

Supporting the Transition to a Low-Carbon, Affordable and Inclusive Transport System in Peri-urban and Rural Districts of Rajasthan



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Abbreviations

2Ws	Two-Wheelers
3Ws	Three-Wheelers
4Ws	Four-Wheelers
DISCOM	Distribution Company
E-3Ws	Electric Three-Wheelers
E-4Ws	Electric Four-Wheelers
EVs	Electric Vehicles
FADA	Federation of Automobile Dealers Associations
ICE	Internal Combustion Engine
MDVs	Medium Duty Vehicles
MSME	Micro, Small and Medium Enterprises
RAJEEVIKA	Rajasthan Grameen Aajeevika Vikas Parishad
RADA	Rajasthan Automobile Dealers Association
RTO	Regional Transport Office
SIAM	Society of Indian Automobile Manufacturers
SMEV	Society of Manufacturers of Electric Vehicles
E-MDVs	Electric Medium Duty Vehicles
NMT	Non-Motorised Transport
DRT	Demand Responsive Transit
HDVs	Heavy Duty Vehicles
E-2W	Electric Two-Wheelers
OEM	Original Equipment Manufacturer
FAME	Faster Adoption and Manufacturing of Electric Vehicles
PM-KUSUM	Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyaan
SGST	State Goods and Services Tax
L1, L2, L3 Charging	Level 1, Level 2, Level 3 Charging
BaaS	Battery as a Service Model
NGOs	Non-Government Organisations
CSOs	Civil Society Organisations
VLEs	Village Level Entrepreneurs
CSCs	Common Service Centre

Executive Summary

India is advancing towards a green energy transition to meet its climate mitigation goals and reduce net emissions. The road transport sector alone accounts for 12 percent of the nation's energy-related CO₂ emissions (International Energy Agency, 2023). Rural India, home to over 65 percent of the population, plays a pivotal role in this transition.

Rural areas face higher commuting demands compared to urban counterparts, resulting in increased travel costs, travel times, and carbon emissions (Pateman, 2011). Introducing Electric Vehicles (EVs) in these regions is, therefore, highly relevant. EVs offer a cost-effective, long-term solution and are less susceptible to global fuel price fluctuations, making them a sustainable mode of transport with significant environmental benefits.

Addressing the disparity in rural-urban EV adoption and identifying the potential for EVs in rural areas is crucial, particularly from the perspective of a just energy transition. Rural and peri-urban mobility in India encounters several challenges, including inadequate public transportation services. This insufficiency hampers residents' ability to travel for education, healthcare, and employment opportunities.

In this context, we have examined the mobility and infrastructure needs in Rajasthan's rural and peri-urban areas to propose ways to develop a low-carbon, resilient commuting system. Rajasthan, with its high rural density and low per capita income, provides a suitable setting for this study. We focused on Banswara and Pratapgarh districts, chosen for their rural-urban population ratios, the ratio of EVs to Internal Combustion Engine (ICE) vehicles, and socio-economic conditions.

Our comprehensive study, which involved qualitative thematic analysis of primary data from 893 respondents across 200 households, reveals several key insights into the mobility landscape of rural and peri-urban areas in Rajasthan.

- **Gender Disparities:** The study indicates that men commute more frequently than women, who typically travel weekly or monthly. Women rely more on public transport than male family members for commuting, highlighting a significant gender disparity in mobility patterns.
- **Last-mile connectivity:** Last-mile connectivity varies significantly between regions. In Pratapgarh, the small area size limits the viability of shared transport options, resulting in

predominantly non-sharing connectivity. In contrast, Banswara, with its larger area, exhibits a clear demand for shared public transport, with three-wheelers (3Ws) and four-wheelers (4Ws) being the dominant modes of travel.

- **Public Transport Quality:** The quality of public transportation is notably poor, characterised by overloading, unregulated tariffs, and substandard vehicles. These issues contribute to a challenging travel experience for residents.
- **Medium-Duty Vehicles (MDVs):** MDVs are crucial for transporting goods and facilitating inter-village commutes, given the limitations of rail networks and inflexible bus routes in rural areas. They play a vital role in maintaining connectivity and supporting local economies.
- **Demand-Based Rentals:** There is a noticeable demand for rental models of 3Ws and 4Ws, particularly for specific family needs. Women commuters, in particular, show a strong preference for such models, which cater to their specific requirements.
- **Potential for EV Two-Wheelers (2Ws):** The study identifies significant potential for EV two-wheelers (2Ws) in rural areas. This potential is driven by high commuting needs, rising fuel prices, and a demand for sustainable transport options similar to urban areas.
- **Challenges in the EV Market:** Despite the potential, the rural and peri-urban EV market faces several challenges. These include a lack of awareness about subsidies, product gaps, difficulties with home-charging infrastructure, poor aftersales service, and limited financial accessibility.
- **E-Rickshaw Market:** The potential for e-rickshaws varies by region. Pratapgarh's terrain limits its feasibility, while Banswara shows emerging opportunities for e-rickshaw adoption, reflecting different regional needs and possibilities.
- **Electric Three-Wheelers (E-3Ws) for Goods Transport:** There is a notable opportunity to deploy electric three-wheelers (E-3Ws) for transporting goods produced by local communities, which could enhance local economic activities and reduce carbon emissions.

To improve the rural and peri-urban transport ecosystem in Rajasthan, several key actions are recommended. One of the primary suggestions is the expansion of Rajasthan's 2022 Electric Vehicle (EV) policy to encompass rural areas, ensuring the seamless integration of EVs into the broader rural transportation framework. Simultaneously, it is essential to enforce stringent road transport regulations, such as passenger limits, tariffs, and vehicle safety standards, to elevate transport quality across these regions.

Introducing electric vehicles in the medium-duty vehicle (MDV) segment, including small electric buses, electric three-wheelers (E-3Ws), electric four-wheelers (E-4Ws), and school vans, can diversify transport options. Implementing demand-based rental models will help cater to varying transportation needs. Furthermore, integrating solar energy into EV charging

systems through the Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyaan (PM-KUSUM) Yojana and the upcoming 2024 Muft Bijli Yojna can offer a sustainable solution for home-based charging.

To make EVs financially accessible, offering interest rate subsidies on EV loans through government banks and micro-finance options will empower rural households. In addition, there is a need to develop products specifically designed for rural markets, fostering local manufacturing under the Micro, Small, and Medium Enterprises (MSME) umbrella. Strategic infrastructure development should also be prioritised, with planning based on travel patterns and public transit needs, while collaborating with local utility providers for optimal results.

Cost-effective alternatives, such as retrofitting existing vehicles, must be encouraged, along with the revitalisation of non-Regional Transport Office (RTO) vehicles, making EV adoption more affordable and stimulating demand. Establishing a battery leasing or swapping model would also reduce the upfront cost burden associated with EV ownership.

To promote greater adoption, raising awareness of available EV subsidies through local outreach events, such as street shows, village fairs, and trade exhibitions, will be vital. Engaging rural women by training them to operate EV three-wheelers, which align well with their mobility needs, can further enhance gender equality in transportation. Finally, capacity-building initiatives aimed at skill development will create job opportunities and improve aftersales services in the EV sector, driving long-term sustainability in this transition.

Introduction

Context Setting

Rural India, which houses over 65 percent of the country's population, plays a critical role in the nation's energy transition (Press Bureau of India, 2023). Understanding the obstacles faced by the EV market in these rural and peri-urban areas is essential for developing effective strategies and interventions. Addressing both supply and demand challenges from public and private perspectives will be crucial in formulating strategies to create an efficient, electric-driven transport network that matches urban infrastructure, accessibility, and service levels.

Rural and peri-urban mobility in India faces significant challenges that impede efficient transportation and connectivity. Public transportation services are often inadequate or non-existent, and the lack of regular bus or train services complicates travel to nearby towns or cities for essential needs such as education, healthcare, and employment. Even individuals with private vehicles, such as motorbikes or cars, encounter difficulties due to the sparse distribution of fuelling stations and a limited after-sales market.

Addressing these mobility challenges in rural and peri-urban areas is vital, particularly given the emerging nature of the EV market in India. This transition must be executed inclusively and equitably to prevent further widening of the rural-urban economic gap. Without timely intervention, the adoption of EVs and the development of supporting infrastructure could remain confined to urban areas, leaving rural regions dependent on unsustainable fossil fuels for their transportation needs.

A Case Study of Two Districts of Rajasthan (Pratapgarh and Banswara)

Rajasthan, with its high rural density and low per capita income, offers a suitable geographic context for developing case studies aimed at prompting policymakers and industry stakeholders to foster a resilient, carbon-free transport network that spans urban, peri-urban, and rural areas. This approach will not only accelerate the transition to electric mobility but also contribute to the socio-economic development of all citizens, regardless of their region.

Banswara and Pratapgarh districts in Rajasthan were selected for this study based on several socio-economic, demographic, and transport-relevant criteria:

High Population Density and Rural-Urban Ratio: Both districts exhibit high rural density and a significant rural-to-urban population ratio, coupled with low per capita income.

Vehicle Adoption Rates: Sales data from 2022-23 indicate that these districts have a higher proportion of conventional Internal Combustion Engine (ICE) vehicles and comparatively lower EV adoption rates.

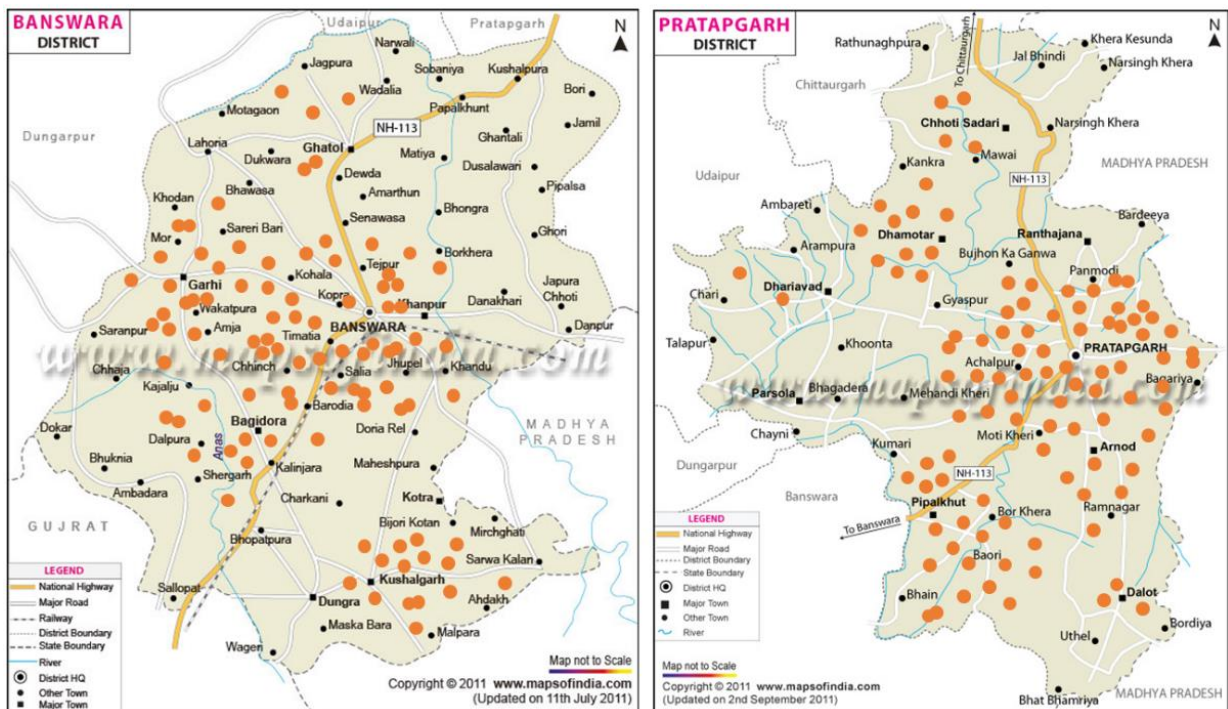
Socio-Economic Conditions: Banswara and Pratapgarh are located in the southern province, a region known for its underdeveloped social infrastructure.

Table 1: District Information

District	Rural to urban population	EV two-wheeler to petrol	EV two-wheeler to diesel
Pratapgarh	91.73 %	2.64 %	3.45 %
Banswara	92.90 %	0.71 %	2.14 %

Note: population data is taken from census 2011 and sales data from Vahan dashboard from 2022 - August 2023.

