#CABH Report

Behavioral Insights for Accelerating Electric Three-Wheeler Adoption in Amritsar

OR

Electric Three-Wheeler (E3W) Transition in Amritsar: Uncovering and Addressing Behavioral Hurdles

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Executive Summary

Electric vehicle (EV) transition of India's road transport sector is imperative for achieving target of Net Zero by 2070 (PIB 2023). The Council on Energy, Environment and Water' (CEEW) analysis shows that a thirty percent penetration of EVs by 2030 can reduce greenhouse gas emissions (GHG) from transport by sixteen million tonnes and seventeen percent of particulate matter (PM) emissions (Soman et al. 2020). It is often assumed that solving for techno-economics through policy initiatives is enough to influence users to switch to EVs. In this report, we argue that this is not always the case. We show that there are behavioural biases that impede the rational decision to switch to EVs. Behavioural biases are systematic inclinations in human decision-making that rarely comply with tenets of logic, plausibility, or reasoning based on probability (Hans et al., 2022).

We study the case of EV transition in the passenger three-wheeler (3W) segment. The total cost of ownership (TCO) of Electric 3Ws (e3Ws) is up to 46 per cent lower than diesel 3Ws (d3Ws) and can increase daily savings of drivers by 30 per cent (Harikumar et al. 2022). Our study of behavioural biases is focused on Amritsar's passenger 3W fleet. In Amritsar, there already exists a local passenger e3W scheme that offers an additional subsidy of INR 1.4 Lakhs, eliminates the upfront cost problem through innovative financing and aims in adoption of 7500 e3W by scrapping of existing d3W, rather than just adoption of new e3Ws. Despite the attractive economics of e3Ws, only 255 d3W drivers switched to e3Ws between the start of the Amritsar's e3W subsidy scheme in 2019 and 1st September 2023.

We collect qualitative evidence through interviews and focus group discussions (FGDs) with diesel and e3W drivers to understand the barriers and motivations for e3Ws. We also use the evidence from a survey of 533 d3W drivers to show how some of the barriers stated by d3W drivers are exaggerated due to underlying behavioural biases.

This report covers the *Target*, *Explore and Solutions* phases of the TESTS framework for behaviour change interventions (Kettle and Persian 2022). We present our findings using the MINDSPACE framework (Dolan et al. 2012) and recommend actions for nudging e3W adoption by d3W drivers in Amritsar.

Key Findings

Drivers do not understand the economic rationale due to discrete mental accounting and sunk cost fallacy

- D3W drivers can increase their daily savings by **10-18%** despite prematurely scraping their d3W and taking up additional EMI liability of e-auto EMI.
- Drivers still state that that they do not want to take up an additional loan. Due to discrete mental accounting, drivers are not able to evaluate that the money saved on diesel expenses (~INR 9000) is more than enough to pay e3W EMI (~INR 6000).
- Drivers state that they do not want to prematurely scrap their existing d3W. Due to sunk cost fallacy, drivers want to make the most out of their investments on their existing d3W which is allowed to ply for 15 years from registration.

Drivers incorrectly perceive e-auto performance due to priming and anchoring effect

- Perception of e3W is primed by high visibility of e-rickshaws which have lower speed, range and battery life in comparison to e3W.
- E3W's performance evaluation is anchored to high performing and much larger d3W and not the drivers' actual requirement. E3Ws on average, are **14%** smaller in size compared to d3W and cannot do inter-city trips. However, e3Ws can carry same number of passengers and inter-city trips are a small proportion of overall operations.
- D3W drivers underestimate e3W range by **30%** but those who have driven at least once estimate a **16%** better range.

Lack of charging infrastructure and difficulty in home charging are real problems

- Even though a fully charged e3W can cover the daily mileage of **73%** of drivers, lack of charging infrastructure is stated as a major barrier by both d3W and e3W drivers.
- Lack of appropriate **earthing** at homes is stated by a major challenge for home charging, especially for the d3W drivers living in rented houses.

Pradhans and peers have a strong influence

- Nearly half of 3W drivers state that they would be highly likely to transition to e3Ws if their Pradhan (local community leader) had an e3W.
- Diesel drivers frequently approach e3W drivers with queries regarding e3Ws. Nearly half of d3W drivers found out about e3Ws through their peers.

Key Recommendations

Improve understanding of economic rationale through communication

- Strategic behaviour change communication can enable d3W drivers to effectively evaluate the economic rationale. Discrete mental accounting as a behavioural bias can be addressed by equating diesel savings with e-auto EMI. For example, communications can be centered on how diesel savings can be used to pay the e3W EMI. Similarly, communicating economic loss in maintaining status quo can address sunk cost fallacy of making the most out of existing d3Ws.

Improve understanding e-auto performance with direct-user-experience

- Evidence clearly indicates that e3W driving experience improves the understanding of e3W performance like range. Such hands-on exposure to e3W can address the priming effect of e-rickshaws as well as anchoring effect of d3Ws and help the drivers realise that existing e3Ws can meet their daily trip requirements.

Build and publicise public charging infrastructure

- Building affordable, accessible and visible public charging infrastructure will have significant positive impact on e3W uptake by addressing range anxiety of drivers with inadequate home charging and those with high daily utilisation. Publicising charging infrastructure development as well as their locations through public maps can further build confidence amongst drivers that their charging requirements can be met easily.

Harness informal networks to improve pride associated with e3W

- Informal networks can be harnessed by using *Pradhans* and existing e3W drivers as messengers of e3W experience and associated benefits. Communications focused on building pride associated with e3W can address ego bias stemming from smaller size of e3Ws.

Most of the evidence on nudging EV adoption focuses on four-wheelers, and comes from developed countries. To the best of our knowledge, we did not find a single paper which looks at behavioural factors affecting preferences for e3Ws. There is a need to conduct proper evaluations via experiments to understand the impact of interventions to nudge e3W adoption. Such trials of nudge interventions, will help develop scalable and cost-effective strategies, and EV incentives may be diverted to segments where favourable techno-economics is yet to be achieved.

Going forward with these findings, CEEW plans to undertake the *Test* and *Scale* phases where these solutions will be tested through field trials in Amritsar to develop scalable interventions to nudge e3W adoption.

All findings and recommendations

Policy actions	Communication Marketing	Service Provision	Environmental Restructuring	Incentivisation	Regulation

ES Table 1 Key findings and Recommendations

Barriers	Stated Reasons	Observed evidence	Underlying Biases	Recommended Actions	Actors			
					Dealers	OEMs	ASCL	DISCOMs
Financial	Don't want to take up loan for e3W. Don't want to prematurely scrap their d3W. Future battery replacement costs will be huge.	Savings increase by ~10 per cent despite e3W loan. Drivers with newer 3Ws are less willing to switch to e3Ws. Battery life is considered equal to battery warranty.	Discrete mental accounting Sunk cost fallacy Loss aversion Incentive bias	Equate e3W loan with money saved from diesel costs.				
				Use a relatable metric like costs /day over per km.				
				Communicate economic loss in maintaining the status quo of using d3Ws.				
				Improve informationinformationinformation on battery warranty, life and replacement costs.				
Range anxiety	E3Ws can't do regular intra-city and occasional inter-city trips.	A fully charged e3W can cover the daily mileage of seventy-three percent of drivers Inter-city trips are a small portion of overall operations. D3W drivers on average underestimate e3W range by thirty-two per cent.	Overestimate small chances	Inform current range and improvements e3W models.				
				Communicate operations of e3W drivers to show actual distances covered by them.				
				Facilitate rental business models of e3Ws.				
				Increase the duration and number of test drives.				
Charging	Drivers need a PCS	Sixty-three per cent drivers'	Anchoring effect	Communicate ease of home charging				

	coverage similar to petrol pumps. Drivers don't have appropriate earthing at homes.	daily requirements can be met by home charging. Fourteen per cent drivers live in rented houses. Energy demand of eighty per cent of 3W mileage can be met by home charging.		and time saved from it.				
				Improve compliance of earthing requirements in household electricity connections.				
				Publicise charging infrastructure maps				
				Establish affordable, accessible and highly salient public charging stations for e3Ws and publicise them.				
Performance and Safety	E3Ws are small and not sturdy. E3Ws can't carry same no. of passengers and do school trips.	Twenty-seven per cent of d3W drivers stated that they would not be proud to show their e3W to other members in their stand. Only sixteen per cent of drivers do school trips.	Priming Ego Anchoring effect	Communicate difference between e-rickshaws and e3Ws.				
				Improve pride associated with e3W.				
				Regulate unsafe overloading in d3W.				
Other Behavioural Biases								
Messenger Bias	Nearly half of 3W drivers state that they would be highly likely to transition to e3Ws if their *Pradhan* (local community leader) had an e3W.			Use e3W drivers and *Pradhans* as agents of change. Communicate e3W benefits through them.				
	Diesel drivers frequently approach e3W drivers with queries regarding e3Ws. Nearly half of d3W drivers found out about e3Ws through their peers.			Give higher referral incentives to existing e3W drivers.				
Social Norms	Forty-two per cent of diesel drivers feel that their peers are switching to e3Ws.			Communicate e3W adoption numbers				

1. Background

Public policies often seek to shape human behavior (Sunstein 2019). Two prevalent strategies for promoting electric vehicle (EV) adoption are economic instruments—pricing the externalities through Pigouvian taxes and monetary incentives, and command and control measures—EV mandates, phasing out/banning petrol and diesel vehicles. Liberty preserving nudge policies, a third category of interventions, have gained momentum due to their ability to guide choices while respecting individual freedom. Their popularity stems from their cost-effectiveness and potential economic and welfare benefits. The United States Environment Protection Agency's (US EPA) fuel economy labels (Long et al. 2021), LEED certification (Scofield 2013), and the India's Bureau of Energy Efficiency's (BEE) star labeling (Rathi and Chunekar 2015) are pertinent cases.
Governments worldwide, including the USA, UK, Australia, and India, have established behavioral insights teams to explore nudge-based, cost-effective policy interventions (Hallsworth 2023; Malhotra and Shah 2023). Nudge policies have proven effective in domains ranging from finance (Cai 2020) and health (Kwan et al. 2020) to mobility choices (Whillans et al. 2021). Globally, some nudge interventions have aimed to steer consumers towards EV purchases (Filippini, Kumar, and Srinivasan 2021; DellaValle and Zubaryeva 2019).
This paper investigates the relevance of nudge policies in expediting EV adoption in India, focusing on passenger three-wheeler (3W) segment in Amritsar to reveal underlying behavioral biases potentially hindering the effectiveness of conventional policies.

1.1 What are behavioural biases?

In policymaking, classical economic models assume rational individuals who always act in their best interest. However, humans aren't purely rational; they exhibit systematic, flawed responses in decision-making (Wilke and Mata, 2012). Kahneman and Tversky coined the term "cognitive biases" to describe these deviations from rationality (Shefrin and Statman, 2003). Extensive empirical evidence from economic experiments in the 1980s and 90s has shown that consumers don't always act rationally, as assumed by classical models (Huck and Zhou, 2011). Cognitive biases, also known as behavioral biases (Garcia-Sierra, van den Bergh, and Miralles-Guasch 2015) , are ***systematic inclinations in human decision making that often don't comply with tenets of logic, plausibility or reasoning based on probability and represent systematic deviations from logical and probabilistic reasoning*** (Hans Korteling and Toet, 2022). In this paper, we use the term "behavioral biases" to refer to these systematic deviations from rational behavior in the context of e3W adoption by d3W drivers.

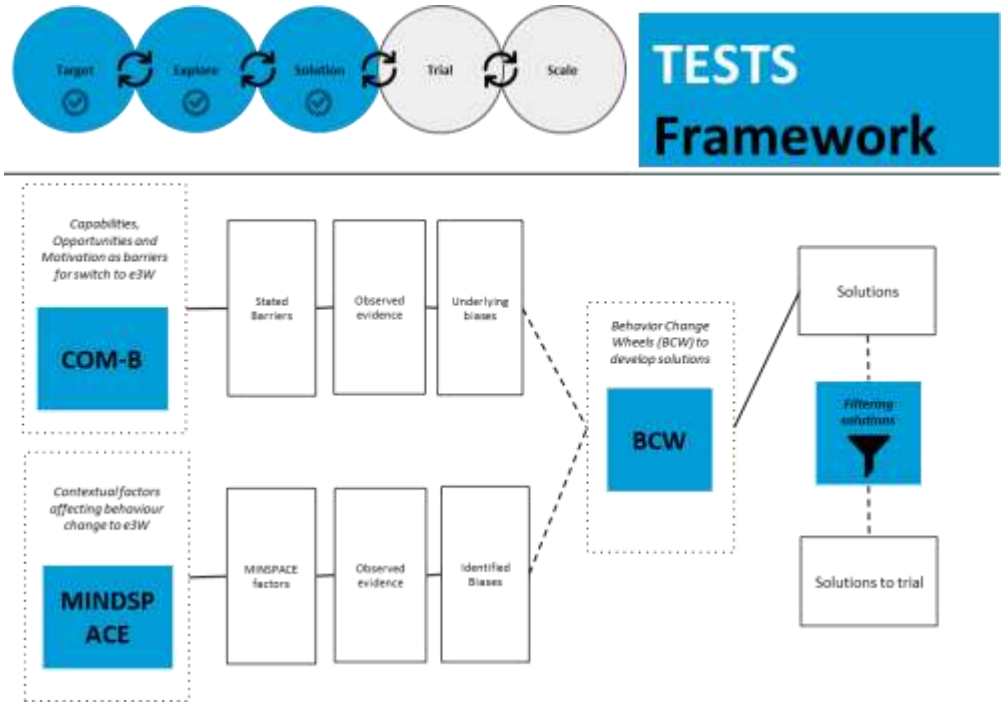
1.2 Behaviour Insights Framework

In the realm of EV adoption, it is imperative to scrutinize behavioral biases that underlie significant obstacles such as high upfront costs and inadequate charging infrastructure. To shed light on this critical issue, New Zealand's Ministry of Environment uses a analytical framework of 'barriers-biases-interventions' to discuss the behavioural insights for accelerating EV adoption in New Zealand (Hutchings 2018). We utilise existing literature to address several key aspects of EV adoption, examine the obstacles that hinder EV uptake, uncover the hidden biases contributing to these

barriers, and put forward viable solutions to overcome them. Another report by Sustainable Energy Authority of Ireland (SEAI 2020) also draws upon prior research to delve into the foundational factors contributing to behavioral biases and barriers in EV adoption. These include issues such as financial barriers, concerns related to range anxiety, challenges with charging, and dealership conditions.

