

Article

Increasing Electric Vehicle Uptake by Updating Public Policies to Shift Attitudes and Perceptions: Case Study of New Zealand

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Abstract: Actions to reduce greenhouse gas emissions are required from all actors. Adopting plug-in electric vehicles (EV) would reduce light motor vehicle travel emissions, a significant and rising emissions source. To encourage EV uptake, many governments have implemented policies which may be less effective than desired. Using New Zealand as a case study, we surveyed private motorists. The results show that consumers are heterogeneous, with varying car-buying motivations, perceptions, attitudes to EVs and awareness of policies. Uniquely, we segmented motorists into four attitudinal groups to ascertain characteristics potentially affecting EV readiness to provide evidence to improve policies and aid social marketing. Our results show the next-most-ready to buy EVs are early mainstream consumers—designated the EV Positives—who were most concerned about vehicle range, perceptions of EV expense, charging-related inconvenience and the unknown value proposition of batteries, and were relatively unaware of incentives compared to EV Owners. The EV Positives favored incentives designed to effect purchase price reductions and increase nation-wide fast-charger deployment. To increase awareness of EVs and shift perceptions of EV expense and inconvenience, we suggest policies that potentially increase EV adoption rates and suggest reframing the language to appeal to EV Positives through information programs. Increasing EV procurement by organizations could increase opportunities for positive information dissemination via employees.

Keywords: electric vehicle; public policy; consumer behavior; adoption; diffusion of innovation



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1. Introduction

Climate change not only requires consumer acceptance of government policies aiming to reduce transport emissions, but in free market economies, it needs consumer action. Research using various scenarios [1] has indicated that motor vehicle emissions can be reduced, which is achievable in most countries [2], and one action private motorists could take is to buy a plug-in electric vehicle (EV) the next time they buy a car [3]. Research indicates that electric vehicle fleets can be evaluated from a harm reduction perspective, for example reducing particulates [4], but also how acceptance affects consumer demand, for example the relationship between EVs and car sharing [5]. In many countries, early adopters are buying EVs, attracted by incentives [6,7] or because they are willing to pay more [8], but there may be resistance from the next market niche.

One potential aspect affecting the likelihood consumers will buy EVs is motorists' perceptions, dependent on their values, attitudes and knowledge [9]. It has been theorized [10] that environmentally significant behavior is complex in variety and causal factors, suggesting consumer purchase behavior is linked to personal capabilities including: literacy, social status, financial resources and behavior specific knowledge and skills; consumer attitudes; and the importance of contextual forces, such as culture, advertising and public policy when behaviors are expensive or difficult.

The purpose of this research is to investigate consumer characteristics and factors that may affect car purchasing behavior and EV uptake, and using this information to suggest

public policy amendments that could enhance EV sales. Moreover, we have adopted new, more focused research than has previously been undertaken that could provide nuanced detail to aid policy implementation.

Social marketing studies have established that to increase efficiency, marketing efforts should be focused on the group next-most-ready to adopt a behavior [11]. Therefore, as a novel approach, our study aims to determine factors that could influence the market segment next-most-ready to buy an EV, by segmenting the market into groups and examining each group. Our objective is to examine attitudes, values and perceptions, awareness and popularity of incentives for both EV Owners and groups of Internal Combustion Engine Vehicle (ICEV) motorists with differing levels of readiness to buy an EV. We differentiate ICEV motorists into Driver Types depending on their attitudes to EVs: EV Positives, EV Anxious and EV Pessimists, and compare them to EV Owners.

We aim to provide evidence to suggest actions, especially by governments, to encourage demand for EVs from the group next-most-likely to change their behavior. Our premise is led by previous research [12], which suggested it is more effective to focus early EV market attention on niches, for example those with green tendencies, by using appropriate incentives, as focusing on the broader market would be inefficient.

Building on prior work that segmented potential EV buyers by attitudinal and demographic factors [8], we go further and test for characteristics of the principal groupings that could affect willingness to buy, how aware motorists are of government initiatives and which incentives are most popular. Our research also tests that ICEV drivers are not an homogeneous cohort [13].

For this research, we undertook a case study (Section 3.2.1) and we used New Zealand (NZ) because: firstly, a previous attempt there to introduce Compressed Natural Gas vehicles could be characterized as sizzle then fizzle, with failure partly attributable to lack of infrastructure and discontinuation of tax credits, and that market complexity was underestimated [14]; secondly, in 2016 the NZ central government introduced policies (Table 1) to attract motorists to buy EVs; Cui et al. [15] offer a useful comparison. The intervening four years has prompted early adopter uptake, especially of cheaper imported second-hand EVs [16], but critically, will the next niche, i.e., the early majority, buy them? New Zealand's population of 4.8 million has high levels of car ownership, with a fleet of about four million light vehicles [16] and the country produces high levels of renewable electricity (84% in 2018) [17]. Substituting electricity for oil as an energy source could avoid potential failure to reduce transport related greenhouse gas (GHG) emissions. Using NZ as a case study could provide useful lessons for analyzing the efficacy of policies introduced to date (Table 1), including a very popular policy enabling importation of cheaper second-hand EVs, and some potential policy additions. This research enables the provision of unique insights for other countries with different policies, or those with few or no policies, to increase the potential for emissions reductions from private motor vehicle transport.

Table 1. New Zealand government key electric vehicle policies 2016. Sources: [18,19].

#	Key Policies	Programs and Initiatives
1	Information/promotion campaign focused on businesses and households	Portal page EV specific information Available models Information links: assistance for potential EV buyers and sellers EV dealer list and guide Buyer guide Guide to recharging Adoption of standardized signage The Energy Efficiency & Conservation Authority has adopted geo-targeted ads to be displayed within 100 m of EV dealerships Ride and drive events Total cost of ownership calculator Battery recycling facility
2	Encourage business and public procurement	Use bulk purchasing to reduce prices and increase model availability Wellington City Council procurement program
3	Contestable fund	Multiple rounds of project funding
4	EV target	2% of car fleet by end 2021
5	Improve regulatory framework	Support private and public infrastructure rollout Charging standards set Rollout of high-speed rechargers Development of EV Roam—a cloud based mobile app All rechargers are interoperable Wellington City Council trial of smart recharging poles
6	Extend EV road user charge exemption	To end 2021
7	Revise tax rules to ensure equity for EVs	Review of depreciation rate and review of fringe benefit tax
8	Change regulations	Road Controlling Authorities to allow access to bus and HOV lanes
9	Form leadership group	Industry local government and agency representation

The rest of this paper is as follows: Section 2 introduces background material relevant to our research; thereafter, Section 3 explains the conceptual framework and methods, Section 4 provides the results, discussed in Section 5, while the conclusions in Section 6 summarize our findings and recommend policies.

2. Background: Factors Affecting Electric Vehicle (EV) Uptake

Previous research has identified that consumer demand for EVs is affected by six key factors: (1) Government Actions that set policies affect consumer behavior [10,13] for example by changing taxes that apply to EVs; (2) Vehicle Attributes, including purchase price, range and fast charger availability, affect consumer uptake [20,21]; (3) Consumer Attitude and World View can be affected by an individual's values, their family and friends, society and the media [22]; (4) Perceptions and Symbolism of EVs can be affected by many factors, including advertising that targets consumer emotions, needs and desires [23], while cars can have symbolic meaning and confer status [24]; (5) Social Marketing can be used to effect social change [25] and achieve socially desirable goals [26]; and (6) Innovation Adoption processes. The latter indicate that for successful diffusion, an innovation that has acceptable attributes requires adequate information about it being transmitted via relevant communication channels, for example person to person, over time through a social system, and that the innovation is consistent with someone's values, experiences and needs [27]. Furthermore, Diffusion of Innovation Theory [27] categorizes the social system into five niches (Innovators, Early Adopters, Early Mainstream, Late Mainstream and Laggards), to indicate people's willingness and timing for potential adoption of an innovation. This

preparedness includes people's risk appetite regarding acceptance of innovations, with an examination of these niches in turn revealing that in the latter groups, not only is there a tendency for the acceptability of risk to decrease, but there is also lower financial capacity to absorb losses should the innovation be a failure, and furthermore, people tend to be less well-educated with lower social status and less likely to be able to influence others, including smaller social circles for many [27]. Lastly, the Laggards may only adopt an innovation if there are no other available options.

The aforementioned factors indicate that when designing policies to promote EVs, consideration should be given to these criteria: that EVs satisfy economic and convenience/utility measures, crucial for many consumers, and attentiveness to their attitudes, values and perceptions, which are important influences on their purchasing behavior [28–30].

To enact behavior change, a consumer requires capability, opportunity and motivation, underpinned by interventions such as education and incentivization, and enabled by policy settings such as fiscal measures, service provision, regulation and communication/marketing [31]. However, there is no 'best' course of action, and planning interventions require an understanding of the intended target, context and barriers [32].

