future transportation

Article

Effect of Policies to Accelerate the Adoption of Battery Electric Vehicles in Finland—A Delphi Study

Sheba Nair [1,*], Riku Viri [1], Johanna Mäkinen [1], Markus Pöllänen [1], Heikki Liimatainen [1] and Steve O'Hern [2,3]

[1] Transport Research Centre Verne, Tampere University, FI-33014 Tampere, Finland; riku.viri@tuni.fi (R.V.); johanna.m.makinen@tuni.fi (J.M.); markus.pollanen@tuni.fi (M.P.); heikki.liimatainen@tuni.fi (H.L.)
[2] Institute for Transport Studies, University of Leeds, Leeds LS2 9JT, UK; s.ohern@leeds.ac.uk
[3] Accident Research Centre, Monash University, Clayton, VIC 3800, Australia
* Correspondence: sheba.nair@tuni.fi

Abstract: Greenhouse gas (GHG) emissions from transport contribute significantly to climate change. Some of the transport policies with the greatest potential to mitigate climate change are related to zero-emission vehicles. This study aimed to analyse the different factors, and their importance, influencing purchase decisions for battery electric vehicles (BEV). Experts' perceptions were collected with a Delphi study consisting of a two-round survey to assess factors that would increase the probability of a petrol- or diesel-car owner purchasing a BEV in Finland in the year 2025. Increasing the possibilities for home charging and the provision of a purchase subsidy were seen as the most important factors. Public fast charging and the difference in use costs between current technology vehicles and BEVs were also recognised as important factors. Existing systems of financial instruments and policies must be constantly evaluated and updated due to the evolving BEV industry.

Keywords: Delphi study; battery electric vehicle (BEV); incentive; charging; adoption; purchase decision

check for updates

Citation: Nair, S.; Viri, R.; Mäkinen, J.; Pöllänen, M.; Liimatainen, H.; O'Hern, S. Effect of Policies to Accelerate the Adoption of Battery Electric Vehicles in Finland—A Delphi Study. *Future Transp.* **2024**, *4*, 67–91. https://doi.org/10.3390/futuretransp4010005

Academic Editor: Lynnette Dray

Received: 13 October 2023
Revised: 15 December 2023
Accepted: 20 December 2023
Published: 12 January 2024

1. Introduction

One of the world's most important global challenges is climate change mitigation. The use of fossil fuels is the leading causes of global warming and climate change [1]. The European Union (EU) aims to be a climate-neutral economy by 2050 to reduce emissions by 55% by 2030 compared to the levels in 1990 [2]. In one EU member state, Finland, the Climate Change Act was enforced in 2015 and updated in 2022 [3]. The Act aims to achieve climate neutrality by 2035 and to reduce greenhouse gas emissions by at least 90% by 2050 compared to the levels in 1990 [3].

Transport accounts for 24% of global greenhouse gas (GHG) emissions [4]. Of the total transport emissions, 72% originate from road transport [4] and passenger cars are responsible for around 12% of total CO_2 emissions in the EU [5]. Global agreements, such as the Paris Agreement [6] and the policies and targets at the EU, national, and local level, as well as consumer awareness of climate change, have led the transport industry to transition to fossil fuel alternatives [1]. Many policies have been adopted to mitigate the emissions from road transport. Especially in the EU, the car industry has met tightening CO_2 emission performance standards, and there are mechanisms to incentivise the uptake of zero- and low-emission vehicles.

Finland, with 5.6 million inhabitants [7] and a car fleet of 2.7 million [8], aims to raise the number of electric vehicles (EVs) on its roads to 700,000 by the year 2030 [9]. At least half of the 700,000 EVs should be battery electric vehicles (BEVs) [9]. In March 2023, the number of BEVs was 53,000 and there were a further 110,500 plug-in hybrid electric vehicles (PHEVs) [8]. However, transformation towards an EV fleet will take time, with an average age of cars in use in Finland of 12.6 years, and an average scrappage age of 22.0 years [10,11]. Currently, the rate of car ownership varies in Finland between regions, with the highest being 583 cars per 1000 inhabitants in South Ostrobothnia and the lowest being 425 cars per 1000 inhabitants in Uusimaa [12].

Electrification of the car fleet and fleet renewal are expected to deliver the considerable reductions in emissions that are needed to reach the goals for climate change mitigation. To analyse the reduction in emissions that can be achieved through electrification of the car fleet, estimations and predictions of future car fleet development are needed. In Finland, it has been assessed that the CO_2 emissions of transport will reduce by about 40% by year 2030 compared to year 2020, assuming that the electrification of the fleet will progress, that the average consumption of internal combustion engine (ICE) cars will decrease, and that the share of renewable fuels will increase [13].

In [14], a model was developed to consider the driving powers of the future Finnish car fleet. However, there are several issues affecting the electrification of the car fleet that need to be considered in modelling. One of the critical issues is the motivation of a consumer to switch from an ICE car and adopt an EV, especially a BEV. Consumers consider, for example, the high purchase price of EVs, availability of charging infrastructure, the long time needed for charging, range anxiety, and use costs when thinking about changing to EVs [15]. However, these barriers can be overcome using properly targeted policies [16]. In this study, information regarding the different policies and their impacts on consumer interest towards BEV adoption are produced to allow for a better understanding of the electrification of the car fleet. This information can later be used to model changes in the car fleet over time. For political decision-making, there is a need for up-to-date perceptions on how the car fleet will change and what can be achieved with different policies that support transition to reach the GHG emission reduction targets. However, given the rapid development in the EV market in recent years, some of the early findings may not be relevant anymore. For example, the development of both charging networks as well as battery capacities may have alleviated range anxiety. On the other hand, new issues have arisen, such as increased fuel prices, and the increased availability of BEV models.

In [17], it was found through a 2021 US-survey that rebate at the time of the car sale was the most-favoured option for users when compared to benefits during the lifecycle of the vehicle. The purchase price of an EV is one of the main concerns. However, purchase prices are predicted to decrease over time due to a reduction in the price of batteries, which is one of the most expensive components of an EV [18]. It is also predicted that this reduction in the price of EVs would reduce the dependency of the consumer on purchase subsidies offered by the government [18]. Another instrument that the government can use to increase the market share of EVs is the use of CO_2 emissions-based taxation, where taxes are levied based on the amount of CO_2 emissions produced by a vehicle [19]. This motivates consumers to opt for low- or zero-emission vehicles [19]. One issue for a consumer is home charging, as it may deliver a monetary advantage, with a decrease in the use cost of EVs compared to public charging. On the other hand, it has been noted that when the number of accessible public chargers rises, so does the share of EVs [20].