In the realm of Behaviour Science, numerous behaviour change models aid in evaluating biases and designing interventions. The MINDSPACE framework, developed by the UK government's nudge unit in 2010, summarizes nine key factors influencing behavior: messenger, incentives, norms, defaults, salience, priming, affect, commitment, and ego (Dolan et al. 2012). It has been applied across various domains (Andrawis et al., 2022; Smith et al., 2022; Hennessey et al., 2020), including energy demand reduction (BIT, 2011), and transport (Metcalfe and Dolan, 2012; Maier, 2012). Alternatively, the EAST framework offers a straightforward approach for policymakers to enhance policy effectiveness using behavioural science, emphasizing that policies should be Easy, Attractive, Social, and Timely (EAST) (BIT, 2012). Additionally, the Behavior Change Wheel (BCW) and the COM-B framework have been proposed by the UK BIT team as more comprehensive tools for behavior change interventions (Michie, van Stralen, and West, 2011). COM-B delves deeper into the underlying factors affecting behavior, including capability, opportunity, and motivation, beyond mere nudges. COM-B framework is a part of BIT's *Target, Explore, Solution, Trial, Scale* (TESTS) approach to tackling behaviour change problems (Kettle and Persian 2022).
Following recent behavioural insights literature, this study uses both COM-B and MINDSPACE to identify biases and BCW to develop solutions within the Target, Explore and Solutions phases of the TESTS framework (*Figure 1*). However, for ease of understanding of stakeholders in the EV space, we classify the discussion of barriers and biases into classes of EV barriers like financial, range anxiety, charging infrastructure and; performance and safety.

Figure 1 Use of COM-B, MINDSPACE and BCW within the TESTS Framework in this study



Source: Authors' representation

1.3 Biases discussed in this report

This section summarises the relevant behavioural biases from literature, which are later discussed in this report in the context of e3W adoption.

Table 1 Literature on behavioural biases discussed in this report

Behavioural factors influencing decision making		Example(s)
Discrete mental accounting	Mental accounting categorizes financial transactions like salary and savings (Dolan et al. 2012). It's akin to dividing funds into "savings jars" for specific purposes (Hahnel et al. 2020). Once allocated, this money isn't easily redirected, leading to suboptimal spending.	Fuel costs saved from improved fuel efficiency is often spent on higher-priced fuel instead spending on other products (Hastings and Shapiro 2013).
Sunk Cost Fallacy	Sunk cost fallacy is a bias where past investments influence future decisions, like watching a boring movie just because you bought the ticket (Strough et al. 2008).	People stall EV purchases till they have utilized their money 'sunk' in their current gas vehicles (Hutchings 2018).
Loss Aversion	Loss aversion is the dislike for losses (Kahneman and Tversky 1979). Studies have found that people care twice as much about avoiding losses than similar gains (Tversky and Kahneman 1992)	Loss averse people are less likely to make energy efficient investments like purchase a fuel-efficient car (Heutel 2019).
Overweigh small chances	People are risk seeking when they have a small chance of winning a large amount and are risk averse when they have a small chance of losing a large amount (Tversky and Kahneman 1992).	People overestimate chances of long distance trips while estimating range requirements in an EV (Hutchings 2018)
Status Quo Bias	Individuals prefer to avoid changes and maintain their current state (Samuelson and Zeckhauser 1988).	Consumers continue using energy inefficient durables until they wear out or overuse them to mentally utilise their initial investment costs (Blasch and Daminato 2018).
Anchoring effect	Anchoring effect is the disproportionate influence initially presented information has on an individuals' actual judgement (Tversky and Kahneman 1974). Initial information acts as a reference	Those with no prior EV driving experience perceived EV range requirement similar to their existing gasoline vehicle rather than their actual needs, the latter being a familiar anchor in a new and less familiar

	point and influences judgement. The effect is found to be higher in more ambiguous and less familiar cases (Furnham and Boo 2011).	situation (Kurani, Turrentine, and Sperling 1994).
Salience	People are influenced by information that draws their attention (Kahneman and Thaler 2006) and tend to ignore other information that is not salient.	EVs that had salient features such as bigger size and a sporty look sold more (DellaValle and Zubaryeva 2019).
Priming	Priming bias occurs when people's latter behaviour is influenced by their initial exposure to certain words, sights, situational cues, or sensations (Dolan et al. 2012).	Priming through facts about the health implications of poor air increased the stated likelihood of individuals opting for electric motorcycles in Nepal (Filippini, Kumar, and Srinivasan 2021).
Incentive Bias	Once a behaviour is associated with external reward, people may be less inclined to undertake the same behaviour in the absence of rewards (Bénabou and Tirole 2003).	Removal or reduction of incentives may result in a fall in electric vehicle growth and in cases, market stagnation (Gómez Vilchez and Thiel 2019).
Ego	Feeling good about oneself and a positive and consistent self-image are important behavioural goals (Michie, van Stralen, and West 2011; Dolan et al. 2012)	Reinforcing self-identities of individuals as environmentalists and social innovators has the potential to increase the adoption of EVs (White and Sintov 2017).
Messenger	Individuals value information differently based on their perceptions about the authority of the source of information—'the messenger' (Dolan et al. 2012) their feelings towards the messenger, and perceived similarity with the messenger (Durantini et al. 2006).	Mistrust in messages by the government may limit action to combat environmental issues like climate change (APA 2009).
Social Norms	Social norms are social considerations or unwritten rules that influence people's behaviour (Nyborg et al. 2016). These can be broadly classified as descriptive (Cialdini 2007), "What most people do" Or injunctive (Gavrilets 2020), "What most people approve of doing".	Social norm messaging is observed to improve EV preferences in Germany (Berneiser et al. 2021) and Sweden (Westin, Jansson, and Nordlund 2018).

Affect	Affect is the act of experiencing emotions and has a large influence on decision making (Dolan et al. 2012)...	Stimulating consumers' anticipated pride can improve their EV purchasing intentions (He et al. 2023).
Commitment	Committing to do an act can increase the likelihood of the act being fulfilled (Cialdini 2007).	Making people pre-commit to future clean energies and efficient vehicles may increase adoption (Metcalfe and Dolan 2012).

1.4 Why study behavioural biases in e3W adoption in Amritsar?

India's EV transition is prominent in the two and three-wheeler segments (2W and 3Ws), with nearly seven times the number of EVs registered in 2022-23 compared to FY 2019-20 (Harikumar and Jain 2023; CEEW CEF dashboard n.d.). Out of the twelve lakh EVs registered in FY 2022-23, 35 per cent belong to the three-wheeler (transport) category (Ministry of Road Transport and Highways 2023). Notably, 94 per cent of the EVs registered in the 3W (transport) category are e-rickshaws, which form a distinct class from passenger 3Ws. While e3W registrations grew 40-fold from 2015 to 2022, e-rickshaw registrations saw an astounding 600-fold increase. It's worth noting that most e-rickshaw drivers adopted e-rickshaws to create job opportunities rather than transitioning from alternative 3W vehicles (Gargi Lahiri and Soumen Nath 2021). Consequently, e-rickshaws have primarily expanded India's 3W fleet rather than facilitating a transition. The discussion in this report only focuses on transitioning the existing internal combustion engine (ICE) based 3W fleet in India, excluding the e-rickshaw adoption.

Electric Three Wheelers (e3W) offer significant cost advantages, being up to 46 per cent cheaper than d3Ws and providing drivers with a 30 per cent increase in daily savings (Harikumar et al. 2022). Moreover, state and central government incentives further bolster the economic case for switching to e3Ws. e3Ws receive incentives of INR ten thousand per Kilowatt-hour (kWh) of battery size through the Faster Adoption and Manufacture of Electric Vehicles (FAME-II) scheme (Harikumar and Thakur 2019). Despite the apparent economic rationale for transitioning to e3Ws and yet a slower transition, 3W segment serves as an ideal study to uncover the underlying behavioral biases impeding the transition.

We investigate the 3W transition in Amritsar, India, where a local policy, the **Rejuvenation of Autorickshaws in Amritsar through Holistic Intervention (RAAHI)** project by **Amritsar Smart City Limited (ASCL)**, incentivizes d3W drivers to shift to electric. The RAAHI project is managed by the National Institute of Urban Affairs (NIUA) and financed by the French Development Agency (AFD), the European Union (EU) and Amritsar Smart City Ltd. RAAHI's e3W scheme offers a subsidy of INR 1.25 lakh and a scrapping incentive of up to INR fifteen thousand, encouraging d3W drivers to switch to e3Ws with zero down payment and low-interest financing. Despite these incentives and the favorable economics of e3Ws, only 255 d3W drivers out of the targeted 7500 have transitioned to e3Ws from the scheme's inception in 2019 till 1st September 2023.

Research questions

In this report, we study the case of Amritsar to answer the following research questions:

- Why are the drivers not switching to e3Ws?

- Amongst the stated reasons for not switching, are there any underlying behavioural biases?
- What interventions can address these?

The rest of the report is organized as follows. Section 2 discusses the data, methods and framework for presenting results. Section 3 discusses the results. Section 4 has discussion around the results and generalizability of the findings. Section 5 recommends policy actions for stakeholders and section 6 concludes the report.

2. Data and Methods

Our study employs an exploratory sequential mixed method design (Mihas 2019), combining focus group discussions (FGDs), semi-structured interviews, and an extensive quantitative survey of 533 d3W drivers. Initially, FGDs and interviews establish the situational context, providing valuable high-level insights into the current status, barriers, and preferences related to e3W adoption. This qualitative data informs our comprehensive quantitative survey and guides the formulation of survey questions aimed at precisely assessing 3W operational patterns, preferences and perceptions of e3W and behavioural factors impeding adoption.

2.1 Focus Group Discussions

To gain a preliminary understanding of the attitudes and perceptions of 3W drivers in Amritsar towards e3Ws, we undertook situational analysis through FGDs and interviews. This is motivated from Community Based Participatory Research Approach (CBPR) wherein stakeholders are engaged throughout the research process and have the opportunity to influence policy action. We approached 3W drivers from key locations in Amritsar – the railway station, bus stand, and Attari-Wagah border to identify participants for our FGDs and interviews. We conducted:

- two FGDs—one with 11 d3W drivers and another with 6 e3W drivers; and
- semi-structured interviews with two e3W drivers.

We gathered insights from multiple respondents about their daily work patterns, needs, the RAAHI scheme, and their perception of e3Ws. Diesel auto drivers highlighted challenges in transitioning, while e3Ws drivers discussed economic and health benefits from the switch. Semi-structured interviews aimed to gather personal insights not shared in group discussions but yielded similar responses. Semi-structured interviews lasted 30 minutes each, while FGDs were one hour, including introductions and clarifications. FGD participants received INR 150 as compensation for their time. Following FGDs and interviews, we qualitatively coded the data using constant comparison analysis (Onwuegbuzie et al. 2009). Open coding identified codes from transcripts, which were then grouped into categories. Using the MINDSPACE framework, we organized these categories into themes, revealing biases inhibiting diesel auto drivers from transitioning to e-autos in Amritsar. These themes guided our quantitative survey design.