Recent research on drivers of EV adoption, e.g., [33–35], points to a knowledge gap on whether values, attitudes and perceptions about EVs vary amongst different ICEV motorist segments, and how they differ to EV owners. Enhanced understanding of such factors, with a particular focus on those next-most-likely to buy an EV, could better inform policy instruments that, if adopted, could increase the attraction of EVs to early mainstream consumers, those more willing to adopt EVs, which this paper aims to address.

3. Conceptual Framework and Methods

3.1. Conceptual Framework

We apply systems thinking to increase insights into the connections between research, policy and practice, and to apply knowledge gained from evidence to improve the design and implementation of policies [36]. Previous research [37] suggests the information search period prior to buying a car is the first opportunity for marketers to present information and influence the consumer's decision. However, mindful of previous work [10,13], we contend that consumers are not homogeneous, perceiving car types differently and their perceptions influence the decision process. Such perceptions are developed well before the information search period, and represent a summation of knowledge, values and attitudes people acquire from disparate sources, including advertising, the media, enactment of government policy and other people. Government policies are impacted on by information about an innovation and by evidence of effective strategies used elsewhere, for example, communication programs [36].

Figure 1 illustrates the conceptual framework developed by the authors to underpin this research. We propose that factors affecting motorists' decisions about the energy source of their next vehicle purchase are influenced by multi-faceted socio-technical inertia that includes Diffusion of Innovation Theory (Section 2) [27], government policies, market failures [38], an individual's world view [22] and Information Integration Theory [39], where individuals integrate new information into prior opinions when forming attitudes and making judgements on an issue. Motorists have diverse attitudes towards EVs and are affected by socio-technical inertia factors to different degrees. By studying different segments of motorists based on their attitudes to EVs, we can gain more nuanced insights into considerations that may be useful for updating policies that could accelerate EV uptake and in social marketing exercises.

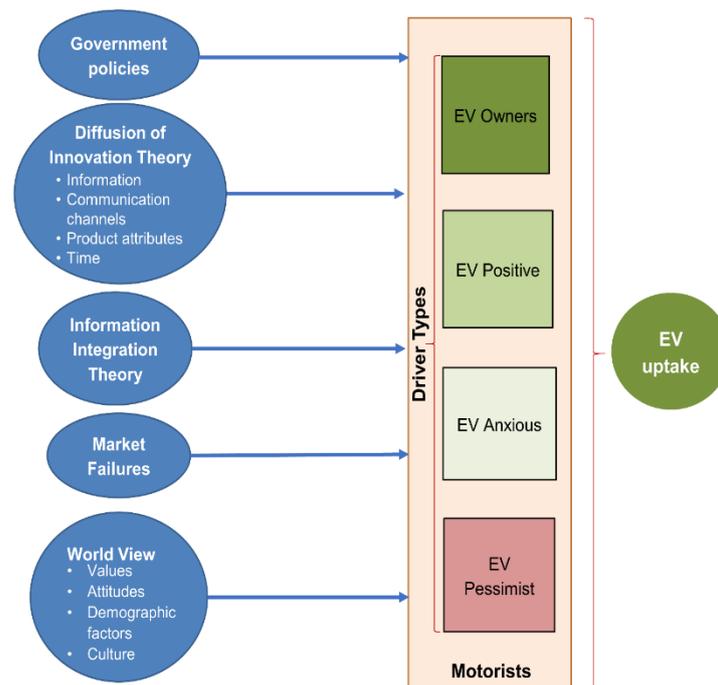


Figure 1. Conceptual framework: the rate at which motorists buy EVs is affected by multiple factors, including consumers’ world views [22], integration of information [39], the processes associated with diffusion of innovation [27] (Section 2) and the influence of government policies and market failures [38]. Motorists were segmented into Driver Types dependent on their attitudes to EVs, and this research focused on four principal types.

3.2. Methodology

3.2.1. Methodological Approach

A case study is an appropriate method [40] to gain a deeper understanding of the complexities of consumer behavior. We investigated motorists’ perceptions and attitudes to EVs and factors that influence car buying using a cross-sectional consumer survey using questionnaires and interviews, conducted March–June 2020. Mixed methods were used to increase equivalence by using alternative measures of the same variables to increase integrity [41]. The interviews helped determine the stability of questionnaire responses [42].

3.2.2. Sampling Frame and Survey Data Collection

The units of analysis were NZ motorists aged 18 or over, who, after a written request for participation, by their participation gave tacit consent for their data to be retained and used anonymously. To enable comparison between EV Owners and ICEV motorists, we conducted two online questionnaires, March–April 2020, containing the same questions, followed by interviews, May–June 2020, randomly sampled from each group.

To sample ICEV motorists the polling company YouGov was selected as the company’s methodology has achieved relative accuracy in election polling [43]. YouGov conducted an online questionnaire using a random sample ($n = 588$), drawn from its extensive national panel, with gender, age and region quotas. Interviewees ($n = 31$) were drawn at random from the half of participants who voluntarily provided contact details. Prior to the main questionnaire, a pilot study ($n = 61$) tested the question validity and order of questions.

To acquire sufficient data for the second group, EV Owners were asked to respond to a request via the members-only EV Owners of NZ Facebook page and the Better NZ Trust website. While the participants were volunteers, who may have strong opinions, the percentage of New Zealanders who own EVs is less than 2% [16]; thus, survey participants ($n = 305$), as Innovators and Early Adopters [27], most of whom could be assumed to be enthusiastic adopters of this technology (see Section 5.1.1), were likely to reasonably repre-

sent the views of many EV Owners. Randomly selected interviews ($n = 31$) were conducted from more than half of the respondents who volunteered and provided contact details.

The questionnaire was administered via the online platform Qualtrics, and the Questions (Table S6) encompassed four main themes: demographic details, car ownership and buying habits; knowledge gathering and communication channels; knowledge, values attitudes and perceptions relating to EVs; and the environment. The questionnaire largely consisted of closed response multiple-choice questions, some with Likert scaled responses from 1–5. Multiple-choice response options were presented with randomized row order to eliminate positional advantage; however, “Don’t know” and “Other” were fixed at the end. Short answer open responses applied to two questions.

Telephone and Zoom interviews were conducted during the COVID-19 pandemic during the first period of restricted movement (lockdown) in NZ. Interviewees, after approving participation, were specifically asked to imagine behaviors and habits relating to the period prior to the lockdown. Interviews were semi-structured, focusing on the themes presented in the questionnaires, and were recorded, with verbal permission for anonymous use, and transcribed for analysis.

3.2.3. Statistical Data Analysis

We used statistical analysis to ascertain insights into motorists’ perceptions, attitudes, awareness of incentives, popularity of incentives and how they acquire knowledge about cars. Appropriately, we analyzed the data from two perspectives to increase our insights: by segmenting the market by attitudes to EVs; and further, by analyzing the data according to how likely a motorist is to buy an EV in the future. These two perspectives can provide a more holistic view of factors affecting motorists’ car buying habits.

3.2.3.1. Market Segmentation by Attitude to EVs

Dependent on their attitude to EVs, questionnaire participants were allocated to one of four groups, henceforth referred to as ‘Driver Type’. ‘EV Owners’ were participants in the EV Owners questionnaire, while ‘EV Positives’, ‘EV Anxious’ and ‘EV Pessimists’ participated in the YouGov questionnaire with groups allocated according to question A16 responses (Table S3), based on Brand et al. (2017) [8].

Driver Type was the chosen metric used to carry out tests of association and results of various questions of interest for each motorist. Pearson’s chi-squared test [44] was used as a test of association between two categorical variables. For questions with Likert-scales, an analysis of variance was used to test if there was a difference among the four Driver Types for their mean Likert scores.

To assess their perceptions of EVs, respondents were asked to record three words to describe EVs. Written responses were converted to single-word synonyms, then analyzed by observing the number of participants using those words appearing most often. Additionally, the numbers of participants who used at least one negative word were tallied. Using synonyms enables latent content analysis that was more apt than the manifest content analysis [45]. A score was tallied for each motorist who used at least one ‘negative word/phrase’, of the three they wrote down to describe EVs. Whether or not a respondent used these synonyms of interest, or at least one negative word, was then associated with Driver Type using Pearson’s chi-squared tests.

A ‘Holm’ adjustment was used for all p -values to account for multiple hypothesis testing [46]. If there was evidence of a relationship between a Driver Type and a question after correcting for multiple comparisons, this association was investigated through Mosaic plots, frequency histograms or boxplots. All plotting and analyses were undertaken in R v4.0.2.

To gain an understanding of perceived barriers, or potential incentives for ICEV motorists, open text responses to Question A24: Complete this statement: “*I would be more likely to buy an EV if . . .*” were analyzed and coded for themes [45], using an iterative process. An inductive approach was applied to search for meaning, responses were read to

generate initial codes then reviewed and refined, and after several passes, frequencies for each of the final themes were recorded.

