, where only 33% of women EV users obtained loans in their own names

Table 28: Mode of financing two-wheeler by fuel type and city

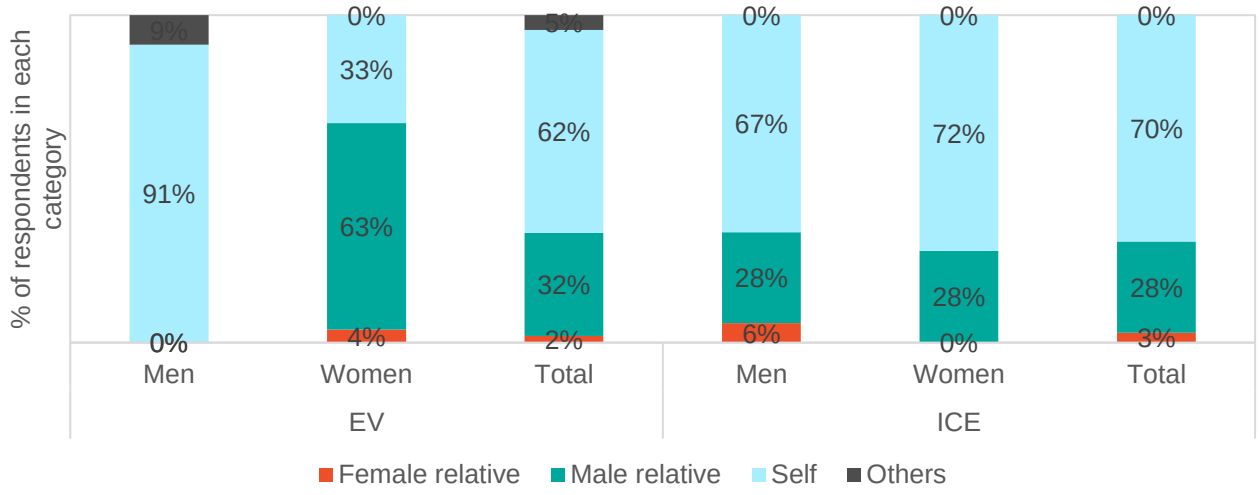
	Chennai	Delhi	Total
EV	50%	50%	50%
Lease/Rent	1%	3%	2%
Owned (Loan)	14%	14%	14%
Owned (One-time payment)	35%	33%	34%
ICE	50%	50%	50%
Lease/Rent	0%	0%	0%
Owned (Loan)	16%	13%	14%
Owned (One-time payment)	34%	37%	35%
Grand Total	100%	100%	100%

Figure 74:Loan registration name by fuel, gender in Delhi



N=68, M=40, W=28; ICE: N=32, M=19, W=13; EV: N=36, M=21, W=15

Figure 75: Loan registration name by fuel, gender in Chennai



N=74, M=30, W=44; ICE: N=39, M=19, W=20; EV: N=35, M=11, W=24

Downpayment, loan tenure and rate of interest

It is observed that the down payment for E2Ws is higher in Chennai (31%) than in Delhi (27%). A gendered analysis indicates that women pay higher down payments in both cities compared to men. For ICE vehicles, the down payment is observed to be lower in Chennai.

The loan tenure in Chennai is relatively shorter (25 months) as compared to Delhi (30 months). The rate of interest is found to be higher in Chennai for EVs (especially for women) but in Delhi the rate of interest is similar for EVs and ICE vehicles across gender. The primary survey revealed that users are not receiving the purchase subsidy offered under the Tamil Nadu EV policy. This is because the policy applies exclusively to commercial E2Ws, and currently, vehicles are not being registered under the commercial category.

Table 29: Down payment as a percentage of vehicle value

Loan registered in the name of	EV			ICE		
	Chennai	Delhi	Total	Chennai	Delhi	Total
Men	26%	25%	26%	23%	29%	26%
Women	33%	31%	32%	23%	32%	26%
Grand Total	31%	27%	29%	23%	30%	26%

Table 30: Loan tenure and rate of Interest

	Chennai		Delhi	
	Average loan tenure (months)	Average interest rate (%)	Average loan tenure (months)	Average interest rate (%)
EVs				
Men	27	11.4	35	9.8
Women	25	13.1	26	9.5
Grand Total	25	12.6	32	9.7
ICE				
Men	27	9.0	31	10.0
Women	24	9.5	28	9.7
Total	25	9.2	30	9.9

N=140 (Women:70) for loan tenure and N=117 (Women:57) for interest rate

Loan approval time

The reported loan approval time is shorter for E2Ws in comparison of Ice two-wheeler. The city-wise analysis indicates that loan approval time is comparative shorted in Delhi than in Chennai. Also loan approval time for women in lower in both Chennai and Delhi

Table 31: Average loan approval time (in days)

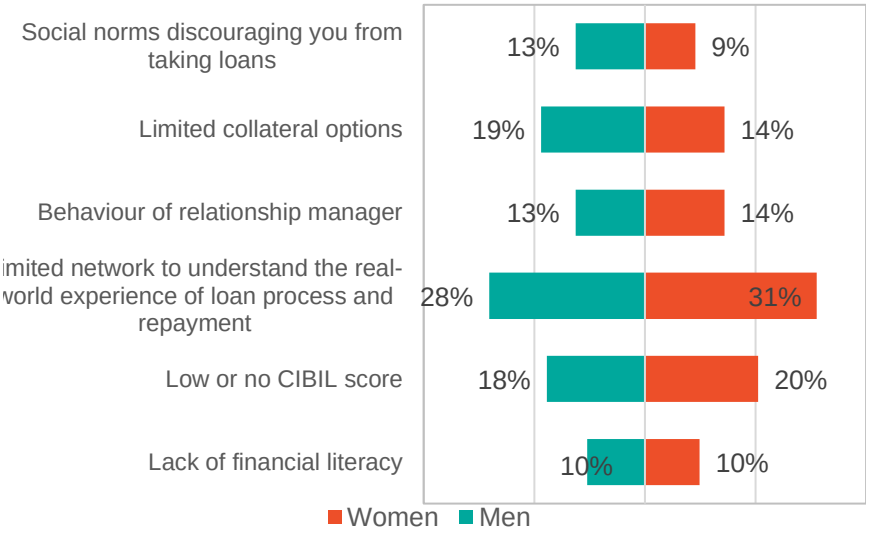
Gender	User	Chennai	Delhi
Men	Overall	6.7	2.4
	EV	6.5	2.7
	ICE	6.9	2.1
Women	Overall	5.7	1.6
	EV	4.0	1.3
	ICE	7.8	2.1

N= 141 (women:71)

Barriers to access finance

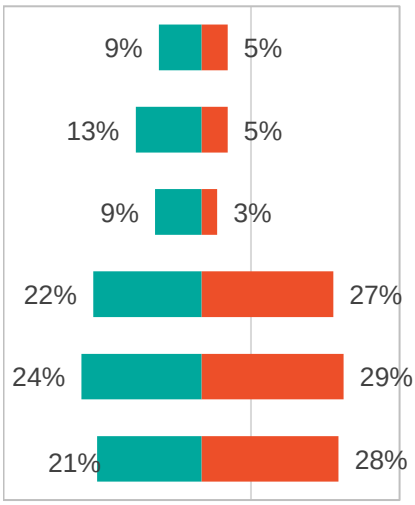
In Chennai, the key barriers to accessing finance include a limited network for obtaining information and learning from the experiences of other borrowers, low or no CIBIL scores, and limited collateral options. Similarly, Delhi faces comparable challenges, including a limited network and low CIBIL scores, and lack of financial literacy. Women have reported the issue of limited network for information exchange from the existing borrowers and low or no CIBIL score.

Figure 76: Barriers to access finance – Chennai



N = 242, M= 121, W=121

Figure 77: Barriers to access finance - Delhi

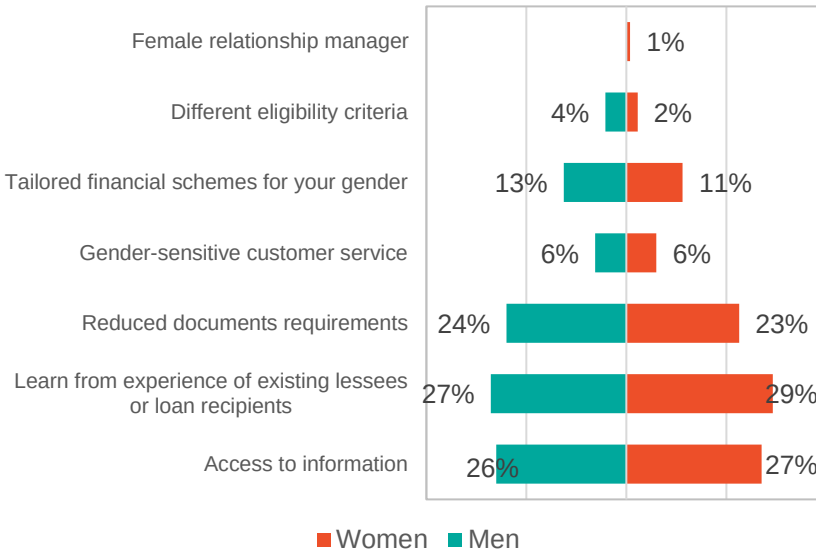


N = 254, M= 126, W=128

Priorities to improve loan process

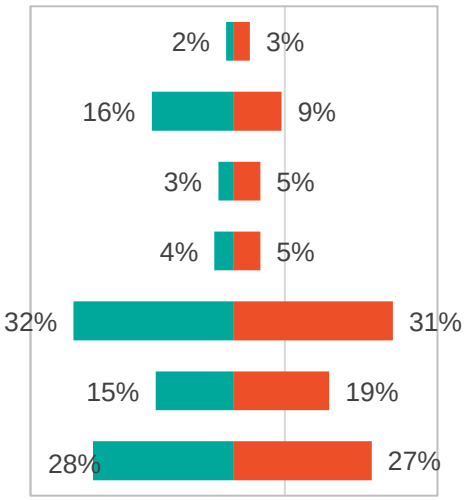
In both cities, respondents prioritized reduced document requirements, increased access to information, and the sharing of experiences by other borrowers. Additionally, respondents in Chennai expressed a preference for tailored financial products, while those in Delhi recommended the introduction of different eligibility criteria based on gender for the loan process.