2.2 Survey

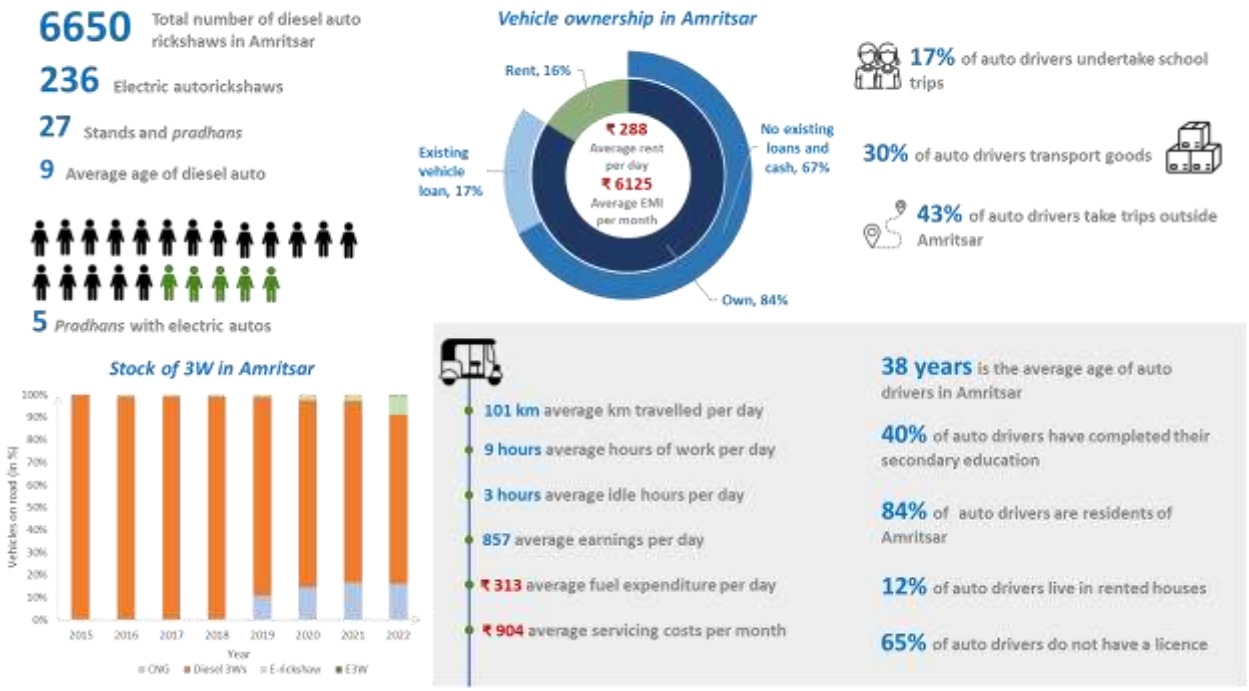
We conducted a quantitative survey to gain additional insights into the themes identified during FGDs. This survey assessed biases using the MINDSPACE framework (Dolan et al. 2012) and was

administered over one week by a third party (NYAS Research n.d.). Data collection utilized a structured questionnaire via a mobile based application (SurveyCTO n.d.). The questionnaire encompassed the following eight thematic sections:

- Socio-economics – Gender, marital status, age, education, resident of Amritsar etc.
- Vehicle details – Ownership, age, vehicle model etc.
- Route & work details – Inter/intra city trips, school/goods trips, usage patterns, idle time etc.
- Income & expenditure – Revenue, fuel costs, maintenance costs, servicing costs etc.
- E3W knowledge – Knowledge on range, charging time, subsidy scheme etc.
- E3W preference, perception & attitude – Likelihood to buy, concerns about battery, charging, range, safety; public charging infrastructure requirement etc.
- Behavioural biases – Influence of messenger, norms, priming, incentives etc.

We estimated the target diesel 3W population to be 6650. A total of five-hundred and thirty-three (N=533) diesel auto drivers across key auto stand locations in Amritsar were surveyed. As there is no existing list of auto drivers in Amritsar and limited understanding of their geographic distribution in the city, we use purposive and convenience sampling techniques (Campbell et al. 2020). The survey questionnaire was administered in both Hindi and Punjabi. Each respondent was given INR 50 as a compensation for participation and each response lasted around 20 minutes.
All the respondents were male, aged between 18 to 70 years (mean age of 38 years). More than half of the respondents have secondary education, one-fifth completed primary education and another one-fifth have no formal education. 84 per cent of the respondents are residents of Amritsar. A descriptive summary of 3W sector in Amritsar is given in Figure 2.

Figure 2 Snapshot of 3W segment in Amritsar



Source: Authors' analysis

We employed a three-point ordinal scale for questions related to preferences, concerns, likelihood etc. For example: 'not likely', 'somewhat likely', and 'highly likely'. The scale used does not have a

neutral point but 'don't know' is given as an option. Such a scale was utilized in the survey, which was not self-administered by the respondents. Additionally, the survey was translated into Punjabi during data collection. The findings from the focus group discussions (FGDs) reveal a general awareness of e3W and the subsidy scheme.

Cronbach's alpha test was conducted on the responses to test the construct validity and reliability of the scale and the value of the Kaiser-Meyer-Olkin (KMO) statistic obtained was 0.770 which is greater than the acceptable threshold of 0.7.

Higher scale is usually preferred as it increases reliability and validity and reduces chances of extreme responses (Weijters, Cabooter, and Schillewaert 2010). However, an optimal scale depends on the study and is selected such that it covers all necessary responses, Jacob and Matell (1971) show that the dichotomous or trichotomous versions of scale does not affect the validity and reliability. Since the survey was conducted by a third party, an absence of neutral point doesn't affect the validity of responses as respondents are more likely to choose neutral option to avoid a negative response in a face-to-face interview/survey (Stocké 2007).

We employ a combination of hypothesis testing, multivariate analysis and ordinal regression techniques. Data collected is analysed using following statistical techniques- correlation, chi-square (cross-tabulations), T-test & analysis of ANOVA; all the testing is done at 95% significance level. We checked for multicollinearity among the independent variables and find no significant correlation.

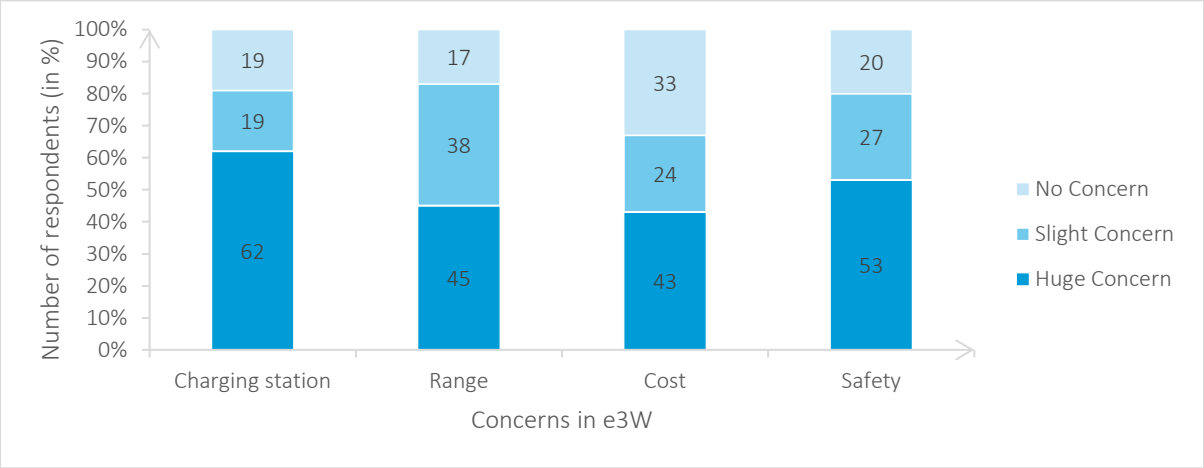
3. Results

This report presents results based on the Target, Explore and Solution phase of the' BIT's TESTS approach (**Error! Reference source not found.**). COM-B framework is used to list the stated barriers for e3W adoption by d3W drivers. For ease of comprehension by EV industry stakeholders, we classify these barriers into four categories – **Financial barriers, range anxiety, charging infrastructure and, e3W performance and safety.** Within each of these broad barriers, we list the reasons stated by the 3W drivers, show evidence on how some of these are not actually true, and discuss the behavioural biases underpinning these stated barriers.

Additionally, we present evidence on the influence of behavioural biases as listed in the MINDSPACE framework, on e3W adoption in Amritsar. BCW framework is applied on both the sets of biases (found through COM-B and MINDSPACE) to arrive at solutions to nudge e3W adoption.

Battery life as a barrier is included within financial as 3W drivers were concerned with the associated costs in the future. In the survey more than half of the drivers select charging station and safety of e3Ws as huge concerns (Figure 3). A large portion of drivers are also concerned about range and costs of e3Ws.

Figure 3 Drivers select battery life, charging infrastructure and safety as huge concerns with e3Ws



Source: Authors' Analysis

3.1 Financial

The first set of barriers highlighted by the d3W drivers concern with the costs of switching to, owning and operating an e3W. Due to the RAAHI scheme, high upfront cost (P. Kumar and Chakrabarty 2020) and lack of financing are not significant barriers to e3W adoption. However, during the qualitative interviews and FGDs, d3W drivers stated some other financial barriers to switching**,** which are listed below.

3.1.1 E3W loan

Stated Barrier – Drivers prefer not to incur additional loans

During FGDs, 3W drivers expressed concerns about assuming additional financial responsibility. Specifically, they mentioned that the monthly installments (EMI) for e3Ws could negatively impact their profitability. For drivers who already have loans for their d3Ws, the prospect of paying two EMIs – one for their existing d3W and another for the new e3W – is a source of worry. This concern is particularly significant for those with loans obtained from informal markets, which often carry high-interest rates and create a substantial financial burden. D3W drivers who operate rented vehicles and are ineligible for RAAHI scheme subsidies as they cannot scrap the d3W they drive. Consequently, they face both financial constraints and high upfront costs, precluding their participation in the scheme.

Qualitative excerpt 1 Drivers prefer not to incur additional loan

During an FGD with d3W drivers, several stated, *"Abhi humein EMI ka koi tension nahin hain"* (Right now we have no tension of EMI).

"Maine abhi-abhi apna loan chukaya hain, main ab nayi 3W nahin khareedna chahata" (I just finished paying my loan, I don't want to buy a new 3W now).

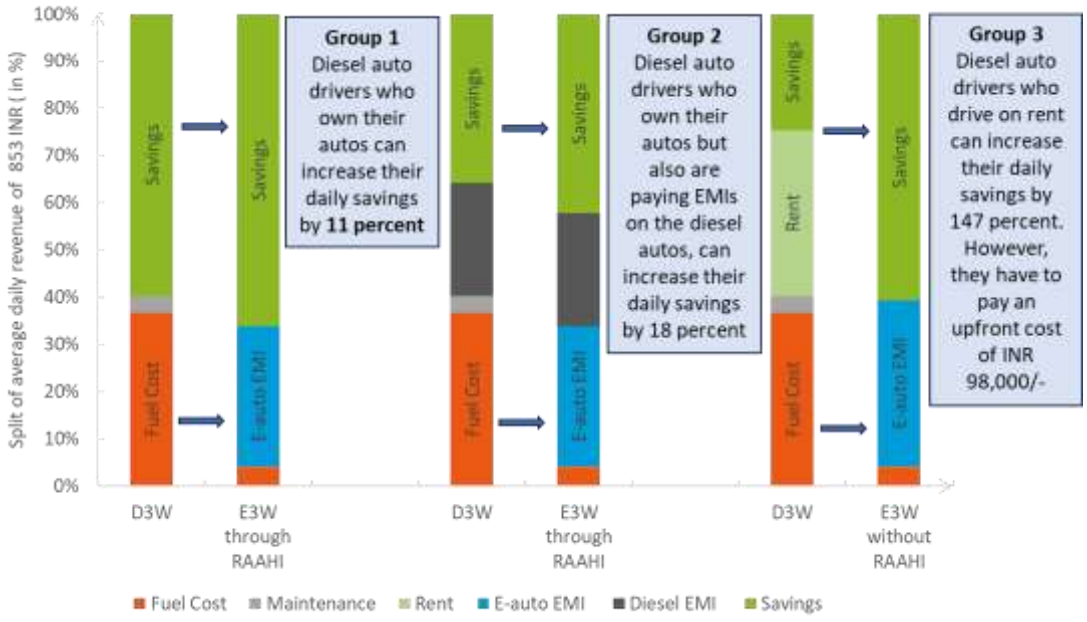
Observed Evidence - Immediate savings impact

There are three groups of d3W drivers: those who own a d3W without a loan (67%), those with existing loans (17%), and those renting (16%). The first two groups can participate in ASCL's RAAHI scheme, offering zero downpayment and 9-12% interest rates for e3W purchase. The third group, ineligible for RAAHI incentives, can still buy e3Ws directly with a downpayment of INR 98,000 and a 13% interest rate.

Analyzing the daily savings change for all three groups, factoring in the additional EMI costs for e3Ws (See Figure 4):

- Group 1: Switching to e3Ws allows d3W owners to achieve an **immediate 11% increase in daily savings**.
- Group 2: D3W owners managing existing EMIs can enjoy an **18% daily savings boost, even while handling two EMIs** - one for their old d3W and another for the new e3W.
- Group 3: D3W **renters can benefit from a substantial 147% increase in daily savings**. However, they must *cover a transition cost of INR 98,000,* representing their upfront investment in purchasing e3Ws.

Figure 4 Reduction in diesel fuel expenses is more than enough to cover e3W loan



Source: Authors' analysis

Underlying Bias – 3W drivers in Amritsar are observed to categorize their expenses and earnings into discrete bundles

The FGDs show there are different mental accounts like 'revenue', 'loan', 'diesel costs' etc. The switch to e3Ws reduces mental expense account of 'diesel costs' but adds to the mental expense account of 'loan' or 'EMI'. As these two mental accounts are non-fungible, the d3W drivers are unable to put them together to understand that their daily savings improve even after accounting for e3W loan.