3.2.3.2. Segmentation by Likelihood to Purchase a BEV

To gain greater insights and confidence in the research, a further set of tests was undertaken. All questionnaire participants were segmented according to their response to Question 15-1, which ascertained their likelihood to purchase a BEV the next time they buy a car. Participants were placed into one of five groups: 'not likely', 'less likely', 'neutral', 'likely' and 'very likely'. This metric will be referred to as 'likelihood to purchase BEV.' To test the effect of a range of variables on their likelihood to purchase a BEV, ordinal logistic regression models were conducted. This method is appropriate as it models the ordinal scale of the 'likelihood to purchase a BEV' and was carried out with the CLM function from the R ordinal package [47].

Individual models were fit for each question of interest and suitable filtering applied. Likelihood ratio tests were used to test the strength of association among variables. To account for multiple hypothesis testing, all p-values were adjusted using a Holm adjustment [46]. After adjusting for multiple comparisons, mosaic plots or boxplots were then used to further investigate evidence of association between a question and the likelihood to purchase a BEV. Plotting and analyses were conducted in R v 4.0.2.

4. Results

4.1. Results of the Driver Type Analysis

Table 2 shows the results of an analysis of NZ motorists, who were segmented into Driver Types (total $n = 893$) according to their attitudes to EVs. The segmentation included three groups of ICEV motorists, derived from answers to Question A16 (Table 3), and EV Owners (Table S1), and facilitates understanding of the diversity among motorists. Of the total, some respondents did not fit any of these categories ($n = 144$) and were excluded from further analysis using this criterion. Analysis of the results (Table 2) demonstrates many significant differences among the Driver Types, with strong evidence of association between Driver Type and most factors investigated ($p < 0.05$). Very low p values indicate a high likelihood that variables are correlated. However, whether motorists bought cars new or used, and whether they researched cars in newspapers or car magazines revealed no significant differences among the Driver Types ($p > 0.05$) indicating it is unlikely the concepts are linked. Mosaic and box plots, Figures 2–4 and Figures S1–S7, illustrate factors under discussion that demonstrated significant differences.

Asking participants to choose as many NZ government initiatives they had heard of was used to measure awareness, with percentages for each presented in Table 4. "Initiative Awareness" is displayed as a box plot (Figure S7) (mean number of initiatives by Driver Type); and further analysis of "Initiative Awareness" showing how likely a motorist is to purchase a BEV as a ratio of number of initiatives heard of is shown in Figure 4.

Table 2. Driver Type analysis results: Pearson’s Chi-squared tests and ANOVAs for the questions of interest compared to ‘Driver Type’ (Question A16). N is sample numbers remaining after filtering, which is a method that is used with test statistics, that is, chi-squared test statistics for chi-squared tests and likelihood ratio test statistics for ANOVAs. Df is the degrees of freedom and ‘p-value’ refers to the p-values after using a Holm adjustment (Holm, 1979) [45] to account for multiple hypothesis testing. Table S6 provides the full wording for each question.

Question Code	Issue	n	Method	Test Statistic	df	p-Value
Gender	Gender	748	Chisq	54.7	3	<0.0001
Age group 1	Age	749	Chisq	66.5	18	<0.0001
D6	Education level/highest achieved	741	Chisq	29.7	6	0.0003
D10	Cars in household (1 or multiple)	749	Chisq	39.6	3	<0.0001
A3	Purchase new or used cars	623	Chisq	3.2	3	0.3576
A5	Frequency of trips > 150 km	749	Chisq	32.5	12	0.0059
A6	Amount willing to spend on a car	728	Chisq	50.7	3	<0.0001
A8	Amount of research when buying a car	749	Chisq	98.6	3	<0.0001
A13	Primary information source	695	Chisq	189.4	18	<0.0001
A14_Magazines	Car research in car magazines	749	Chisq	5.0	3	0.3433
A14_Newspaper	Car research in newspapers	749	Chisq	10.2	3	0.0676
A14_Online	Car research online or social media	749	Chisq	142.8	3	<0.0001
A14_14	Rarely reads about cars	749	Chisq	42.6	3	<0.0001
A20b	Hope for NZ in the future	704	Chisq	123.1	12	<0.0001
A22_11	Have not heard of EV initiatives	749	Chisq	143.9	3	<0.0001
A23_12 ^a	I would never buy an EV	749	Chisq	84.9	2	<0.0001
Word use	Negative word association with EVs	749	Chisq	294.0	3	<0.0001
Word use	Expensive	749	Chisq	76.7	3	<0.0001
Word use	Economical	749	Chisq	79.2	3	<0.0001
Word use	Low-range	749	Chisq	54.1	3	<0.0001
Word use	Ecofriendly	749	Chisq	22.9	3	<0.0001
Word use	Fun	749	Chisq	11.7	3	<0.0001
A15_1	Likelihood of purchasing BEV	731	ANOVA	22.9	3	<0.0001
A15_2	Likelihood of purchasing PHEV	730	ANOVA	33.3	3	<0.0001
A17_1	Importance of vehicle range	743	ANOVA	66.7	3	<0.0001
A17_2	Importance of purchase price	749	ANOVA	267.2	3	<0.0001
A17_3	Importance of total ownership costs	740	ANOVA	266.4	3	<0.0001
A17_4	Importance of suitable EV model	746	ANOVA	156.3	3	<0.0001
A17_5	Importance of cheaper servicing costs	709	ANOVA	34.9	3	<0.0001
A17_6	Importance of fast charger network	737	ANOVA	41.3	3	<0.0001
A17_7	Importance of battery life	740	ANOVA	48.2	3	<0.0001
A22_count	Count # initiatives heard of	749	ANOVA	160.5	3	<0.0001

Note ^a Question A23_12 was only asked of ICEV motorists.

Table 3. ICEV motorists—attitudes to EVs from YouGov survey question A16 (n = 588).

Response Option	Attitude to EVs	Frequency	Percent	Analysis Group
1	It’s about time, why wouldn’t you	43	7.3	EV Positives
2	Yes please, it would save how much fuel?	111	18.9	
3	Yes please, but make it a plug-in hybrid for now, thanks	117	19.9	
4	Great idea, but where would I charge it?	84	14.3	EV Anxious
5	If everyone else is maybe . . .	25	4.3	
6	Will they save the planet? Don’t think so	76	12.9	EV Pessimists
7	I would never be seen in one of those	13	2.2	
8	I do a lot of driving, convince me	57	9.7	
9	Don’t know	62	10.5	

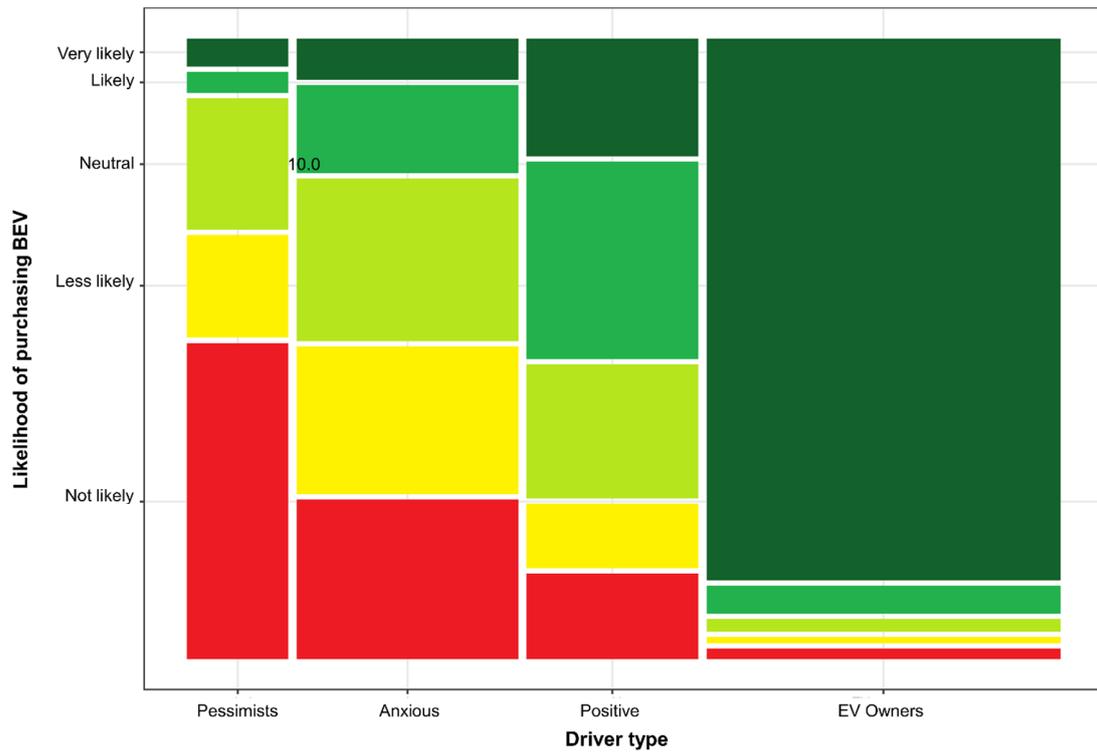


Figure 2. Likelihood of purchasing a fully electric vehicle (BEV) (A15-1) as a ratio of Driver Type (A16). Motorists were segmented into four Driver Types, dependent on their attitude to EVs, and as attitude to EVs improved, the likelihood of purchasing a BEV increased. Most EV Owners indicated they were ‘very likely’ to buy a BEV the next time they buy a car.