This research seeks to understand the factors that would affect the purchase of BEVs in Finland in the year 2025. The timeframe of the year 2025 was chosen as the BEV market and uptake of BEVs are currently in a rapid transition phase and it would be more difficult to estimate effects for a longer timeframe. Additionally, the short timeframe was considered to have policy relevance for current decision-making. The research questions of this study are as follows:

RQ1: What are the factors that affect purchase interests towards BEVs?
RQ2: How do these factors affect purchase decisions?
RQ3: What are the most potent factors that affect purchase interests towards BEVs in Finland in the year 2025, and what policies can be implemented in Finland, if there is a will to support BEV adoption in future?

RQ1 and RQ2 are addressed through a review of previous research and different policy documents issued by the government. The findings were then combined with a two-round expert survey using the Delphi method to answer RQ3.

This article is structured as follows: Section 2 presents the factors affecting the purchase interest towards BEVs among consumers based on a review of the literature. Next, the methodology of the Delphi study is explained (Section 3), and the analysis of the results (Section 4) is presented. This is followed by the discussion (Section 5) and the conclusions (Section 6) of this study, along with its limitations and avenues for future research.

2. Factors and Policies Affecting EV Adoption

The factors and policies affecting EV adoption were investigated through a search of the academic literature. This literature study was a simple literature review of articles from Scopus and Web of Knowledge databases. It was not a systematic literature review, and no specific search query was used. Search terms included "electric vehicle", "BEV", "charging", "policy", "subsidy", "taxation", "adoption", and "barrier". The search was conducted using the ScienceDirect database. Additional material was also found through reviewing the references in articles identified in the search. Section 2 presents an overview of the factors and polies affecting EV adoption. When thinking of the different factors that relate to EV adoption and can be guided by policies, two main factors related to costs and to EV charging were considered. These are discussed in Sections 2.1 and 2.2, respectively. In the literature, we found a mixed use of terminology and most of the studies were about EVs in general, while some were focused more specifically on BEVs. Thus, the literature is focused generally on EVs, even though there might be different experiences with EVs and BEVs in reality.

In [21], it was found that consumer adoption of EVs is linked with alternative options, costs, demographic factors, habits, lifestyle, long-term benefits, preferences, psychological factors, situational factors, and social status. Positive factors that motivate consumers to adopt EVs are government financial aid, reliability, independence from oil, reduction in polluting gases, and improvement in air quality [15,22]. Factors that dissuade consumers from buying EVs are range anxiety [23], long charging times [24], a lack of charging infrastructure [23], high purchase prices [22], less concern for environmental protection [25], increased use of individual transport [22], a lack of trust [21], lack of information [21], a large number of charging events compared to refuelling events [15], unwillingness of consumers to pay substantial premiums [26], safety concerns while charging [27], unknown or lesser resale value [27], consumer confidence [28], environmental issues due to battery disposal [29], uncleanliness of the electric grid [30], and the absence of an established used car market [29]. Additionally, especially in countries like Finland [31] due to harsh winter conditions, the batteries of electric vehicles are discharged more quickly because of the low temperatures [31], thereby affecting the range of the vehicle [32,33].

The gap between the expectations of consumers and the reality of EVs is large [21]. Information should be readily, easily, and completely available. It should also be up to date. There is a need for a centralized database with complete information on prices, options for different EVs, incentives, parking, charging, and repair. This would lead to an increase in trust and the confidence of consumers, and therefore, an increase in the purchase motivation of consumers [1,26].

The other benefits of owning an EV, such as access to bus lanes or high-occupancy lanes, or benefits in parking, are usually estimated to be an additional bonus and not a clear motivator, as their effect is quite small. For example, in [34], it was noted that access to high-occupancy lanes in Canada for EVs would only result in a 0.1–0.3% increase in the number of EVs by 2040, as both the roads where those lanes exist and times when they provide benefits are limited. In addition, in [35], it was noted that if EVs are given access to certain lanes, it may reduce congestion on regular lanes. However, it is noted that when the share of EVs increases, the action can become negative, with high-occupancy lanes becoming congested.

2.1. Factors Related to Costs

There are some general points to be noted when considering different factors that aim to influence the car fleet through costs. In [36], it was stated that to gain the best results in cumulative CO_2 reduction, faster policy effects are more advantageous, since the results have a long-term effect. Additionally, it should be noted that there is no one-solution-for-all, and targeted actions should be used to implement different policies for different groups [16]. In [37], it was identified that the best possible policy mixes, where fuel economy regulation was found to be the most impactful, driver alone and EV mandates were found to be the most cost-effective policies and the most useful in starting the diffusion of EVs when the share is low.

2.1.1. Effect of Financial Incentives on EV Market Share

In a UK-based study [36], it was noted that pricing subsidies and clear feebates were the most effective, as people tend to favour direct up-front savings more than lifecycle savings. This was also supported by a 2021 US-based survey, where a rebate at the time of sale was the most-valued option [17]. Research studying subsidies for EV purchases available in Canada found a positive effect on the EV share [34]. It was estimated that a 6000 CAD subsidy per EV purchase would create a 15–20% point increase in the EV share by 2040, if the subsidy was put in place for the whole 20 years [34]. In [38], it was found that a 1000 USD increase in financial incentive would cause the EV market share to increase by 0.06%. However, this study was conducted when the market was different, with only a limited number of BEV models available, which likely affects its applicability in the current market situation.

Lutsey et al. identified that price parity between BEVs and conventional cars could be achieved in Chinese markets between the years 2026 and 2029, while shorter-range vehicles could achieve parity in the year 2025 [39]. However, they note that, if fewer resources are focused on technical advancement in this field in China, there could be a 1–3-year delay for price parity. This is also supported by the results of [40], in which a possible price parity for small vehicles in 2025 was indicated, suggesting that all BEV models will be competitively priced against the regular alternatives at around 2030. In [18], it was estimated that a rapid increase in the EV share would occur after the year 2029, when battery costs will reach their lowest level. The decreasing price of EV batteries is linked with a reduction in the purchase price of EVs, which would, in turn, affect the need for a subsidy.