3.1.2 Premature Scrapping of d3W

Stated Barrier – Drivers don't want to prematurely scrap their d3W

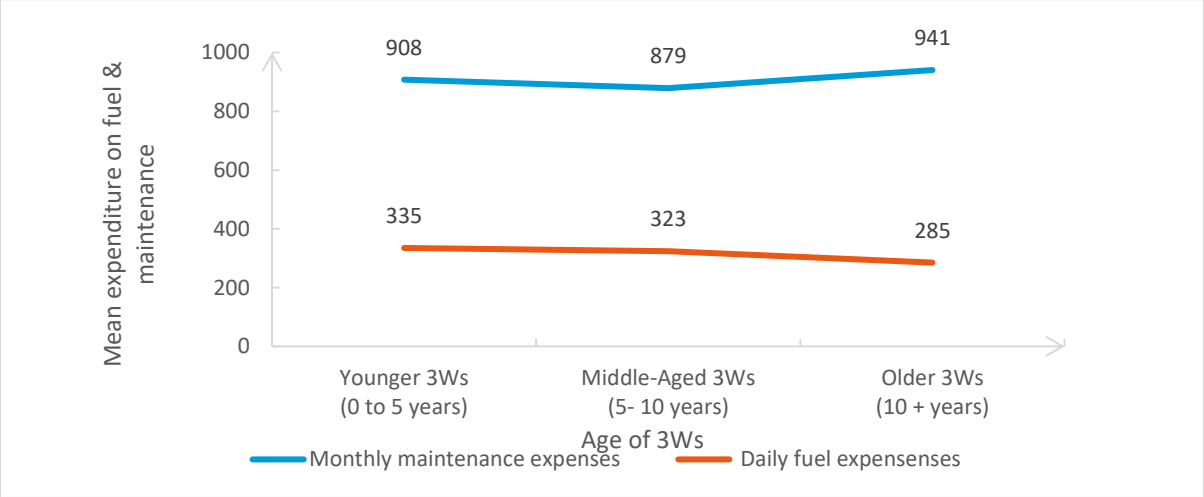
Drivers argue that the INR fifteen thousand scrapping incentive falls far short of the actual value of their diesel vehicles. Many believe it's financially unwise to prematurely scrap vehicles with plenty of life left and anticipate getting better returns in the second-hand market.

Observed Evidence - Transitioning to e3Ws is consistently and a continuous economic improvement over using d3Ws

Legally, 3W in Amritsar can operate for 15 years from registration. Approximately 11 per cent of 3W exceed this limit, while around 63 per cent of d3W still have at least 6 years left (out of 15). Despite d3W drivers expressing concerns about financial losses from early scrapping, our analysis contradicts this notion.

The analysis in Figure 4 considers an average daily fuel cost of INR 313 and monthly maintenance expenses of INR 903. Figure 5 demonstrates that the economic benefits of switching to e3Ws hold true regardless of the vehicle's age. Fuel and maintenance costs for d3Ws don't significantly differ with age. Consequently, holding onto their current d3Ws incurs daily financial losses for drivers, dispelling the belief that early scrapping incurs economic loss.

Figure 5 Fuel and maintenance costs for d3Ws don't significantly differ with age



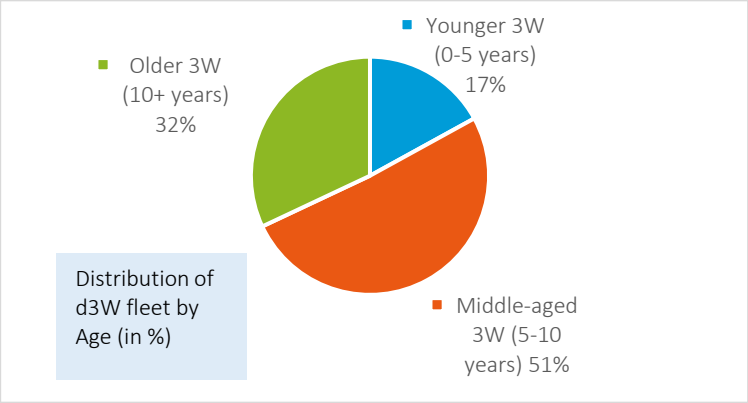
Source: Authors' analysis

Underlying Bias – Sunk Cost Fallacy

The d3W drivers want to make the most out of their investment in their current vehicle. A common statement in our interactions with d3W drivers, indicative of this bias was, *"Jab tak chal raha hain, chalne do"* (For as long as it can run, let it run).

Average age of a d3W in Amritsar is about nine years. Based on vehicle age, we classify d3W drivers into three groups (Figure 6).

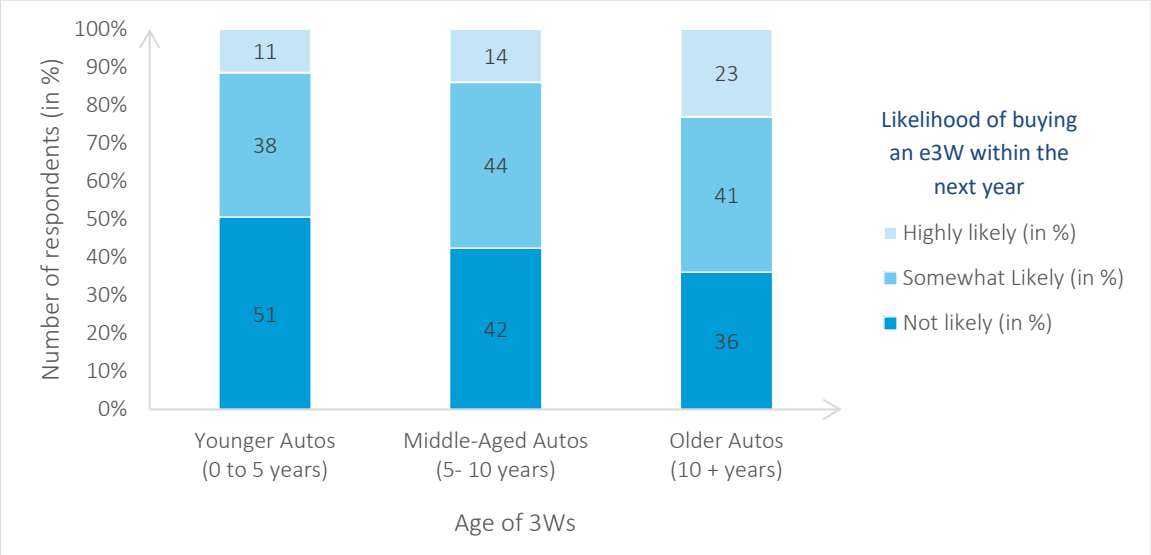
Figure 6 About a third d3W are older than ten years



Source: Authors' Analysis

Only 11 per cent of the respondents with younger d3w expressed a strong likelihood to buy an e3w within a year, while 23 per cent with older d3w expressed a similar intention. To test whether the age of an auto influences the purchase decision, we performed an ANOVA. The results indicated there is a statistically significant difference across the likelihood of purchasing an e3W with respect to age of the auto. We further did the robust equality of mean tests: Welch test and Brown-Forsythe test to validate the findings of ANOVA. Both the tests confirmed the existence of a significant difference likelihood of buying e3W in older and younger d3Ws. That is, **vehicle age has a statistically significant influence on the likelihood to buy a e3W**.

Figure 7 Drivers with younger 3Ws are less likely to buy an e3W



Source: Authors' analysis

Drivers with younger d3W may have higher sunk cost fallacy due to the burden of existing d3W EMIs for some.

3.1.3 Battery Replacement costs

Stated Barrier – Divers are concerned about future battery replacement costs

FGDs show that 3W drivers are concerned about the substantial future cost of battery replacement after switching to e3Ws, leading to anticipated losses. Drivers additionally worry about e3W batteries being damaged by rain or improper charging practices.

Qualitative excerpt 2 Drivers are concerned about uncertain future battery costs

> In FGDs, respondents stated, *"Gaadi ka guarantee sirf 3-4 saal ka hain, uska battery aur motor bohot mehenga hain. Isliye 3 saal mein humare liye loss hoga"* (The guarantee for the vehicle is only 3-4 years, the battery is expensive and the motor is expensive and so we will incur a loss after 3 years).

Observed Evidence - Uncertainty regarding battery life

Sixty per cent of diesel drivers in the survey have stated battery life to be a huge concern regarding e3Ws. E3W drivers assume the life of the battery to be exactly 3 years because both empaneled e3W original equipment manufacturers (OEMs) offer a warranty of 3 years on the battery (Piaggio n.d.; Mahindra n.d.). Due to uncertainty regarding the technology, **drivers tend to conflate battery warranty with the actual battery life** alluding to the broader issue of battery life standardization and performance tests, or lack thereof.

Underlying Bias - Loss Aversion

We measure loss aversion in risky choices through a coin toss experiment, where 3W drivers decide whether to accept or reject six hypothetical gambles (Q1 to Q6) with a 50-50 probability of gain and loss (Gächter, Johnson, and Herrmann 2010). The winning prize is fixed at INR 50, while the loss varies from INR 10 to INR 60 in Q1 to Q6, respectively. This approach, using small financial stakes, ensures we measure loss aversion rather than risk aversion (Rabin 2013).

Around 8 per cent of d3W drivers accepted all the gambles or Q1 to Q5 but rejected Q6, while the remaining 92 per cent exhibited loss aversion. The degree of loss aversion (Tversky and Kahneman 1991) among 3W drivers is measured at 2.6, indicating that **they value losses nearly thrice as much as gains**. This level of loss aversion is 25 per cent higher than that found among Indians by Wang et al. (2017).

3.2 Range Anxiety

Limited range of the available e3W model offerings is stated as a barrier in the FGDs. 45 per cent respondents in the survey indicated range as a huge concern with e3Ws.

3.2.1 Intra-city trips

Stated Barrier – Drivers consider e3W range inadequate for their daily requirements

About 61 per cent drivers feel that e3Ws will not be able to do the same trips as their current d3Ws. The drivers perceive that this inability to do the same number trips will lead to revenue loss.

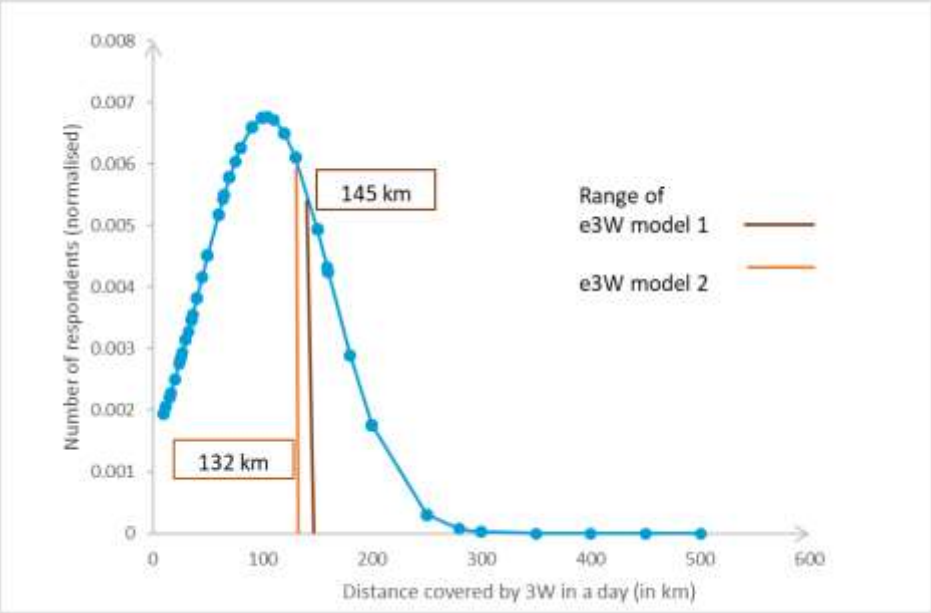
Qualitative excerpt 3 Drivers are anxious about e3W range to meet their requirements

> A d3W driver states in FGD, *"log 10km-20km dur se aarhe hai toh 20-40 wahi nikal gaya. Aur baaki reh gaya apne pas 40km. Aur 40km chalaega toh kya kamai rahega uska."* (Some people come from their houses which are 10-20 km away. 20-40 km of the battery range is lost there itself, now what is remaining is 40 km of the range. What can they earn by driving 40 km?)

Observed Evidence - E3Ws range can meet typical daily requirements of three-fourths of d3W drivers

Approximately 73 per cent of respondents reported traveling distances 'yesterday' that were shorter than the range of the e3W model with the lowest range (132 kms) available at the time of the survey (Figure 8). Surprisingly, 61 per cent of these drivers believed that switching to e3Ws would result in fewer trips for them.