Figure 78: Parameters prioritised in the design of a two-wheeler – Chennai



N = 242, M= 121, W=121

Figure 79: Parameters prioritised in the design of a two-wheeler – Delhi

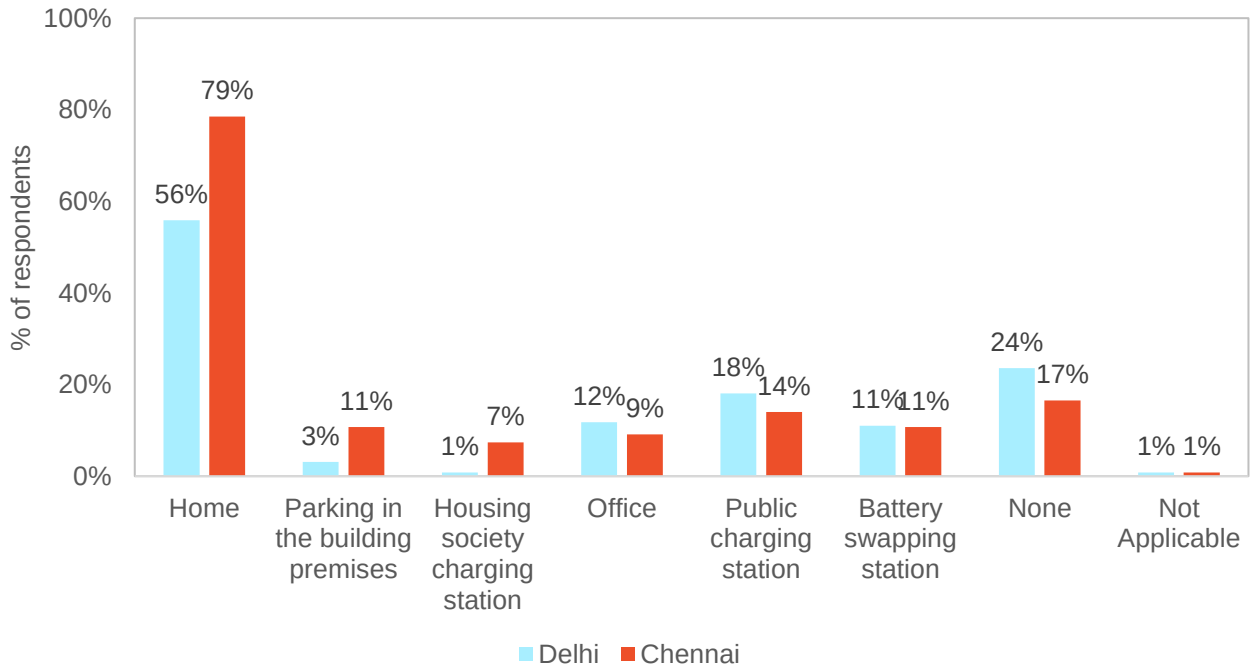


N = 254, M= 126, W=128

Charging infrastructure

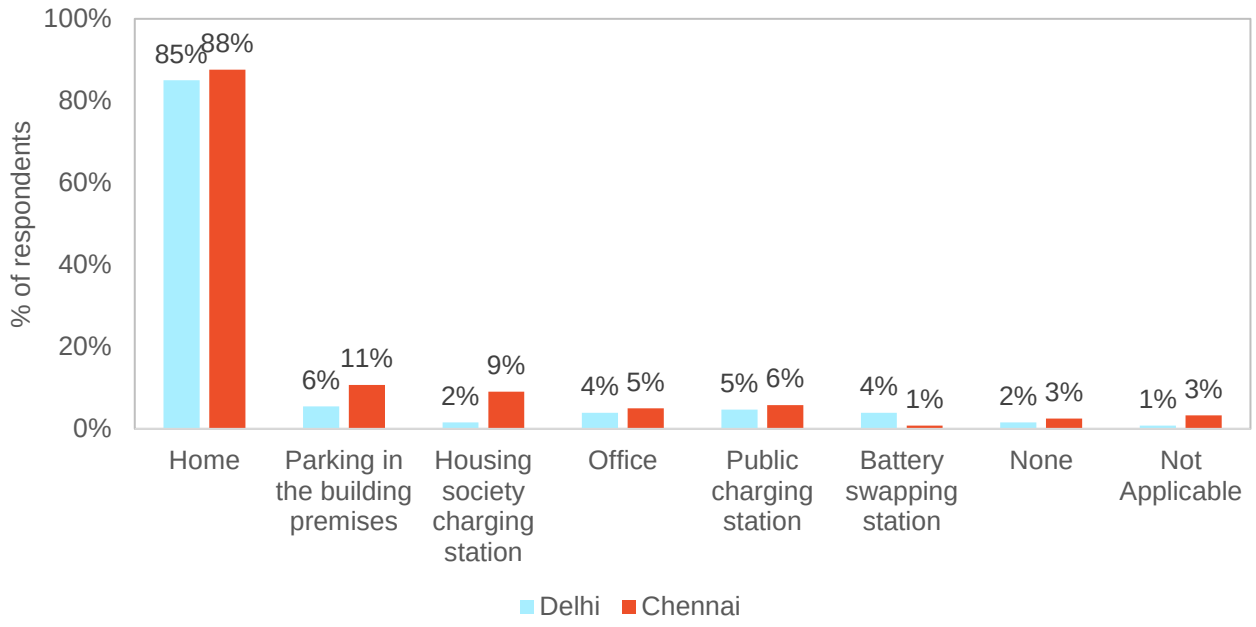
The primary location for charging EVs in both cities is at home, regardless of time of the day. Even so, a higher proportion of EV users in Delhi (18%) utilise PCS compared to those in Chennai (14%) (Figure 80). The observed difference in the utilisation of public charging stations between the two cities is not statistically significant as per the chi-square test.

Figure 80: Location of charging during the day, by city



N: C: 121; D:127

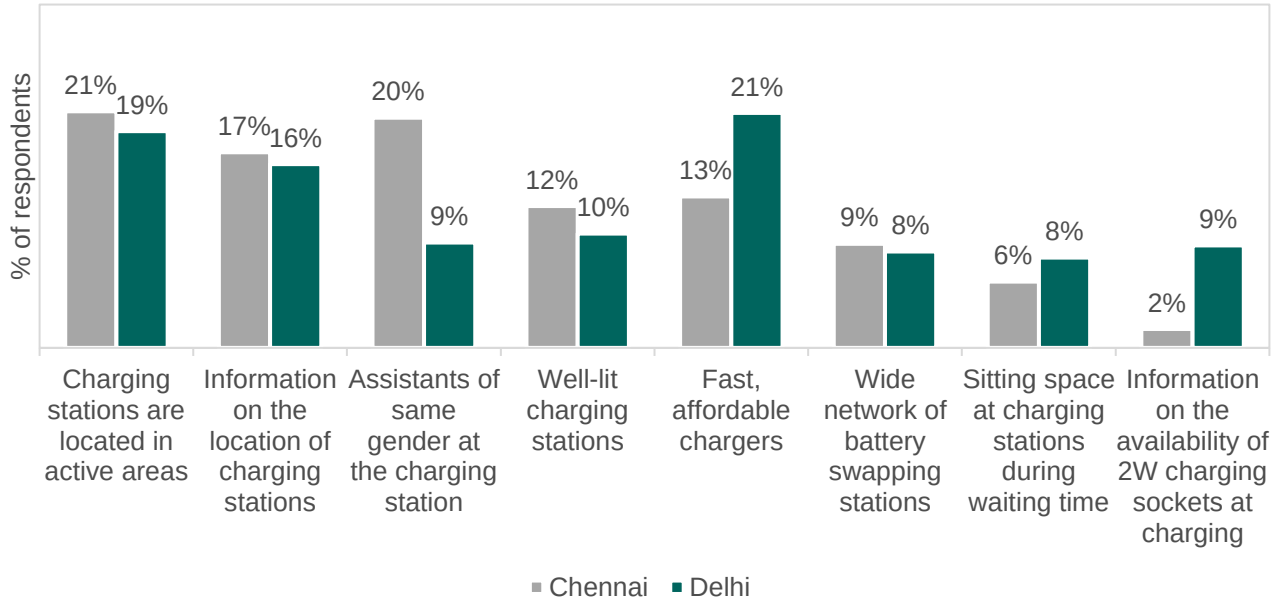
Figure 81: Location of charging during the night, by city



N: C: 121; D:127

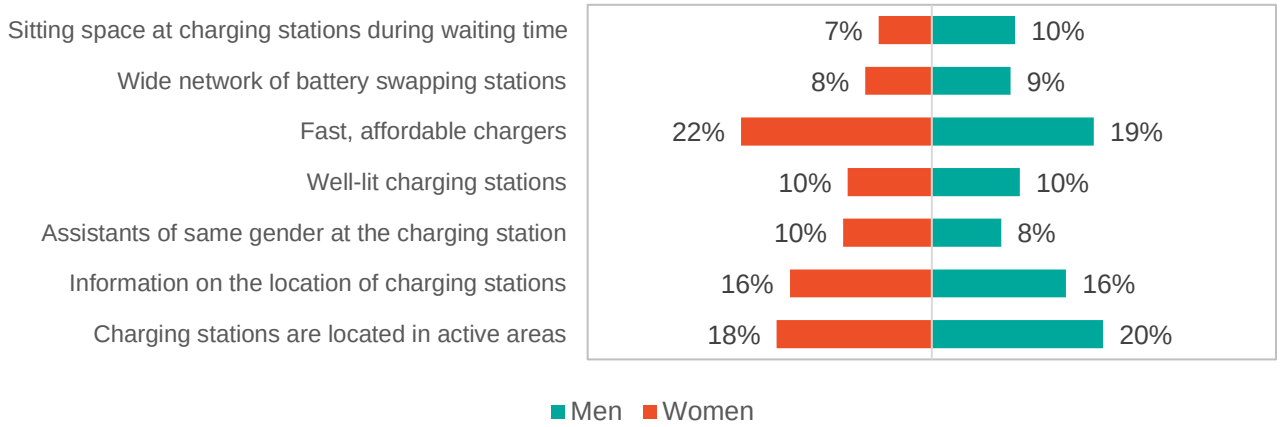
Furthermore, commercial users in Delhi prioritise a network of battery swapping stations. In Chennai, commercial users also emphasize the need for fast and affordable chargers, in addition to the shared priorities related to battery swapping stations. A gender-disaggregated analysis showed that both men and women have similar priorities (Figure 83, Figure 84). However, women prefer to have assistants of same gender at charging stations.