Figure 1: Surveyed Households in Banswara and Pratapgarh Districts



Source: Prepared by authors

The study conducted in Banswara and Pratapgarh aims to identify gaps in mobility services and barriers to EV adoption in these districts. The findings have been used to design targeted interventions that promote an inclusive and affordable mobility system for all.

This report explores the potential to replace the existing fossil-fuel-driven transport network with a greener system and to build new networks where they are inadequate or non-existent through electric mobility interventions. Adopting cost-effective and efficient commuting options would enhance access to education, healthcare, employment, and business opportunities, thereby contributing to the socio-economic development of rural communities. Additionally, this progress will address gender disparities in mobility access.

Methodology

The primary objective of this study is to provide stakeholders with insights into the development of an affordable, inclusive, and low-carbon transport system tailored for rural and peri-urban regions of Rajasthan. To achieve this, the study was conducted through a detailed, phased approach, ensuring a thorough examination of the various facets of transport development in these areas.

Secondary Literature Review

To gain a thorough understanding of the transport needs in Rajasthan's rural areas, as well as the opportunities and challenges associated with adopting electric vehicles (EVs), a comprehensive review was conducted. This review involved documenting various international studies and relevant national initiatives that address rural mobility issues and promote electric mobility. The insights gained from this review have been instrumental in shaping and guiding the subsequent actions of the study.

Scoping Visit and Formation of Project Advisory Committee (PAC)

The scoping visit served as a pilot survey to establish initial connections with stakeholders and resource persons, and to gain a preliminary understanding of the on-ground situation. Informal discussions with both sellers and buyers of conventional and electric vehicles provided valuable insights into commute requirements—both public and personal—available public transport options, and barriers to EV adoption. These conversations also shed light on general awareness of EV benefits and policy support, helping to shape the framework for the subsequent stakeholder consultations.

To further guide and refine the project, a Project Advisory Committee (PAC) was formed, comprising five subject matter experts. The PAC's role was to oversee each project activity, evaluate findings, and identify key areas for further intervention. Their expertise was instrumental in connecting with relevant stakeholders in government agencies and industry, significantly enhancing the quality and effectiveness of the project's execution.

Stakeholder Consultations

Drawing on insights from secondary literature, the scoping visit, and guidance from the PAC members, stakeholder consultations were carried out with government officials, academicians, and industry players to gain diverse perspectives on rural mobility. The goal was to evaluate the policy and market structures surrounding EVs and explore how these frameworks could be leveraged to enhance EV adoption rates. These consultations proved invaluable in formulating policy recommendations.

The stakeholder mapping covered the following groups:

- National Agencies: NITI Aayog, Common Service Centres, Ministry of Heavy Industry, Ministry of Rural Development
- State-Level Policymakers: Transport Department, Department of Rural Development, DISCOMs, and regulators
- District-Level Administration: Block Development Officers
- Industry: EV manufacturers/dealers, charging service providers, and automobile associations (e.g., SMEV, SIAM, RADA, FADA)
- Financial Institutions: Banks and local financing agencies
- Skilling Agencies: Skill Council for Green Jobs, Local Skill Development Centres
- State Livelihood Generation Agency: Rajasthan Grameen Aajeevika Vikas Parishad (RAJEEVIKA)
- Research Organisations: Entities working on similar areas in other regions

An open, semi-structured discussion format was used for the consultations, followed by a qualitative analysis approach. This methodology allowed for the development of a grounded theory, using EV sales in rural areas as a reference point for evaluating and recommending effective strategies.

Mobility Needs and Infrastructure Assessment

A phased survey was conducted across 200 households in the middle- and low-income brackets within two districts of Rajasthan (Banswara and Pratapgarh). The survey aimed to include participants from diverse backgrounds in terms of occupation, gender, age, and education to ensure a representative and unbiased dataset.

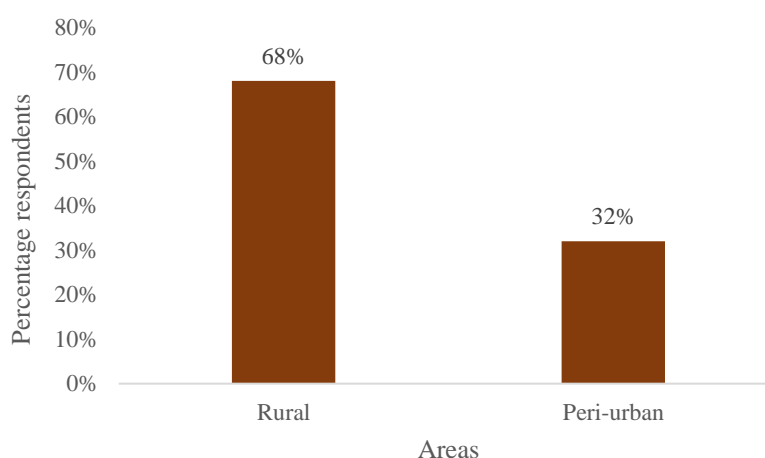
Our survey yielded a total of 893 responses, with the sample comprising 68 percent rural respondents and 32 percent peri-urban respondents. This distribution ensures a broad and representative coverage of the target demography. Detailed information about the survey is provided in the Table 2.

Table 2: Details of Household Surveys

District	No. of locations	No. of households	No. of households surveyed (peri-urban)	No. of responses	No. of households surveyed (rural)	No. of responses	Total responses
Pratapgarh	72	102	38	178	64	319	497
Banswara	60	92	24	101	68	295	396

* The data for six households was not incorporated into the analysis due to sub-standard responses.

Figure 2: Area-wise Contribution to the Total Survey



Two sets of semi-structured survey questionnaires were developed to gather both qualitative and quantitative data. One set focused on assessing infrastructure needs, while the other was designed to evaluate mobility requirements. The mobility needs assessment considered a range of socio-economic and transportation factors, including education level, income, commuting frequency, preferred modes of transportation, factors influencing commuting choices, vehicle ownership, usage of public transport, and monthly commuting expenses.

On the infrastructure side, the assessment examined the availability and accessibility of public transport, the EV ecosystem, the reliability of power supply, road conditions, awareness of electric vehicles (EVs) and relevant policies, and the barriers to EV adoption. Together, these assessments provided a comprehensive view of both the transportation and infrastructure landscape.

Data Analysis and Formulation of Policy Recommendations

Qualitative thematic analysis was used to derive meaningful narratives from the data. Rigorous use of graphical representations and descriptive statistics allowed for a detailed presentation of the socio-economic and demographic profiles of the sample, as well as their mobility and infrastructural needs. This analysis helped identify key areas where gaps exist. The findings were subsequently distilled into three sets of recommendations: one for consumers, one for industry stakeholders, and one for policymakers.

Key Findings from the Surveys



Mobility Needs Assessment

A mobility vision begins with the mobilisation and preparatory phase, which involves assessing community needs and engaging with stakeholders. This section focuses on the demand side of rural and peri-urban mobility, identifying key areas where electric vehicle (EV) interventions could be most impactful.

General Profile of the Respondents

This section presents a gender-wise, age-wise, and occupation-wise breakdown of the respondents, offering insights into the socio-economic and demographic composition of the survey. Males make up 54 percent of the total respondents, while females account for 46



percent, indicating fairly balanced gender participation (Figure 3). Over half of the respondents fall within the 11-40 age group, which represents the most frequent commuters (Figure 4). In terms of occupation, the three largest groups are students (36 percent), farmers (23 percent), and homemakers (22 percent), reflecting a diverse representation of livelihood activities (Figure 5).

Figure 3: Gender-wise Contribution to the Survey

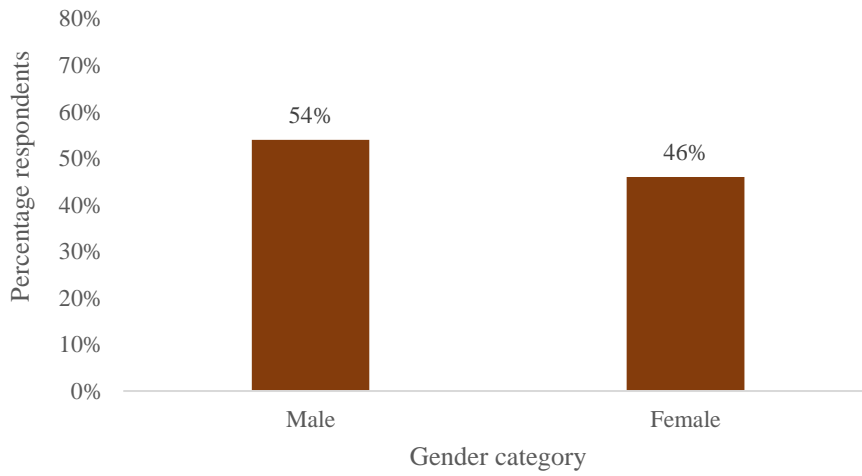


Figure 4: Age-wise Contribution to the Survey

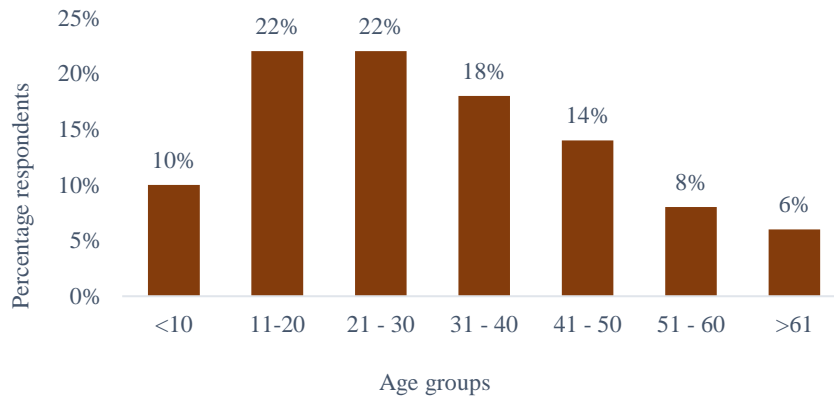
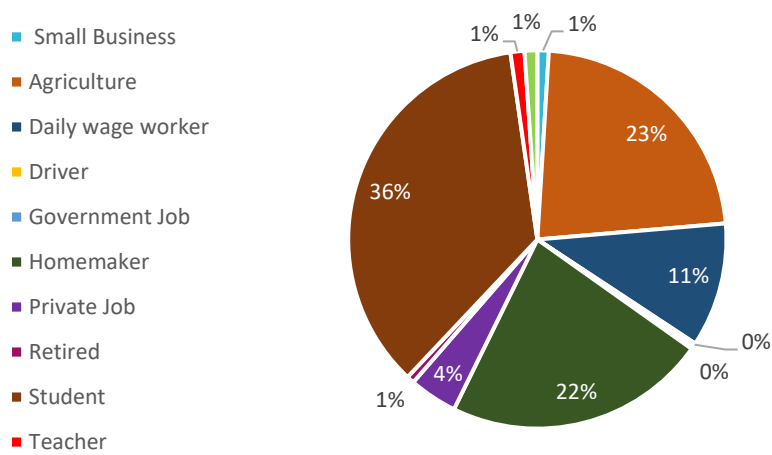


Figure 5: Occupation-wise Contribution to the Survey



Public Commute

The need for public transportation is crucial in the context of a low-carbon transition. A well-developed public transport system not only reduces individual carbon footprints but also better connects peri-urban and rural areas with towns and distant locations, thereby enhancing economic and social opportunities. The survey reveals that several factors drive the demand for a robust public transport system in rural and peri-urban regions (Figure 6). Cost-effectiveness stands out as a primary motivator, along with the need for family-related travel and long-distance journeys.