Figure 8 73 per cent of drivers' daily distances can be covered by one full charge of an e3W

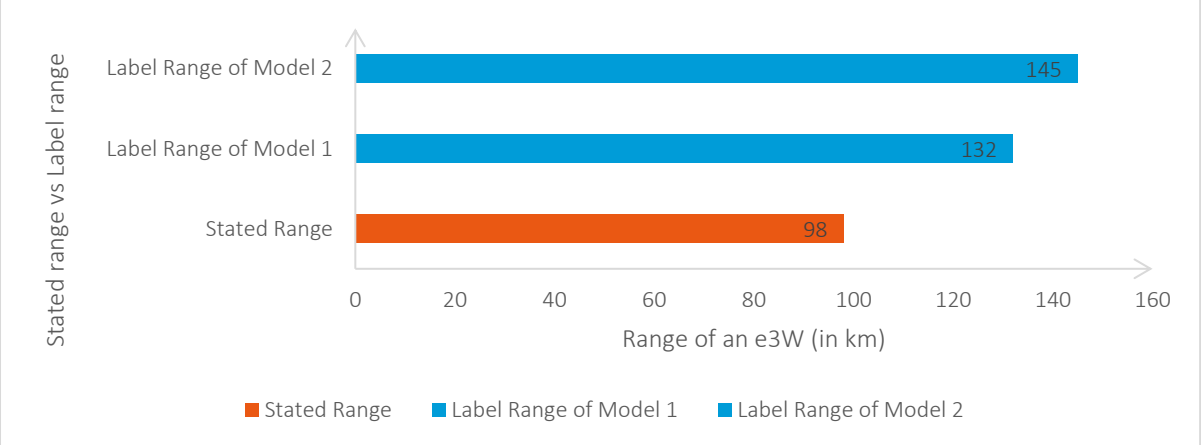


Source: Authors' analysis

Underlying Bias 1 - Drivers underestimate e3W range

Survey shows that almost one-third of d3W drivers don't know the range of a fully charged e3W. Another 40 per cent of respondents think the range of an e3W on full charge is equal or less than 100 km. D3W drivers on average **underestimate the e3W range by up to 32 per cent** lower than what it is stated in e3W OEM labels Figure 9.

Figure 9 D3W drivers on average underestimate e3W range up to 32 per cent

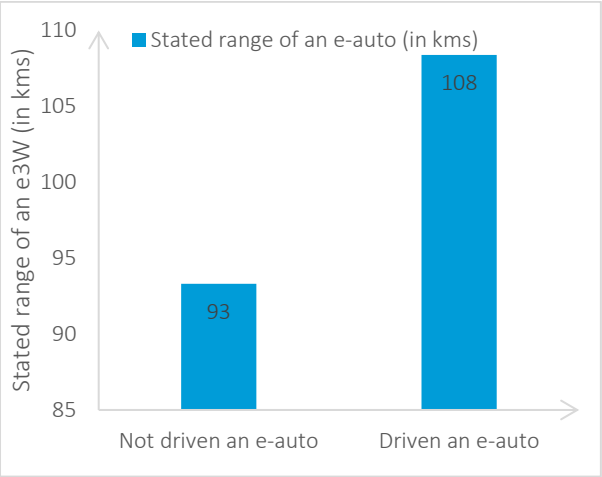


Source: Authors' analysis

Underlying Bias 2 - Drivers who have driven e3W perceive e3W range closer to the label range

We find that the underestimation of e3W range is much higher in those who haven't driven an e3W in the past. Figure 10 shows that d3W drivers who have driven an e3W at least once in the past perceive the e3W range to be 16 per cent more than those who haven't. However, it is to be highlighted that even those who have driven an e3W, still continue to underestimate the actual range of e3Ws available in Amritsar. The lack of awareness about other features of e3Ws is discussed in section 3.6.

Figure 10 Those who have driven e3W estimate range to be 16 percent higher than those who haven't

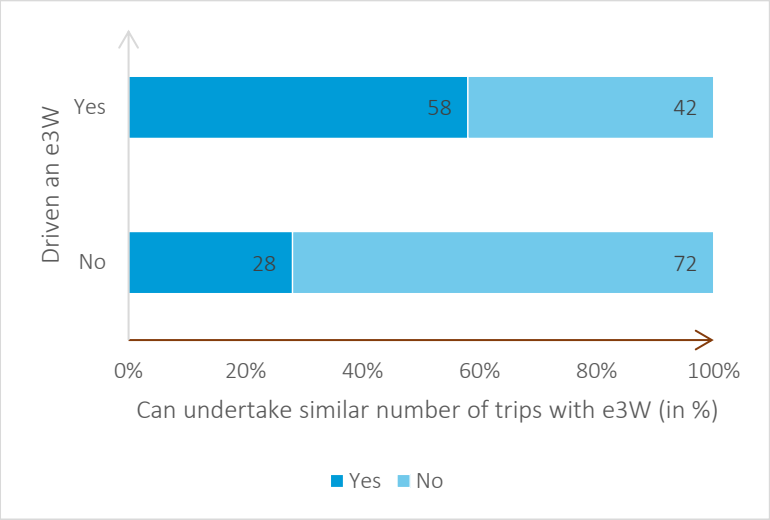


Source: Authors' analysis

To further validate this finding, two groups of respondents were taken: those who had driven an e3W (N=207) and the rest who had not driven an e3W before (N= 326). The results of a two-sample t-test revealed a statistically significant ($p<0.05$) difference in the stated range of an e3w across the two groups.

Almost 60 per cent of those who have test driven e3W also think that e3W can meet their operational requirements (Figure 11). Only a third of those who didn't drive think so. A chi-square test was performed to validate the result and a statistically significant relationship was obtained with a p-value less than 0.001.

Figure 11 ~60 per cent of those who have driven e3W, state e3W will meet their requirements



Source: Authors' analysis

3.2.2 Long distance trips

Stated Barrier – Drivers can't do occasional inter-city trips with e3W

Drivers cited the limited range of e3Ws as a barrier to switching, particularly for inter-city trips. They expressed concerns that e3Ws cannot handle outstation trips, which typically yield higher revenue than local city trips. This limitation was a significant reason mentioned during the FGDs for not choosing e3Ws because of their inability to fulfil roundtrips to Jalandhar (~80 km from Amritsar).

Observed Evidence – Inter-city trips are a small portion of overall driving requirements

Among the drivers we surveyed, a substantial 56 per cent reported that they hadn't ventured beyond Amritsar in the past week. When it comes to d3W drivers, our analysis suggests that they have approximately a 12 per cent chance of securing an outstation trip on any given day. Interestingly, our survey data highlights an intriguing trend among individuals who are accustomed to frequent outstation trips; they appear to harbor some uncertainty about maintaining the same level of trip frequency when transitioning to an e3W.

To delve deeper into this phenomenon, we categorized our respondents into two distinct groups: the first group comprises individuals who express confidence in maintaining their trip frequency with e3Ws (N=203), while the second group consists of those who express apprehension about this transition (N=312). The results of a two-sample t-test reveal a statistically significant distinction between these two groups. This finding strongly suggests that individuals who frequently embark on outstation trips are notably more concerned about the prospect of maintaining their trip frequency with e3Ws.

Stated Barrier – Drivers can't go to Attari-Wagah border twice with e3W

Attari - Wagah border which is about 30 km one-way from Amritsar city-center, is a popular tourist destination in Amritsar. In FGDs, it was mentioned by the drivers that they will not be able to go to Attari-Wagah border twice if they switch to an e3W. They fear that the limited range of the vehicle

will prevent them from taking any multiple trips to Attari-Wagah border on a single charge/fully charged battery.

Observed Evidence - Multiple trips to Attari-Wagah on the same day are unlikely

Our semi-structured field interviews reveal a crucial point: drivers rarely make two trips to the Attari-Wagah border in a single day. This is because the main attraction, the armed forces' procession at the international border, occurs for just an hour every evening. Thus, 3W trips primarily involve transporting tourists from the city center to the border, waiting for the procession, and returning with the tourists. The need for a driver to make two trips to the Attari-Wagah border on the same day is exceedingly unlikely.

Underlying Bias - Drivers overestimate small chances of e3Ws running out of charge

Drivers overestimate the chances of undertaking inter-city trips or multiple long trips on the same day like the ones to Attari-Wagah border. By overestimating the chances of these trips in regular operations, the d3W drivers overestimate the chances of e3W running out charge.

3.3 Charging infrastructure

Nearly two-thirds of the survey respondents stated lack of charging infrastructure as a huge concern influencing their decision to switch to e3Ws. Currently, there are no e3W charging stations established in Amritsar. However, a process is in place by ASCL for installing e3W charging stations at 18 locations in Amritsar (Tribune 2023b).

3.3.1 Lack of public charging infrastructure

Stated Barrier – Drivers need a public charging station coverage similar to petrol pumps

The need for charging stations was resonated by d3W drivers as well as e3W drivers. During our FGD with d3W drivers, several stated that drivers would be more inclined to transition if public charging stations (PCS) are widely installed.

E3W drivers too during their interviews also stated that coverage of charging stations needs to be similar to petrol pumps. Some e3W drivers who stated to have charged at local stores pointed out that these stores don’t always allow e3Ws to charge as shop owners are concerned about high electricity costs.

Qualitative excerpt 4 Drivers emphasise the need for PCS

D3W driver: "Charging point har route mein lagane chahiye…Sabse pehle iska charging point lagna chaiye har jagah raste me jaha 2-3 banda charge kar le." (Charging points should be placed on every route…First and foremost, charging points must be set up on every route, where 2-3 people can charge).

E3W drvier: "*Dukaandar charge karne hi nahin dete. Ek baar mujhe apne 3W charging se nikaalna pada kyunki bohot bijli le raha tha. Woh charging metre dekh raha tha"* (Shop owners don't want to allow me to charge. Once, I was asked to remove my 3W because of how much electricity was being consumed. He was observing the charging meter).

It is worthwhile to note that both existing e3W drivers (from FGDs) and d3W drivers (from survey and FGDs), indicated the need for PCS. In the survey, the 413 drivers stated that on an average they need charging stations every 10 km. The responses varied significantly from 0.5 km to 70 km with standard deviation of 10 km, highlighting the lack of understanding on PCS coverage requirement among 3W drivers.

Observed Evidence - Charging station requirement is overestimated by drivers

E3W drivers indicated in the FGD that they charge the vehicle at home during night and don't need to charge again during the day. Figure 8 shows that daily requirement of 73 per cent of drivers can be met on single full charge. If we remove the drivers who live in rented accommodations from this, that still leaves 63 per cent of drivers, who can meet their daily requirements with just home charging. However, PCS is necessary to meet operational requirements of 37 per cent drivers.

Underlying Bias – Anchoring effect

In the case of evaluating the need for charging infrastructure, drivers in Amritsar use the existing diesel/petrol station coverage as an anchor, instead of evaluating e3W's actual requirement (Tversky and Kahneman 1974).

3.3.2 Lack of reliable and safe access to private home charger

Stated Barrier – Drivers don't have appropriate earthing at homes

In FGDs, drivers highlighted inability to install earthing in their rented residential units due to financial concerns or reluctance from house owners. E3W drivers pointed out that in the absence of earthing, claiming warranty on the battery would not be possible and expenses would not be covered by the company.

Qualitative excerpt 5 Drivers highlight lack of earthing as barrier against home charging

> *"Woh kaam (earthing) pehle hi karwaana chahiye… Agar battery ka problem ho jaata hain toh hum company ko kehte hain ki iski battery ka problem hain…company waale humare ghar mein inquiry bhej denge ki jaake dekho ghar mein earth laga hua hain. Agar aapne laga hain toh humaare guarantee hain, agar humne earth nahin lagaya hain toh humaari guarantee nahin maani jaati"* (Earthing should be done in the beginning itself…if there is a problem with the battery and we tell the company that there is a problem with the battery…the company will send an inquiry to our homes to check if we have earthing in place. If it is there then your warranty is valid, if earthing is not done, then our warranty won't be considered.)

Observed evidence - Only 16 per cent live in rented accommodations

Only 16 per cent of respondents live in rented accommodations. Nevertheless, PCS is necessary for operational requirements of two groups; those who live in rented houses, and those who drive more than e3W range on full charge (~130 km). Excluding these two groups, it is estimated that energy demand of 82 percent of mileage requirement of Amritsar's 3W fleet can be met by home charging.

'H' (Percentage of mileage that can be met through home charging) = $\left(1 - \frac{b+c}{a}\right) \times 100$

'a' = Total mileage requirement of the 3W fleet (54037 km, N=533)

'b' = Mileage requirement of those living in rented accommodation (6072 km, N= 64)

'c' = Mileage requirement of those travelling more than e3W range of ~130 km (3659 km, N=131)

3.4 Performance and safety

During the FGDs, d3W drivers emphasized the significance of a vehicle's physical appearance and features in their purchasing decisions. When discussing e3Ws, they consistently compared them to d3Ws, revealing several concerns related to the physical attributes, exterior looks, and performance of e3Ws, which are further elaborated below.

3.4.1 Safety

Stated Barrier – Drivers think e3Ws are small and not sturdy

More than half of drivers in the survey indicated safety as a huge concern. In FGDs d3W drivers pointed out that the e3W has a fiber body, making them more susceptible to damage in case of a collision. An e3W driver also recounted an instance where a car hit a parked e3W and broke its bumper.