2.1.2. Impacts of Fuel- and Use Cost Difference on the Rate of EV Adoption

Fuel costs and use costs are important factors that affect the total cost of ownership. Increasing fuel prices make low-emission vehicles and EVs more appealing, since even with larger up-front payments, the total costs of ownership could be lower. In a study on Italian markets, it was found that the competitive pricing of BEVs would generate a twofold market [41]. This study referred to a situation where there is a good charging infrastructure that allows people who drive more to use EVs and gain benefits from lower use costs, while people driving less often can use petrol cars and benefit from lower up-front costs. It was also noticed that, even if there were no EV purchase subsidies in place by the year 2025, an increase in gasoline prices would make EVs favourable [41]. In a German study, it was stated that a 25% increase in fuel prices would double the baseline EV-stock in their scenarios [42]. Similar results are shown in a study where it was estimated that a 7–8% increase in gasoline prices caused by carbon pricing development would lead to 10% increase in EV sales in Canada in 2040 [34].

2.2. Factors Related to Charging

Home charging is the most important charging related factor associated with BEV uptake [34,43,44]. In [43], it is noted that charging at home is a financial benefit, as it allows lower use costs for BEVs. In [44], it is stated that even though financial benefits are the major reason for EV uptake, the possibility of charging at home is a critical factor. According to [45], households residing in both separate dwellings and in apartments belonging to a housing complex prefer having access to private charging over using a communal charging station.

In a study, it was shown that new building codes, which require EV charging to be provided in residential and commercial buildings, could have a 1.5–4.5% effect in 2040 on new EV sales [34]. This study also found that, if the public charging network is raised to 0.5 chargers per gas station from the current rate of 0.18, this would result in a 0.5–2% increase in the new share of EVs in Canada in 2040 [34].

In [38], the relationship between socio-economic factors and electric vehicle market shares in 30 countries were examined. The study found that an additional charging station per 100,000 residents would increase the EV market share by 0.12%, which was found to be twice as effective as a 1000 USD financial incentive at encouraging EV adoption. In [20], it was observed that a 1% rise in the number of charging points led to the expectation of a 0.3% average rise in the BEV share in Swedish municipalities. This effect was greater in urban municipalities than in suburban and rural municipalities [20].

3. Methodology

This study presents results from a two-round survey using the Delphi method. The Delphi method uses a structured group communication process to solve a complex problem [46]. The process involves multiple rounds of communication between the researchers and respondents, wherein the respondents answer a set of questions. After the researchers analyse these answers, the analysis is reported anonymously to the respondents and a new set of questions is proposed [46].

Traditionally, the Delphi method has been implemented in studies aiming to reach expert consensus when studying a probable future [47]. However, in this study we chose the Disaggregative Delphi approach, which aims to explore alternative futures [48]. This was selected for our Delphi study as the aim was to explore experts' views on the future without the need to reach a consensus, embracing the versatility of perceptions. The process of the Delphi study is shown in Figure 1.

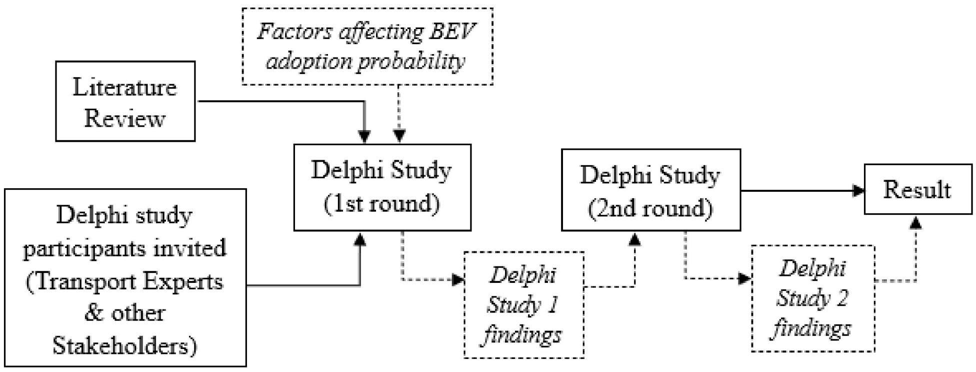

Figure 1. The Delphi Study Process.

Respondents were transport experts and stakeholders of the EV Ecosystem from Finland (details in Section 3.1, Table 1). Since all participants are experts, they will be referred to as respondents throughout this paper. Data were collected using an online tool called LimeSurvey. An online tool was used due to the COVID-19 pandemic and the locations of the respondents. Since there was an interest in both the factors influencing purchase interest in BEVs, and the effects of these factors individually and together, the Delphi study was conducted in two rounds. The questionnaire for the second round was constructed based on the analysis of the responses of the first round of the Delphi study. A summary of the first-round results was shared with the respondents. Due to the iterative nature of the study, some of the results from the first round of Delphi study are presented in this methodology as the results were used to form the second round of Delphi study. To stress the importance of argumentation, the questionnaire of the Delphi study included several open-ended text questions.

Table 1. Delphi study respondent details.

Organisation Type	Invited Experts	First Round Respondents		Second Round Respondents	
	Number	Number	Share	Number	Share
Government agency	14	8	26.7%	5	26.3%
Municipal authority	5	4	13.3%	3	15.8%
Non-profit organisation	7	3	10.0%	1	5.3%
Research institute or university	7	7	23.3%	4	21.1%
Private company	13	7	23.3%	6	31.2%
Other	0	1	3.3%	0	0.0%
Total	46	30	100%	19	100%

The first round of the Delphi study ran from 26th of August to 9th of September 2021. The focus was on identifying the factors related to BEV adoption and estimating their effects in Finland in the year 2025. The second round of the Delphi study started less than a month after the first round closed, and it ran from 5th of October to 3rd of November 2021. It focused on the effects of the most important influencing factors identified in the first round, individually, in different combinations, and their total combined effects. During the second round, respondents were also asked to comment on the results of the first round of the Delphi study.