An important observation is the cost disparity between public and private transportation. While the majority of surveyed households spend between ₹ 3,000 to ₹ 4,000 per month on private transport, their expenditure on public transport is significantly lower, ranging from ₹ 1,000 to 1,500. This underscores the importance of a strong public transport system in reducing the financial burden of private commuting. Figure 6. Factors for choosing public transport:

Figure 6: Factors for Choosing Public Transport

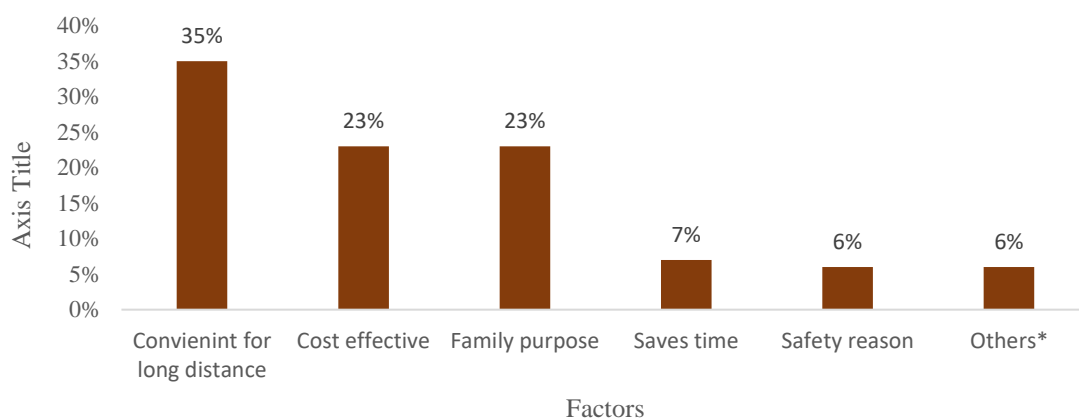
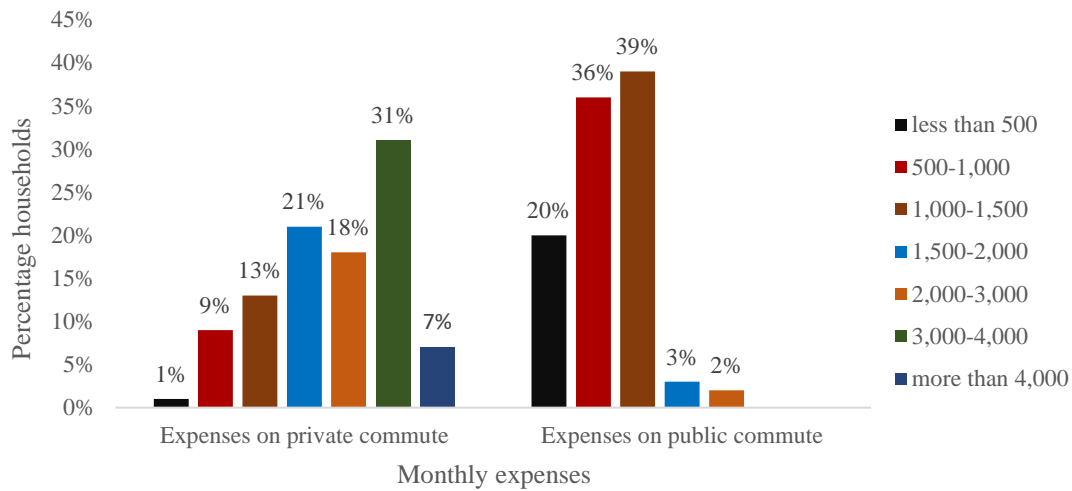


Figure 7: Monthly Commute Expenses



Last Mile Connectivity and Role of MDVs: In the rural and peri-urban contexts of Western countries, shared rides for last-mile connectivity are often limited due to dispersed settlements and a lack of coordination (Soder & Peer, 2018). However, the situation is different in the selected districts of Rajasthan, where population density is relatively high. In Pratapgarh, the small geographical area makes shared rides less common, as last-mile connectivity is mostly achieved through non-shared options. The average distance covered by commuters is typically between 2-3 kilometres. For shared rides, vehicle operators would need to charge ₹ 10-15 per person and accommodate 5-6 passengers to generate the same ₹ 100 earned from a single non-shared ride over the same distance. The absence of fixed routes for three-wheelers further supports the prevalence of non-shared auto-rickshaws in Pratapgarh.

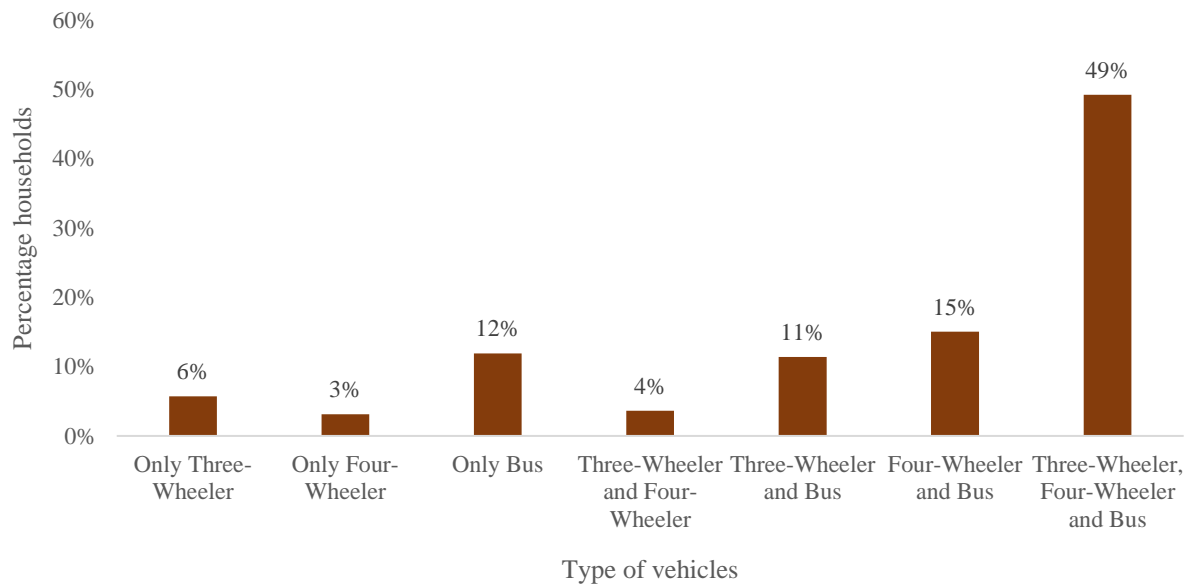
In contrast, Banswara, with its larger area, shows a stronger demand for an integrated public transport system, where three-wheelers and four-wheelers (medium-duty vehicles) dominate on a shared basis, catering to the need for more efficient and affordable transportation options.

The region lacks rail connectivity, with the nearest railway stations located in Udaipur and Chittorgarh in Rajasthan, and Ratlam in Madhya Pradesh. This absence of rail infrastructure impacts goods transportation, making private transport agencies critical to the logistics network. In this context, electric medium-duty vehicles (E-MDVs) for goods carriage present a viable alternative. The importance of MDVs is further highlighted for inter-village commuting, given the inflexibility of bus routes in both districts.

Survey data reveals that 49 percent of households rely on a combination of three-wheelers (3Ws), four-wheelers (4Ws), and buses for commuting to nearby cities. More than half of the households surveyed do not have direct access to the state bus transport system. These findings

underscore the need for a multimodal transport system in the selected districts to ensure efficient and reliable commuting options.

Figure 8: Mode of Commute to Nearby Urban Centres between Peri-urban and Rural Areas



Private Commute

Commuting Pattern: The survey highlights frequent mobility to nearby cities which serve as key hubs for socio-economic activities. Mobility to the city was, therefore, used as a core parameter in the analysis. The findings show that 29 percent of respondents commute to nearby towns or cities daily, followed by 19 percent who travel every 2-3 days, 18 percent on a monthly basis, and 17 percent each on a weekly or biweekly basis. Additionally, two-wheelers (2Ws) emerge as the most commonly used vehicles among households (Figure 11). This underscores the critical role of city commutes and the reliance on personal transport options like two-wheelers for daily mobility.

2W Market: Despite the poverty-stricken rural and peri-urban landscape, there is a notable demand for 2Ws in the survey areas. Although the majority of households have low annual incomes, with 88 percent earning below ₹ 2,70,000, nearly all households own a two-wheeler. Even the poorest households either possess a 2W or aspire to purchase one, despite the financial strain caused by rising fuel prices. This reflects the importance of two-wheelers as an essential mode of transportation, viewed as a necessity rather than a luxury, even in economically disadvantaged communities.



Non-motorised transport (NMT), such as cycling, is often promoted as a low-carbon and sustainable alternative to 2Ws for short distances in Western countries (Szymanska & Chomentowska, 2022). In Scandinavian countries, for example, well-planned cycling lanes encourage sustainable mobility across different social classes and ethnic groups. However, the Indian context presents a stark contrast. Bicycles and other NMT options are often stigmatised as being the choice of the poor, with their frequent use perceived as a sign of a lower standard of living—a similar trend observed in South Africa (Maphakela et al., 2013).

In rural and peri-urban areas of India, owning a 2W is a significant status symbol, prompting individuals to prioritise purchasing one even when financial resources are scarce. Additionally, the tropical climate, characterised by heat and humidity, further deters the adoption of bicycles and other non-motorised transport options. These social and environmental factors contribute to the high desirability of 2Ws despite their higher costs and environmental impact.

As a result, the survey districts reflect a well-established market for 2Ws, with growing demand indicating their vital role in enhancing rural mobility. However, to ensure that vehicle ownership aligns with environmental sustainability, it is crucial to consider alternatives. A study in China demonstrated a strong positive relationship between electric vehicle (EV) ownership and improved rural mobility (Yu & Zhao, 2021). This suggests that integrating EVs could provide a more sustainable solution while continuing to meet the mobility needs of rural populations.

Table 3: Vehicle Type Owned by Households

Vehicle Type	Owned by the Households
No Vehicle	1
Bicycle	37
Two-Wheeler	192
Three-Wheeler	4
Four-Wheeler	24
Total Households	194