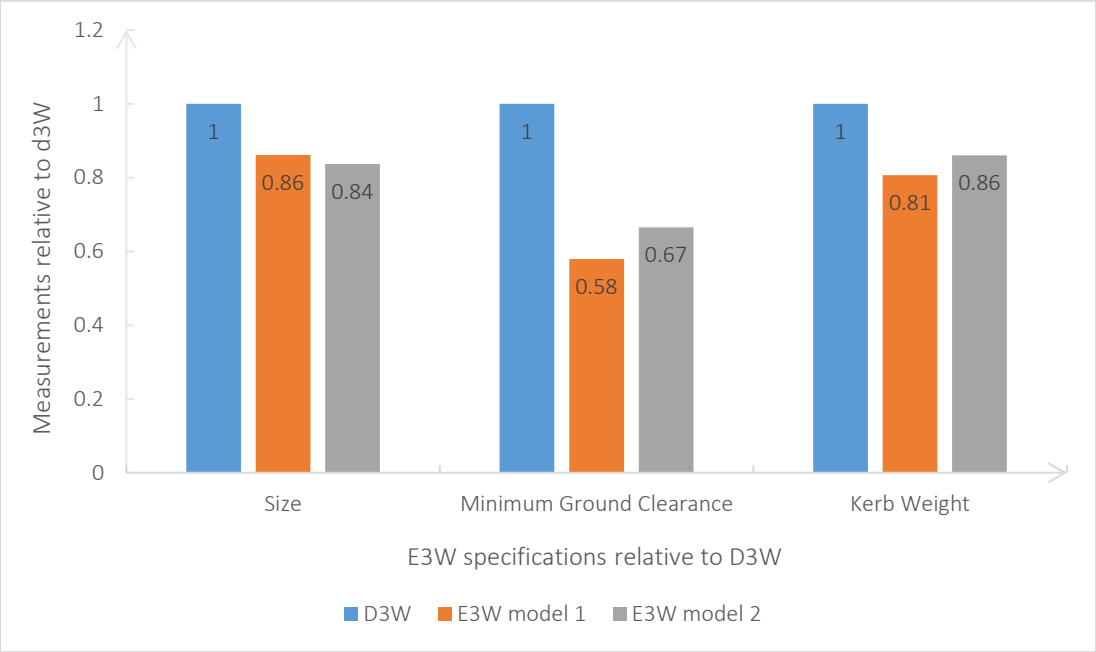
Qualitative excerpt 6 Drivers feel that e3W is not sturdy

> *"Iska (e3W) body fibre ka banta hain, majboot nahin hain. Yeh (d3W) lohe ka banta hain, body pura lohe ka hain, majboot hain"* (The body of e3Ws is made of fibre, it is not strong. D3Ws are made of iron, the entire body is of iron, it is strong).

Observed evidence -3Ws appear smaller in size but comply with the same standards

Comparing the vehicle specifications of e3W models with existing d3W models in Amritsar(Piaggio n.d.; 'Piaggio' 2023; Mahindra n.d.), we find that that e3Ws are indeed smaller in terms of size, minimum ground clearance and kerb weight (
Figure 12). Size is assumed as a product of 'width', 'length' and 'height' as provided in the vehicle specs. However, e3W must meet the same safety standards of any L5M vehicle classification as per ARAI (Ministry of Road, Transports & Highways 2019). To the best of our knowledge, there is no evidence suggesting a higher risk of damage from accidents involving e3Ws.

Figure 12 E3W models are at least ~14 per cent lower in size, ground clearance and kerb weight compared to d3W



Source: Authors' analysis

Even though e3W comply with the same standards and have a similar carrying capacity, the difference from d3Ws negatively influences preferences for them. We list three underlying biases attributable to this.

Underlying Bias 1 - Priming by e-rickshaws

There are almost three thousand e-rickshaws registered till today in Amritsar (Ministry of Road Transport and Highways 2023). E-rickshaws are low speed electric passenger vehicles (LSEV), mostly operating on lead acid batteries (R. S. Kumar et al. 2022). There are many concerns around e-rickshaws w.r.t performance, safety, durability and its effectiveness as a sustainable livelihood opportunity (Singh, Mishra, and Tripathi 2021). CEEW's study in Lucknow has shown that e-rickshaw drivers have lower incomes in comparison with 3W and tempo drivers (Narayan Mall et al. 2023).

Only 13 per cent drivers state that e-rickshaws have had no impact on their perception of e3Ws. About 19 per cent drivers feel that safety is a huge concern with e3Ws. 55 per cent of these drivers are also the ones who stated that their understanding of e3Ws is highly influenced by an e-rickshaw.

FGDs show e3W drivers as well as d3W drivers in Amritsar are not in favour of e-rickshaws. Both groups recognized the two as different vehicles. However, e3W drivers more clearly stated performance differences as opposed to d3W drivers.

Qualitative excerpt 7 Drivers are aware of subpar performance of e-rickshaws

> D3W drivers when asked about e-rickshaw stated, “E-rickshaw koi company ke nahin hote. Woh bohot Dheere chalte hain, chotte hain, aur registered nahin hain.” (E-rickshaws are not of any company. They are slow, small, and are not registered.)

Underlying Bias 2 - Ego

Twenty-seven per cent of d3W drivers stated that they would not be proud to show their e3W to other members in their stand. Due to priming by e-rickshaws drivers perceive switching from diesel to e3W a downgrade in power. The difference in size (see Figure 12; Figure 13) and variation in material further compounds this bias.

Figure 13 Diesel and e3Ws parked at the Amritsar Railway Station – 28 February 2023

Source: CEEW team

Underlying Bias 3 – Anchoring effect

Anchoring effect is relevant in the case of perceived barrier of e3W performance and safety as well. We observe that while evaluating purchase decision of an e3W, drivers compare the size of e3W with size of d3W as well as the material of d3W with that of e3W.

3.4.2 Carrying capacity

Stated Barrier - E3Ws can’t carry same number of passengers

In addition to the structural material of e3Ws, d3W drivers also voiced concerns over the cargo/carrying capacity/size of e3Ws. In FGDs, drivers emphasize e3W’s inability to carry same number of passengers as d3W in a single trip. Concerns about the size of an e3W and the reduction in passengers, particularly school students were reiterated many times throughout the FGDs. Drivers fear that lower carrying capacity of e3W will lead to revenue loss.

Observed Evidence - Only 16 per cent drivers undertake school trips

Our survey shows that 16 per cent of drivers in Amritsar undertake such school trips. However, E3Ws also have the same number of permitted passenger capacity (3+1 passengers) as any L5M 3W, regardless of technology.

Underlying Bias – Discrete mental accounting

As shown in the context of evaluating e3W EMI, drivers evaluate multiple expenses and earnings is discrete bundles. The FGDs showed that even within revenue, there were different mental accounts like 'revenue from school trips' and 'revenue from tourist trips'. One participant highlighted that on switching to e3Ws, he is certain to lose the revenue from school trips and is also aware that his diesel expenses will come down, but is unable to determine if switching to e3W will be profitable for him. As 'revenue from school trips' and 'diesel costs' are non-fungible mental accounts, drivers are not able to evaluate net benefit from switching to e3W.

3.5 Other Behavioural Biases

3.5.1 Incentive Bias

We delve into the possibility of unintended consequences arising from the incentives offered to d3W drivers in Amritsar to switch to e3Ws. Initially, the subsidy amount for e3Ws under the RAAHI project was set at INR 75,000 per vehicle (excluding the scrapping incentive). However, due to a lackluster response and feedback from driver unions, the local government decided to increase the subsidy to INR 1.25 Lakh (excluding the scrapping incentive) in January 2023.

Our survey reveals a crucial insight: **nearly two-thirds of drivers expressed that they would not make the switch to e3Ws without these incentives**. This reliance on incentives raises a potential concern. If the government discontinues these incentives either due to the completion of the project timeline or the depletion of funds allocated for subsidizing e3Ws, there is a risk that the transition to e3Ws may come to an abrupt halt, driven by this incentive bias.

However, we also shed light on a mitigating factor. Amongst those drivers who believe that their local leaders or Pradhans would strongly support their transition to e3Ws, the impact of the incentive bias is considerably softened (see section 3.5.2).

3.5.2 Messenger

Government as the sole messenger may not be effective

Evidence from FGDs show mistrust on government messaging regarding e3W benefits. Participants have mentioned that 3Ws are often thought of as a nuisance and this is being communicated by the government. In Amritsar, 3Ws have often been singled out as culprits for city congestion and pollution, as reported (Indian Express 2022). However, it's worth noting that there is no concrete evidence to substantiate these claims. Furthermore, there have been reports in the media suggesting the banning or seizure of old d3Ws in Amritsar (Bagga 2023). These negative narratives and the heavy-handed measures taken in the city may have undermined the government's effectiveness as a messenger when trying to convey the benefits of e3Ws.

Qualitative excerpt 8 Drivers are unhappy about not being involved in policy formulation

D3W drivers in FGDs said, *"Kisi ne humse nahin poocha, government khud scheme banate hain, 3W drivers ke saath baat tak nahin karte. Woh apne marzi se stand chunte hain, 3W driver ko kya chahiye samajhte nahin"* (There was no consultation with the 3W drivers, the government makes schemes without discussing with 3W drivers. They decide stands, station without understanding the needs of the 3W drivers.).

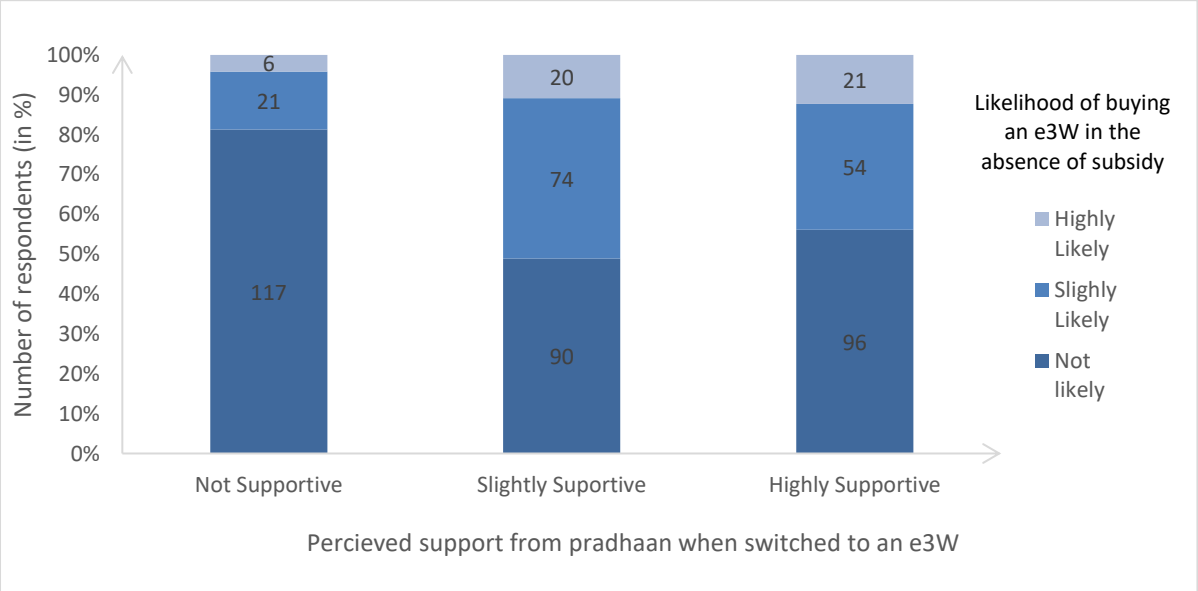
Qualitative evidence hints that Government as a sole messenger for communicating benefits of e3Ws may not be effective.

Pradhans have a strong influence on e3W purchase decision of d3W drivers

Pradhans are informal leaders of 3W stands. In Amritsar, there are 27 stands, each having 30 to 120 3Ws. Each stand has one Pradhan. Almost half of 3W drivers state that they would be highly likely to transition to e3Ws if their *Pradhan* had an e3W. Only 7 *Pradhans* out of 27 have switched to e3Ws. In FGDs, several said that the Pradhan is the most important and they consult him before any crucial decisions, such as purchasing a new vehicle.

We find that 21 per cent of drivers who stated that their *Pradhan* will be highly supportive are highly likely to buy an e3W in the absence of subsidy. This is in contrast to those who stated that their Pradhan will not be supportive, of which only 6 per cent are highly likely to purchase an e3W in the absence of subsidy.

Figure 14 Drivers stating that their Pradhan will be highly supportive are more likely to buy an e3W in the absence of subsidy



Source: Authors' Analysis

Existing e3W drivers themselves can be effective messengers

E3W drivers often share that they are frequently approached by d3W drivers seeking insights into their experience with e3Ws. Our findings indicate that a sense of pride in owning an e3W can be influenced significantly through peer-to-peer communication. According to the survey, nearly half of the d3W drivers receive information about e3Ws from their peers, and an impressive 80 percent of

them express a sense of pride in showcasing their e3Ws. In contrast, only one-fourth of those who gather information through mere observation of an e3W share the same feeling. We validated this result with a chi-square test, which confirmed a strong and statistically significant relationship ($p < 0.001$).

Qualitative excerpt 9 E3W drivers are frequently approached by d3W drivers

> In an interview, one of the *Pradhans* who drives an e3W stated, "puchte hain, bohot puchte hain, kaisi hain gaadi, kaisi chalti hain, koi mushkil toh nahin hain" (People ask, people ask me a lot about how my vehicle is, how it runs, if I'm facing any difficulty).

ASCL organised *3W Mela* (*e3W Fair*) to increase awareness and uptake of e3Ws in May 2023. At the *mela*, a '*peer-to-peer interaction booth'* was set up, where diesel drivers could interact with e3W drivers on how their lives had improved after switching to e3Ws. The stall had one of the highest footfalls in the *3W Mela*. This again indicates the comfort and trust 3W drivers have in discussing issues and e3W purchase decisions with their peers who have already switched.

Figure 15 E3W drivers (R) discuss the benefits of e3Ws with d3W drivers (L) at the RAAHI 3W Mela.

***Peer to peer interaction booth**, where d3W drivers can discuss their e3W related concerns with e3W drivers themselves had one of the highest footfalls amongst all stalls in RAAHI Mela organised by ASCL, on 19th May 2023.*
Source: CEEW team

3.5.3 Social Norms

Peers switching to e3Ws has a strong influence on individual preference for e3Ws

The survey shows that 42 per cent of diesel drivers feel that their peers are switching to e3Ws. 17 per cent state that they will switch if their peers also switch. We find a statistically significant and high correlation (0.7833) between drivers' stated impact of their peers switching to e3Ws on their behaviour and their likelihood of buying an e3W in the next one year.