Figure 82: Priorities to improve charging infrastructure



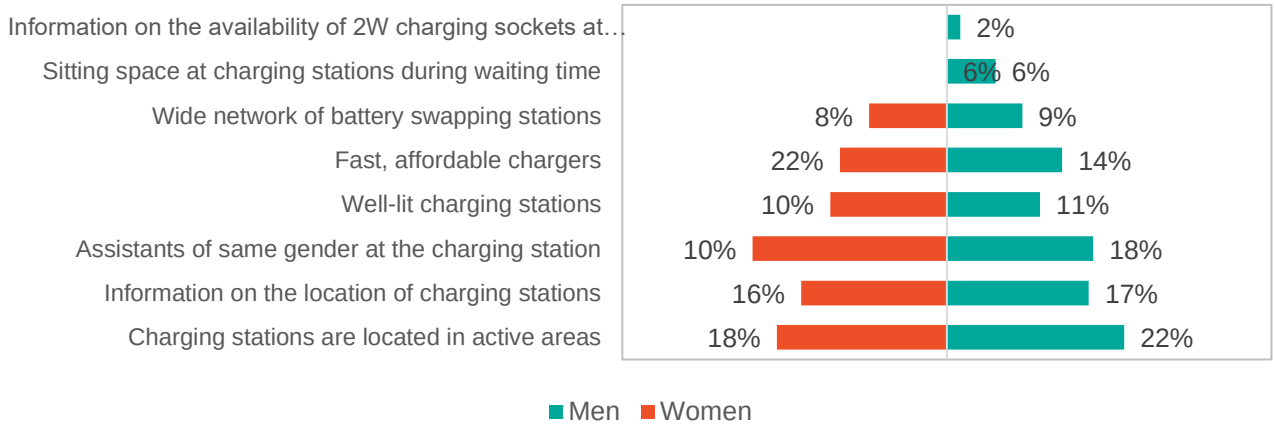
N: C: 121; D:127

Figure 83: Priorities to improve charging infrastructure- Delhi, by gender



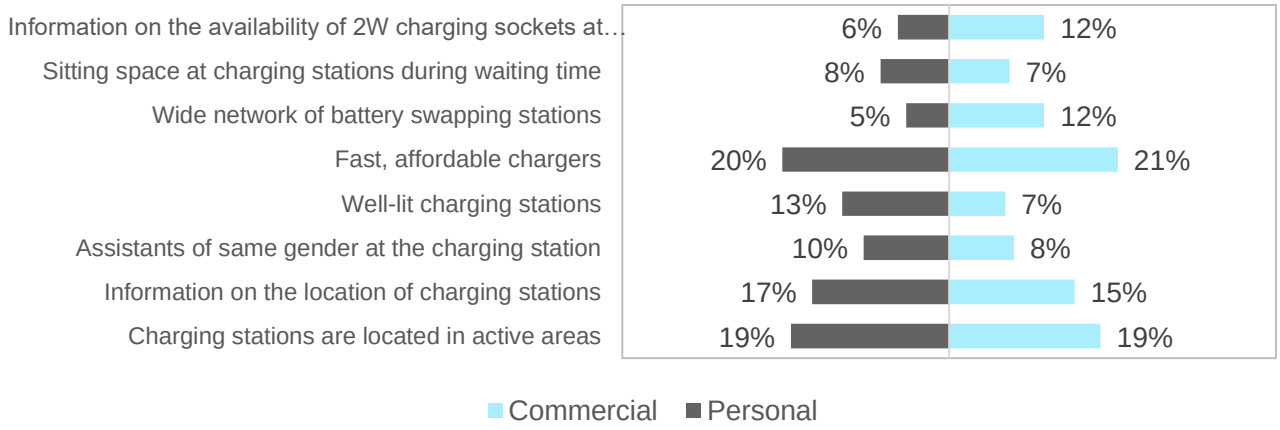
N: F- 65, M- 62

Figure 84: Priorities to improve charging infrastructure- Chennai, by gender



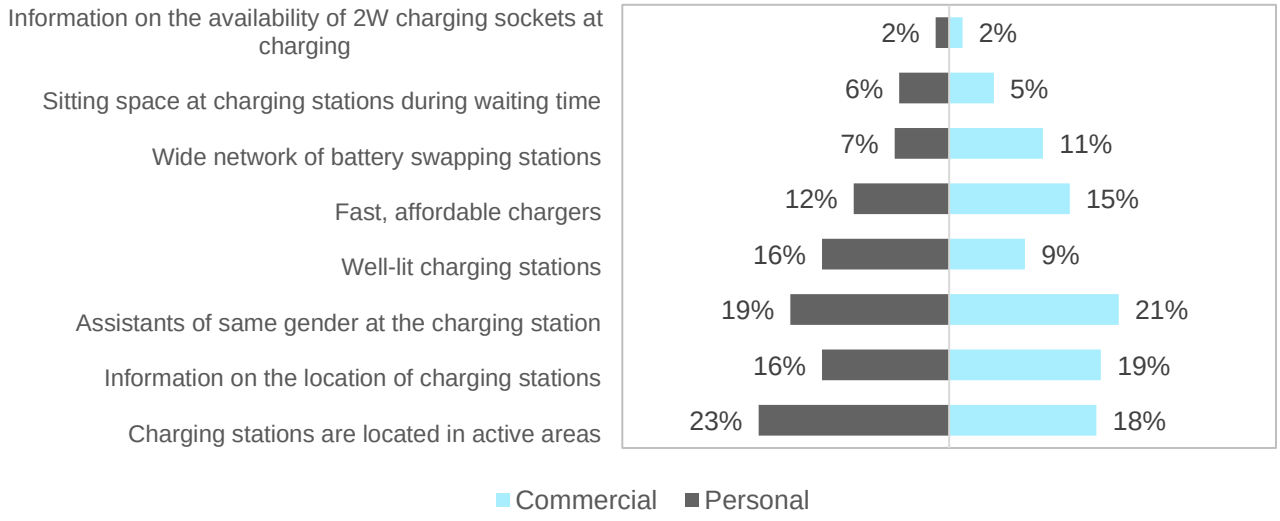
N: F- 60, M- 61;

Figure 85: Priorities to improve charging infrastructure- Delhi, by type of work



N: W- 65, M- 62

Figure 86: Priorities to improve charging infrastructure- Chennai, by type of work and gender



N: *W- 60, M- 61*

Analysis of charging infrastructure audits: Delhi

Indicator 1: Ease of locating the charging point

This indicator includes four attributes: accuracy of location (as displayed on portals or applications), signage, visibility and real-time information on availability,

The locations of charging stations are not accurately available on online platforms. Each operator maintains their own platform or mobile application, making it difficult for users to identify all available charging stations nearby. Though the Transport Department of Delhi provides the location of charging stations in their application One Delhi, still there is limited awareness among users about this application. Moreover, it appears that these charging stations were marked at the time of installation but the details have not been updated on the applications such as if the charger is malfunctioning or been removed. Charging points at several locations are difficult to locate with no signage.

Indicator 2: Security

This indicator includes the following attributes: location in active area, lighting, height of charging point, presence of fire extinguisher, CCTV camera, helpline number and safety instructions, accessibility to the nearest exit, trained personnel at or near the charging point.

On an average, charging points in Delhi were rated as 'poor' on this indicator. The majority of charging stations did not have any attendant or security personnel. CCTV cameras were installed only at a handful of stations, particularly on those located at petrol pumps and along roadsides. CCTV surveillance is essential for ensuring the safety of users but also for protecting the infrastructure, as few stations in central Delhi experienced vandalism. Fire extinguishers are a critical safety feature due to the risk of electrical fluctuations and fire incidents. These were provided at all audited battery swapping stations and petrol pumps but were absent at CPs on roads, in commercial areas and in market areas. Given the high foot traffic in these locations, prioritising safety measures like fire extinguishers is crucial to protect users and the surrounding infrastructure.

Indicator 3: Charging infrastructure and network connectivity

This indicator includes four attributes: interoperability, availability of fast-charging points, availability of instructions on using the charging point and waiting time.

In Delhi, the audit of charging stations resulted in a 'satisfactory' score for this indicator. Vandalism and theft are significant issues faced by CPOs in Delhi. As a result, some CPOs have adopted various strategies to prevent vandalism (Figure 40) or are not operational.