Figure 9: Income Profile of the Households

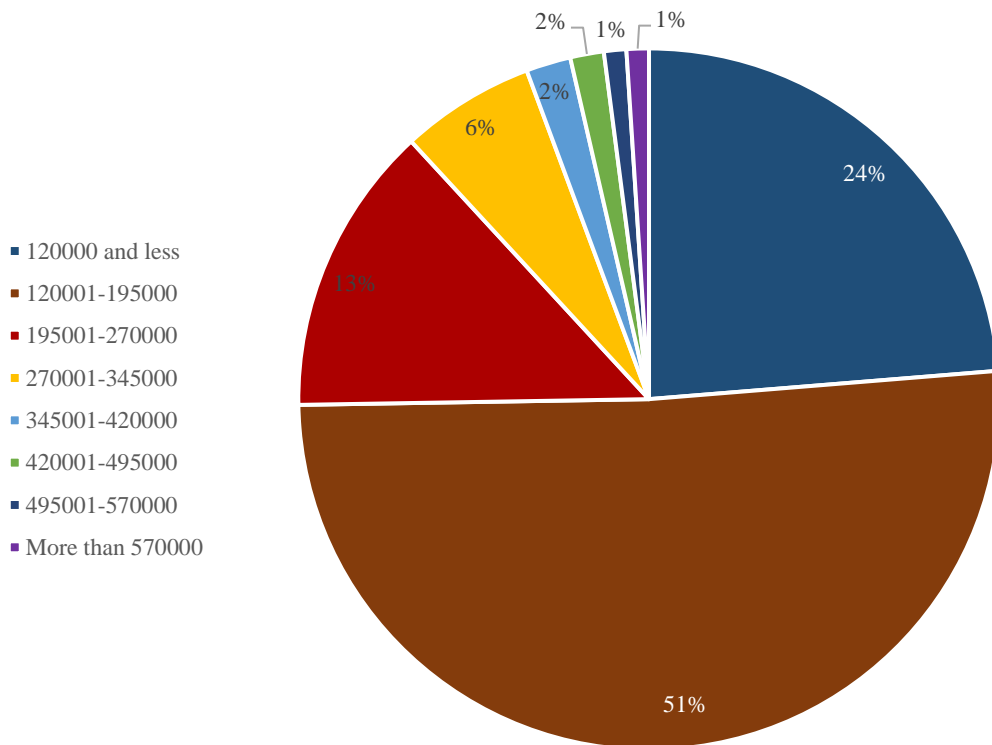


Figure 10: Commute Frequency of the Respondents

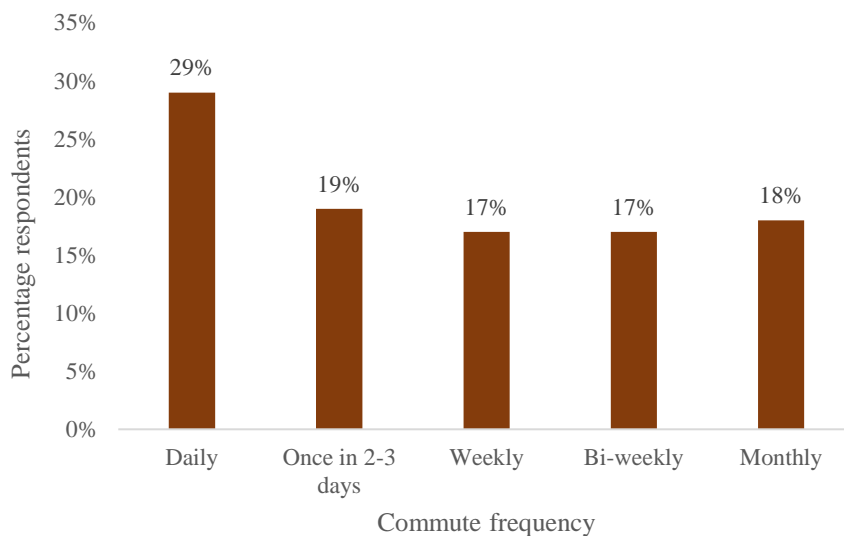
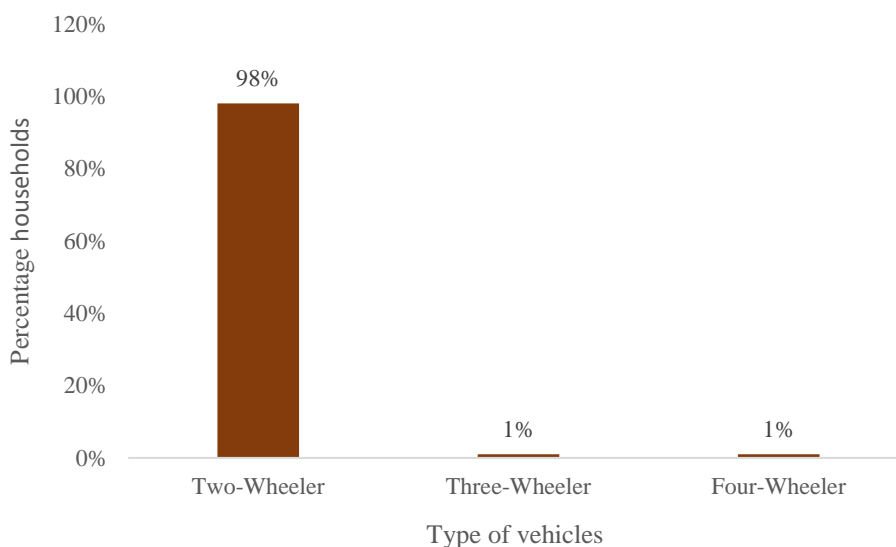
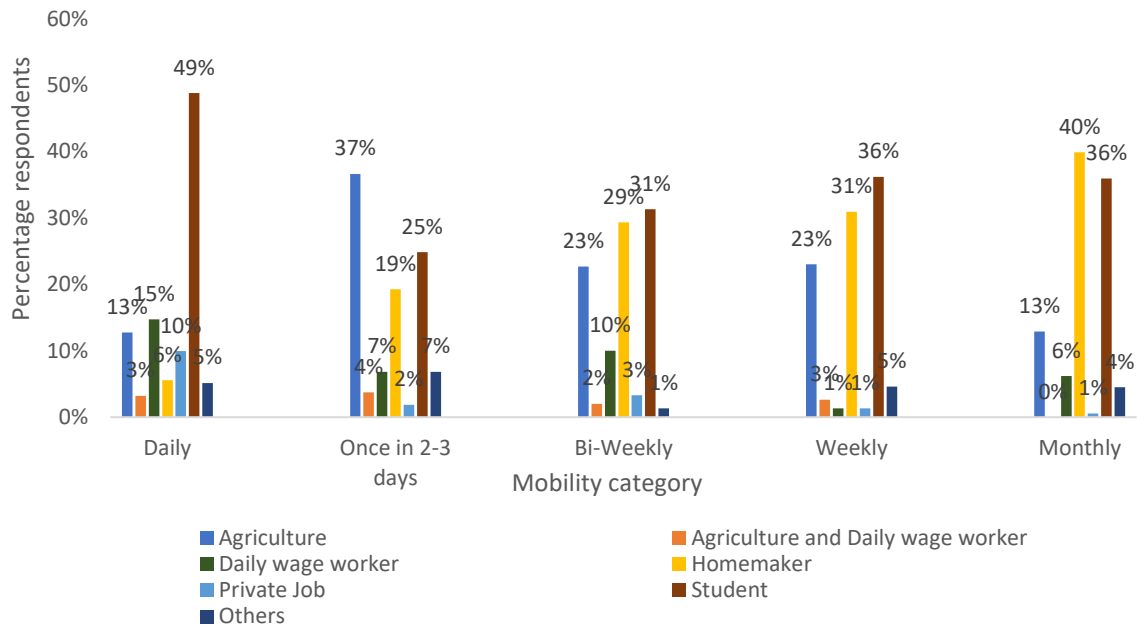


Figure 11: Most Used Vehicles by the Households



Mobility Variation across Occupation: There is a notable variation in mobility needs based on occupation. Students represent the largest group among daily commuters, followed by agriculturists and daily wage workers. In contrast, homemakers are the least mobile group, as illustrated in the Graph (Figure 12), with most engaging in travel primarily on a monthly basis. This reflects the different commuting patterns and travel frequencies associated with various occupations.

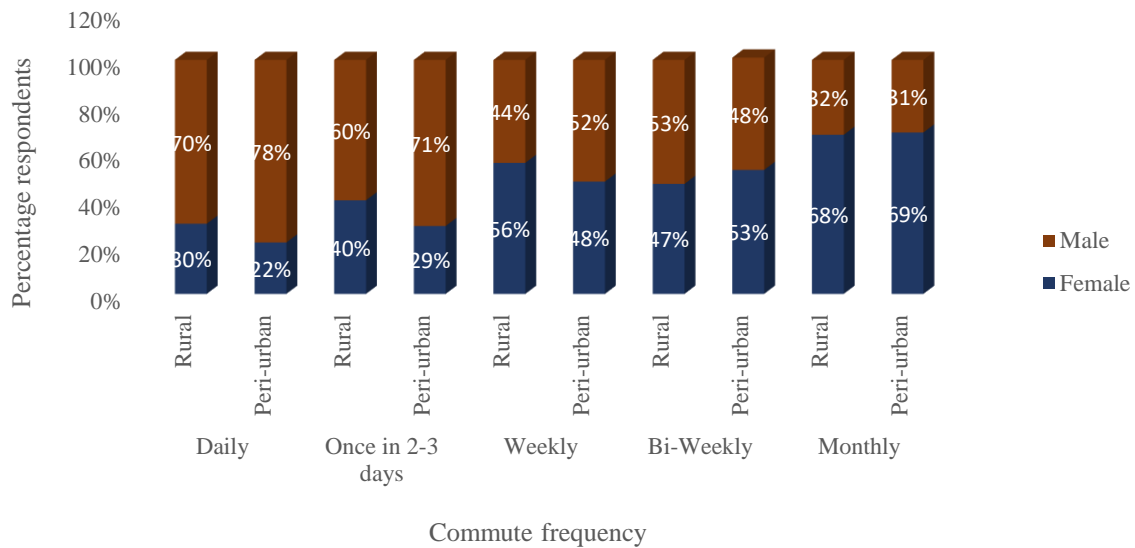
Figure 12: Major Occupational Groups in Different Commuting Categories



Mobility Variation across Gender: An intriguing aspect of the mobility needs assessment is the gender-based variation in commuting patterns. Men are the predominant frequent commuters, while women are more represented in lower-frequency travel categories. This trend suggests that women generally have less frequent mobility needs compared to men, which is compounded by fewer available options. Women's travel is largely confined to weekly, bi-weekly, and monthly intervals and relies heavily on public transport and male family members.

A sub-group analysis of peri-urban and rural respondents was conducted to identify any area-specific differences. Although both rural and peri-urban areas show a similar trend of higher mobility among men, the gender disparity is more pronounced in peri-urban areas (Figure 13). This indicates a more significant variation in commuting patterns by gender in peri-urban settings compared to rural areas.

Figure 13: Gender-wise Commute Frequency



Demand Responsive Mobility: In addition to maintaining a baseline level of public transport in rural areas, the International Transport Forum (2021) advocates for demand-responsive transit (DRT) solutions. In the surveyed region, a demand-based rental model for three-wheelers (3Ws) and four-wheelers (4Ws) is already in place. This system allows users to hire a 3W or 4W on an as-needed basis, catering to occasional needs such as attending functions, visiting the market, or handling medical emergencies.

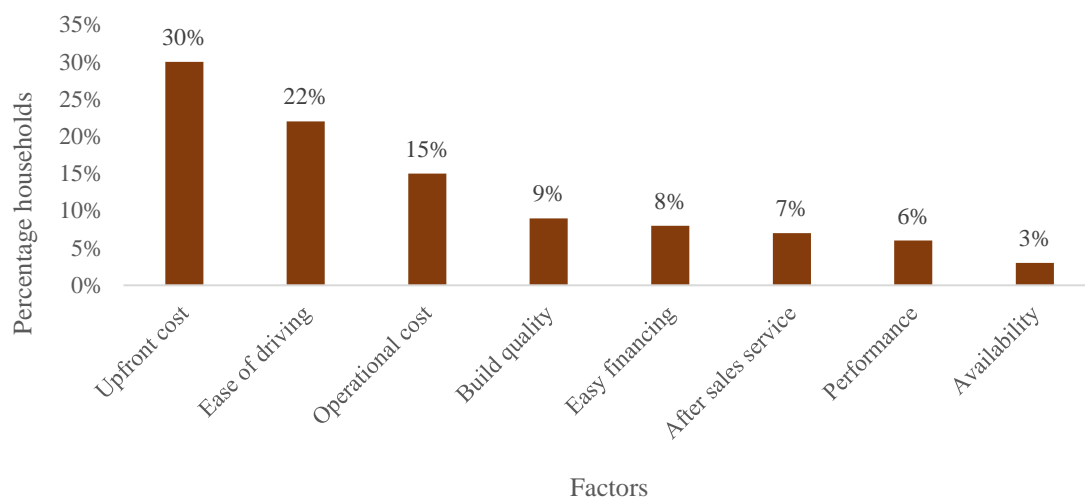
This model effectively addresses the mobility needs of entire families for specific events and is particularly beneficial for women who commute on a monthly or bi-weekly basis. The flexibility of DRT ensures that transport options are available when needed, enhancing accessibility and convenience in the selected districts.

Lack of Awareness: The purchase of electric vehicles (EVs) in the survey areas is significantly impacted by their higher upfront cost compared to conventional vehicles (Figure 14). Affordability is a primary concern for 34 percent of respondents when considering an EV as their next vehicle (Figure 15). Additionally, a major factor affecting EV adoption is the lack of awareness about available subsidies. Over 70 percent of respondents are unaware of the subsidy benefits that could make EVs more affordable.

A subgroup analysis revealed that this lack of awareness is consistent across both rural and peri-urban areas. Understanding and utilising these subsidies could potentially reduce the cost of EVs to levels comparable to conventional vehicles, making them a more viable option for many households.

Although the subsidy for electric vehicles (EVs) has decreased from 40 percent a few years ago to 15 percent under the new policy regime, the production costs are expected to decrease over time due to economies of scale and increased local manufacturing. As a result, the price of EVs is likely to become competitive with internal combustion engine (ICE) vehicles, making them an attractive option. However, for this potential to be realised, it is crucial to first raise awareness about the available subsidies. Enhanced understanding of these financial incentives will play a key role in boosting EV adoption.

Figure 14: Factors Influencing EV Purchase



Product Gap: The study has highlighted a significant product gap in the rural and peri-urban markets, which is crucial for manufacturers to address in their future strategies. Rural consumers require more durable and heavy-duty vehicles to effectively handle the types of goods they transport. However, the existing models are often too sophisticated and lightweight to meet these needs. Furthermore, the absence of standardised industry guidelines has created uncertainty among manufacturers, particularly regarding battery placement and vehicle design. This lack of standardisation exacerbates the issue, complicating efforts to develop vehicles that truly address the needs of rural and peri-urban areas.