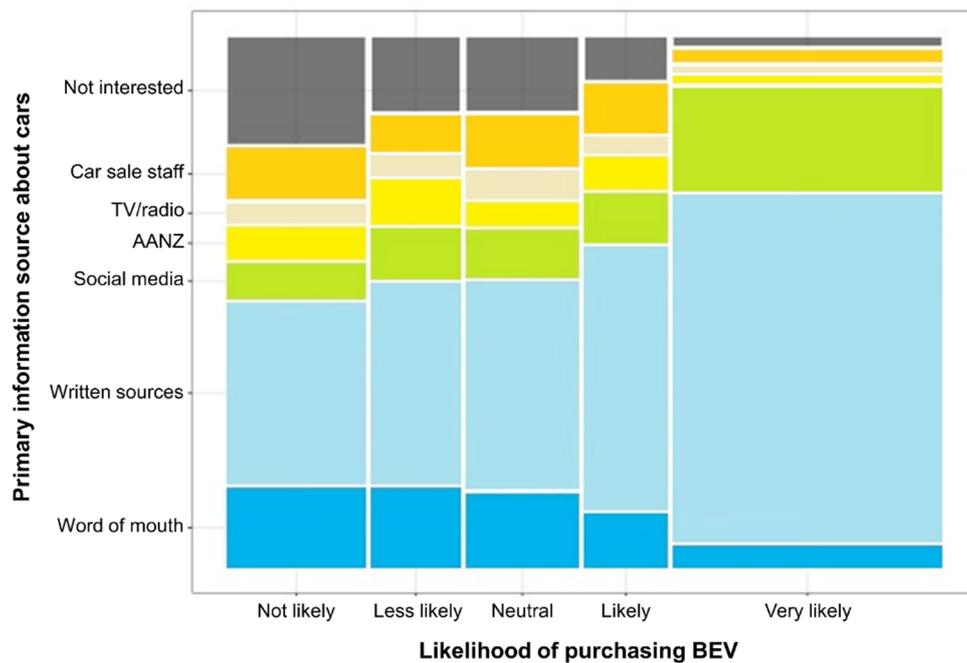


Figure 3. Mosaic plot showing the proportion of primary information sources for each likelihood of buying a BEV score. Written sources, followed by social media, were the most often consulted by those ‘very likely’ to buy a BEV in the future.

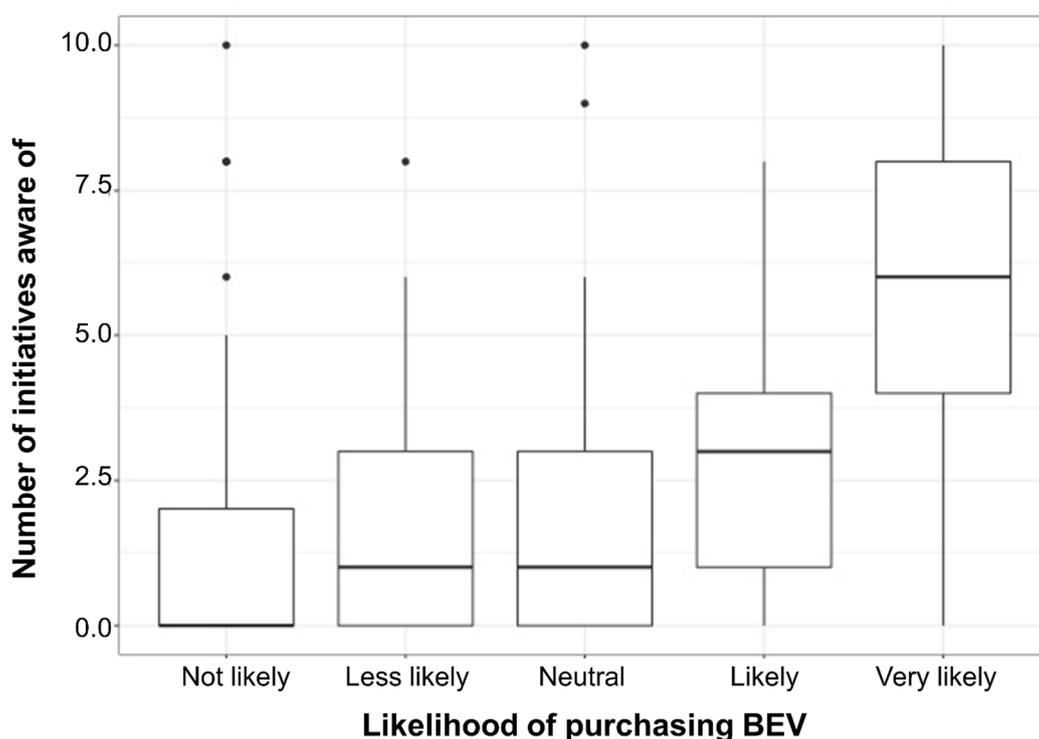


Figure 4. Box plot showing the number of initiatives motorists had heard of for each recorded 'likelihood to purchase a BEV' score. The dots on the figure represent outliers, the boxes represent the interquartile range for each score and the bold line represents the median score. The likelihood of purchasing a BEV increases as the number of initiatives a motorist is aware of increases.

Table 4. NZ Government EV incentive policies: Awareness and preference of motorists, expressed as percentages for each Driver Type.

Initiative	EV Owners		EV Positives		EV Anxious		EV Pessimists	
	Aware	Prefer	Aware	Prefer	Aware	Prefer	Aware	Prefer
EV ride and drive events	84.3	18.4	9.1	11.0	9.5	11.9	6.7	12.4
Importation of secondhand EVs	85.6	40.7	18.8	36.4	18.4	36.8	12.4	24.7
First registration tax exempt until 2021	45.2	14.4	18.8	29.2	11.9	24.7	16.9	15.7
EV use of bus lanes	61.0	10.2	13.6	25.3	11.4	21.4	12.4	20.2
Information website	43.0	4.9	14.3	17.5	11.4	17.4	6.7	15.7
Nation-wide fast charge network	87.5	53.4	35.7	48.1	38.3	56.2	36.0	22.5
Smartphone app for charger locations	27.9	3.6	20.8	33.1	17.9	36.8	12.4	18.0
EV Grants—Contestable fund	59.7	13.4	7.8	11.5	6.5	7.5	6.7	4.5
Potential Clean Car Discount	73.8	29.2	30.5	51.3	30.3	42.8	23.6	31.5
Potential Clean Car Standard	49.5	12.5	24.7	20.8	21.4	14.9	13.5	6.7
I am not aware of any initiatives	0.7		35.1		38.3		41.6	
Don't know		5.9		3.2		8.5		12.4
I would never buy an EV				1.9		1.5		30.3
I would have bought an EV regardless		52.1						

4.2. Results of Likelihood to Buy Ratio Tests

A further set of tests, as described in Section 3.2.3.2, was used to check for correlation of likelihood to buy a BEV with a range of factors. Table 5 and Figures 2 and 3 synthesize the results from the application of these tests. Table 5 demonstrates that when considering the relationship of several factors, there is evidence to suggest that there is a correlation between the likelihood of buying a BEV and a motorists' attitude to EVs (A16) and these

factors ($p < 0.05$). Figure 2 shows the relationship between Driver Type and Likelihood to purchase a BEV as a mosaic plot. There was no correlation with whether motorists did their research about cars in newspapers or car magazines (Table 5, $p = 1$).

Table 5. Likelihood Ratio Tests Results: tests undertaken using ordinal logistic regression models with ‘Likelihood to purchase a BEV’ as the response variable. n is the number of samples left after filtering, df is the degrees of freedom and ‘ p -value’ refers to the p -values that have been adjusted to account for multiple hypothesis testing using a Holm adjustment [45] to account for multiple hypothesis testing.

Question Code	n	Test Statistic	df	p -Value
A16_Driver Type, attitude to EVs	731	409.2	4	<0.0001
A8_Motorist does a lot of research/or not	861	78.6	1	<0.0001
A13_Information source	799	132.3	7	<0.0001
A14_Car Magazine	861	0.2	1	1
A14_Newspaper	861	0.1	1	1
A14_Online	861	107.0	1	<0.0001
A14_14 Rarely reads car articles	861	42.8	1	<0.0001
A22_11 Not heard of initiatives	861	170.8	1	<0.0001
A22_count Number initiatives heard of	861	313.2	1	<0.0001

Mosaic plots show differences among the categories tested; the width of each category reflects the number of participants in that category and the height of each “tile” in the mosaic reflects the proportion choosing each option available.