The lack of clear and adequate instructions at charging stations particularly at battery swapping stations poses a challenge for users. Informal conversations with individuals near the charging infrastructure revealed instances where users struggled for around 15 minutes to swap a battery because of insufficient instructional information at the station. This significantly impacts user experience and underscores the need for availability of instructional information, along with the presence of an attendant at the charging stations especially during the initial phase of the electric mobility transition.

Indicator 4: Amenities

In Delhi the charging stations audited lacked amenities such as seating areas, shaded waiting areas, drinking water and toilets. As a result, the average score of stations audited was 'very poor' for this indicator. A critical observation during the audits was the lack of availability of space to park the vehicle during charging (Figure 89). Many charging points are located in areas where it is difficult for an electric two-wheeler to be parked while charging. Further, the absence of shaded waiting areas is a crucial aspect that needs consideration due to the high temperatures observed in both the cities which is exacerbated by climate change.

Figure 87: Battery swapping station at petrol station (Vinod Nagar)

Figure 88: Fast charging station at a petrol station (Pitampura)

Figure 89 Lack of space to park an E2W to charge (Chandni Chowk)

Figure 90 Lack of space to park an E2W to charge

Figure 91 Lack of shade at charging point (Hauz Khas)

Source: The Urban Catalysts

Analysis of charging infrastructure audits – Chennai

Indicator 1: Ease of locating the charging station

Chennai faces similar issues as Delhi regarding the mapping of charging stations. These issues include the need for multiple applications to identify or locate nearby charging points, and outdated information regarding their availability.

The lack of adequate signage at charging stations makes it difficult for users to locate them. In both the cities charging points are often obstructed by parked vehicles and advertisement boards. These issues are primarily observed at location where individual charging points are located. Charging stations situated in public spaces such as petrol pumps are easier to locate and identify due to separate structures or signage built nearby.

Indicator 2: Safety and security

The placement and maintenance of charging points for E2Ws appear poorly planned. They are often located in inaccessible, deserted areas or at lower heights (<4 feet) making it accessible to children and increasing personal safety risks for them. Charging stations in Chennai performed better on this indicator but fire extinguishers necessary for safety from electrical fluctuations and fire incidents, were available only at audited charging stations which are located at petrol pumps. And they were absent at charging points on roads, in commercial areas, market areas and residential areas.

Indicator 3: Charging infrastructure and network connectivity

In Chennai, another important issue is the lack of instructional information regarding the use of charging points. Some stations feature complex interfaces that are not user-friendly especially for first-time users. For example, EESL charging stations have touchscreen panels that may appear inactive, leading to uncertainty among users about the station's operational status (Figure 92).

Furthermore, Ather has installed fast chargers for their own manufactured vehicles and provide a three-point socket for E2W of other manufacturers. These sockets by design are hidden and remain invisible unless people know there is a socket located there. The information regarding this is not provided at all stations and when it is available, it is only provided in English, which is not comprehensible by all users. Thus, the available interoperability is of no use if a user is unaware of the socket, potentially leading to the mistaken assumption that the station is exclusive to Ather vehicles.

Indicator 4: Amenities

Similar to Delhi, the charging stations audited in Chennai lacked amenities such as: seating areas, shaded waiting areas, drinking water and toilets. As a result, the average score of stations audited was ‘poor’ for this indicator. Main observations during the audits were the lack of availability of space to park the vehicle at the time of charging. As many charging points are located in areas where it is difficult for an electric two-wheeler to be parked.

Figure 92: Touch screen CP at Anna Nagar Metro station, operated by EESL

Figure 93: Ather charging station with three-point plug

Source: The Urban Catalysts

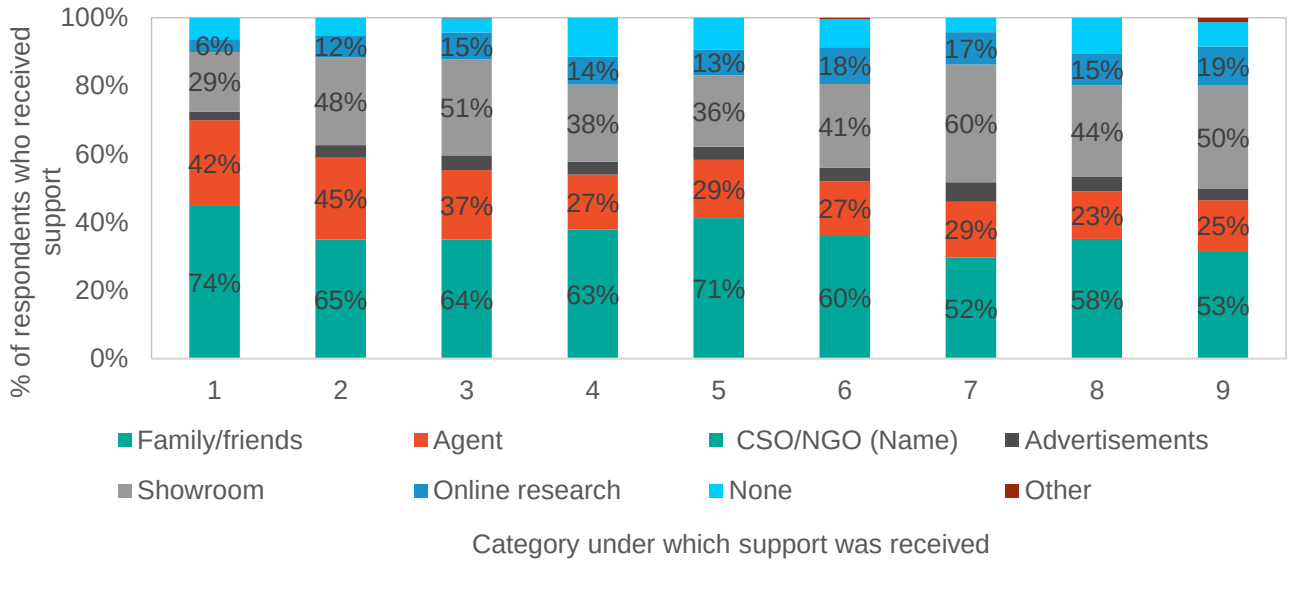
Figure 94: Ather charging station with instructional information at Kotturpuram MRTS Station

. *Source: The Urban Catalysts*

Institutional support

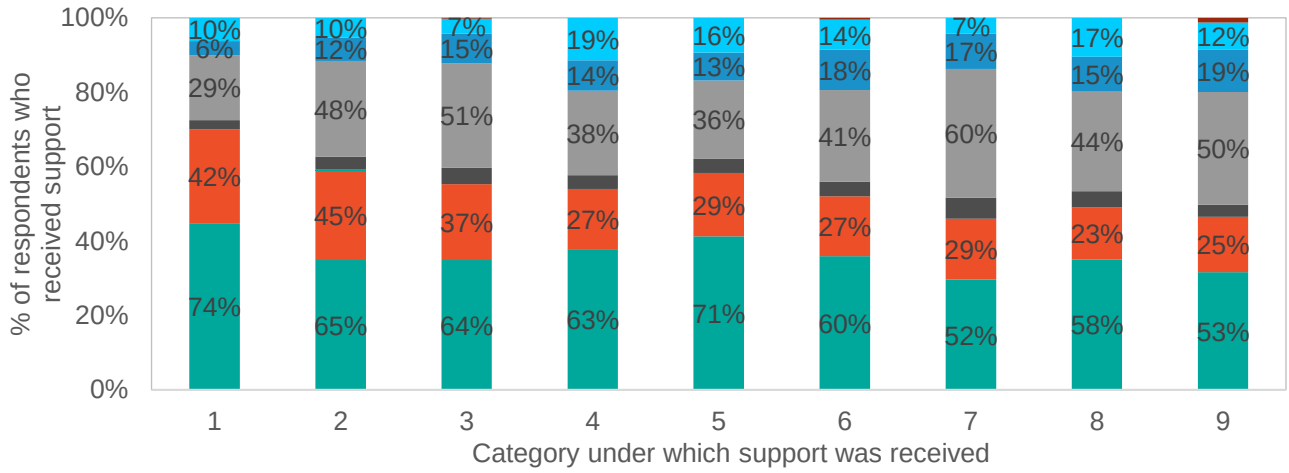
Women have lower level of awareness of the existing financial benefits such as upfront subsidies
In Delhi, 59% of female respondents report awareness of the EV purchase subsidy, compared to 69% of male respondents. In Chennai, awareness levels drop, with only 33% of female respondents and 53% of male respondents aware of the subsidy. Awareness of the road tax waiver for EVs is comparatively low, with only about 40% of respondents aware of this benefit. Respondents reported that the primary sources of information and support for purchasing vehicles-in both cities- are predominantly friends and family, followed by agents and showrooms.

Figure 95: Type of support EV users received in Delhi



N = 254

Figure 96: Types of support EV users received in Chennai



N = 242

1	Support in obtaining driving licence	6	Information on charging infrastructure in the city
2	Information on TCO	7	Information on special deals or discounts on the purchase of E2Ws
3	Information on financial products	8	Convince household members on the model and type of the vehicle
4	Connect with other E2W/ ICE 2W users	9	Training on digital services
5	Connect with 2W users of the same gender		

Annexure 2: Gender-responsive Charging Infrastructure Guidelines

The Urban Catalysts developed guidelines for the placement and quality of charging stations based on their on-ground assessments, surveys and focus group discussions with male and female E2W users and key informant interviews with CPOs.