Figure 16 Amritsar - E3W drivers who participated in the rally organised by ASCL on 18th May 2023

Source: CEEW team

Older drivers are more influenced by the peers to switch to e3Ws than younger drivers

D3W drivers can be classified into three groups: those highly likely (17 per cent), slightly likely (40 per cent) and not likely (43 per cent) to switch if their peers purchase an e3W. To test whether the age of the respondent influences these levels of likelihood of purchasing an e3W, we performed an ANOVA. The results indicated there is a strong statistically significant differences ($p<0.001$) in age of the respondents across the three groups. Welch test and Brown-Forsythe test confirmed the existence of significant difference between the groups to validate the findings of ANOVA.

Drivers feel that they will face resistance from their peers if they switch to e3Ws

45 per cent of drivers strongly feel that they will face resistance from their peers if they switch to e3Ws. The emotional resistance to switching to e3Ws is further discussed in the section 3.5.6.

3.5.4 Salience

We investigate the focal points of attention among d3W drivers when they consider switching to e3Ws and examine how this attention evolves once they gain firsthand experience with e3Ws.

Negative outcomes from switching to e3Ws are more salient amongst d3W drivers

The FGDs show that diesel drivers think of potential losses more than benefits when thinking about switching to e3Ws. This includes; loss of revenue from being able to do fewer km and/or carry fewer passengers with an e3W, future battery costs etc.

Positive outcomes from using e3Ws are more salient amongst e3W drivers

Similar to diesel drivers, we find that e3W drivers too are concerned about battery life but emphasise a lot more on the positive outcomes from adopting e3Ws. In FGDs and qualitative interviews, e3W drivers emphasise on attributes of e3Ws like low costs and ease of use due to no noise and vibrations.

Qualitative excerpt 10 Positives of e3W are salient for e3W drivers

> When we asked e3W drivers what they thought about e3Ws during the FGD, one of the first 3W drivers to transition to e3Ws said, *"Sabse badiya cheez yeh hain, ki e3W bohot shaant hain, tourist ko bohot pasand hain. Aur yeh diesel se kaafi sasta hain. Diesel mehenga hain. Electric se humein sukoon milta hain. Main pehla 3W driver tha jisne e3W khareeda"* (The best thing about e3Ws is that it is silent, tourists love it. It is also cheaper, diesel is expensive. Electric gives us peace of mind. I was the first to buy an e3W, I've been driving 3Ws for 10 years).

Our findings confirm that nature of decision by d3W drivers to switch to e3Ws focuses their attention on aspects of outcome like revenue loss and battery replacement, which will not be salient once they switch, as is observed in e3W drivers, who focus more on the positive aspects of outcome.

3.5.5 Status Quo Bias

A common statement in our interactions with d3W drivers indicative of sunk cost fallacy discussed is also indicative of status quo bias, *"Jab tak chal raha hain, chalne do"* (For as long as it can run, let it run). Presence of sunk cost fallacy, loss aversion and social norms discussed in this report are factors adding to the status quo bias of using diesel autos. Status quo bias is reinforced by loss aversion, transition costs, sunk costs etc. (Godefroid et al. 2022) as well as social norms (Zhang et al. 2016).

3.5.6 Affect

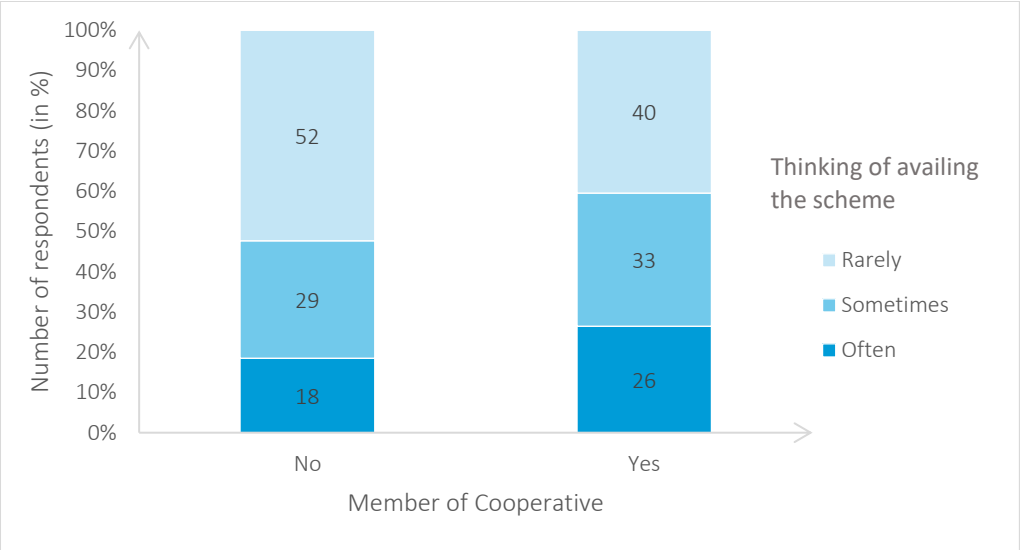
Coercing d3W drivers to switch may not be productive

As highlighted in section 3.5.2, 3W drivers feel that they are thought of as a nuisance and this is being communicated by the government. There were also protests observed by d3W drivers against e3W adoption at multiple instances (Tribune 2023a). This shows that despite the fact that e3Ws improve the livelihood of drivers, there are driver communities/individuals strongly opposing the transition. This may be attributed as an emotional response or *affect*.

3.5.7 Commitment

In the case of e3W adoption in Amritsar there are some interventions that the local government undertook which may be relevant here. A cooperative society of Amritsar's 3W drivers was formed as a part of the RAAHI project. Being a member of this cooperative, is the first step to availing e3W through the government scheme. Here we observe that despite over 500 3W drivers joining the cooperative, only 30 had procured an e3W as of February 2023. However, survey showed that members of cooperative are more likely to avail the RAAHI scheme. 56 per cent of drivers in the survey stated that they are members of the cooperative society. About 26 per cent who stated to be cooperative members are thinking of availing the subsidy scheme in contrast to 18 per cent of non-members who are thinking of availing the scheme. Hence, as shown in Figure 17, cooperative members may be more likely to avail the scheme than non-members of the cooperative society.

Figure 17 Members of 3W drivers cooperative society think of availing the scheme more than non-members



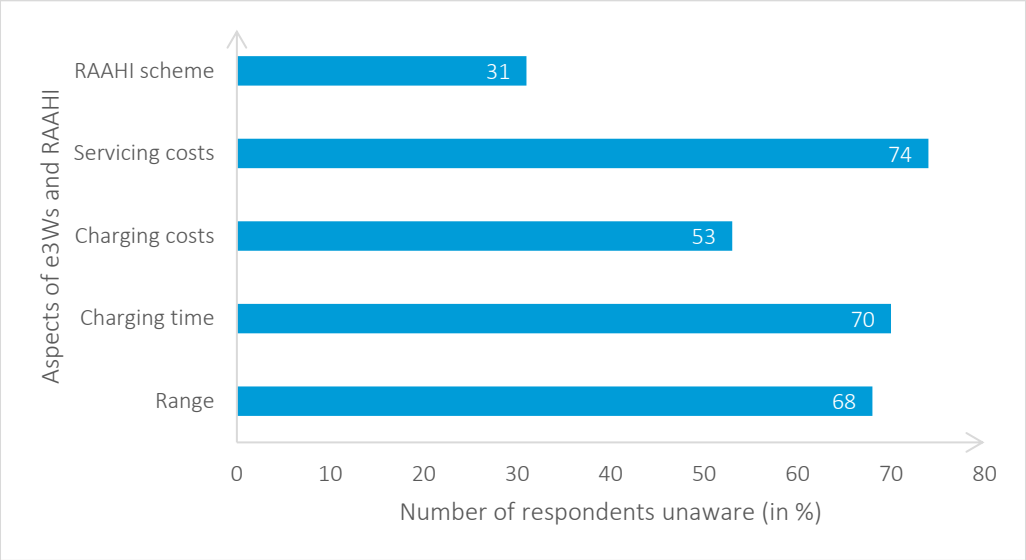
Source: Authors' analysis

Later in July 2023, the ASCL conducted a registration drive, giving stickers to the d3W drivers and sought commitment to switch to e3Ws by September 2023 (Rana 2023). The commitments were not collected in any documented format. Over 3000 drivers were registered and got the RAAHI stickers. The RAAHI stickers assured the illegally plying d3Ws in Amritsar against traffic enforcement till September and a chance for those to switch to e3Ws. This may be a combination of coercion and commitment. Just about 50 e3W applications came in August 2023 from the 3000 drivers who registered in July. Hence, apart from the effect of cooperative membership, we don't have clear evidence on the presence of commitment bias or understanding of the how effective commitment related methods will be to nudge d3W drivers in Amritsar to switch.

3.6 General lack of awareness about e3Ws

We find that there is a general lack of awareness about e3W features, performance and the subsidy scheme. We summarise the findings Figure 18.

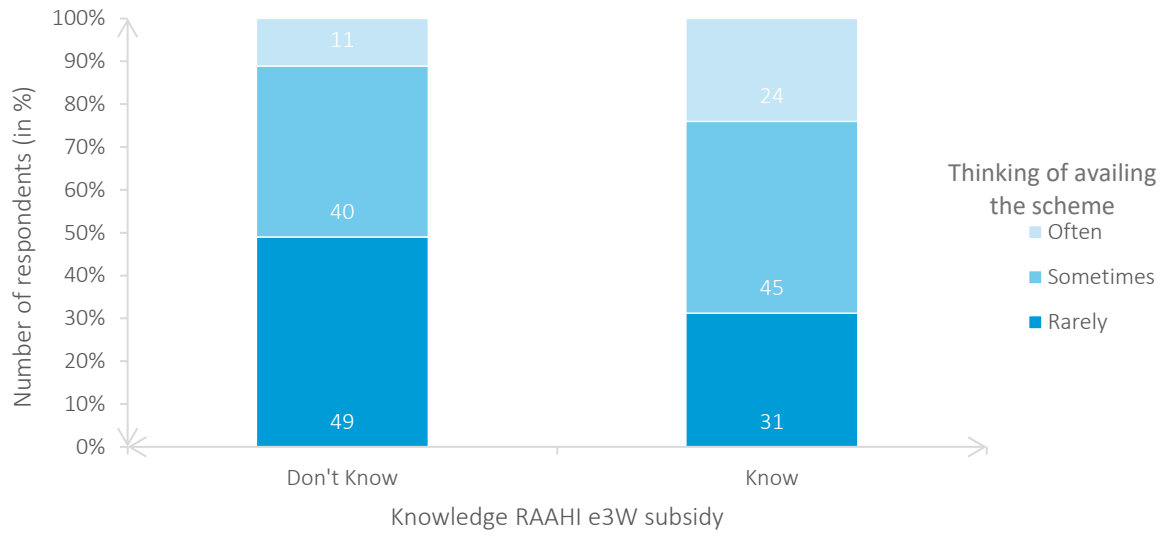
Figure 18 Majority of d3W drivers are unaware about RAAHI scheme, e3W costs, features and performance



Source: Authors' analysis

Drivers who know about the subsidy amount are thinking more about availing the scheme. 24 per cent of 3W drivers who are aware about the subsidy think often of availing the scheme in contrast to just 11 per cent of those who don't know about the subsidy (Figure 19).

Figure 19 D3W drivers aware of subsidy scheme think more about availing the scheme



3.7 Factors driving e3W preferences

We used an ordinal regression model to measure the impact of economic consequences on the purchase decision of an e3W. 'Likelihood to purchase an e3W next year' was taken as the dependent variable, it was measured at three-point ordinal scale: *Not likely, Slightly likely, Highly likely*. The findings help us to understand the role of different factors in the individual's purchase decision

Following independent variables were taken into account for building the regression model: 'economic benefit', 'charging as a barrier' and 'user-driven experience' on the willingness to switch to e3W.

Table 2 Estimated parameters influencing e3W preferences

	Independent Variables	Coefficients
Socio-Demographics	Resident Ownership (1: Owner; 0: Rented accommodation)	0.383
	Age of the respondent	0.048
	Income	-0.077
Vehicle	Age of the d3W	0.089
	Ownership of the D3w (1: Own; 0: Rented)	0.522*
Work Pattern	School trips (1: Yes; 0: No)	-0.093
	Goods trips (1: Yes; 0: No)	0.622**
	Outstation trips	0.019
	Distance travelled	0.006
	Idle time	0.056
Expenditure	Expenditure on Fuel	-0.230*
	Expenditure on Service	0.348
Economic Benefits	Stated change in Income after switching to e3W	0.608***
	Benefit of switching to e3W (e3W_benef; 1: Not beneficial, 2: Somewhat beneficial, 3: Highly beneficial)	
	Base category: e3W_benef 1	
	e3W_benef_2	1.656***
	e3W_benef_3	1.830***
Charging & Range of an e3w	Difficulty in charging an e3w (e3W_charge; 1: Not difficult, 2: Slightly difficult, 3: Very difficult)	
	Base category: e3W_charge_ 1	
	e3W_charge_2	0.657**
	e3W_charge_3	1.402***
	Concern for battery life in E3w (e3W_blife; 1: No concern, 2: Slight Concern, 3: Huge concern)	
	Base category: e3W_blife_concern_1	
	e3W_blife_concern_2	-0.712*
	e3W_blife_concern_3	-0.459
	Ability to have same trip frequency with e3W (1: Yes; 0: No)	-0.254
Others	Driven an e3W (1: Yes; 0: No)	1.170***
p<0.001***, p<0.05**,p<0.10*		
Pseudo R-squared value: 0.19		

Table 2 presents the results of ordinal regression; the economic factors such as improvement in the daily earnings and their perceived benefit from e3W were found to be statistically significant and have more influence on the respondents' willingness to purchase compared to other variables.