5. Discussion of the Results

This research aimed to gain greater insights into consumer behavior by investigating differences between different groups of motorists, which could better inform government policy updates. This research ascertained that motorists’ attitudes towards EVs are not homogeneous. Based on previous research (Section 2) indicating that attitudes to EVs are an important marker for EV readiness, we segmented survey participants based on Driver Types and mapped them against those devised by Rogers (2003) [27] to represent societal niches (Section 2), as there are common characteristics. We consider EV Owners as Innovators and Early Adopters; the EV Positives are conceived as the Early Majority; the EV Anxious are conceived as the Late Majority; while the Pessimists correspond with the Laggards.

Social marketing (Section 2) indicates the desirability of focusing marketing efforts on the segment most likely to act next. Hereafter, we demonstrate that the attitudes and values displayed by each segment indicate EV Positives are the next-most-ready to purchase EVs. We begin our discussion with Driver Type characteristics, followed by a discussion of factors relevant to EV readiness.

5.1. Profiling Driver Types

Analysis of Driver Types confirms New Zealand’s motorists are heterogeneous in their attitudes towards EVs. Each Driver Type displays different characteristics. There is strong evidence of an association between Driver Type and their likelihood to buy a BEV and most other factors (Table 2). However, no significant differences between groups appear for whether motorists bought vehicles new or used, and their preferences when researching cars, whether in magazines or newspapers. More than 94% of NZ motorists surveyed could park their car off-street with levels similar among Driver Types, indicating other factors were likely to be more important when considering the type of car to buy. Hereafter follows a more detailed discussion of the findings for each Driver Type.

5.1.1. EV Owners

Most EV Owners were enthusiastic about EVs, with 80.7% choosing the attitudinal option “It’s about time, why wouldn’t you” with a further 16.4% choosing “Yes please,

it would save how much fuel" (Table S1), indicating a high degree of enthusiasm for the technology. Most EV Owners were much more likely to buy a BEV next time they buy a car rather than a PHEV (Figure 2 and Table S6). High BEV ownership (94.1%) could explain these very different scores for the two types of EVs. Further demonstrating enthusiasm for EVs, more than half would have bought an EV regardless of any initiatives offered (Table 4), such as removing EVs first registration tax or ride and drive showcase events.

Interviewee EV#27 gave a typical response when asked if he would buy a BEV again: "Oh, 100%", but to a PHEV "No", while he had "managed to convince three people to buy an electric car at my old school that I taught at."

Compared to all other Driver Types, EV Owners had the lowest proportion of school-only educated people; were more likely to spend more than NZ\$30,000 on their next car, and to own multiple vehicles (82.6%) including at least one ICEV (76.1%); and more frequently drove further than 150 km on individual trips (Table S2).

5.1.2. EV Positives

In contrast to most EV Owners, EV Positives were more likely to identify cost savings as a reason to buy an EV in the future, with more than twice as many ICEV drivers (Table 3) choosing "Yes please, it would save how much fuel?" rather than "It's about time, why wouldn't you." The Positives were only slightly more likely to buy a BEV compared to a PHEV. A representative response about potential EV purchase was Interviewee ICEV#12:

"I would definitely buy an EV. The car we've got now, we got it in 2017, we could have gone electric car potentially, just above the price range, but we weren't quite there yet, but if we were doing it again now then we would definitely be able to" and "I would like to say for the environment, but probably the costs, it's much cheaper to run."

5.1.3. EV Anxious

Results (Table 3) show that EV Anxious preferred PHEVs rather than BEVs: over half of the EV Anxious thought EVs were a good idea, but would prefer PHEVs for now, while the remainder expressed concerns about recharging facilities, despite most having access to off-street parking (Table S6). Potentially, concerns include anxiety about charging generally, including rechargeability away from home. Such concern is consistent with Norwegian research findings, where ICEV owners were three times more worried about charging issues than EV owners [48].

These two "Anxious" interviewees exemplified the following concerns:

Interviewee ICEV#2: "Just hearing their stories of how friends had to stop and plug in and recharge, and that just put us off, and nice that we could get this car [petrol hybrid] and the price wasn't too bad. That's a better option for us."

Interviewee ICEV#4: "How far I am going, without needing recharging every day, I don't want a car shorting out on me constantly."

Messaging from EV owners could be used to counteract such apprehensions. Previous research indicates EV owners usually recharge at home [49] and prefer home recharging rather than filling up an ICEV at petrol stations [50]. At-home recharging may be an unexpected bonus that could be used in marketing. **Interviewee EV#11** expressed that sentiment well: "And I really like the fact that I can just plug it into the wall at home. I think that's the most underestimated advantage of them."

5.1.4. EV Pessimists

The Pessimists were a small group (Table 3), with most drivers skeptical of EVs; 85.4% chose "Will they save the planet, I don't think so" (Option 6). The remainder could not envisage themselves as identifying with EVs, selecting "I would never be seen in one of those" (Option 7). Of the ICEV motorists, Pessimists were least likely to buy either a BEV (Figure 2) or PHEV (Table S6 A15–2).

Interviewee ICEV#21 was representative, and was not amenable to EVs, "to be honest electric cars don't do anything for me" and was skeptical "The thing that puts me off mostly is all

the hype that goes on around the whole electric car thing. They market them as if it's a be all and end all, and they're not."

Interviewee ICEV#11 asked about buying an EV, *"doesn't interest me, well, you know, the charging, I am not happy about the disposal of the batteries, they try and hide that."* And *"I don't know if there is leakage of the charge if you don't use the vehicle."*

Pessimists were more likely to be one-car owners, were not as well educated, had lower proportions in the younger age groups, and drove long distances less frequently compared to other Driver Types (Table S5).

5.2. Valuing the Environment

Evidence supports that for EV Owners, the vehicles' environmental credentials were a strong motivation for purchase. Respondents were asked about the importance to them of three factors: economy, environment and society, and results show that EV Owners had a strong environmental regard in their hopes for the future state of NZ (Figure S2). Furthermore, regard for the environment was the most important factor for EV Owners motivating EV purchase (Tables S3 and S5).

Interviewee EV#29 summed up environmental regard: *"I think the primary motivation is concern for the environment, we wanted a cleaner way of moving around."*

Interviews revealed that EV Owners in multi-car households tended to use their EV more often than their other cars to maximize the advantages of owning one. For example, **Interviewee EV#3**, owner of seven vehicles: *"If the e-Golf is available, the Golf is the first vehicle out the gate every day. It changes the way you think when you've got an electric vehicle, we think who is going to do the most kilometers in town to maximize the savings by having that electric vehicle. . . . It does 95% of our vehicle usage, that particular vehicle . . . In five years' time all my vehicles will be electric."*

Such sentiments are consistent with Norwegian research, demonstrating that in households with both electric and conventional cars, EVs replaced 82% of ICEV use [51].

5.3. Identifying Concerns and Potential Barriers to EV Adoption

Potential barriers to adoption were revealed by responses to questions regarding motorists' EV concerns. There is strong evidence for an association between Driver Type and the importance of individual vehicle attributes ($p < 0.0001$). For the EV Positives, the most important of the vehicle attributes were the expected life of an EV's battery and purchase price followed by range (Table S6, Figures S4 and S5). Having a network of rechargers right around NZ was only slightly less important (Figure S6), whereas the attributes of 'Total ownership costs', 'availability of a model EV to suit their needs' and that 'electric cars have fewer servicing requirements' were of less concern.

For most factors, EV Owners, with practical experience and research to inform them, were the least concerned, which is consistent with findings previously demonstrated among Norwegian motorists [48].

Potential barriers to EV adoption for non-owners were further explored with ICEV drivers (Table S4), who were asked to complete the statement: *"I would be more likely to buy an EV if . . ."* Responses revealed that ICEV drivers were very concerned about purchase price, with Positives more worried by this than any other factor. Pessimists were the only group explicitly stating that they would not buy an EV (21%), complementing results from other questions: *"I would not buy an EV"* (A23-12) and with their limited likelihood of buying BEVs or PHEVs (Figure 2).

An EV Owner's quote exemplifies the importance of range anxiety when choosing which EV model to buy:

Interviewee EV#30: *"The protocol in our house is who's going to be driving the most that day, and the furthest, and who is going to be doing the most driving takes the EV . . . That's how I managed to convince him [partner], because he was the one with the anxiety about the range. You know, he wants [the range] to go to 450 kms. And I said, even if we get this one, we won't be charging it up maybe once a fortnight, which is what it has turned out."*

5.4. Information Acquisition When Buying Cars

Access to information is regarded as an important influence on motorists when choosing cars (Section 2). Our results from two sets of tests support this finding, as the likelihood of EV ownership diminished, engagement with written sources about cars declined (Table 5, Figures 2 and 3). There is strong evidence of an association between Driver Type and: level of research undertaken when buying cars (A8: $p < 0.0001$); primary source of information when buying cars (Figure S1); use of international online sites or social media (A14 – 11 + 12: $p < 0.0001$); claims that the respondent ‘rarely, if ever, read about cars’; and a lack of awareness about initiatives to encourage EV uptake (Table 2). Further statistical testing provides evidence of a correlation between Likelihood to buy a BEV (across all motorists) and these same factors (Table 5).