Parameter	Guidelines
The recommendations highlighted in the green box are discretionary, while the others are mandatory. The guidelines are designed to improve the use of E2W charging points in urban environments, with a focus on addressing the needs of all users, especially women.	
Ease of finding the charging point	
Location, details and availability	● The CP should be within 5m walking distance of the location shown on an application; ● All CPOs should be mandated by SNA, to provide accurate status of the charging points; and update any change in status within 24 hours; ● The mobile phone application such as One Delhi[66] should have the following information along with the existing features[67]: - Real-time update on the availability of the CP; - Location details of the CP- Surface parking, basement or the roadside; - Option for users to rate the CP on a 5-star scale.
Signage	● Install signage at charging points with a visibility of 50 meters, both in the day and night, as per IRC:067; ● Place signage at the entrance of surface or basement parking areas including information on the type of charging point, its compatibility, and directions to the CP.
Visibility	● Place the CPs to ensure clear line of sight from 5-10 metres and without being obstructed by parking or advertisements.
Safety and Security	
Active area	● Charging points should be located in areas with regular pedestrian traffic such as near metro stations, bus stops, ground floor retail uses; ● Charging points located in parking areas must be situated within 15 meters of entrances, or exits or access ramps.
Standalone liquor store	● A minimum distance of 50 meters should be maintained between a charging point and standalone liquor stores.
Lighting	● CPs located at surface parking/roadside should have lighting at night with the minimum lux level of 30 (143); ● CPs located in the basement should have a clear lighting of minimum 40 lux at all times of the day.
CCTV camera	● All charging points may be monitored by CCTV[68] cameras, either by installing dedicated cameras or ensuring coverage by existing surveillance systems.

66 In 2022, the Transport Department of Delhi upgraded the One Delhi application to include a new feature for locating electric vehicle charging stations.

67 Number of connectors, directions to reach the CP, information on the type of charging point and interoperability details;

68 The cameras should be capable of recording in both day and night conditions, with a minimum resolution of 1080p. The footage should be stored for at least 7 days, with backup options for enhanced security. Regular maintenance checks should be performed to ensure the cameras are functional and recording correctly.

Height of CP	• Charging point connectors should be located at a minimum height of 1.2m (4 feet) from the ground to protect it from water logging or floods • The EVSE should be sheltered from the rain and sun.
Fire	• A fire extinguisher (of Class C[69]) should be available at the charging point (144). Operational instructions for the fire extinguisher should be prominently displayed on the cylinder in both English and the local language, accompanied by visual aids.
Helpline number	• As recommended by BEE guidelines[70], helpline numbers should be prominently displayed at/near charging points; CPOs are encouraged to implement an IVR system to address frequently observed issues, with an option to direct users to an emergency helpline if the issue (specific to emergency) remains unresolved;
Ease of access and egress	• Provide a clear 2m wide pathway to facilitate unobstructed access and egress for vehicles using the charging point. This pathway should be demarcated with paint or signage to prevent parking or other obstructions; • Do not install CPs on footpaths/cycle tracks where they would interfere with pedestrian/cyclists or make it difficult for vehicles to access the charging point;
Charging infrastructure and network connectivity	
Detailed user instructions	• All CPs, except 3-point plug should have step-by-step information on how to use charging infrastructure, displayed in English and the local language, accompanied by visual aids; CPOs can also provide this information by providing a QR code at CP;
Interoperability information	• Brand-specific charging points should include information on the type of charger and its interoperability with other systems; CPOs are encouraged to install multiple types of chargers at each station (e.g., fast, and slow,) to cater to different user needs and reduce dependency on a single charging method. This increases resilience and reduces the impact of any single charger being out of service;
Amenities	
Dedicated space for charging an E2W	• Provide designated parking space of 2m x 1m per E2W, corresponding to the number of available CPs. These spaces should be clearly marked or painted to indicate that they are reserved exclusively for charging vehicles; • Measures should be in place to prevent non-charging vehicles from occupying charging spaces. In parking areas, this responsibility can be assigned to parking attendants.
Shaded areas for rest	• Locate the CP in a sheltered area; • If there is no shaded seating space available near the CP, provide at least two seats per charging point.
Additional Amenities	• For charging stations with at least 3 CPs, locate the CS within 5-minute walking distance of amenities such as toilets and drinking water[71]; • Provide clear directional signage near the charging point to indicate the location of amenities.

69 Recommended for fires caused by electrical equipment.

70 BEE guidelines recommend to display Customer Care Number of CPO; National Emergency Number 112 and Women Helpline 1091.

71 BEE guidelines recommend amenities at public charging stations having EVSE catering to more than 10 numbers of e-four-wheelers.

Annexure 3: Charging Infrastructure Assessment Framework

The Urban Catalysts developed an assessment framework to evaluate the existing charging points[72] aiming to make them more responsive to all users, including women, and to increase their utilization. The framework is structured around four indicators with 23 associated attributes (Table 33). The attributes were identified and weighted through focus group discussions with E2W users, and modified with feedback from industry and experts and audits at various charging stations. A charging station/point will be evaluated on a scale of 99, with each indicator assigned a specific weightage. The performance rating scale is as follows:

Table 32: Rating score of a charging station/point

Total score	Rating	
0-33	Very poor	
33.01 - 66	Poor	
66.01- 99	Satisfactory	

Table 33: Charging infrastructure assessment framework

1. Ease of finding charging stations (CS)				
Rate the overall ease of locating the charging station	*Very difficult or does not exist*	*Difficult*	*Easy*	*Very Easy*
Scores	*Score 0*	*Score 1*	*Score 2*	*Score 3*
Accuracy of the location of the CS	Not located on Google Maps or it does not exist	Located on Google Maps, but it is located beyond 50 m	Located on Google Maps, but it is within 50 m	Precisely located on Google map
Real-time information on the availability of the CP	Not Operational	Information is not available	Information is available but not accurate	Information is available and accurate
Signage	Does not exist	Legible from a distance of up to 25 m	Legible from a distance of 25-50 m	Legible from a distance of over 50 m
Visibility	Present, but not clearly visible at the location	Visible from a distance of up to 25 m	Visible from a distance of 25-50 m	Visible from a distance of over 50 m
2.Safety and Security				
Rate the overall perception of safety and security	*Very unsafe*	*Unsafe*	*Safe*	*Very safe*
Scores	*Score 0*	*Score 1*	*Score 2*	*Score 3*
Active area	No people nor ground-level active use	Very few people (<2) or limited ground-level active use	Some people (3-5) or some ground-level active use	More people (6 or more) or more ground-level active use
Stand-alone liquor store	There is a liquor store within 50 m			There is/ is not a liquor store beyond 50 m
Lighting	Dark or dimly lit	Charging point is well-lit	Charging point and surrounding area of 50 m is well-lit	Charging point and surrounding area of 100 m is well-lit

[72] With a focus on electric two-wheelers.

CCTV camera	No			Yes
Height of the CP	The charging point is below a height of less than 4 feet			Charging point is at a height of 4 feet or above
Fire extinguisher	No fire extinguishers present	Fire extinguishers are available without any instructions	Fire extinguishers are available with instruction in English or regional language	Fire extinguishers available with instructions in English and regional language
Helpline number and safety instructions	No safety instructions or helpline number	Either helpline or safety instructions are displayed in English or regional language	Helpline number and safety instructions are in English or the regional language	Helpline number and safety instructions are provided in English and the regional language
Ease of access and egress	There is no clear space for access and egress	There is limited clear space for access and egress	There is some clear space for access or egress	There is clear space for access or egress.
Information on the gender of the users	No			Yes
Trained personnel at the charging station	No			Yes
3. Charging infrastructure and network connectivity				
Rate the overall charging infrastructure and network connectivity	*Deteriorated and not connected*	*Poor condition and not connected*	*Well-maintained with patchy network*	*Well maintained and consistent connectivity*
Scores	*Score 0*	*Score 1*	*Score 2*	*Score 3*
Interoperability	No			Yes
Availability of fast charging points	0	0-25%	25-50%	> 50%
Information on how to use the CP	No information is available	Basic instructions are provided in English or regional language	Clear instructions are provided in English or regional language	Clear instructions are provided in English and the regional language
Waiting time to use the charging point	>15 minutes	10-15 minutes	5-10 minutes	< 5 minutes
4. Amenities				
Rate the overall amenities	*No amenities are available*	*Amenities are available, but insufficient*	*Sufficient amenities are available as per the CPs*	*Sufficient amenities cater to users and those waiting*
Scores	*Score 0*	*Score 1*	*Score 2*	*Score 3*
Shaded waiting area	No waiting area	A waiting area is provided but not shaded	The shaded waiting area is sufficient for users	The shaded waiting area is sufficient for existing and potential users.

Seating	No seating area	A seating area is provided, but not sufficient for all users. (less than the number of CP)	Seating area sufficient for all users (equal to the number of CP)	Seating area sufficient for existing and potential users (At least 10% more than the number of CP)
Drinking water within 100m	No drinking water is available	Drinking water is available within 100 m of the CP	Drinking water is available within 50m of CP	Drinking water available at the CP
Gender disaggregated clean toilets within 100 m	No gender disaggregated; clean toilets are available within 100m	Gender disaggregated; clean toilets are available within a 100 m distance of the CP	Gender disaggregated; clean toilets are available within a 50 m distance from the CP	Gender disaggregated; clean toilets (including those for gender minorities) are available within a 50 m distance from the CP
dedicated space for charging E2Ws	No dedicated space for charging E2Ws	Dedicated space for charging E2Ws is available, but less than the number of CPs	Dedicated space for charging E2Ws is same as the number of CPs	Dedicated space for charging E2Ws is 10% more than the number of CPs

Annexure 4: Rationale for the women-focused purchased subsidies

The subsidy is aimed at providing a parity in the acquisition costs for electric two-wheelers amongst men and women. The following could be eligibility criteria for women to obtain the additional subsidy:

- A resident of the state;
- Between the age group of 18-45 years at the time of registration of the EV;
- The purchased vehicle should be registered on the name of women applying for the subsidy;
- A valid driving license issued in the female applicant's name;
- The applicant must not have availed an electric vehicle subsidy;
- A certificate from a registered employer, delivery platform (e.g., Urban Company, Zomato), or a registered non-profit women's support organization (e.g., SEWA), verifying that the individual has been actively engaged with the platform for a duration of 3 months;
- The vehicle must not be transferred to a male for a period of five years from purchase date.