Throughout our study, we followed the Finnish National Board on Research Integrity, good academic practices, and the recognised norms of research ethics. The respondents gave consent to participate in the Delphi study, and they had the opportunity to decline and stop participating in the Delphi study at any time. Respondents were informed that they were not required to answer all questions.

Since the responses were collected anonymously, the responses could not be removed from the study data. No connecting information was collected for respondents, and thus, it was not possible to link answers from the two rounds of the Delphi study. However, given the small sample, there was a possibility to identify the actual respondent based on their job title, organisation type and LimeSurvey's respondent tracking tools. However, this information was only present during data collection and not used during the analysis. The respondent tracking was used to enable reminders to be sent to respondents, and this concern was resolved through the research privacy notice (created according to European General Data Protection Regulation) provided to the respondents. This notice and other information regarding the Delphi study, such as reporting and use, were presented as a statement to the respondents at the beginning of the Delphi study questionnaire.

The Delphi study questionnaire was available in both Finnish and English. Translations of the Delphi study questionnaire and results were developed by bilingual members of the research team. The Delphi study questionnaire for the first and second rounds are presented in the Supplementary Materials.

3.1. Delphi Study Respondents

The Delphi study respondents were identified as transport experts and stakeholders of the EV Ecosystem from Finland. The experts and stakeholders represented five different organisation types, namely, government agencies, municipal authorities, non-profit organisations, research organisations and universities, and private companies. The private companies consisted of charging providers, car dealer organisations and consultant companies working in the field of EV development. For every organisation type, several persons, either already known by the authors or considered relevant based on their job title, were contacted by email. The experts were briefly presented with the research topic and the aims of the study and were asked whether they would be willing to participate, or whether they would be able to name another suitable expert from their organisation or field they represent.

The number of Delphi study respondents, or the sample size, was based on factors such as the availability of experts (which could be reduced due to other commitments or disinterest in the next round), the research location in Finland (because the study is pertaining Finland), and the ability of the researcher(s) to conduct a Delphi study [49].

The first round of the Delphi study was sent to 46 experts (Table 1) and 30 responses were received (65.2% response rate). The second round of the Delphi study was sent out to the same 46 experts, and 19 answers were obtained (41.3%). Table 1 presents a summary of the experts by organisation type in the two study rounds. One expert is classified as 'Other' since the respondent had a long background in a government agency but was not affiliated to the agency during the study.

3.2. First Round of Delphi Study

The first round of the Delphi study focused on the different factors that may influence interest in purchasing a BEV by an ICE car owner when buying a new car in the year 2025. The basic scenario was presented: *When a person owning a petrol- or diesel-vehicle is purchasing a new car in Finland in 2025, the person has a 10% probability to choose a BEV. This 10% is defined as the baseline probability and refers to the situation in which no new measures have been implemented that would affect the uptake of BEVs in Finland.* The baseline probability of 10% was estimated based on the trend during 2019–2021 in Traficom's data [50] of new car sales in Finland.

It was highlighted to the experts that the baseline probability of 10% does not refer to the share of BEV sales in 2025, rather, it refers exclusively to a situation when a car buyer considers a shift from a petrol- or diesel-powered car to a BEV. The actual share of BEV sales is likely to be higher in the year 2025, since there is a greater probability that current BEV and plug-in hybrid car owners will choose a BEV as their next vehicle [26,51,52]. Throughout the Delphi study, it was stated that while the 10% probability represents the baseline, a minor shift referred to a 20% probability, a medium shift to 40% probability, and a major shift to 60% probability of changing from a petrol- or diesel-powered car to a BEV.

In the first round of the Delphi study, the first questions asked about individual factors that may affect the probability of choosing a new BEV instead of a petrol- or diesel-powered car, and the effects these factors may have on purchase probabilities in the target year of 2025. Factors were selected based on findings from Section 2. A summary of factors is presented in Table 2. Additional background information (about the situation in Finland) on the factors, provided to the experts during the Delphi study, is presented in the Supplementary Materials, Part 3.

Table 2. Background information on factors that affect BEV adoption probability.

Factor	Background Information
Purchase subsidy for a new BEV	Experts were asked to consider a situation where the provision of purchase subsidy would not continue after December 2021 in Finland, as there was no decision regarding year 2022 at the time of the Delphi study.
Annual taxation difference between a same-sized BEV and petrol-powered car	Current price difference informed to the experts was that a same-size petrol-powered car pays about EUR 20 less annual tax than a BEV. The calculation process is explained in the Supplementary Materials in Table S1.
Use cost difference for driving power per kilometre between a same-sized petrol-powered car and BEV	At the current price level, the cost of driving power of a medium-sized car is estimated to be about 14 cents/km for a petrol-powered car and 3 cents/km for a BEV. This results in a 11 cents/km price difference in use costs between petrol-powered cars and BEV. The calculation process is explained in the Supplementary Materials in Table S2. The cost of driving power for petrol-powered cars was used for calculating the use costs difference, because they are more common in the Finnish car fleet than diesel cars (1.88 million compared to 752,000 in the end of 2021 [53].
Share of households that have access to at least 11 kW home charging	Home charging was defined as the possibility of charging at least 11 kW and charging up to 50–60 kWh during the night in the vicinity of the home. This would allow a BEV with a range of about 300 km to charge, provided that the car's battery capacity does not otherwise limit this. It should be noted that not every car owner has a reserved off-street parking space. Especially in larger cities, many car owners are using residential on-street parking and cannot acquire their own home charging point. For example, in the inner city of Helsinki, approximately 50% of car owners have a residential parking permit, indicating that they probably do not have access to reserved off-street parking space [54]. In other cities, the share of car owners using on-street parking is lower, but there is no detailed data available. However, most of the car owners, who are dependent on on-street parking, are living in multi-unit residential buildings. In 2021, 47% of Finnish households lived in multi-unit residential buildings [55].
Number of public basic chargers per 10 EVs	A public basic charging point enables the transmission of electricity with a power of up to 22 kW. The Directive 2014/94/EU on the deployment of alternative fuels infrastructure recommends that there should be at least one public basic charging point for every 10 electric cars (BEVs and plug-in hybrids) [56]. In Finland, the ratio was 0.7 basic charging points for every 10 electric cars in June 2021 [57].
Number of public fast chargers per 100 BEVs	A public fast charging point enables the transmission of electricity with an output of more than 22 kW. The Directive 2014/94/EU on the deployment of alternative fuels infrastructure recommends that there should be at least one public fast charging point for every 100 BEVs [56]. In Finland, the ratio was 6 fast charging points for every 100 BEVs in June 2021 [57].
Share of commuters using passenger cars and also having the ability to charge at their workplaces	Workplace charging refers to a charging point with a power of at least 11 kW and allows charging up to 50–60 kWh, during the working day. This would allow a car to have a range of about 300 km, provided that the car's battery capacity does not otherwise limit this. According to the Finnish National Travel Survey [58], there is an estimated 750,000 daily car commutes to work in Finland. It is assumed that charging at a workplace is tax-free for the employee, as it is currently defined until the year 2025 in Finland [59].