EV Owners were the most likely to undertake research when buying a car, with most (95.7%) claiming they did a lot of research. EV Owners mainly used written sources focusing on online sources, including international and social media to update their knowledge about cars (Figure S1), and had the lowest proportion of drivers claiming they rarely, if ever, read about cars. EV Owners were the least likely to claim they were unaware of any EV initiatives (Table 4, Figure S3). These results may be the result of targeting the EV Owners Association of NZ Facebook page or Better NZ Trust webpage to obtain respondents, as these people were already engaged in online participation, compared to the randomly sampled ICEV motorists. However, it is possible that EV Owners generally, being innovators and early adopters (Section 2), are enthusiastic and better informed about EVs than non-EV motorists.

By contrast, the Positives and Anxious groups showed similar patterns for level of research—their primary information source relied more heavily on word of mouth and other information sources than for EV Owners (Figure S1). These two groups used online resources similarly, less than EV Owners, and, with higher proportions of those who ‘rarely, if ever, read about cars’ compared to EV Owners.

Pessimists were the least engaged of all groups with finding out about cars. Few pessimists claimed they did a lot of research (A8); they were most likely to be uninterested in finding out about cars (A13); they were least likely to use online sources to update their knowledge of cars (A14 11 + 12) (Figure S1); and they were most likely to claim they ‘rarely, if ever, read about cars’ (A14–14). Pessimists were least likely to be aware of EV initiatives (Figure S7, A22–11).

5.5. Awareness of Initiatives

The NZ government introduced many policies to encourage consumers to buy EVs in 2016 (Tables 1 and 4). Subsequently, these initiatives have been reported in various media. Despite this, ICEV motorists’ knowledge about these initiatives overall could be regarded as relatively poor. There is strong evidence of an association between Driver Type and the count for number of initiatives motorists had heard about (Figure S7) and the admission that no initiatives had been heard of. Awareness of initiatives appears to be inverse to the amount of research undertaken about cars (Section 5.4), with statistical testing demonstrating a correlation of likelihood to buy a BEV and the amount of research undertaken to update knowledge about cars (Table 5, A8). Previous experimental research demonstrated a correlation between information reducing uncertainty and increasing likelihood to buy [52].

5.6. Incentivizing EV Uptake

Ten initiatives were presented to motorists (Table 4), with respondents asked to nominate up to three initiatives they most preferred. The analysis revealed the most preferred overall was ‘provision of a network of fast chargers around the country’, appealing most to the Anxious (56.2%), then the EV Owners (53.4%) and Positives (48.1%). Public installation of fast chargers has twice the impact on EV sales, compared to slower chargers [53], and

are considered essential [54] for enabling longer trips than an EV's range, thus increasing a motorist's self-efficacy.

The government-developed 'Smartphone App, used to locate rechargers', (called EV Roam) was most popular with the Anxious (36.8%). Increasing knowledge about the availability of this program could help allay fears and reduce range anxiety. A very low proportion of EV Owners (3.6%) selected this option in their top three. A low proportion of EV Owners had heard of EV Roam (27.9%), and a possible explanation is that they use other apps to locate rechargers on long trips (e.g., Plugshare).

The recommended, but not implemented, 'Clean Car Discount' [55] as a bonus-malus scheme, which is cost-neutral to the government, is a policy designed to ensure vehicle buyers pay more for the first registration of high-emission cars and less when registering low- or zero-emission vehicles. This incentive potentially provides a financial reward for enacting low-emission behavior by reducing EV upfront costs to consumers, thereby narrowing the purchase price differential to ICEVs. Although unavailable to date, this policy was most appealing to Positives (51.3%) and the Anxious (42.8%) and less to the Pessimists (31.5%). EV Owners (29.2%) were least likely to favor this initiative, but as many would have bought an EV regardless of incentives (52.1%) and already owned an EV, this choice perhaps indicates no future advantage to them personally. The 'Discount' could help change perceptions (Section 5.7) that EVs are "expensive" and could help reinforce the "economical" perceptions held by many motorists. Reducing the higher costs to either buy or run an EV has been utilized by many governments as a policy measure to attract EV uptake [6], and any action that potentially increases the price of EVs, for example by introducing road user taxes on EVs to provide income for governments could be considered counterproductive.

More important to EV Owners (40.7%) than the discount was the policy enabling 'importation of second-hand EVs' from Japan and the UK (Table 4), which is consistent with the high percentage of EV Owners who had bought second-hand imported EVs (83.3%, discounting the 'didn't know'). As there was no significant difference for the association between Driver Type and whether a motorist buys new or used vehicles (Table 2), it could be argued that this is an economically rational measure appealing to all Driver Types.

If the aim of providing incentives is to increase rates of EV ownership among NZ motorists, it is reasonable to suggest that the two most helpful incentives we investigated were: 1. Increasing national deployment of fast chargers, thereby increasing convenience and reducing range anxiety, and 2. Reducing EVs upfront price, either through cheaper second-hand imports or via financial support such as the 'Clean Car Discount' policy. Previous observations [20], found minimizing the cost differential between EVs and ICEVs, was very important to encourage uptake, which our research has demonstrated is important to New Zealanders. Additionally, the introduction of the 'Clean Car Standard', while not popular with many motorists (Table 4), has the potential to encourage manufacturers to increase the number of EVs imported to NZ to reduce their brand's overall emissions burden, and therefore, avoid any potential penalties attached to that measure, as occurs in the European Union [56].

5.7. Perceptions about EVs

Asking motorists for three words that popped into their heads they associated with EVs revealed interesting perceptions of EVs. There is a strong association (Table 2) with Driver Type and motorists choosing certain concepts (at least one negative word; 'Expensive'; 'Economical'; 'Low-range'; 'Ecofriendly'; and 'Fun': $p < 0.0001$).

The results (Table S5) demonstrate that with increasing aversion to EVs by Driver Type, there is an increasing use of at least one negative concept, with 'expensive' as the most outstanding. Only the EV Owners did not see 'expensive' as noteworthy. Five years earlier, it was reported [57] that EVs' relatively high upfront cost presented a considerable hurdle for New Zealand motorists, with testing revealing it was only if the purchase price became half of conventional cars that all motorists were convinced to change. Our results

show for ICEV drivers this perception of ‘expensive’ is still strong. However, our results also demonstrated positive perceptions: EV Positives were equally likely as EV Owners to regard EVs as ‘Economical’, and more likely to consider them ‘Ecofriendly’.

Marketing cars involves careful branding to convey positive imagery that suits the emotions, desires and needs of the target markets (Section 2). Therefore, to create a more positive perception for EVs, reframing the language to show EVs as representing the ‘good life’ [58], adoption of EV Owners’ language could be beneficial. Comparing the language of Positives and EV Owners, the chief difference is that Positives perceive EVs as ‘expensive’, whereas EV Owners think they are ‘fun’. Both groups agree they are ‘economical’ and ‘ecofriendly’, and such sentiments may be useful in marketing campaigns.

The language used by some of the EV Owners expresses well the advantages they perceived about EVs:

Interviewee EV#22: *“So the last time I updated my spreadsheet (. . .) was probably the beginning of this year and I had saved \$24,000 in my car over two and a half years, and it cost me \$32,000 [to buy]. So, I was well ahead. It’s raised my standard of living well, of course. That’s the whole point, it not only raises everybody’s standard living because you’re not spewing out fumes, but you’re improving your own standard of living, and New Zealand’s because they’re not importing the fuel. And somebody in New Zealand’s got a job because you do that.”*

Interviewee EV#5: *“It’s around the ethics of it. It’s around the green credentials. Then the cost savings associated with it are amazing . . . I was in a car yard in town, [with] a Leaf parked out front. And I took it for a drive just for fun, really. And I was blown away by the performance and in the way it handled and the quietness of it.”*

Interviewee EV#8: *“So partially environmental, partially cost. It was a case of, actually, the driving experiences are all nicer.”*

Our results demonstrate there are differences among Driver Types. To market EVs to the most EV ready, in this case the Positives, then a positive image ought to be promoted. The Positives could use EV Owners as role models, who can provide evidence that the product is viable. It has been suggested [59] that for the next marketing niche to accept a product, they need a compelling reason to change. EVs could be promoted by creating a value proposition that this product is better than competing alternatives, in this case ICEVs.

While the ‘Clean Car Standard’ was not especially popular with motorists (Table 4), it could encourage car dealers to increase the number of EVs they import at no cost to the government, and therefore, taxpayers (See Section 5.6). Similarly, growing procurement by organizations would improve sales and potentially expand model availability, an important measure for the EV Positives (Table S6, A17_4). Additional procurement could increase communications about EVs through the channel of employees who may speak to their contacts about their experiences. Such actions could provide evidence that governments and other large organizations think EVs are a suitable option, as has been demonstrated in Norwegian research that showed government procurement fostered EV sales [60].