As expected, there is a negative statistically significant relationship between concerns for battery life and purchase intention. This validates the presence of loss aversion around uncertain future battery replacement expenses, impeding e3W adoption, discussed in section 3.1.3.

Interestingly, a positive statistically significant relationship between respondent's perception about charging difficulty and their purchase intention. That is, despite of perceiving charging to be difficult, drivers are willing to purchase an e3W.

While looking at other factors that model controls for; there is a positive statistically significant association between ownership of a d3W and purchase intention, respondents who have their own d3W are more likely to purchase than the drivers driving on rent. This could be attributed to rental drivers not being eligible for subsidy under RAAHI as discussed in section 3.1.1.

Interestingly, respondents undertaking goods trips were found to display more likelihood of purchasing an e3W. This is contradictory to the findings of limited carrying capacity as a stated barrier discussed in section 3.4.2. 3W drivers who do goods trips also on average cover 12 per cent more daily distance than others. Average vehicle age within these groups (nine years) may be a reason for their higher likelihood of e3W purchase.

Fuel expenses were found to have a negative statistically significant relationship with the purchase intention, possible reason for this could be that respondents with higher fuel expense also do higher kilometres and may have higher range anxiety as discussed in section 3.2 and hence are less likely to switch to e3W.

Lastly, respondents who have driven an e3W had a strong and positive statistically significant relationship with the purchase intention indicating the importance of a user driving experience. This validates the findings presented in section 3.2.1 where we show that those who have driven e3W have better understanding e3W operational abilities. We have discussed this effect observed elsewhere also in section 4 and recommended interventions focussed on e3W driving experience to d3W drivers in section 5.

Overall, the regression results show that understanding of economic benefits, e3W driving experience and mitigating of concerns around battery life can significantly improve e3W preferences amongst d3W drivers.

4. Discussion

Charging infrastructure, range anxiety and battery life

Limited public charging infrastructure is a major barrier impeding switch to e3W by d3W drivers in Amritsar. The need for charging infrastructure may be overestimated by the 3W drivers, but that does not discount lack of charging infrastructure as a real barrier. We show that public charging infrastructure is essential for 3W drivers who live in rented houses or drive more than ~130 km daily. Establishing PCS for e3W is a necessary step for ASCL to accelerate e3W uptake. Ensuring that these are visible and accessible will have positive implications on reducing range anxiety.

CEEW recommended four major locations for e3W PCS based on feedback from 133 3W drivers who interacted at camps set up by ASCL. ASCL has initiated process for installing e3W PCS in 18 locations including those recommended by CEEW (Tribune 2023b).

Similarly, e3W battery life is a concern for both diesel and electric 3W drivers. We show how drivers conflate battery warranty with actual battery life. As there are no e3Ws older than 3 years, there is no clear evidence to show that battery life of an e3W is more than 3 years. This barrier must be addressed by OEMs by mitigating uncertainty surrounding battery life.

Financial barriers

Unlike charging infrastructure, policy action is already in place to address the costs of transitioning to e3W. Behavioural biases of discrete mental accounting and sunk cost fallacy are reducing the effectiveness of existing incentives under RAAHI to change behaviour. Hence, it is imperative to focus on mitigating underlying biases behind these stated financial barriers.

Performance and safety

We did not find any clear evidence on increased accident risk or deviation in permitted passenger load in a e3W vis-à-vis a d3W. These stated barriers are clearly driven by biases of anchoring effect, ego and priming by e-rickshaws. Pride associated with car ownership around the world is well explored in literature (Moody 2019). In the context of 3W, its accessories are a medium for the driver to impress a consistent and positive self-image. The seats, music system, paintings/stickers etc. in the 3W help the driver project a positive image. However, e3W's difference in size, material, kerb weight etc. in comparison to existing d3W may have negative influence on its purchase.

We observe a case where the one of dealers, attempted to reduce the difference in size between e3Ws and the current d3Ws in Amritsar to enhance the sales. The dealer stated that they added an extra external *'metal armour'* to the vehicles. The dealer also changed the tire size and made slight modifications to make the e3W appear "bigger". The impact of these modifications may have negatively impacted the e3W efficiency. However, the dealer stated that these modifications significantly increased the sale of e3Ws as it resonated with the identities of d3W drivers.

Biases as barriers and enablers

Some behavioural biases are to be mitigated and some biases are to be leveraged. For example, discrete mental accounting by drivers impedes drivers from comparing diesel savings with e-auto EMI. This must be mitigated. In contrast, biases like messenger and norms can potentially act as enablers for mitigating the barriers. For example, we show that using *Pradhans* and e3W drivers as messengers of e3W benefits can positively influence likelihood of e3W adoption.

Hence, policy approach for nudging e3W adoption in Amritsar should be two pronged. One, remove barriers like charging infrastructure and range anxiety through policy action informed through behavioural insights. Two, mitigate behavioural biases behind the stated financial, performance and safety barriers while leveraging other behavioural biases like norms and messenger to mitigate the same barriers.

Influence of e3W driving experience

D3W drivers underestimate the e3W range and performance; and overestimate the probability of the trips where e3W may technically fail (like outstation trips). We observe that the positives of e3W like no noise and vibrations, substantially low operational costs, superior performance in comparison to e-rickshaws are salient for the e3W drivers. Amongst the d3W drivers, we find that those who have driven e3W have a better sense of range and ability of e3W to meet their needs. Hence, a direct user experience for can easily improve the understanding of e3Ws. These are basically test drives but for longer periods. There is also evidence in literature on positive effects of EV driving experience on their preferences (Brückmann 2022; Bühler et al. 2014).

Generalizability of findings

We use purposive and convenience sampling to get a representative sample of d3Ws in Amritsar. Although internal validity is established, external validity of these findings is not universal. Some insights like that on the influence of *pradhans* on e3W purchase decisions may not be valid for all cities. However, that still doesn't mean that the findings from this paper are not valid for any other Indian cities' 3W fleet. We compare the case of d3W drivers in Amritsar with that of Kochi in Kerala. Many factors like average distance travelled, daily revenue earned, diesel expenses, age distribution of d3Ws, type of diesel vehicle models, ownership patterns etc. are similar (Table 3).

Table 3 Case of 3W drivers in Amritsar is similar to Kochi

	Amritsar	Kochi
Daily Utilisation (kms)	103 km	100 km
Daily Revenue earned	INR 853	INR 950
Daily Diesel expenses	INR 295*	INR 229*
Average vehicle age	8.9 years	4 years
Ownership	84% drivers are owners	84% drivers are owners

*Normalised with diesel price in Delhi, as on 31st March 2022 (PPAC 2022)

5. Recommendations

This report emphasises the need to look beyond techno-economics in accelerating e3W adoption. While favourable techno-economics is a necessary condition, there are behavioural biases that may render conventional policy instruments. We also make a case for greater engagement of stakeholders and community members in policy formulation and implementation processes through CBPR. The primary recommended actions have been listed with insights into the solutions trailed by CEEW in Amritsar. The a detailed list of all recommendations are classified as communication/marketing, service provision, environmental restructuring, incentivization and regulation using the BCW framework (Michie, van Stralen, and West 2011). These recommendations are also marked as actions for dealers, OEMs, ASCL and electricity distribution companies (DISCOM) Amritsar (Table 5).

Improve understanding of economic rationale through communication

- Strategic behaviour change communication can enable d3W drivers to effectively evaluate the economic rationale. Discrete mental accounting as a behavioural bias can be addressed

by equating diesel savings with e-auto EMI. For example, communications can be centered on how diesel savings can be used to pay the e3W EMI. CEEW team is trialing the same in Amritsar with the message “Saved money on diesel, and used it to pay e3W EMI” in the local language, Punjabi (**Error! Reference source not found.**). Similarly, communicating economic loss in maintaining status quo can address sunk cost fallacy of making the most out of existing d3Ws.

Improve understanding e-auto performance with Direct user experience

- Our evidence clearly indicates that e3W driving experience improves the understanding of e3W performance like range. Such hands-on exposure to e3W can address the priming effect of e-rickshaws as well as anchoring effect of d3Ws and help the drivers realise that existing e3Ws can meet their daily trip requirements. CEEW is trialing this intervention by piloting 10 e3Ws to provision 3-day driving experience each with 300 d3W drivers in Amritsar.

Figure 20 10 e3W deployed for direct user experience pilot with 300 d3W drivers in Amritsar

Source: CEEW team

Build and publicise public charging infrastructure

- Building affordable, accessible and visible public charging infrastructure will have significant positive impact on e3W uptake by addressing range anxiety of drivers with inadequate home charging and those with high daily utilisation. Publicising charging infrastructure development as well as their locations through public maps can further build confidence amongst drivers that their charging requirements can be met easily.

Harness informal networks to improve pride associated with e3W

- Informal networks can be harnessed by using *Pradhans* and existing e3W drivers as messengers of e3W experience and associated benefits. Communications focused on building pride associated with e3W can address ego bias due to smaller size of e3Ws. CEEW

is trialing a campaign titled “Sadkaan da Sartaaj” meaning ‘Kings of the Road’ centered around the Pradhans who have already shifted to e3Ws (Figure 21).

Figure 21 Behaviour change communication hoarding trialed to nudge e3W adoption in Amritsar

Source: CEEW team

Conduct trials to develop cost-effective and scalable solutions

- Most of the evidence on nudging EV adoption in literature are focused on four wheelers and from developed countries. To the best of our knowledge, there is not a single paper we found which looked at behavioural factors affecting preferences for e3Ws. There is a need to conduct proper evaluations via experiments to understand causality of interventions to nudge e3W adoption. This will enable development of cost effective and scalable solutions for e3W adoption. Such trials of nudge interventions, will help introduce and scale cheaper strategies and the EV subsidies may be diverted to segments where favourable techno-economics is not yet achieved.

Table 4 Legend for classification of recommended actions using BCW framework

Communication Marketing	Service Provision	Environmental Restructuring	Incentivisation	Regulation

Table 5 Recommended actions for nudging e3W adoption in Amritsar

Barriers	Recommended Actions	Actors			
		Dealers	OEMs	ASCL	DISCOMS
Financial	Equate e3W EMIs with money saved from diesel costs.				
	Use a relatable metric like costs at per day instead of per km.				
	Communicate economic loss in maintaining the status quo of using d3Ws.				

	Improve information on battery warranty, life and replacement costs.				
Range anxiety	Inform current range and improvements e3W models.				
	Communicate operations of e3W drivers to show actual distances covered by them.				
	Facilitate rental business models of e3Ws.				
	Increase the number of vehicles and period given for test drives.				
Charging infrastructure	Communicate ease of home charging and time saved from it.				
	Improve compliance of earthing requirements in household electricity connections.				
	Publicise charging infrastructure maps				
	Establish visible public charging stations for e3Ws and publicise them.				
Performance and Safety	Communicate difference between e-rickshaws and e3Ws.				
	Improve pride associated with e3W. For example - emphasise on power				
	Regulate unsafe overloading in d3W rickshaws				
Other Behavioural Biases					
Messenger Bias	Use e3W drivers and Pradhans as agents of change. Communicate e3W benefits through them.				
	Give higher referral incentives to existing e3W drivers.				
Social Norms	Communicate e3W adoption numbers				

Source: Authors' analysis

6. Conclusion

In this report, we studied the case of d3W drivers in Amritsar who despite being offered subsidies, incentives and economic opportunity, are reluctant to switch to e3Ws. We show that diesel drivers can earn more money from the very first day of switching to e3W, even after accounting for the e3W loan. We study contextual behavioural factors using the MINDSPACE framework and present the stated barriers, observed evidence and underlying biases impeding switch to e3W by d3W drivers in Amritsar. Using BCW framework, we suggest 5 categories of actions for four types of stakeholders. However, as evidence from behavioural science literature is scarce for both India and e3W adoption, we emphasise a need for proper field trials or evaluations to develop cost effective and scalable solutions.

This report covers the *Target*, *Explore and Solutions* phases of the BIT's TESTS framework. Going forward, CEEW is undertaking the Test and Scale phases where these solutions will be tested

through field trials in Amritsar to develop scalable behaviour change interventions to nudge e3W adoption. Based on insights presented in this report, the impact of driving experience of e3Ws on stated and revealed preferences for e3W will be measured. Additionally, CEEW in collaboration with ASCL is trialing communication interventions focusing on economic benefits of e3Ws and interventions to harness the informal networks through *Pradhans* and e3W drivers as messengers. CEEW is also supporting ASCL for making Amritsar's e3W transition gender inclusive by increasing e3W uptake by women drivers. These results from Amritsar, will serve as a benchmark for planning scalable interventions for accelerating e3W adoption in other Indian cities.

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