Figure 15: Constraints in Buying EV as Next Vehicle

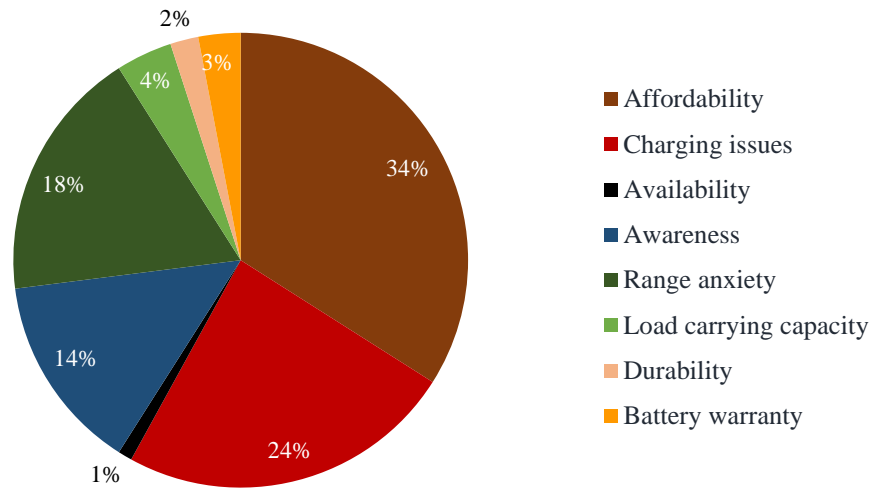
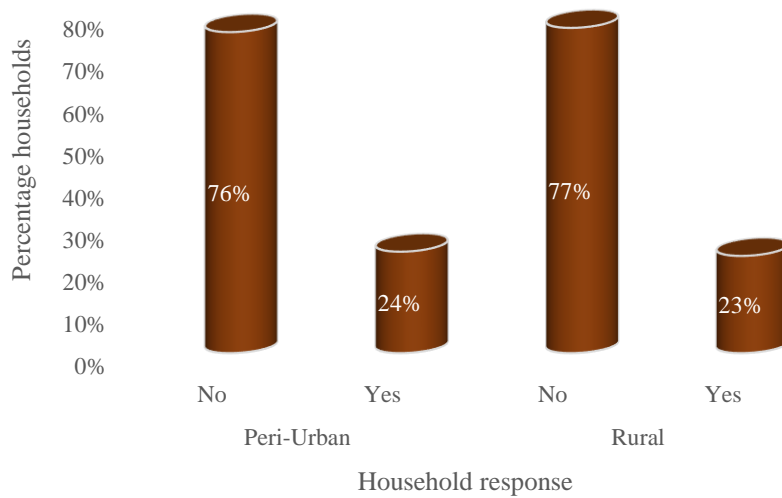


Figure 16: Awareness on EV Subsidies



Infrastructure Assessment

Public Commute

Despite the critical role of public transportation, rural and peri-urban areas frequently lack adequate facilities. The study has evaluated the current state of public transport availability and accessibility and has identified key areas for improvement. These recommendations aim to enhance the effectiveness of public transportation in these regions, addressing gaps and ensuring better service for residents.

Assessment Parameters: The evaluation of public transport encompasses the following parameters for availability, accessibility, and affordability:

Availability: Public transportation options are present with regular operations of public three-wheelers (3Ws), four-wheelers (4Ws), and buses within the region.

Accessibility: This parameter addresses the ease of access to public transport. A lack of accessibility occurs when public transport is either not available within a convenient distance or is not directly reachable. Even when transport options are within a reasonable distance, low frequency and long waiting times can hinder reliability.



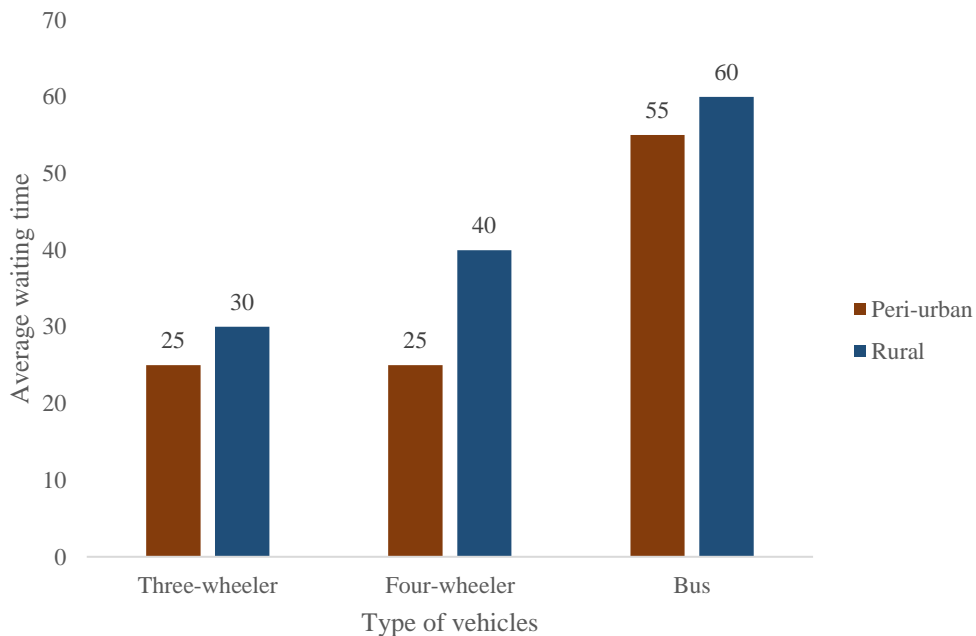
Affordability: Transport expenditure should ideally constitute no more than 10-15 percent of a household’s total budget.¹

Average Waiting Time: Both accessibility and availability of public transport require significant improvements in the rural and peri-urban areas of the districts. Currently, the average waiting time for buses is notably high, at 75 minutes. Fixed bus routes, combined with long waiting times and limited direct access to state bus services, necessitate the use of three-wheelers (3Ws) and four-wheelers (4Ws) for trips exceeding 20 kilometres.

The waiting times for 3Ws and 4Ws are also substantial, averaging 35 minutes for three-wheelers and 55 minutes for four-wheelers. This indicates a need for an increased number of these vehicles. The situation is particularly challenging in rural areas compared to peri-urban regions, as shown in the subgroup analysis (Figure 17).

Given these issues, there is considerable potential for electric vehicles (EVs) in the 3W and 4W segments. Introducing EVs could alleviate waiting times while supporting a transition to low-carbon mobility solutions.

Figure 17: Average Waiting Time (in minutes)



¹ The definition of affordability is taken in reference [Transportation Affordability](#) and [Strategies to Keep Public Transport Affordable](#)

Limited Scope of E-rickshaw: In Pratapgarh, the potential for E-rickshaws is limited due to the region's undulating topography and its average elevation of 580 meters above sea level. The load-carrying capacity of E-rickshaws is insufficient for navigating these conditions effectively. Despite government efforts to integrate E-rickshaws into the transportation system under the Shyama Prasad Mukherji Rurban Mission, aimed at connecting peri-urban areas with cities, the pilot projects have not succeeded. This suggests that E-rickshaws are facing challenges in promoting viable last-mile connectivity solutions in this area.

Conversely, in Banswara, E-rickshaws are gaining traction, with the market beginning to expand as evidenced by the opening of several dealerships in 2023. However, due to the lack of local manufacturing, these vehicles are sourced from other cities, primarily serving small and medium enterprises seeking logistical solutions rather than public transit needs. There is a promising opportunity to deploy E-3Ws for transporting goods produced by local communities, through cooperative-led initiatives such as Udaan sanitary products and Saras dairy products.

Challenges in the EV Intervention in the 3Ws and 4Ws Segment: The future potential for electric three-wheelers (E-3Ws) and four-wheelers (E-4Ws) hinges on addressing two primary challenges. Firstly, there is a prevailing perception that EV variants of autos are smaller and less robust compared to their conventional counterparts, despite both types of vehicles offering similar seating capacities. As a result, E-autos introduced in the rural areas of the target districts are likely to face significant competition from conventional vehicles, especially in the initial stages.

Secondly, the infrastructure in rural areas like Banswara and Pratapgarh is currently inadequate to support the widespread adoption of E-3Ws and E-4Ws. Establishing a comprehensive network of public charging and battery-swapping stations should be a top priority. A study in China highlights the positive impact of robust road infrastructure on rural mobility, underscoring the crucial role of government involvement in developing the necessary infrastructure to facilitate the transition to electric vehicles.

Western countries are demonstrating a strong commitment to developing infrastructure tailored for electric vehicles (EVs) in rural areas. For instance, the U.S. Department of Transportation has introduced a rural toolkit designed to aid in planning rural e-mobility programs. This toolkit evaluates the readiness of rural areas for EV adoption and identifies necessary charging infrastructure.

The 'Bipartisan Infrastructure Law' underscores the importance of government investment in EV charging infrastructure, supported by various federal incentives and loan programs. Additionally, many utilities and credit unions offer low-interest loans to support EV initiatives,

reflecting the collaborative effort across different levels of government and financial institutions to enhance rural EV infrastructure (US Transport Department, 2023).

India could benefit from these international initiatives by focusing its investments on small and medium-sized villages rather than large-scale rural areas. This is because smaller villages often face greater challenges in rural mobility due to the lack of quality local services. Prioritising these areas for investment can more effectively address their higher demand for improved transportation options and support equitable mobility solutions.

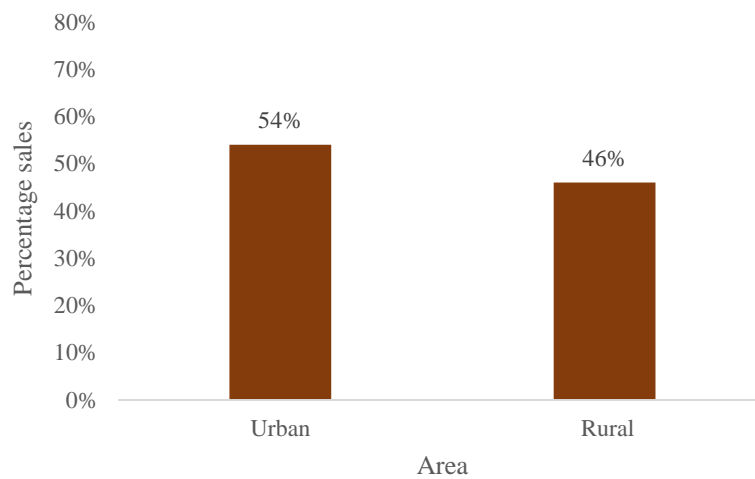
Private Commute

Potential Rural EV Market: Data from EV dealers and showrooms in Pratapgarh and Banswara reveal that sales in the surrounding rural areas are comparable to those in the cities for the period from 2021 to 2023 (Figure 18). Urban areas account for 54 percent of total EV sales among surveyed dealers, while rural areas contribute 46 percent. However, the growth rate in these areas remains relatively slow.

In the surveyed regions, nearly every household owns at least one vehicle used for personal commuting and goods transportation. Current electric two-wheeler (E-2W) scooters offered by original equipment manufacturers (OEMs) fall short in meeting multipurpose needs due to concerns over durability and sturdiness. Additionally, the compact design of electric scooters is not well-suited for longer commutes involving multiple passengers, which is common in peri-urban and rural areas where three people often travel together on a single motorcycle. The social appeal of faster bikes among youth, particularly males, further complicates the adoption of E-2Ws.