Government policies encourage uptake of EVs [6], and the government ought to provide a clear lead, being seen to act [61]. Our results provide evidence to contend that one action the NZ government could take—which would likely increase EV sales—is to implement earlier policy suggestions [55], namely, one of the most popular incentives, the ‘Clean Car Discount’, helping reduce the price differential between EVs and ICEVs, and counteracting EVs’ negative image of ‘expensive’, potentially creating a positive value proposition and rewarding good behavior. However, not only should there be a positive value proposition, opposing forces need to be considered.

Noel et al. (2019) [62] suggested conservative forces propagate perverse concepts to oppose change by promulgating and reinforcing range anxiety. To counteract such an effect, consideration that the second most popular incentive for EV Positives was a network of fast chargers (Figure S6) suggests further work needs to be done, not only deploying more rechargers, but increasing messaging about how to find them via smartphone apps. Our results suggest that ICEV motorists’ knowledge about initiatives supporting EVs is limited (Table 4, Figures S3 and S7), and that likelihood to buy an EV diminishes as the awareness

of initiatives diminishes (Figure 4). Thus, updating policies aiming to increase awareness of incentives could be a valuable strategy.

6. Conclusions and Policy Implications

This research aimed to provide evidence that could support policy changes to enhance EV uptake. Our results demonstrate that rates of EV adoption could be accelerated by understanding factors affecting car buyers, including motorists' preferred incentives, especially for the next-most EV ready, the early majority, namely EV Positives.

New Zealand motorists perceived the strongest barriers to EV purchase were: vehicle range, ICEV Driver perceptions that EVs are expensive, inconvenience relating to charging and the unknown value proposition of batteries. The evidence this research provides points towards four main courses of action by governments, which could be advantageous if the aim is to widen the appeal of EVs, especially to the early majority in our case the EV Positives being the next-most-ready to buy EVs:

1. Implement previously proposed policies of the 'Clean Car Discount' to reduce EVs' purchase price, which was the most preferred by EV Positives; additionally, although this policy was not especially popular with motorists, the 'Clean Car Standard' could increase EV importation by manufacturers (enhancing EV choices for motorists), with no cost burden on the government, and hence taxpayers. However, this measure could provide a source of government income through penalties imposed on manufacturers if they fail to meet the standard. Importantly for New Zealanders, the measure will have the additional benefit of reducing emissions and ensuring polluters pay more;
2. Increase funding for additional fast-charger deployment nation-wide, by all levels of government;
3. Reframe EVs' image to portray EVs as representing the good life by providing value for money and lifestyle gains for motorists; for example, that there is more money available for other things and that EVs are fun to drive. Such sentiments could be disseminated through increased advertising and more information campaigns, by governments and other stakeholders, for example, motoring organizations and manufacturers, including the availability of cheaper second-hand EVs and existence of smartphone apps that help locate rechargers;
4. Increase procurement of EVs, for example, by government departments, to increase sales certainty for car dealers and increase communication via employees to increase EV awareness amongst motorists.

Supplementary Materials: The following supplementary materials are available online at <https://www.mdpi.com/article/10.3390/en14102920/s1>, Table S1 Attitudes to EVs for EV Owners (A16) ($n = 305$). Table S2 Socio-demographic profiles: ICEV and EV motorists, shown as percentages. Table S3 EV Owners: Percentage of EV Owners who nominated factors (in an open response question: *The main reason I bought a plug-in electric car is . . .*) that motivated them to buy an EV, some owners nominated more than one factor. Table S4 ICEV motorists only: Response to A24 "I'd be more likely to buy an EV if . . ." showing percentage of respondents who mentioned any particular category. Table S5 Numbers of motorists mentioning a concept, and percentages of words/concepts used by each Driver Type. Table S6. Survey questions relevant to this paper. Figure S1 Primary information source when researching cars for each Driver Type (A13). Figure S2 How motorists would hope New Zealand to be in 20 years' time for each Driver Type (A20b). Figure S3 Motorist has not heard of EV initiatives for each Driver Type (A22-11). Figure S4 Importance of vehicle range when considering EV purchase for each Driver Type. Figure S5 Importance of vehicle price when considering EV purchase for each Driver Type (A17-2). Figure S6 Importance that there is a network of rechargers located right around New Zealand for each Driver Type. Figure S7 Box plot—Number of initiatives aware of for each Driver Type (A22-count).

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Abbreviations

BEV	Battery Electric Vehicle
EV	Electric vehicle
GHG	Greenhouse gas
ICEV	Internal combustion engine vehicle
NZ	New Zealand
PHEV	Plug-in hybrid electric vehicle

References

- Nanaki, E.A.; Koroneos, C.J. Climate change mitigation and deployment of electric vehicles in urban areas. *Renew. Energy* **2016**, *99*, 1153–1160. [CrossRef]
- Broadbent, G.H. Comment on “Consumer purchase intentions for electric vehicles: Is green more important than price and range?” K. Degirmenci, MH Breitner Transportation Research Part D 51 (2017) 250. *Transp. Res. Part D Transp. Environ.* **2018**, *65*, 849–852. [CrossRef]
- Miotti, M.; Supran, G.J.; Kim, E.J.; Trancik, J.E. Personal Vehicles Evaluated against Climate Change Mitigation Targets. *Environ. Sci. Technol.* **2016**, *50*, 10795–10804. [CrossRef] [PubMed]
- Madziel, M.; Campisi, T.; Jaworski, A.; Tesoriere, G. The development of strategies to reduce exhaust emissions from passenger cars in Rzeszow City—Poland. A preliminary assessment of the results produced by the increase of E-fleet. *Energies* **2021**, *14*, 1046. [CrossRef]
- Campisi, T.; Ignaccolo, M.; Tesoriere, G.; Inturri, G.; Torrisi, V. The Evaluation of Car-Sharing to Raise Acceptance of Electric Vehicles: Evidences from an Italian Survey among University Students. In Proceedings of the Conference on Sustainable Mobility, Skiathos Island, Greece, 27–29 May 2020; SAE Technical Papers: Warrendale, PA, USA, 2020. [CrossRef]
- European Commission. European Alternative Fuels Observatory. Available online: <https://www.eafo.eu/> (accessed on 10 November 2020).
- IEA. *Global EV Outlook 2020*; OECD Publishing: Paris, France, 2020. [CrossRef]
- Brand, C.; Cluzel, C.; Anable, J. Modeling the uptake of plug-in vehicles in a heterogeneous car market using a consumer segmentation approach. *Transp. Res. Part A Policy Pract.* **2017**, *97*, 121–136. [CrossRef]
- Haustein, S.; Jensen, A.F. Factors of electric vehicle adoption: A comparison of conventional and electric car users based on an extended theory of planned behavior. *Int. J. Sustain. Transp.* **2018**, *12*, 484–496. [CrossRef]
- Stern, P.C. Toward a coherent theory of environmentally significant behavior. *J. Soc. Issues* **2000**, *56*, 407–424. [CrossRef]
- Kotler, P.; Lee, N. *Marketing in the Public Sector: A Roadmap for Improved Performance*; Wharton School Publishing: Upper Saddle River, NJ, USA, 2007; ISBN 0-13-187515-9.
- Green, E.H.; Skerlos, S.J.; Winebrake, J.J. Increasing electric vehicle policy efficiency and effectiveness by reducing mainstream market bias. *Energy Policy* **2014**, *65*, 562–566. [CrossRef]
- Liao, F.; Molin, E.; van Wee, B. Consumer preferences for electric vehicles: A literature review. *Transp. Rev.* **2017**, *37*, 252–275. [CrossRef]
- Struben, J. The Diffusion of Complex Market Technologies: Multifaceted Dynamics for Alternative Fuel Vehicles. In Proceedings of the 2008 Industry Studies Conference Paper, Boston, MA, USA, 1–2 May 2008; Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1135732 (accessed on 17 May 2021).
- Cui, H.; Hall, D.; Lutsey, N. Update on the Global Transition to Electric Vehicles through 2019. 2020. Available online: <https://theicct.org/publications/update-global-ev-transition-2019> (accessed on 17 May 2021).