Delhi

The **total cost of ownership[73] for E2Ws is 29% to 58% higher for women** in Delhi as compared to men, largely due to differences in vehicle utilization. Men travel 1.3 to 1.7 times more than their female counterparts, depending on whether the use is commercial[74] or personal[75] purposes (Table 34). The difference in per kilometre costs becomes significant as compared to the acquisition cost of the E2W when considered on annual and life time basis (Table 35). A subsidy of around INR 3,000/kWh, up to INR 10,000/vehicles could to reduce the TCO for women by 15% to 29% (Table 35).

Table 34: Average distance travelled in Delhi, by gender (in km)

	Personal			Commercial		
	Men	Women	Difference	Men	Women	Difference
Delhi	31	24	22%	105	61	42%

Table 35: Gender difference in the cost of an E2W in an ownership period of 10 years

	Personal				Commercial			
	Usage *(km/yr)*	Gendered TCO Diff. *(INR/km)*	TCO Diff. *(INR/year)*	NPV *(INR)*	Usage *(km/yr)*	Gendered TCO Diff. *(INR/km)*	TCO Diff. *(INR/year)*	NPV *(INR)*
Without recommended subsidy	7,245	0.64	4,638	34,525	18,315	0.49	8,950	66,628
With recommended subsidy of INR 3,000/kWh	7,245	0.45	3,294	24,525	18,315	0.42	7,607	56,628

Table 36: Total cost of ownership of E2W for selected models (for an ownership period of 10 years)

	Personal			Commercial		
	Men	Women	Difference	Men	Women	Difference
Without recommended subsidy	2.47	3.11	0.64	0.84	1.33	0.49
With recommended subsidy of INR 3,000/kWh	2.47	2.92	0.45	0.84	1.26	0.42

Note: TCO is calculated considering Electric two-wheeler (Ola S1 Pro)

[73] TCO is calculated over a 10-year ownership period and includes the cost of battery replacement. Additionally, it factors in the Delhi state subsidy of INR 5,000 per kWh and an INR 10,000 subsidy for Electric Mobility Promotion Scheme 2024.

[74] Users who are involved in commercial activities, requiring multiple daily trips, are either registered on delivery platforms or employed by organizations for parcel and order distribution.

[75] Users who use their E2W to commute to a fixed employment location without the need for multiple daily trips.

Tamil Nadu

Tamil Nadu currently has a scheme for subsidising commercial EVs at the rate of Rs. 10,000/kWh up to Rs. 30,000/vehicle. However, since two-wheelers are currently not registered in commercial category, this subsidy is not being disbursed. It is proposed that the same subsidy could be disbursed to women users. The proposed of subsidy is expected to create parity in the acquisition cost of E2Ws and reduce the TCO for women by 16-39%.

Table 37: Average distance travelled in Chennai, by gender (in km)

	Personal			Commercial		
	Men	Women	Difference	Men	Women	Difference
Chennai	24	16	33%	53	30	43%

Table 38: Gender difference in the cost of an E2W in an ownership period of 10 years

	Personal				Commercial			
	Diff in usage km/year	TCO diff. per/km	TCO diff. per/year	NPV	Diff in usage km/year	TCO diff. per/km	TCO diff. per/year	NPV
Chennai	4,650	1.87	8,678	64,603	9,045	1.15	10,368	**63,707**
Tamil Nadu (U)	4,650	2.49	11,579	86,196	-	-	-	-

Note: The 2011 Census does not include any travel-related information for individuals employed as delivery personnel.

Table 39: Total cost of ownership of E2W for selected models (for an ownership period of 10 years)

	Personal			Commercial		
	Men	Women	Difference	Men	Women	Difference
Without recommended subsidy	3.42	5.28	1.87	1.61	2.76	1.15
With recommended subsidy of INR 3,000/kWh	3.42	4.42	1.00	1.61	2.31	0.70

References

1. International Energy Agency. Transitioning India's Road Transport Sector. ; 2023.
2. Ministry of Road Transport and Highways. Vahan Dashboard. [Online].; 2024 [cited 2024 March. Available from: https://vahan.parivahan.gov.in/vahan4dashboard/vahan/dashboardview.xhtml.
3. Kumar DP, Nunes L, Pai M. Opportunity for Electric Two-wheeler (e-2W) in Hyperlocal Economy of India. ; 2021.
4. Sachdev A. Electric 2-wheeler sales on upswing after subsidy shock. mint. 2023.
5. Ministry of Road Transport and Highways. Road Transport Year Book 2019-20. ; 2023.
6. Evolve I. Last mile delivery. ; 2024.
7. Bhattacharyya R. Online delivery companies rush to hire women riders amid increasing attrition. The Economic Times. 2022 April.
8. Athulya V, Ramya M. A Study on Women's Preference towards Two-Wheeler Brands ith Special Reference to Calicut City. 2017.
9. Amsaveni R, Kokila R. A Study on Satisfaction Levels of Working Women Towards Two Wheelers in Coimbatore, Tamil Nadu. Indian Journal of Marketing. 2014 May; 44(5).
10. Dheenadhayalan V, Shanmugapriya R. Awareness of women consumers towards two-wheelers - A study with reference to Pondicherry. Indian Journal of Management. 2020; 11(8).
11. Bhatia M, Chauhan HA, Kumar aD. Study of Factors Influencing Consumer Behaviour towards Electric Two-wheelers in Gujarat. ; 2021.
12. Bhat FA, Verma A. Consumer intention to accept electric two-wheelers in India: a valence theory approach to unveil the role of identity and utility. ; 2023.
13. Sudarsan Jayasingh TGA. Factors Influencing Consumers' Purchase Intention towards Electric Two-Wheelers; 2021.
14. D OM. Gender and policy lab opened in Chennai. Times of India. 2022 April.
15. The Hindu Bureau. The Hindu. [Online].; 2024. Available from: https://www.thehindu.com/news/national/tamil-nadu/tn-cabinet-approves-state-new-policy-for-women/article67768710.ece.
16. Outlook. Tamil Nadu Leads India In Electric Vehicle Manufacturing, Accounting For 40% Of The Country's Production. 2023 September.
17. Sonal Shah MSSSSGAS. Safe and secure public transport in Delhi. Delhi:; 2023.
18. The Economic Times. Delhi govt notifies Motor Vehicle Aggregator scheme, mandates companies to switch to EVs by 2030. The Economic Times. 2023 November.
19. The Urban Catalysts. [LinkedIn].; 2024 [cited 2024 September 20. Available from: https://www.linkedin.com/showcase/welectric-program/.
20. Parashar BK. Women's share in driving licences issued between April-August only 5% in UP. Hidustan Times. 2019.
21. Shah S, Rajiv R, Lokre A. India; 2021.
22. Diwakar Raj S, Kannan N. A study on consumer perception towards two-wheeler industry among different brands with special reference to Chennai City. International Journal of Health Sciences. 2022; 6(S2).
23. Gupta NS. Girls drive India's scooter boom. The Times of India. 2017 April.

24. Yulu. [Online].; 2024 [cited 2024 March. Available from: https://www.yulu.bike/blogposts/5-reasons-to-buy-yulu-wynn-today/.

25. Yulu. Yulu. [Online].; 2023. Available from: https://www.yulu.bike/blogposts/explore-the-advantages-of-electric-bikes-in-urban-commuting/.

26. AEEE; ICA. Catalysing the Market Transformation of Electric Two-wheelers in India. [Online].; 2022. Available from: https://aeee.in/wp-content/uploads/2022/07/ICA-AEEE-Whitepaper-2022.pdf.

27. EVReporter. Resale of electric 2Ws and 3Ws in India - Secondary market for electric vehicles. EVReporter. 2021 January.

28. International Energy Agency. Global EV Outlook 2023. ; 2023.

29. Aayog N. Driving affordable financing for electric vehicles in India. ; 2022.

30. ET Auto. [Article].; 2022 [cited 2024 March 18. Available from: https://auto.economictimes.indiatimes.com/news/two-wheelers/yamaha-motors-enters-e-2w-leasing-with-zypp-electric/92124147.

31. Aayog N, Institute RM. Mobilising Finance for EVs in India. ; 2021.

32. JMK Research & Analytics. Indian EV market - Annual Report Card. ; 2024.

33. TransUnion CIBIL. TransUnion CIBIL Insights Indicate Growing Financial Inclusion of Women Borrowers in India's Credit Market. 2023 March.

34. Singh A. Exploring demand-side barriers to credit uptake and financial inclusion. ; 2021.

35. Reserve Bank Innovation Hub. Gender and Finance in India. 2022.

36. MOHFW. National Family Health Survey 5. Delhi:, DOHFW; 2021.

37. Sumanjeet , Dash , Mohan B. Gender Discrimination in Accessing Finance by Women-Owned Businesses: A Review. Int Womens Stud; 2021.

38. Ulrich Eberle RvH. Sustainable transportation based on electric vehicle concepts: A brief. Energy & Environmental Science. 2010 June; 3(6).

39. The Deccan Chronicle. Barriers to the Adoption of Electric Vehicles: Evidence from India. Deccan Chronicle. 2023 June.

40. S&P Global Mobility..; 2023 [cited 2024 March. Available from: https://www.spglobal.com/mobility/en/research-analysis/women-not-buying-electric-vehicles.html.

41. Geotab. [Online].; 2023 [cited 2024 March. Available from: https://www.geotab.com/press-release/ev-adoption-study/#:~:text=%E2%80%9CThe%20lack%20of%20consistency%20in,Car%20%26%20Platform%20Solutions%20at%20Geotab.