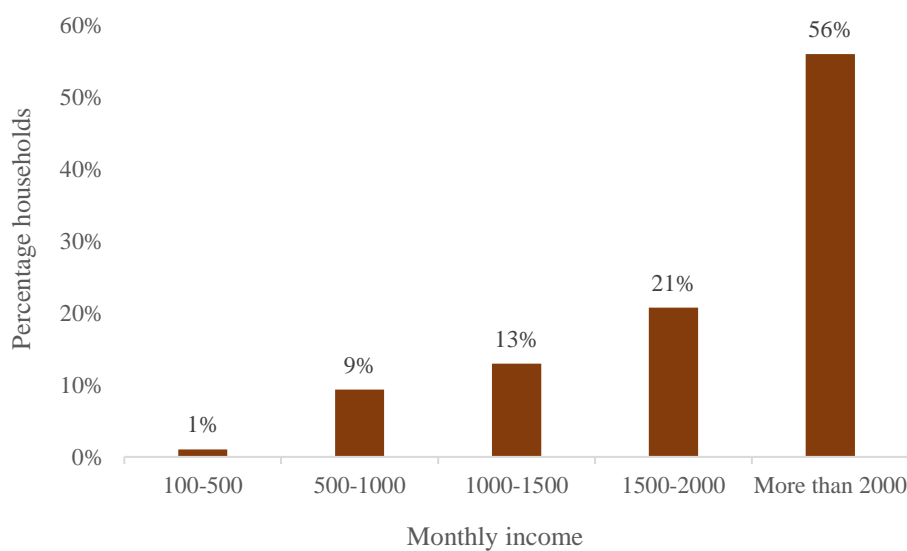


Figure 18: Area-wise EV Sales



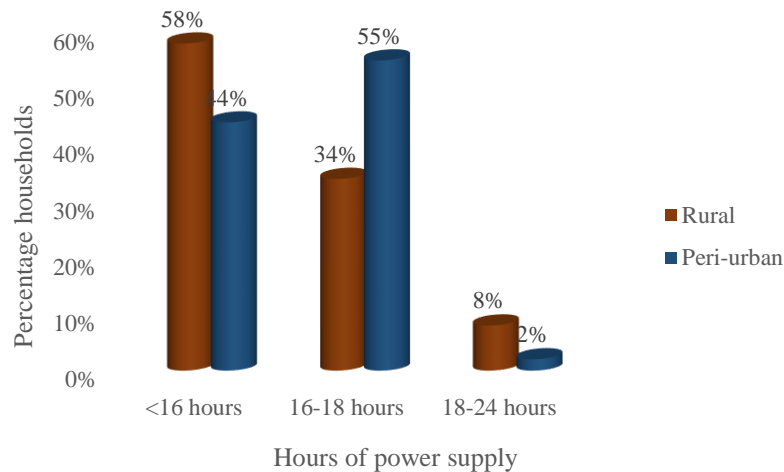
Fuel Price: Primary data indicates that 56 percent of the sampled households spend over ₹ 2,000 per month on vehicle fuel, highlighting a significant concern. Considering the mobility needs of the surveyed areas (Figure 10), the rising fuel prices present a compelling case for introducing electric vehicles (EVs) in the two-wheeler segment. With a well-established rural market for 2Ws, there is substantial potential for EVs to capture a share of this market. However, to realise this potential, it is crucial to address the existing challenges related to EV adoption.

Figure 19: Household Monthly Fuel Cost (₹)



Home Charging: A major infrastructural challenge that hinders the adoption of electric vehicles (EVs) is the issue of home charging. This concern is the second most significant barrier for potential EV buyers (Figure 15). Over 50 percent of surveyed households face power supply shortages, which complicates the feasibility of EV ownership, particularly in areas with limited public charging infrastructure. Analysis shows that this problem is more acute in rural areas compared to peri-urban regions, with 58 percent of rural households receiving less than 16 hours of power daily, compared to 44 percent in peri-urban areas.

Figure 20: Power Supply Situation at the Households



Subpar Aftersales Service: Another prevalent infrastructural challenge is the inadequate aftersales service, which is already a recognised issue in urban areas but is exacerbated in rural regions due to an inefficient sub-dealership system. In Banswara and Pratapgarh, the dominance of 2W sub-dealers has weakened the supply chain. These sub-dealers often close down due to an inability to address product gaps, consumer dissatisfaction with long wait times, and low sales. Additionally, the limited number of showrooms, lack of skilled mechanics, and irregular supply of essential parts in rural and peri-urban areas contribute to a negative perception of EVs. Customers may face wait times of 7-15 days for service requests, and if specific spare parts are unavailable, vehicles could be in the workshop for nearly a month. This poor customer experience discourages potential buyers. Furthermore, while some companies offer online complaint submission, rural residents often find these technical processes cumbersome.

Lack of Financial Accessibility: The role of financial institutions, particularly microlenders, is crucial in the context of rural India. While loans can help offset the higher upfront cost of electric vehicles (EVs), current financing options are not tailored to peri-urban or rural areas. The existing financial mechanisms are often unfavourable for rural populations. Survey data, corroborated by expert opinions, reveal that poor credit scores and stagnant bank accounts frequently hinder loan approval. Additionally, rural areas in Rajasthan often fall into what is termed a "negative zone," where high default rates on loans lead to restrictions on further loan approvals.

Policy Recommendations

Rural and peri-urban areas require innovative mobility solutions that go beyond technology and focus on creative approaches to address three key aspects: economic viability, social inclusion, and environmental benefits. Based on our on-the-ground study, we recommend the following strategies to foster innovative solutions in the selected districts:

Policy Makers

Policy Level Focus on Peri-Urban and Rural Areas

In the future, it is crucial to develop rural-specific plans and offer targeted subsidies to address the mobility gap between urban and rural areas. Urban regions have benefited significantly from initiatives like the FAME² scheme, leaving rural areas lagging behind. To bridge this disparity, targeted commitments and goals tailored to rural needs are essential. The Smarta report on rural mobility in Europe underscores a similar issue, identifying the lack of rural-focused policies as a significant challenge. Existing policies tend to be top-down and urban-centric, which leads to limited responsibility and accountability for rural areas. The report advocates for distinct policies for rural regions to ensure a more equitable distribution of mobility services and improve access in these areas.

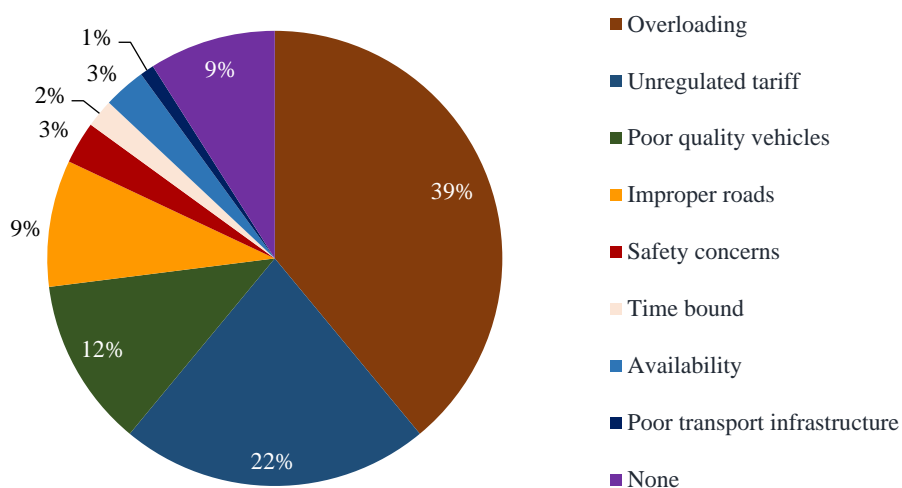
Rajasthan Government's EV policy of 2022 offers a strong foundation for advancing rural and peri-urban mobility. While the policy currently focuses on eight priority cities (Jaipur, Jodhpur, Kota, Udaipur, Bikaner, Ajmer, Bharatpur, Alwar) based on non-attainment criteria, its scope could be expanded to include the adjacent rural and peri-urban areas surrounding these cities. Additionally, the policy should incorporate standardised industry guidelines to ensure consistent product quality and reliability across all regions. This extension and enhancement would help bridge the mobility gap and promote equitable EV adoption throughout the state.

² The FAME scheme was launched in 2015 under the National Mission on Electric Mobility. The scheme aims to promote the use of electric vehicles in India by providing incentives and subsidies. FAME has been extended in 2019, which provides an incentive of ₹ 10,000 per kWh of battery capacity for most EVs. The scheme has planned to expand the EV charging network by sanctioning 2,877 charging stations in 68 cities across 25 States/UTs and 1,576 stations across 9 Expressways and 16 Highways. However, the focus of the scheme is cities and urban population.

Scope of Improvements in Public Vehicles

In the surveyed districts, significant improvements are needed in the public transportation system. Commuters in rural and peri-urban areas frequently report issues with overloading, unregulated fares, and high-ticket prices for traditional public 3Ws and 4Ws in Banswara and Pratapgarh. Specifically, 39 percent of households are concerned about overloading, while 22 percent express dissatisfaction with the pricing mechanisms of the current public transport system. To address these issues, it is crucial to enforce strict regulations on road transport operations, including passenger limits and fare controls. Furthermore, the government should issue guidelines to ensure minimum standards and quality for vehicles to enhance passenger safety and comfort.

Figure 21: Scope for Improvement in Public Transport



Scope for EV in MDV

In the surveyed areas, inter-village transportation heavily depends on medium-duty 3Ws and 4Ws, which typically cover 150 to 200 kilometres per day, reaching nearly every stretch of road at least once or twice daily. Introducing electric vehicles (EVs) for this segment could be a viable option. However, it would necessitate the development of comprehensive EV infrastructure to tackle challenges related to charging and maintenance. Alternatively, deploying small electric buses, E-3Ws, and E-4Ws on routes leading to city centres could help mitigate operational difficulties. Additionally, integrating EVs into a Demand-Responsive Transit (DRT) model could further enhance the efficiency and feasibility of rural mobility solutions.

However, introducing electric vans and minibuses in rural areas presents regulatory challenges. One major issue is determining the appropriate type of permit for these vehicles. For example, if these intermediate vehicles are classified under taxi permits, they would be limited to carrying no more than seven passengers, whereas in practice, these vehicles often transport 15 to 20 people, creating a significant regulatory hurdle. Additionally, because these vehicles do not fall under the category of buses, they cannot be licensed as such under existing state transport regulations. To address these issues, there needs to be the creation of a new permit category specifically for medium-duty vehicles (MDVs) like electric vans and minibuses.

Renewable Energy-Based Charging

Rajasthan Government's EV policy of 2022 strongly promotes the use of renewable energy for EV charging and swapping stations. This initiative can be effectively implemented in rural areas by utilising existing central schemes designed to expand solar power in rural India. For example, integrating the PM-KUSUM Yojana and the new Muft Bijli Yojna (2024) with home EV charging systems could significantly address power supply issues for rural households. These programs provide a viable path for enhancing the sustainability and feasibility of EV adoption in these areas.

Enhancing the Rural Accessibility of Finance

Given the financial constraints faced by rural populations in Rajasthan, micro-finance institutions play a critical role. To support rural EV adoption, the state's EV policy should incorporate provisions for EV-specific loans within the micro-finance sector. By integrating interest rate subvention—a form of subsidy that lowers loan costs—into government-backed financial programs, the affordability of EV loans can be enhanced. This approach would address one of the major concerns in rural financing: loan repayment. Strengthening the financial infrastructure in this way can gradually encourage micro-finance institutions to include EVs in their offerings, ultimately supporting broader adoption of electric vehicles in rural areas.

Product Placement and Local Manufacturing

To fully realise the potential of E-2Ws in rural and peri-urban areas, it is essential to target the right models. Current E-2Ws must match the power output and build quality of internal combustion engine (ICE) two-wheelers to accelerate adoption rates, which remain slow compared to urban areas due to differing commute requirements.

Addressing the sub-dealership issues is crucial to improving the supply chain and adoption rates. Inefficiencies in the current sub-dealership system have led to a mismatch between demand and supply. Encouraging local manufacturing can help bridge this gap, as local

producers are better equipped to meet the specific needs of rural consumers and respond to local demand more effectively.

A robust local supply chain ensures that products are readily available to consumers, addressing a major pain point in rural and peri-urban markets. By fostering local manufacturing, we can positively impact local economies through job creation, support for small-scale industries, and overall economic growth in these areas. Local manufacturers can swiftly adapt to changing market demands and introduce new models or features tailored to rural consumers' specific needs. This adaptability is often lacking in larger companies, which tend to have longer development cycles and are less responsive to niche markets.

Government support is vital for promoting local manufacturing. By offering tax breaks, subsidies, or grants to local manufacturers within the MSME framework, the government can incentivise the production of two-wheelers. These financial incentives can reduce production costs, enhancing the competitiveness of locally manufactured 2Ws. Such measures will not only make these vehicles more affordable but also stimulate growth in the local manufacturing sector, ultimately benefiting rural and peri-urban economies.