16. Ministry of Transport (New Zealand). Vehicle Fleet Statistics. Available online: <https://www.transport.govt.nz/mot-resources/vehicle-fleet-statistics/> (accessed on 10 November 2020).
17. NZ Government. *Energy in New Zealand 2019*; NZ Government: Wellington, New Zealand, 2019.
18. Barton, B. Electric vehicles policy announcement. *N. Z. Law J.* **2016**, *1*, 268–270. Available online: <https://hdl.handle.net/10289/11146> (accessed on 17 May 2021).
19. Ministry of Transport (New Zealand). Electric Vehicles: Package of Measures To Encourage Uptake. 2016. Available online: <https://www.transport.govt.nz/assets/Uploads/Cabinet/Electric-Vehicles-Package-of-Measures-to-Encourage-Uptake.pdf> (accessed on 17 May 2021).
20. Bjerkan, K.Y.; Nørbech, T.E.; Nordtømme, M.E. Incentives for promoting Battery Electric Vehicle (BEV) adoption in Norway. *Transp. Res. Part D Transp. Environ.* **2016**, *43*, 169–180. [[CrossRef](#)]
21. Mersky, A.C.; Sprei, F.; Samaras, C.; Qian, Z. Effectiveness of incentives on electric vehicle adoption in Norway. *Transp. Res. Part D Transp. Environ.* **2016**, *46*, 56–68. [[CrossRef](#)]
22. Harding, R.; Hendriks, C.M.; Faruqi, M. *Environmental Decision-Making: Exploring Complexity and Context*; Federation Press: Sydney, Australia, 2009; ISBN 978-186287-748-1.
23. Bagozzi, R.P.; Gopinath, M.; Nyer, P.U. The role of emotions in marketing. *J. Acad. Mark. Sci.* **1999**, *27*, 184–206. [[CrossRef](#)]
24. Urry, J. The ‘System’ of Automobility. *Theory Cult. Soc.* **2004**, *21*, 25–39. [[CrossRef](#)]
25. Kotler, P.; Zaltman, G. Social Marketing: An approach to planned social change. *J. Mark.* **1971**, *35*, 3–12. [[CrossRef](#)] [[PubMed](#)]
26. Andreasen, A.R. The life trajectory of social marketing. *Mark. Theory* **2003**, *3*, 293–303. [[CrossRef](#)]
27. Rogers, E.M. *Diffusion of Innovations*, 5th ed.; Simon and Schuster: New York, NY, USA, 2003; ISBN 9780743222099.
28. Carley, S.; Siddiki, S.; Nicholson-Crotty, S. Evolution of plug-in electric vehicle demand: Assessing consumer perceptions and intent to purchase over time. *Transp. Res. Part D Transp. Environ.* **2019**, *70*, 94–111. [[CrossRef](#)]
29. Rezvani, Z.; Jansson, J.; Bodin, J. Advances in consumer electric vehicle adoption research: A review and research agenda. *Transp. Res. Part D Transp. Environ.* **2015**, *34*, 122–136. [[CrossRef](#)]
30. White, L.V.; Sintov, N.D. You are what you drive: Environmentalist and social innovator symbolism drives electric vehicle adoption intentions. *Transp. Res. Part A Policy Pract.* **2017**, *99*, 94–113. [[CrossRef](#)]
31. Michie, S.; van Stralen, M.M.; West, R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implement. Sci.* **2011**, *6*, 42. [[CrossRef](#)]
32. White, K.; Habib, R.; Hardisty, D.J. How to SHIFT consumer behaviors to be more sustainable: A literature review and guiding framework. *J. Mark.* **2019**, *83*, 22–49. [[CrossRef](#)]
33. Gong, S.; Ardeshiri, A.; Hossein Rashidi, T. Impact of government incentives on the market penetration of electric vehicles in Australia. *Transp. Res. Part D Transp. Environ.* **2020**, *83*, 102353. [[CrossRef](#)]
34. Jones, A.; Begley, J.; Berkeley, N.; Jarvis, D.; Bos, E. Electric vehicles and rural business: Findings from the Warwickshire rural electric vehicle trial. *J. Rural Stud.* **2020**, *79*, 395–408. [[CrossRef](#)]
35. Melton, N.; Aksen, J.; Moawad, B. Which plug-in electric vehicle policies are best? A multi-criteria evaluation framework applied to Canada. *Energy Res. Soc. Sci.* **2020**, *64*, 101411. [[CrossRef](#)]
36. Best, A.; Holmes, B. Systems thinking, knowledge and action: Towards better models and methods. *Evid. Policy A J. Res. Debate Pract.* **2010**, *6*, 145–159. [[CrossRef](#)]
37. Satish, S.M.; Bharadhwaj, S. Information search behaviour among new car buyers: A two-step cluster analysis. *IIMB Manag. Rev.* **2010**, *22*, 5–15. [[CrossRef](#)]
38. Bator, F.M. The Anatomy of Market Failures. *Q. J. Econ.* **1958**, *72*, 351–379. [[CrossRef](#)]
39. Anderson, N.H. Integration theory and attitude change. *Psychol. Rev.* **1971**, *78*, 171–206. [[CrossRef](#)]
40. Yin, R.K. *Case Study Research and Applications*, 6th ed.; Sage Publications, Inc.: Los Angeles, CA, USA, 2018; ISBN 9781506336169.
41. Cresswell, J.W.; Poth, C.N. *Qualitative Inquiry and Research Design*, 4th ed.; Sage Publications, Inc.: Thousand Oaks, CA, USA, 2018; ISBN 978-1-5063-6117-8.
42. Bryman, A. *Social Research Methods*, 4th ed.; Oxford University Press: Oxford, UK, 2012; ISBN 978 0 19 958805 3.
43. Twyman, J. Getting It Right: YouGov and Online Survey Research in Britain. *J. Elect. Public Opin. Parties* **2008**, *18*, 343–354. [[CrossRef](#)]
44. Pearson, K.X. On the criterion that a given system of deviations from the probable in the case of a correlated system of variables is such that it can be reasonably supposed to have arisen from random sampling. *Lond. Edinb. Dublin Philos. Mag. J. Sci.* **1900**, *50*, 157–175. [[CrossRef](#)]
45. Hay, I. *Qualitative Research Methods in Human Geography*, 2nd ed.; Oxford University Press: Melbourne, Australia, 2005; ISBN 0-19-55079-X.
46. Holm, S. A Simple Sequentially Rejective Multiple Test Procedure. *Scand. J. Stat.* **1979**, *6*, 65–70.
47. Christensen, R.H.B. Analysis of Ordinal Data with Cumulative Link Models—Estimation with the R Package Ordinal, R-Package Version. 2015. Available online: https://cran.r-project.org/web/packages/ordinal/vignettes/clm_article.pdf (accessed on 17 May 2021).
48. Figenbaum, E.; Kolbenstvedt, M.; Elvebakk, B. *Electric Vehicles—Environmental, Economic and Practical Aspects—As Seen by Current and Potential Users*; Institute of Transport Economics (TØI): Oslo, Norway, 2014.

49. Figenbaum, E.; Kolbenstvedt, M. *Learning from Norwegian Battery Electric and Plug-in Hybrid Vehicle Users*; Institute of Transport Economics (TØI): Oslo, Norway, 2016.
50. Bunce, L.; Harris, M.; Burgess, M. Charge up then charge out? Drivers' perceptions and experiences of electric vehicles in the UK. *Transp. Res. Part A Policy Pract.* **2014**, *59*, 278–287. [[CrossRef](#)]
51. Haugneland, P.; Bu, C.; Hauge, E. The Norwegian EV success continues. In Proceedings of the EVS29 International Battery, Hybrid and Fuel Cell Electric Vehicle Symposium, Montreal, QC, Canada, 19–22 June 2016; pp. 1–9.
52. Broadbent, G.H.; Metternicht, G.; Drozdowski, D. An Analysis of Consumer Incentives in Support of Electric Vehicle Uptake: An Australian Case Study. *World Electr. Veh. J.* **2019**, *10*, 11. [[CrossRef](#)]
53. Ma, S.C.; Fan, Y. A deployment model of EV charging piles and its impact on EV promotion. *Energy Policy* **2020**, *146*, 111777. [[CrossRef](#)]
54. Lieven, T. Policy measures to promote electric mobility—A global perspective. *Transp. Res. Part A Policy Pract.* **2015**, *82*, 78–93. [[CrossRef](#)]
55. Barton, B.; Schutte, P. *Electric Vehicle Policy: New Zealand in a Comparative Context*; University of Waikato: Hamilton, New Zealand, 2015.
56. European Commission. CO2 Emission Performance Standards for Cars and Vans. Available online: https://ec.europa.eu/clima/policies/transport/vehicles/regulation_en (accessed on 10 May 2021).
57. Ford, R.; Stephenson, J.; Scott, M.; Williams, J.; Rees, D.; Wooliscroft, B. *Keen on EVs: Kiwi Perspectives on Electric Vehicles, and Opportunities to Stimulate Uptake*; Centre for Sustainability, University of Otago: Dunedin, New Zealand, 2015; ISBN 978-0-9941219-6-7.
58. Friis, F. An alternative explanation of the persistent low EV-uptake: The need for interventions in current norms of mobility demand. *J. Transp. Geogr.* **2020**, *83*, 102635. [[CrossRef](#)]
59. Moore, G.A. *Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Customers*, 3rd ed.; Harper Business: New York, NY, USA, 2014; ISBN 978-0-06-229298-8.
60. Figenbaum, E.; Assum, T.; Kolbenstvedt, M. Electromobility in Norway: Experiences and opportunities. *Res. Transp. Econ.* **2015**, *50*, 29–38. [[CrossRef](#)]
61. Happer, C.; Philo, G. The role of the media in the construction of public belief and social change. *J. Soc. Polit. Psychol.* **2013**, *1*, 321–336. [[CrossRef](#)]
62. Noel, L.; Zarazua de Rubens, G.; Sovacool, B.K.; Kester, J. Fear and loathing of electric vehicles: The reactionary rhetoric of range anxiety. *Energy Res. Soc. Sci.* **2019**, *48*, 96–107. [[CrossRef](#)]