42. UNICEF. Gender Transformative Approaches for the Eimination of Female genital Mutilation. ; 2020.

43. Investopedia. Investopedia. [Online].; 2024 [cited 2024 July 25. Available from: https://www.investopedia.com/terms/c/central_limit_theorem.asp.

44. Efficiency BoE. Bureau of Energy Efficiency. [Online].; 2022 [cited 2024 06 28. Available from: https://evyatra.beeindia.gov.in/public-charging-stations/.

45. Switch Delhi. Switch Delhi. [Online].; 2024 [cited 2024 September 02. Available from: https://ev.delhi.gov.in/charging-station.

46. Ministry of Power. Charging Infrastructure for Electric Vehicles- Guidelines and Standards. ; 2018.

47. Ministry of Heavy Industries. [Online].; 2024. Available from: https://heavyindustries.gov.in/ministry-heavy-industries-electric-mobility-promotion-scheme-2024.

48. BEE. BEE. [Online].; 2024. Available from: https://evyatra.beeindia.gov.in/central-govt-initiatives/.

49. Niti Ayog. [Online].; 2024 [cited 2024 November 15. Available from: https://www.niti.gov.in/index.php/verticals/infrastructure.

50. Ministry of Heavy Industries. Ministry of Heavy Industries. [Online].; 2024 [cited 2024 June 27. Available from: https://heavyindustries.gov.in/particulars-department-heavy-industry-organization-functions-and-duties.

51. The Gazette of India. Notification CG-DL-E-24112023-250248. 2023..

52. Ministry of Heavy Industries. https://fame2.heavyindustries.gov.in/. [Online]. [cited 2024 July 30. Available from: https://fame2.heavyindustries.gov.in/.

53. Ministry of Heavy Industries. Press Information Bureau. [Online].; 2022. Available from: https://pib.gov.in/Pressreleaseshare.aspx?PRID=1808115#:~:text=The%20Ministry%20of%20Heavy%20Industries,9%20Expressways%20under%20this%20phase.

54. Business Standard. Rs. 5790 Crores Subsidy Given To EV Manufacturers Under Phase-II Of FAME India Scheme. [Online].; 2024. Available from: https://www.business-standard.com/markets/capital-market-news/rs-5790-crores-subsidy-given-to-ev-manufacturers-under-phase-ii-of-fame-india-scheme-124020500274_1.html.

55. GIZ. Electric Vehicle Charging Infrastructure and its Grid Integration in India:. New Delhi:; 2022.

56. Ministry of Power. Clarification on charging infrastructure for Electric Vehicles with reference to the provisions of the Electricity Act, 2003. 2018..

57. Central Electricity Authority. Central Electricity Authority. [Online]. [cited 2024 June 26. Available from: https://cea.nic.in/functions/?lang=en.

58. Ministry of Power. Ministry of Power. [Online]. [cited 2024 June 24. Available from: https://powermin.gov.in/en/content/electric-vehicle.

59. Ministry of Road Transport and Highways. Ministry of Road Transport and Highways. [Online]. [cited 2024 June 30. Available from: https://morth.nic.in/about-us.

60. Society of Indian Automobile Manufacturers. Society of Indian Automobile Manufacturers. [Online]. [cited 2024 June 25. Available from: https://www.siam.in/technical-regulation.aspx?mpgid=31&pgidtrail=32.

61. Press Information Bureau. Press Information Bureau. [Online].; 2020 [cited 2024 June 25. Available from: https://pib.gov.in/PressReleasePage.aspx?PRID=1645394.

62. Automotive Research Association of India. Automotive Research Association of India. [Online]. [cited 2024 June 25. Available from: https://www.araiindia.com/services/department-and-laboratories/hmr.

63. India Standards Portal. India Standards Portal. [Online]. [cited 2024 June 25. Available from: https://indiastandardsportal.org/standardbodiecontent.aspx?StandardBodyId=2.

64. Automotive Research Association of India. Automotive Research Association of India. [Online]. [cited 2024 June 25. Available from: https://www.araiindia.com/services/research-and-development.

65. Press Information Bureau. Press Information Bureau. [Online].; 2023 [cited 2024 June 25. Available from: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1911399.

66. BEE. Income Tax deduction for purchase of Electric Vehicles. [Online].; 2024. Available from: https://evyatra.beeindia.gov.in/central-govt-initiative-details/mof-2/.

67. Ministry of Housing and Urban Affairs. Ministry of Housing and Urban Affairs. [Online]. [cited 2024 June 25. Available from: https://mohua.gov.in/#.

68. Press Information Bureau. Press Information Bureau. [Online].; 2019 [cited 2024 June 25. Available from: https://pib.gov.in/Pressreleaseshare.aspx?PRID=1564744.

69. Bureau of Indian Standards. Bureau of Indian Standards. [Online]. [cited 2024 June 25. Available from: https://www.bis.gov.in/.

70. MoEFCC. Ministry of Environment, Forest and Climate Change. [Online].; 2024. Available from: https://moef.gov.in/introduction.

71. MoEFCC. Battery Waste Management Rules, 2022. 2022..

72. Industries Department, Tamil Nadu. Tamil Nadu Electric Vehicles Policy 2019. ; 2018.

73. Industries IP&CD. Tamil Nadu Electric Vehicle Policy 2023. Chennai:; 2023.

74. Tamil Nadu State Nodal Agency. [Online].; 2024 [cited 2024 November 14. Available from: https://app1.tangedco.org/dsmenergy/evstation.xhtml.

75. Industries Department, Tamil Nadu. [Online].; 2019. Available from: https://cms.tn.gov.in/sites/default/files/go/ind_e_176_2019.pdf.

76. Industrial Economist. The Industrial Economist. [Online].; 2024. Available from: https://industrialeconomist.com/tamil-nadu-will-soon-have-the-largest-recycling-plant/#:~:text=The%20Tamil%20Nadu%20government%20has,tide%20over%20this%20change%20smoothly.

77. Government of National Capital Territory of Delhi. Delhi Electric Vehicle Policy 2020. ; 2020.

78. Delhi Transport Department. [Online].; 2024. Available from: https://x.com/TransportDelhi/status/1768886886905630820.

79. The Times of India. Delhi govt sets up an electric vehicle cell to put policy on fast track. [Online].; 2022 [cited 2024 September 13. Available from: https://timesofindia.indiatimes.com/city/delhi/delhi-govt-sets-up-an-ev-cell-to-put-policy-on-fast-track/articleshow/90086769.cms.

80. The Print. Delhi govt looks at rapid expansion of electric vehicle charging infrastructure. The Print. 2022 July.

81. Directorate of Training and Technical Education. Directorate of Training and Technical Education. [Online].; 2024 [cited 2024 September 14. Available from: https://tte.delhi.gov.in/tte/about-us.

82. Bureau of Energy Efficiency. EV Yatra. [Online]. [cited 2024 July 22. Available from: https://evyatra.beeindia.gov.in/state-ev-policies/.

83. Neha Gupta AA. EV-Ready India Feminising EV Value Chain. OMI Foundation; 2024.

84. Krishna S, Ahmad F. A Step Towards Tamil Nadu's EV Future: An Assessment of the Tamil Nadu Electric Vehicle Policy 2023. [Online].; 2023 [cited 2024 September 10. Available from: https://itdp.in/tn-ev-future/.

85. Ministry of Labour and Employment. Report on Absenteeism, Labour Turnover, Employment and Labour Cost, Annual Survey of Industries. ; 2019-20.

86. Ministry of Education. All India Survey on Higher education 2021-22. Ministry of Education, Department of Higher Education; 2024.

87. Banerjee A. Times of India. [Online].; 2022. Available from: https://timesofindia.indiatimes.com/auto/policy-and-industry/delhi-dseu-to-train-100-ev-mechanics-every-year-as-part-of-green-jobs-creation-goal/articleshow/94371085.cms.

88. The Hindu. The Hindu. [Online].; 2021. Available from: https://www.thehindu.com/news/cities/Delhi/delhi-govt-launches-online-registration-for-e-auto-permits-with-33-reservation-for-women/article37050435.ece.

89. Statistics and Data Division. Registration of Micro, Small and Medium Entriprises (MSMEs) in India. ; 2020-22.

90. Ministry of Statistics and Programme Implementation. Time Use in India-2019. National Statistical Office; 2019.

91. Bazar B. [Online]. [cited 2024 07 7. Available from: https://www.bankbazaar.com/tax/tamil-nadu-road-tax.html.

92. NDTV. Ultimate toolbox. [Online].; 2024 [cited 2024 07 08. Available from: https://www.ndtv.com/fuel-prices/petrol-price-in-chennai-city.

93. TANGDECO. [Online].; 2023 [cited 2024 07 09. Available from: https://www.tangedco.org/static/tangedco/assets/files/tariff/2023/onepage30062023.pdf.

94. Nibedita Dash AB. Cost comparison of battery swapping, point charging, and ICE two-wheelers in India. Delhi:; 2021.

95. Nadu GoT. COMMISSIONERATE OF TRANSPORT AND ROAD SAFETY. [Online]. [cited 2024 04 08. Available from: https://tnsta.gov.in/Indexes/vehicle_drivinglicence.

96. department T. Transport department Governmnet of NCT of Delhi. [Online]. [cited 2024 04 08. Available from: https://transport.delhi.gov.in/transport/learner-licence-0.

97. Nimje SN. Sarathi Parivahan: Everything you need to know about driving license. [Online].; 2023. Available from: https://www.business-standard.com/india-news/sarathi-parivahan-everything-you-need-to-know-about-vehicle-details-123110200889_1.html.