All questions asked whether each factor would enable a change in probability (from the baseline of 10% to 20%, 40%, and 60%) in the interest in choosing a BEV, and what value that factor should have to enable the specific change in probability. For example, it was asked that "In your opinion, would it be possible to achieve a 20% probability of buying a BEV with the provision of a purchase subsidy?" If the expert answered "Yes", the expert was asked to present the value for the purchase subsidy likely to achieve the change in probability. For each factor, similar questions were presented for the 40% and the 60% probability. The expert was not asked to present any value if they considered that the factor would not enable the shift in the probability. After the three questions related to the probability changes, the experts were asked to give reasons for their answers related to each individual factor. Experts were also asked to name any other factors that might affect the adoption of BEVs in Finland by the year 2025, either positively or negatively. If these 'other factors' were found to be relevant by the authors, they were then considered in the second round of the Delphi study.

Next, the experts were asked about the baseline percentage, i.e., what is the probability for a petrol- or diesel-vehicle owner choosing a BEV in the year 2025, if no additional measures or changes in policies affecting the adoption of BEVs were implemented in Finland. This question was set to find out whether the expert considered the baseline probability to be different than the 10% stated in the prior questions. Answers to this question were used to set a more justified baseline probability for the second round of the Delphi study. In addition to asking about the baseline percent, the experts were asked to give reasons or to otherwise comment on their answer. The responses varied from 10% to 60%. The majority (59%) of the answers were between 20% to 40%, averaging to 31% (n = 29). As such, a rounded figure of 30% was selected for the baseline probability for the second round of the Delphi study. Based on the open comments, the main reasons for these higher probabilities were lower battery prices that would lead to lower prices of BEVs as well as development of the EV market, where more BEV models would exist due to both EU regulations and general demand in the global markets.

The first round of the Delphi study asked the experts to prioritise the seven factors named in Table 2, based on how great an impact they think the factors would have. Since the second round of the Delphi study planned to focus more on the combinations of different factors, the experts were next asked to choose two factors they thought would be the best combination to increase the number of BEVs in Finland. Here again, the experts were asked to give reasons for their views.

The final question was about the experts' organisation type (mandatory) and job title (optional to answer). These were used in reporting the respondents' profiles. The Delphi study questionnaire concluded with an open question where respondents could provide additional feedback.

3.3. Second Round of Delphi Study

The design of the second round of the Delphi study was finalised based on the input and the comments received in the first round of the Delphi study. The questions focused on the same metric, i.e., the probability of a petrol- or diesel-vehicle owner choosing a BEV in the year 2025 when buying a new car, but the way of setting the questions and the baseline probability were different. In the first round of the Delphi study, the experts were asked for the values related to the different factors in the three different probability changes. In the second round, the values for the different factors were given based on the first round of the Delphi study answers. The experts were asked about the effect, i.e., the probability that the given value would have. Based on the results from the first round of the Delphi study, the baseline of a 10% probability was changed to a 30% probability. Figure 2 presents this change in baseline probability and the factors considered in the first and second round of the Delphi study.

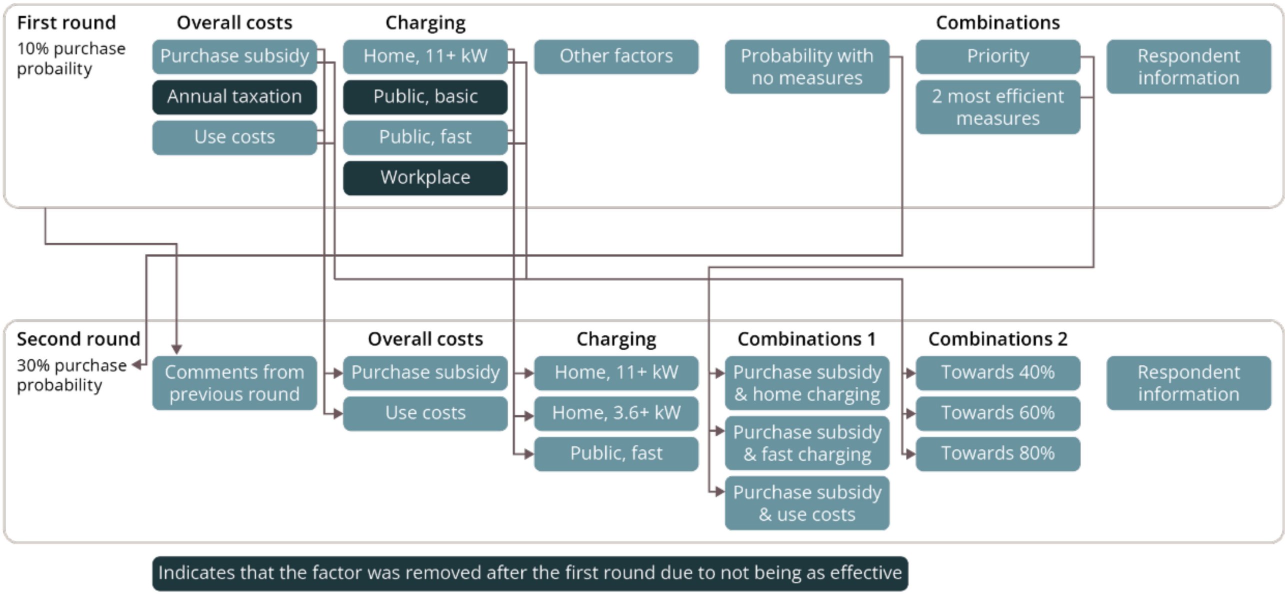

Figure 2. Factors and questions considered in the first and second rounds of the Delphi study.