Charging Planning

State governments offer several incentives to support the development of EV charging infrastructure. These include easy land access, de-licensing, reimbursement of State Goods and Services Tax (SGST), coverage of costs related to upstream electricity infrastructure, a 5-percent interest subsidy on loans for entrepreneurs, and a 20-percent capital subsidy on equipment investments. Charging enterprises can take advantage of these benefits to lower costs and enhance their operations.

Government collaboration is essential in communicating these incentives and identifying suitable locations for public charging stations, including station types (L1, L2, or L3). Policymakers should consider consumer travel patterns, public transit accessibility, and workplace charging availability when developing their plans.

Additionally, engaging local utility providers in the planning process is crucial. Their insights can help align EV power demand with local grid capabilities, ensuring that the charging infrastructure is both feasible and effective.

Industry

Retrofitting

Given the numerous challenges associated with purchasing an EV in rural and peri-urban regions, exploring alternative solutions is essential. Retrofitting presents a promising option. Survey data indicates that vehicles in these areas are often used well beyond their estimated lifespan, frequently serving for more than ten years and sometimes up to twenty years. Retrofitting existing vehicles into electric ones offers an economically viable alternative to buying new EVs. It allows owners to extend the lifespan of their current vehicles while significantly reducing fuel costs.

Public transport also presents an opportunity for retrofitting. In rural areas, autos and medium-duty vehicles (MDVs) are vital for transportation. Given the limitations of the existing bus system in the surveyed regions, 3Ws and 4Ws play a crucial role in medium and long-distance travel. Introducing EVs in this segment could be effective. However, retrofitting existing vehicles may offer a more pragmatic approach.

Retrofitting avoids the risks associated with launching entirely new vehicle designs. For example, many people are sceptical about the robustness of new EV designs for autos, often perceiving them as smaller and less durable. This scepticism can hinder the adoption of new E-3Ws and E-4Ws. By retrofitting existing vehicles, which people are already familiar with, and simply replacing internal combustion engines with batteries, we can increase acceptance and ease the transition to electric mobility.

The concept of retrofitting is already included in the state government's EV policy. However, to enhance its impact, there is a need to expand its scope. This can be achieved by promoting retrofitting enterprises under the MSME framework and establishing dedicated retrofitting zones in identified industrial areas. These zones could focus on manufacturing and supporting retrofitting activities, thereby increasing the availability and adoption of retrofitted EVs.

Figure 22: Estimated Lifecycle of Two-Wheelers

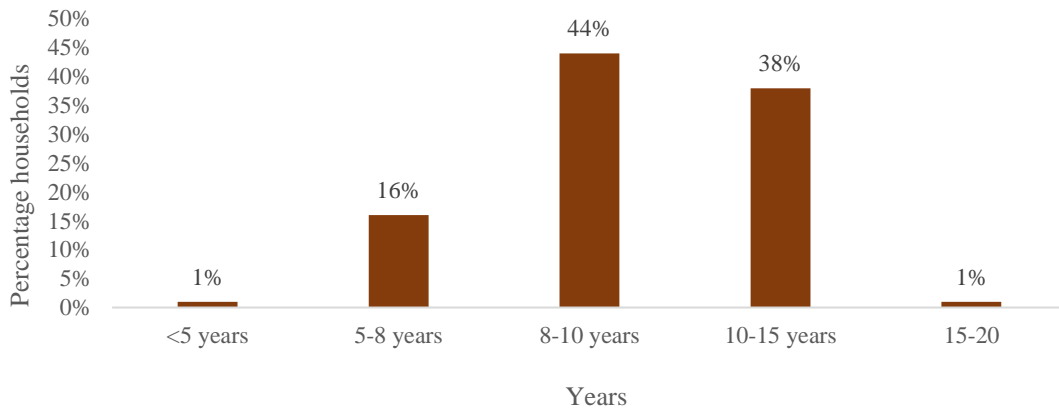
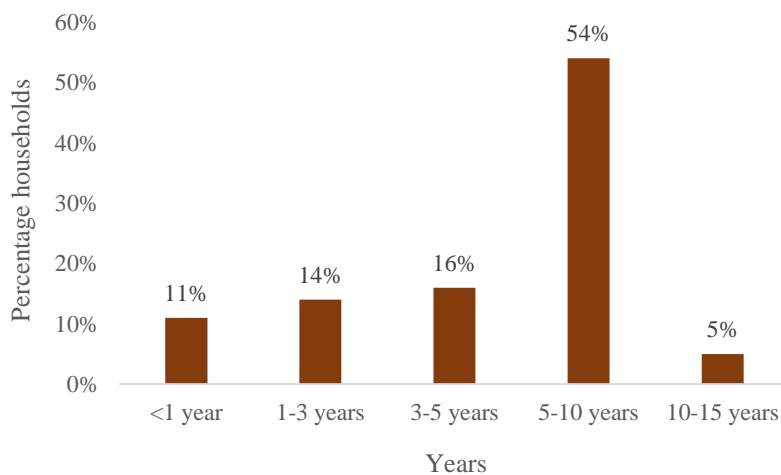


Figure 23: Current Age of Two-Wheelers



Strategic Charging Infrastructure Development

In addition to affordability and home charging challenges, range anxiety remains a significant barrier to the adoption of electric two-wheelers (E-2Ws). Inadequate home charging infrastructure exacerbates this issue, making the establishment of public charging stations crucial. These stations are essential not only for addressing range anxiety but also for facilitating the deployment of EVs in public transport.

To effectively support rural and peri-urban areas, charging stations should be strategically located at key sites such as hospitals, schools, markets, and other economically important areas. Additionally, high-traffic roads connecting villages to cities should be prioritised for installing these stations. This approach ensures that EV users have access to reliable charging options, thereby improving the feasibility and attractiveness of E-2Ws for potential buyers.

Revival of Non-RTO Vehicles

Reviving non-RTO vehicles as electric vehicles (EVs) could provide substantial benefits to rural and peri-urban markets. These vehicles, which typically do not require formal registration or adherence to strict regulations, are generally more affordable. This lower cost makes them an attractive option for lower-income households in rural areas, where purchasing power is often constrained. By converting these budget-friendly vehicles into EVs, we can increase accessibility and foster wider adoption among economically disadvantaged communities.

Battery as a Service Model (Baas)

The Battery-as-a-Service (BaaS) model holds considerable promise for the EV ecosystem in rural and peri-urban areas. This model separates the ownership of the battery from the vehicle, allowing consumers to lease or swap batteries as needed. A key advantage of the BaaS model is its potential to lower the upfront cost of EVs. In rural and peri-urban regions of Rajasthan, where average incomes are lower than in urban centres, the high initial cost of EVs, largely driven by the cost of the battery, can be a significant barrier to adoption. By decoupling the battery from the vehicle, BaaS makes EVs more affordable. Consumers can buy EVs at a reduced price and pay for the battery on a subscription or pay-per-use basis, making it more accessible for those with limited financial resources.

The BaaS model offers significant flexibility for users, especially in rural areas where long distances between charging stations can be a challenge. By allowing users to swap a depleted battery for a fully charged one at designated swapping stations, the BaaS model addresses concerns related to limited charging infrastructure. This approach is particularly advantageous in regions where developing a comprehensive charging network may be slow. BaaS enables users to travel longer distances without the constant worry of finding a charging station, thereby enhancing the convenience and practicality of EVs in these areas.

The BaaS model centralises battery management, enabling more effective monitoring and maintenance of battery health. This centralised approach helps ensure that batteries are properly serviced, which reduces the risk of premature degradation. In rural areas, where advanced maintenance services may be limited, BaaS provides a dependable method for keeping batteries in optimal condition, thereby extending their lifespan and lowering overall costs for users. Furthermore, this model offers local entrepreneurs the opportunity to engage in the EV ecosystem by establishing and managing battery swapping stations, thereby contributing to regional economic development.

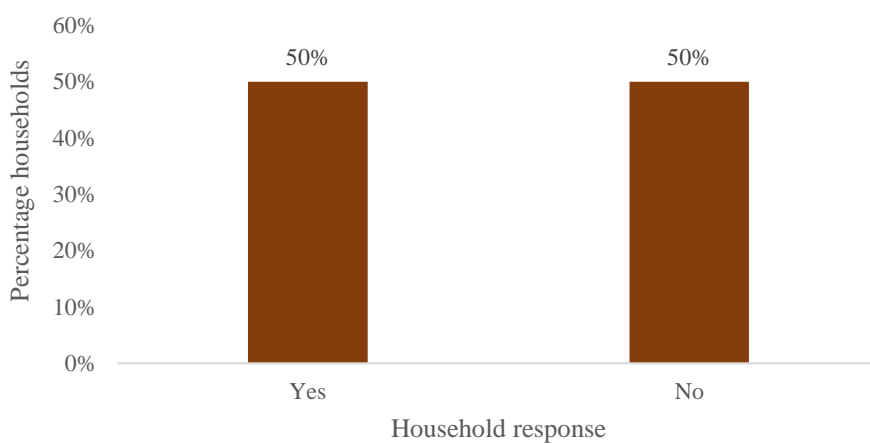
Consumers

Awareness Generation

The findings indicate a significant lack of awareness regarding EVs and the associated subsidies, which presents a major barrier to adoption due to the high upfront cost. Awareness programs about available subsidies could play a crucial role in promoting EV adoption. Our study reveals that 50 percent of households view subsidies as a significant factor in their EV purchase decisions. To reach the remaining households, targeted efforts should focus on educating them about the subsidy programs and the economic advantages of EVs compared to conventional vehicles.

Engaging existing dealerships in awareness campaigns can be effective. This could include organising street demonstrations, facilitating on-the-spot registration at village fairs, and hosting exhibitions at weekly markets or trade fairs. Additionally, showcasing E-autos through live demonstrations can create a tangible impact and boost their adoption.

Figure 24: Influence of Subsidy on Buying Decision



Women's Economic Empowerment

Being a tribal region, there are several NGOs actively involved in various socio-economic initiatives. RAJEEVIKA, an autonomous society under the Department of Rural Development, has already launched programs focused on electric mobility in rural areas. Their well-established community engagement structure presents a valuable opportunity to further promote sustainable transportation solutions, generate local employment, and enhance women's participation in the transition to electric mobility.

Banswara has a more extensive network of NGOs and CSOs compared to Pratapgarh, which can be effectively harnessed to promote electric mobility in peri-urban and rural areas of Banswara. RAJEEVIKA, which also operates in Banswara, has not yet undertaken electric mobility programs but has established 44 cluster-level federations in the district, involving 4,500 families from various rural and peri-urban backgrounds. This network presents a valuable resource for implementing electric mobility initiatives.

In both districts, it was noted that while women are actively involved in agriculture and handicrafts, their role in transportation is limited. By providing proper training through workshops and continuous education programs, women can be more effectively engaged in the transportation sector. The design of E-3Ws is particularly well-suited for women, making their involvement in this area both practical and advantageous.

Employment Opportunity and Capacity Building

A significant challenge in the EV ecosystem within the surveyed areas is the shortage of skilled mechanics and technicians. Addressing this issue through skill enhancement and capacity building can unlock substantial employment opportunities in both the aftersales market and the Battery-as-a-Service (BaaS) model. Establishing and maintaining battery swapping stations, along with managing battery logistics, demands a skilled workforce. Collaborating with the Centre for Excellence, an initiative by the Ministry of Skill Development and Entrepreneurship, can facilitate the creation of a skilled labour pool. This would not only address the demand for qualified technicians in the BaaS model but also improve in-house mechanics at showrooms, thereby enhancing aftersales services.