98. Ministry of Road Transport and Highways. Central Motor Vehicles Rules.; 2023 [cited 2023 April 10 [2023 Amendment to Central Motor Vehicles Rules, 1989]. Available from: https://morth.nic.in/sites/default/files/notifications_document/draft%20GSR%20180(E)%20dated%2013th%20March%202023%20Hybrid%20ELectric%20vehicles.pdf.

99. Ministry of Road Transport and Highways. [Online].; 2021 [cited 2024 March 12. Available from: https://morth.nic.in/sites/default/files/notifications_document/GSR%20240%28E%29%20dated%2031st%20March%202021%20Committee%20A%20Licensing%20of%20drivers%2C%20Fitness%20and%20Registration%20of%20motor%20vehicles%20%20.pdf.

100. Iyer NV. A Technical Assessment of Emissions and Fuel Consumption Reduction Potential from Two and Three Wheelers in India. International Council on Clean Transportation; 2012.

101. NITI Aayog, SIDBI, RMI. De-Risking Lending for a Brisk EV Uptake. ; 2024.

102. Bajaj Finserv. Bajaj Finserv. [Online].; 2024 [cited 2024 March 11. Available from: https://www.bajajfinserv.in/two-wheeler-loan-eligibility-and-documents.

103. Shriram Finance. Shriram Finance. [Online].; 2024 [cited 2024 March 11. Available from: https://www.shriramfinance.in/two-wheeler-loan-eligibility.

104. Ministry of Statistics and Programme Implementation. Periodic Labour Force Survey (PLFS) - July 2022-June 2023. Annual Report. , National Sample Survey Office; 2023.

105. EVReporter. EVReporter. [Online].; 2019. Available from: https://evreporter.com/guide-to-ev-charging-and-standards-in-india/.

106. IIT Bombay and Fraunhofer IEE. Smart Charging Stategies and technologies for Electric Vehicles. ; 2021.

107. ZigWheels.com. ZigWheels.com. [Online].; 2022 [cited 2024 July 30. Available from: https://www.zigwheels.com/news-features/ev-guide/ev-simplified-types-of-chargers/44695/.

108. Ather. Ather. [Online].; 2024. Available from: https://www.atherenergy.com/faq/vehicle/ather_450_series.

109. Ola. Ola. [Online].; 2024. Available from: https://www.olaelectric.com/hyper-charger-network.

110. Alvarez & Marsal. Electric Vehicles: Spotting the Challenges & CHarting the Course. ; 2022.

111. Sonal Shah RRAL. Moving towards gender equitable public transport operations in a post COVID-19 world. Delhi:; 2021.

112. MOWO. MOWO. [Online]. Available from: https://www.mowo.in/mowo-origin.

113. anew. anew. [Online]. Available from: https://www.anewindia.org/.

114. Foundation A. Azad Foundation. [Online]. Available from: https://azadfoundation.com/.

115. times E. Mahindra Logistics onboards women e-bike riders for last-mile deliveries. Economic times. 2023.

116. BikeDekho. BikeDekho. [Online].; 2024. Available from: https://www.bikedekho.com/.

117. Shetty S. The Ministry of Heavy Industries Launches EV Taskforce and Electric Mobility Promotion Scheme 2024. [Online].; 2024. Available from: https://emobilityplus.com/2024/04/20/india-charges-ahead-ministry-of-heavy-industries-releases-ev-roadmap-to-pioneer-global-e-mobility-transition/.

118. Ministry of Power. Guidelines for Installation and Operation of EV Charging Infrastructure. [Online].; 2024. Available from: https://powermin.gov.in/sites/default/files/webform/notices/Guidelines_and_Standards_for_EVCI_dated_17_09_2024.pdf.

119. Baureu of Energy Efficiency, MoP. Guidelines for Installation and Operation of Electric Vehicle Charging-2024..

120. Transport Analysis. Road Taffic-Vehicle Statistics. [Online].; 2024. Available from: https://www.trafa.se/en/road-traffic/vehicle-statistics/.

121. MoRTH. Order specifying types of Motor Vehicles on the basis of its usage. https://morth.nic.in/sites/default/files/notifications_document/Draft%20So%20-%20vehicle%20classification%20on%20usage_0001.pdf:; 2021.

122. The Hindu Bureau. The Hindu. [Online].; 2024 [cited 2024 December 02. Available from: https://www.thehindu.com/news/cities/Delhi/delhi-govt-extends-ev-policy-till-march-2025-revives-subsidies-tax-exemptions/article68924591.ece.

123. Department of Mission Shakti, Govt. of Orissa. Guidelines on new scheme titled "Mission Shakti Scooter Yojna". ; 2023.

124. The Hindu. The Hindu. [Online].; 2021. Available from: https://www.thehindu.com/news/cities/Delhi/delhi-govt-launches-online-registration-for-e-auto-permits-with-33-reservation-for-women/article37050435.ece.

125. The Print. The Print. [Online].; 2022. Available from: https://theprint.in/india/14-out-of-743-women-applicants-get-their-e-autos-registered-under-delhi-govt-initiative-officials/1033302/.

126. Govt. of Tamil Nadu. My Scheme. [Online].; 2018. Available from: https://www.myscheme.gov.in/schemes/atwsfww#benefits.

127. Schaeffler India. Schaeffler India. [Online].; 2024. Available from: https://www.schaeffler.co.in/en/news-media/press_releases/press_releases_detail.jsp?id=88029824#:~:text=A%20collaborative%20venture%20between%20Schaeffler,Technical%20Enhancement%20Programme%20(STEP).

128. Abhijeet Singh. Mobility Outlook. [Online].; 2024. Available from: https://www.mobilityoutlook.com/news/ather-energy-teams-up-with-tata-iis-to-support-indias-ev-workforce-skilling/.

129. Directorate of Training and Technical Education. Directorate of Training and Technical Education. [Online].; 2024. Available from: https://tte.delhi.gov.in/tte/govt-industrial-training-institutes-itis.

130. DTTE, Govt. of Delhi. Fee structure of Delhi Government ITI's for session 2023-24/25. [Online].; 2024. Available from: https://cdnbbsr.s3waas.gov.in/s35249ee8e0cff02ad6b4cc0ee0e50b7d1/uploads/2023/05/2023052591.pdf.

131. DTTE. Industrial Collaboration of Department of Training & Technical Education. [Online].; 2023. Available from: https://cdnbbsr.s3waas.gov.in/s35249ee8e0cff02ad6b4cc0ee0e50b7d1/uploads/2023/06/2023060128.pdf.

132. Commissionerate of Employment & Training. List of courses in ITIs. ; 2024.

133. Reserve Bank Innovation Hub. Frictionless Finance for Every Woman in India. ; 2023.

134. Bhardwaj T. Financial Express. [Online].; 2022. Available from: https://www.financialexpress.com/life/lifestyle-international-womens-day-biggest-challenge-for-women-entering-logistics-karina-bhasin-ceo-even-cargo-explains-2451685/.

135. Even cargo. Even cargo. [Online].; 2024. Available from: https://evencargo.in/service.

136. NRDC. NRDC. [Online].; 2024. Available from: https://www.nrdc.org/bio/sameer-kwatra/clean-transportation-access-rural-india-0#:~:text=To%20help%20lower%20this%20barrier,for%20EV%20financing%20for%20beneficiaries.

137. Bangalore Mirror. Women drivers to board Namma Yatri. Bangalore Mirror. 2024 January.

138. Jain A. https://www.lokmattimes.com/national/bengaluru-women-auto-preneurs-earn-rs-42-lakhs-through-namma-yatri-mahila-shakti-program-a475/. [Online].; 2024. Available from: https://www.lokmattimes.com/national/bengaluru-women-auto-preneurs-earn-rs-42-lakhs-through-namma-yatri-mahila-shakti-program-a475/.

139. NITI Aayog, SIDBI, RMI. De-Risking Lending for a Brisk EV Uptake. ; 2024.

140. VidaWorld. [Online].; 2024. Available from: https://www.vidaworld.com/vida-v1-pro.html.

141. Motor World India. [Online].; 2024. Available from: https://www.motorworldindia.com/hero-motocorp-vida-v1-ev-gamechanger-or-not/.

142. Transport Research Wing, MoRTH. Road Accidents in India. ; 2022.

143. UTTIPEC, Delhi Development Authority. Street Design Guidelines. ; 2010.

144. Bureau of Indian Standards. Selection, Installation and Maintenance of First-Aid Fire Extinguishers- Code of Practice. ; 2010.

145. Power Mo. Charging Infrastrcture for Electric Vehicle (EV) - the revised consolidated Guidlines & Standards. ; 2022.

146. International Copper Association India (ICA) and Alliance for an Energy Efficient Economy (AEEE). Catalysing the market transformation of electric two-wheelers in India. 2022..

147. National Statistics Office. Annual Survey of Industries 2020-2021. Ministry of Statistics and Programme Implementation; 2024.

148. Rajpal NK. SHG Federations in Odisha: Management, Challenges and Opportunities.; 2018. Available from: https://www.rjhssonline.com/HTML_Papers/Research%20Journal%20of%20Humanities%20and%20Social%20Sciences__PID__2019-10-1-29.html.

149. BEE. Bureau of Energy Efficiency. [Online].; 2024. Available from: https://beeindia.gov.in/en/programmesenergy-efficiency-in-transport-sector/electric-mobility#:~:text=BEE%20has%20been%20nominated%20as,of%20EV%20Public%20Charging%20Infrastructure.

150. Press Trust of India. The Economic Times. [Online].; 2024 [cited 2024 September 15. Available from: https://economictimes.indiatimes.com/industry/renewables/delhi-cabinet-gives-nod-to-extend-electric-vehicle-policy-till-june/articleshow/108543635.cms?from=mdr.

151. Ministry of Statistics and Programme Implementation. Periodic Labour Force Survey 2023-24. Annual Report. National Sample Survey Office; 2024.

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