To begin the second round of Delphi study, key findings from the first round were presented, and the experts were asked to comment on these. Next, the experts were asked about five factors and their effects on the probability of choosing a BEV, when a petrol or diesel car owner buys a new car in the year 2025, with the following values:

- if EUR 5500 purchase subsidy is offered for a new BEV;
- if 55% of car-using households have at least 11 kW charging capacity at home;
- if 55% of car-using households have at least 3.6 kW charging capacity at home;
- if there are at least 16 public fast charging points per 100 BEVs;
- if there is a difference of 26 c/km in use costs between same-sized BEVs and petrol cars.

Based on the results of the first round of the Delphi study, it was noted that annual taxation, public basic charging, and workplace charging were not considered to have much of an effect. Therefore, they were removed from the second round, but the purchase subsidy, use cost difference and public fast charging were kept. Home charging was presented as having at least 11 kW power in the first round, but during the second round, home charging was also asked to have at least 3.6 kW power based on the comments received in the first round.

The experts were also asked about the level of importance of each factor in different areas of Finland using a 5-point scale (very important, important, moderately important, slightly important, and not important). The different area types provided were urban, semi-urban, and rural areas, which follow the classes of Finnish urban–rural classification [60].

The next questions focused on combinations of factors affecting the probability of purchasing a new BEV. There were three different pairings: purchase subsidy and home charging; purchase subsidy and public fast charging; and purchase subsidy and difference in use costs between petrol cars and BEVs. Purchase subsidy was presented in each of the pairings based on the results of the first round of the Delphi study.

Following this, views on the combination of different factors were asked by presenting pre-given probabilities. The experts were asked which of the factors should be put in place to achieve a 40%, 60%, or 80% probability of purchasing a new BEV. For the 40% and 60% probabilities, the numerical values were based on the first round of the Delphi study answers, i.e., the average value given to reach 40% and 60% probability, respectively. For 80%, no numerical values were presented. Instead, the experts were able to choose the factors that would be needed as well as enter numerical values for those factors. For every probability, the experts were also allowed to mention other influencing factors.

Every set of questions in the second round included the option to provide open-ended comments to elaborate on their answers. The final questions in the second round of the Delphi study asked about the expert's organisation type and job title and general feedback on the study.

3.4. Analysis

For the analysis of the results, responses were first translated into English since most of the respondents opted to respond to the Delphi study in Finnish. The number and the percentages of responses, along with the descriptive statistics (average, standard deviation, minimum and maximum) related to the different factors were calculated for every question (as shown in the Supplementary Materials in Part 4. The number of responses for each question varied as respondents had the option to not answer some questions.

3.4.1. First Round of Delphi Study

The positive and negative issues affecting the demand of BEVs in Finland by the year 2025 were ranked by frequency. Responses to the question on ranking the seven factors (Table 2) were analysed to reveal the top four factors (purchase subsidy, home charging, public fast charging and use cost difference) that affect the purchase interests towards BEVs.

The average values of responses obtained for the questions related to these four factors were calculated based on the varying probabilities (20%, 40% and 60%) of the achievement of buying a BEV. Additionally, the cumulative average values of every factor were calculated. These values were used to frame questions for the second round of the Delphi study.

Similarly, the answers to questions where two of the seven original factors were combined were also ranked to understand the combinations of factors that would work best to raise purchase interest in BEVs.

3.4.2. Second Round of Delphi Study

The level of importance of the factors (top four factors from the first round of the Delphi study) to increase the probability of choosing a BEV in urban, semiurban, and rural areas were assessed.

The questions, where the most important factor from the first round of the Delphi study (purchase subsidy) was combined with the other factors, along with their average values (also obtained from the first round of the Delphi study), demonstrated which combination was preferred. The probabilities, provided by the respondents, were averaged, and the combination with the highest probability was ranked the highest.

As explained in Section 3.3, the last set of combination questions in the second round of the Delphi study were multiple choice questions. Respondents were required to choose the factors needed to achieve at least a certain percentage of probability (40%, 60% and 80%) that, when a petrol or diesel car owner buys a new car in the year 2025, a BEV will be chosen. In the analysis, the total number, and the averages of the responses (answered as 'yes' or 'no') were calculated to understand which factors would be the most important ones to achieve a certain probability.

4. Results

In the first round of the Delphi study, the respondents were asked to rank the seven factors from the most to the least impactful factor (Table 3). According to the respondents, purchase subsidy to buy a new BEV, increasing home charging options, and measures affecting car use costs were the most important factors. While formulating questions for the second round of the Delphi study, other than the three factors mentioned above, we also considered increasing public fast charging options as an additional factor (ranked fourth in the first round of the Delphi study).

Table 3. Impact ranking of the seven factors, which were discussed in the first round of the Delphi study. (1 = greatest impact, 7 = least impact).

Factor	Average Rank Score	Number of Respondents, Who Ranked Factor to Have the Most Impact
Increasing home charging options (N = 26)	2.19	8
Purchase subsidy to buy a new electric car (N = 25)	2.80	12
Measures affecting car use costs (N = 24)	3.54	6
Increasing public fast charging options (N = 26)	3.92	0
Increasing charging options at workplaces (N = 25)	4.72	0
Change in annual tax of electric car (N = 24)	5.13	0
Increasing public basic charging options (N = 25)	5.32	0

4.1. Cost-Related Factors

Figure 3 presents key results regarding purchase subsidy, use cost difference and annual taxation. The results will be discussed in more detail in their own subsections.