Introducing EVs in School/College Transportation Fleet

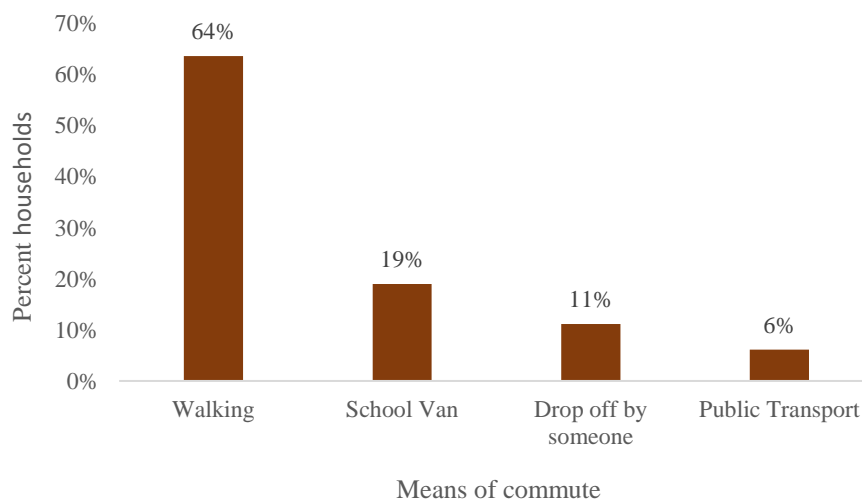
Among the total surveyed respondents, 25 percent are school-going students who have daily mobility needs. These students rely on various modes of transportation for their commutes (Figure 25), including traditional options such as school vans, which rank as the second most common means of travel for them. Given the high usage of school vans among this demographic, there is a significant opportunity to introduce electric vehicles (EVs) into this segment.

By replacing conventional school vans with electric alternatives, we can address several key issues. First, EVs can provide a cleaner and more sustainable mode of transportation, reducing the environmental impact associated with diesel or petrol-powered vehicles. Second, integrating EVs into the school transport system could lead to cost savings over time due to lower operational and maintenance costs compared to traditional fuel-based vehicles.

Additionally, the transition to electric school vans can serve as a practical demonstration of EV benefits, potentially influencing other transportation sectors in the region.

To facilitate this transition, targeted interventions could include incentives for schools to adopt EVs, such as subsidies or grants, and the establishment of dedicated charging infrastructure at schools. Engaging with local authorities and school management can help ensure the smooth implementation of this transition, ultimately contributing to a greener and more efficient transportation system for students in the surveyed areas.

Figure 25: Means of Children’s Commute



The Role of Common Service Centres (CSCs) in Enhancing EV Adoption

Online portals offered by Original Equipment Manufacturers (OEMs) often fail to engage potential buyers effectively, as they are perceived as untrustworthy and lack appeal in rural areas. Village Level Entrepreneurs (VLEs), part of the CSC’s³ e-mitra service initiative, provide crucial support in facilitating online transactions by assisting customers with digital processes. Despite their potential, VLEs have not yet significantly influenced market growth. However, with targeted reforms and updated policies promoting sustainable transportation, VLEs could play a pivotal role. By bridging the gap between rural consumers and digital platforms, they could enhance trust in online purchasing, support EV adoption, and facilitate a more inclusive approach to expanding rural and peri-urban transport networks.

³ CSC comes under the Ministry of Electronics and IT, Government of India. The CSCs aim to serve as the delivery points for various electronic services. These form part of the National e-Governance Plan and offers a grass-root level, transparent, and unhindered way to deliver government, social, and private sector services to the citizens.

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Appendix

Appendix 1: List of Stakeholders

1. Anand Chennira, Chief Strategy Officer, Sun Mobility
2. Aravind Harikumar, Research Associate, ICCT
3. Bhoopendra Khandelwal, Cluster Business Manager, AU Small Finance Bank
4. Charith Konda and Purva Jain, Energy Specialist and Analyst, Institute for Energy Economics and Financial Analysis
5. Daulat Ram Meena, BDO, Gram Panchayat Parishad, Pratapgarh
6. Dhruva Singh, Manager, Ola Electric, Banswara
7. Gaurav Chaudhary, Manager-E-Mobility, CSC
8. Ghanshaym ji Patidar, Director, Neel Gagan FPO, Dhamotar (Pratapgarh)
9. Gopal Pandya, Baineswar Lok Vikas Sansthan, Banswara
10. Hardik, District Manager, Resources, Rajeevika
11. Inderjeet Singh, District Manager, Pratapgarh
12. James Chakwizira, Professor, Urban and Regional Planning, University of Venda
13. Jitesh Paliwal, Manager, Okinawa, Pratapgarh
14. Kailash Bharoliya, ACEO, Zila Parishad/ District Position Manager, Rajeevika
15. Kailash Bharoliya, District Manager (Banswara), Rajasthan Grameen Aajeevika Vikas Parishad
16. Kapil Dev, District Manager (Pratapgarh), Rajasthan Grameen Aajeevika Vikas Parishad
17. Kapil Dev, District Manager, Rajeevika, Pratapgarh
18. Kapil, Manager, Ola Electric, Pratapgarh
19. Kuldeep Rawal, Village Level Entrepreneur (VLE), Banswara
20. Kuldeep Rawal, VLE, Banswara
21. Kushagra, Manager, Okaya EV, Banswara
22. Lal Bahadur Srivastava, Reliance Foundation, Banswara
23. Lokendra Sharma, Proprietor, Hero Electric, Pratapgarh
24. Manmohan Agarwal, Chairman, Private Bus Union of Pratapgarh; Member, State Private Bus Association, Rajasthan
25. Manmohan Agarwal, Chairman, Private Bus Union, Pratapgarh / Secretary, State Private Bus Transport Association
26. Mohan Pandya, NM Sadguru Foundation, Banswara

27. Nathalie Ortar, Senior Researcher, LAET, ENTPE, University of Lyon, France
28. Neha Sakka, Engineer (P&IA), Jaipur Vidyut Vitaran Nigam Limited and Coordinator of Centre of Excellence for Electric Mobility
29. Nitesh Seth, Founder, EV Charz
30. P L Patel, Lead, Vaagdhara Foundation, Banswara
31. P. P. Patel, Lead, Vaagdhara Foundation
32. Pawan, Manager, Vok Electric, Pratapgarh
33. Rajendra Jaiswal, Director, Prakriti Foundation
34. Rameshwar, Manager, Hero Electric, Banswara
35. Rani Jain, Deputy Commissioner, Pollution Control, Rajasthan Transport Department
36. Sharif Qamar, Associate Director, Transport and Urban Governance, The Energy and Resource Institute
37. SK Saroj, Chairman, Federation of Electric Vehicle Association
38. Stefanie Peer, Faculty-Department of Socioeconomics, Vienna University of Economics and Business
39. Sunanda Sinha, Assistant Professor-Centre for Energy and Environment, MNIT Jaipur
40. Sunil Bhatnagar, Chief Experience Officer Lithium Project, IPLTech Electric
41. Suresh, Manager, National Urban Livelihood Manager, Municipal Office, Pratapgarh
42. Tarachand Ninama, Manager, Unnat Kisan FPO, Senawasa (Banswara)
43. Vaishnav Enterprises, Rokat Electric Vehicle, Banswara
44. Vijay Kumar Meena, DTO, Pratapgarh
45. Vimal Prasad, Chairman, Unnat Kisan FPO, Ghatol (Banswara)
46. Vineet Sharma, CEO, Neel Gagan FPO, Dhamotar (Pratapgarh)
47. Vitthal, Manager, Namu Motors, Banswara
48. Wasim, District Manager, Kriti Sansthan, Pratapgarh

Appendix 2: Survey Questionnaires

Mobility Needs Assessment Survey

Survey no.:

Location:

District:

Type of location:

1. Name:
2. Occupation:
3. Numbers of members in Family:
4. Details of the family members:
5. How often do you go to city or nearby towns?
6. How far is the city or the location you visit often?
7. What is the preferred choice of commute for these destinations?
8. What is the preferred mode of commute?
 - 8.1 What kind of vehicle do you own?
 - 8.2 How many such vehicles do you own?
 - 8.3 What vehicle is mostly used for commute purposes?
 - 8.4 How old are these vehicles?
 - 8.5 How many years does a vehicle generally serve?
 - 8.6 What is the fuel cost on a monthly basis?
 - 8.7 What is the annual maintenance cost?
 - 8.8 What was the cost at the time of buying these vehicles?
 - 8.9 Does all these costs a matter of concern for you?
 - 8.10 Can you provide details on your annual income?
 - 8.11 Are you aware about cost and environmental benefits of EVs?
 - 8.12 If yes. Would you be interested in buying an EV as your next vehicle?
 - 8.13 If no. What are the constraints for you to not buy an EV?
 - 8.14 Do you know anyone that owns an EV?
 - 8.15 If yes. Have you discussed advantage/disadvantages of owning an EV with that person?
 - 8.16 If no. Explain in brief about the advantages.
 - 8.17 Are you aware about the subsidies on electric vehicles?
 - 8.18 Will subsidies influence your decision of buying an EV?
 - 8.19 What are the other factors that can influence you for buying an EV?
 - 8.1.1 Do you own any vehicle?
 - 8.1.2 If yes. Why do you use public transport?

- 8.1.3 How many different vehicles are required for commute to city and further purposes?
 - 8.1.4 Is state transport buses available for going to city?
 - 8.1.5 Do you opt for shared rides in case of three-four wheelers?
 - 8.1.6 If as per requirement? Explain those requirements?
 - 8.1.7 How far is the first point of access to public transport?
 - 8.1.8 How do you get to this point of access?
 - 8.1.9 Is public transport easily available?
 - 8.1.10 If yes/no. What is the daily frequency of that category of vehicle?
 - 8.1.11 If yes/no. What is the average waiting time for these vehicles?
 - 8.1.12 How would you rate the quality of your commute?
 - 8.1.13 Are the roads suitable for walking, cycling, motorised transport?
 - 8.1.14 Any other concern? Such as overloading, poor vehicle quality, higher tariff, unregulated tariff, etc.
 - 8.1.15 What improvement would you like to see in public transport?
 - 8.1.16 What is the monthly expenditure of the household on public transport?
 - 8.1.17 Is this cost an economic concern?
 - 8.1.18 How far is the school of the children of the household?
 - 8.1.19 How do children commute to school?
 - 8.1.20 How often do you require a three-four-wheeler for completely personal use. For example, transportation of agriculture goods?
 - 8.1.21 What is the cost for one such single usage?
 - 8.1.22 Are non-motorised transport like bullock cart or camel cart still utilised? And for what purposes?
 - 8.1.23 Given an option. For the same purpose, would you choose motorised or non-motorised transport and why?
9. In case, the respondent already owns an EV.
- 9.1 Are you satisfied with your vehicle performance?
 - 9.2 What are the advantages that your vehicle has over conventional vehicle?
 - 9.3 What are the disadvantages of owning an electric vehicle?
 - 9.4 With the overall experience, would you recommend buying an EV to your peers?
 - 9.5 If no. What needs to be improved so that you find it easy to recommend EVs to others?
 - 9.6 Do you think it is necessary to have public charging infrastructure:
 - 9.7 What is the power supply situation in your area?
 - 9.8 Have you ever found power supply a constraint for charging your vehicle?
 - 9.9 Is your electricity connection earthed?

Infrastructure Assessment Survey

Survey no.:

Location:

District:

1. Dealership:
2. Category of vehicle:
3. Proprietor:
4. Operating as:
4. Year of opening:
5. Details of Staff:
6. Areas under operation:
7. Total units sold
 - 7.1 For three-wheeler category:
 - 7.1.1 Is the product manufactured locally or imported?
 - 7.1.2 If imported. What is the location of manufacturer?
8. No. of product variant:
9. Top selling variant:
10. Details of all variant:
11. Any challenges with subsidy disbursal:
 - 11.1 If yes. Can you talk about major challenges?
12. Aftersales service:
 - 12.1 Minimum response time:
 - 12.2 Availability of spare parts:
 - 12.3 Total maintenance downtime if the component is available.
 - 12.4 If not available:
 - 12.5 Total maintenance downtime if the component is not available.
 - 12.6. Any challenges with warranties?
 - 12.7 Any initiative on training locals on repair/maintenance of EVs?
 - 12.8 If yes. Please provide details?
 - 12.9 If no. Any such plans for future?
13. Financing
 - 13.1 Name of the partnered financier:
 - 13.2. Cost of finance:
 - 13.3 Documents required for financing:
 - 13.4 Time duration in finance approval
14. Provisions for charging infrastructure
15. Future plans for the dealership?
16. Remarks on what is required for the growth of this market?

CUTS International

Established in 1983, CUTS International (Consumer Unity & Trust Society) is a non-governmental organisation, engaged in consumer sovereignty in the framework of social justice and economic equality and environmental balance, within and across borders. More information about the organisation and its centres can be accessed here: <http://www.cuts-international.org>.



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