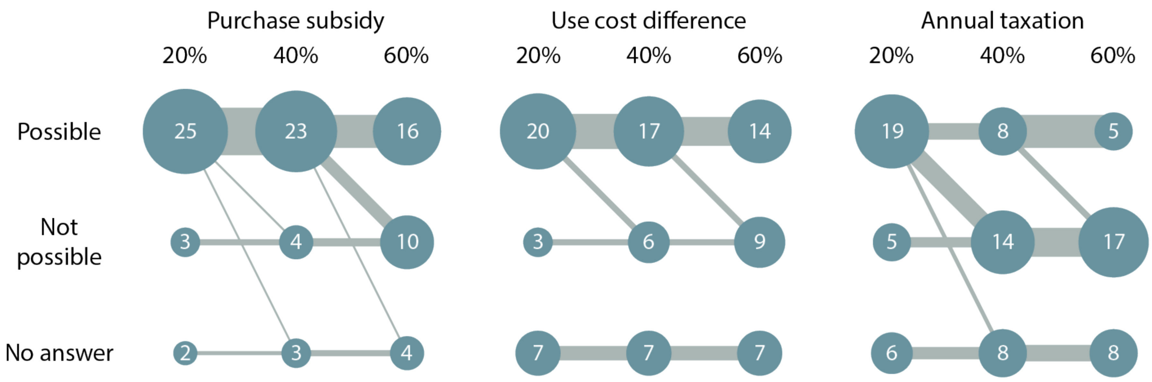

Figure 3. Deviation of results in purchase subsidy, use cost difference, and annual taxation. The weights of the lines correlate to the number of respondents (mentioned in the circles).

4.1.1. Purchase Subsidy

According to 77% of the respondents (N = 30) in the first round of the Delphi study, purchase subsidy is required to increase the probability of a person choosing a BEV. They were also of the opinion that, for the probability of purchasing a BEV to be 20%, 40% and 60%, the average values of the purchase subsidy should be EUR 3326 (N = 24), EUR 5364 (N = 22) and EUR 7750 (N = 16), respectively.

For the second round of the Delphi study, their average, EUR 5500, was considered as the value of the purchase subsidy. The respondents for the second round of the Delphi study opined that, with this value of purchase subsidy, the probability of a person choosing a BEV would be 56% (average value) (N = 17). Additionally, purchase subsidy was considered moderately important in urban areas, and important in semi-urban and rural areas. The reasons provided were that urban people generally have more money to invest in a new car, and the longer distances in rural areas would require vehicles with larger batteries that are usually more expensive. However, some respondents questioned whether purchase subsidies should vary by location. Respondents' comments to the questions on purchase subsidy highlighted the importance of purchase price and the price difference between ICE cars and BEVs:

> *"By the year 2025, the availability of different electric car models and price level of new electric cars will have improved significantly. It is also assumed that the price difference between an ICE car and a BEV will be much smaller in the year 2025 than it is now."* (Comment from first round of Delphi study)

> *"The purchase subsidy of EUR 5500 is already a significant incentive to purchase a BEV. In areas outside the metropolitan area, purchase subsidy is more important, because I believe that people living in these areas, need longer range (= more expensive) BEVs."* (Comment from second round of Delphi study)

Respondents also noted that although purchase subsidy may help to increase the purchase probability of BEVs, it is not a long-term solution to increase the BEV adoption rates.

4.1.2. Use Cost Difference

In the first round of the Delphi study, 67% of the respondents (N = 30) indicated that use cost difference (change in fuel price) per kilometre between same-sized petrol cars and BEVs is an important factor that would cause a minor change in the probability of a person choosing a BEV to 20%. The average value of use cost difference, as indicated by the respondents (N = 21), was 16 cents/km. For the probabilities to change to 40% and 60%, the average values of use cost difference were 25 and 36 cents/km (N = 18 and N = 15), respectively. The respondents of the second round of the Delphi study said that, for an average value of 26 cents/km use cost difference, the probability of a person choosing a BEV would change to 62%.

Use cost difference was the most important factor in rural areas and was also important in urban and semi-urban areas. The respondents' comments highlighted issues related to the use costs and the differences between ICE cars and BEVs:

> *"Fuel prices might be an effective factor, as it is a use cost every driver sees daily. Taxes are paid only once a year and are easy to forget."* (Comment from first round of Delphi study)

> *"Total cost of a BEV vs. an ICE car is a significant factor in choosing a new car if the difference can be made transparent to the buyer. The importance is emphasized in rural areas, where scepticism about BEVs is greatest."* (Comment from second round of Delphi study)

4.1.3. Annual Taxation

Changing the annual taxation between a BEV and a petrol-powered car of the same size was indicated to influence BEV adoption by 63% of the respondents (N = 19). For a change in the probability of a person choosing a BEV to 20%, 40% and 60%, the respondents suggested that the reduction in the annual taxation must be EUR 99 (N = 19), EUR 295 (N = 8) and EUR 342 (N = 5), respectively. Annual taxation was not considered in the second round of the Delphi study. The respondents' comments highlight the relative unimportance of the annual taxation:

> *"The differences in the current annual taxes on BEVs and petrol cars are so small that they are irrelevant for purchase of a car. In other words, annual taxes on a petrol car should be clearly higher if the taxes are to influence the situation when buying a car in favour of choosing a BEV."* (Comment from first round of Delphi study)

> *"The annual tax is not the biggest expense. If it was removed entirely, I think some (people) could be motivated to switch to BEVs. But if there was no other factor in place, I don't think it would do the trick on a large scale."* (Comment from first round of Delphi study)

4.2. Charging-Related Factors

Figure 4 presents key results regarding charging. The results will be discussed in more detail in their own subsections.

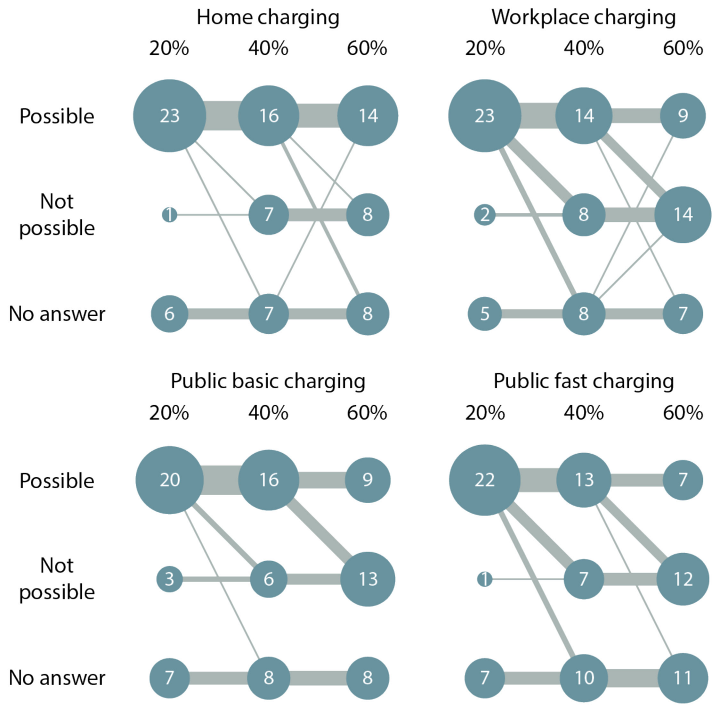

Figure 4. The deviation of results in different charging related factors. The weights of the lines correlate to the number of respondents (mentioned in the circles).

4.2.1. Home Charging

Respondents were asked how the probability of choosing a BEV would be affected by the provision of home charging with power of at least 11 kW. Responses indicated that the share of car-using households, that should have home charging possibility, was 39% for a minor change (N = 22), 53% for medium change (N = 16) and 68% for major change (N = 14). The overall average was 53%.

For the second round of the Delphi study, if 55% of car-using households were to have home charging possibility with at least 11 kW of power, the purchase probability of 50% was the average value given by the respondents (N = 18). If 55% of car-using households were to have a home charging possibility with at least 3.6 kW of power, the average value of the purchase probability given by the respondents (N = 18) was 47%. Related to the differences between 3.6- and 11-kW charging power, some respondents highlighted that offering faster (at least 11 kW) home charging on a large scale would be expensive.

Home charging was considered very important in urban areas and important in semiurban and rural areas. Comments from the respondents highlight that in semiurban and rural areas, where most people live in detached or row houses, home charging is usually easier to realise, as people often have their own parking space and a power outlet. However, it should be noted that charging power would be lower when using a regular outlet (max. 3.6 kW). In urban areas, one of the main issues is a lack of reserved parking spaces. Car owners using residential on-street parking must rely on public charging stations, workplace charging or charging points installed in on-street parking spaces. In addition, it is often challenging to install charging points in parking premises owned or managed by housing cooperatives. These issues can be related to technical issues, high infrastructure costs, complex ownership issues and difficult decision-making processes. Comments related to home charging by one respondent highlight these issues:

"Supporting slow (and) smart charging is worth it, but what is the point of supporting 11 kW charging with 3–5 times higher prices? Society should enable transition to electric transport, but 11 kW home charging is luxury, which should not be categorically supported." (Comment from second round of Delphi study)

"The biggest challenges are in cities and densely populated areas, because in addition to the decision-making of housing cooperatives, the problems are e.g., technical constraints (complex ownership of large parking garages, higher power requirements and thus higher costs, lack of parking space, etc.). Supporting resident parking charging would be one way to increase this if housing cooperatives do not have the possibility to organize charging." (Comment from second round of Delphi study)

4.2.2. Fast Public Charging

Respondents were asked about the provision of public fast charging (charging power > 22 kW) and the number of public fast charging points that should be available for every 100 BEVs in the year 2025. The average number of public fast charging points for every 100 BEVs were 8, 15, and 25 fast charging point per 100 BEVs, for 20%, 40% and 60% probabilities, respectively. For the second round of the Delphi study, an average purchase probability of 44% was given for an average of 16 fast charging point per 100 BEVs in the year 2025.

Two roles for public fast charging were identified by respondents. First, it enables charging in urban areas for those who do not have home charging possibilities, and second, it enables longer driving distances and relief from range anxiety. For this purpose, the location of charging points is very important (e.g., near highways, transport hub locations, locations near tourist destinations etc.).

"The locations of public charging stations must be selected according to a plan, at least on network level." (Comment from second round of Delphi study)

Additionally, the respondents were asked about the level of importance that the provision of fast public charging would have in increasing the probability of choosing a BEV in urban, semi-urban and rural areas. It was considered important in all three area types. However, the importance of fast public charging was higher in urban areas, where more people do not have the opportunity to charge at home.

4.2.3. Basic Public Charging

Respondents were asked if the provision of public basic charging (charging power $\leq$ 22 kW) would influence purchase decisions. If respondents considered that a change would be possible, they were also asked about the number of charging points that should be available for every 10 electric cars (BEVs and plug-in hybrids) in the year 2025 in order to achieve the change. The average number of public basic charging points were 1.5, 3, and 5 per 10 electric cars for 20%, 40%, and 60% probabilities, respectively. The overall average was 3 basic charging point per 10 electric cars.

The respondents did not consider public basic charging as important as home charging or public fast charging, because the availability of public basic charging is not usually considered when buying an electric car. However, public basic chargers can relieve range anxiety. Several respondents highlighted that the location of public basic charging points is more important than the exact number of charging points, and one responded commented that:

> *"Perhaps a more important concern is where public recharging points are located: they should be where people do business, but on the other hand also geographically widespread enough for "backup power" to always be available. The role of public recharging points is, in my view, more soothing to the consumer's fears of running out of power, to which it is difficult to give numerical value. However, the role is an important confidence builder."* (Comment from first round of Delphi study)

Based on the results of the first round of the Delphi study, in which basic public charging was not seen as an important factor, there were no questions related to basic public charging in the second round of the Delphi study.

4.2.4. Workplace Charging

Next, the provision of workplace charging was considered. If respondents considered change to be possible, they were also asked about the share of employees (using cars to travel to work) who should be able to charge at their workplace to achieve the change in probability. The share of employees using cars to travel to work who should have workplace charging were 30%, 51%, and 62%, for probabilities of 20%, 40%, and 60%, respectively, according to the respondents (N = 23, 14, 9). The total average was 43%.

Generally, workplace charging was seen as an important factor for those who do not have a home charging possibility. It was also noted that the popularity of workplace charging depends on the price of charging. In addition, if workplace charging is supported financially, it could encourage the use of private cars for commuting. This would contradict the aim of increasing the use of sustainable transport modes. Based on the responses from the first round of the Delphi study, workplace charging was not seen as an important factor in comparison to others; therefore, there were no further questions related to workplace charging in the second round of the Delphi study. The following quotes highlight some of the respondents' thoughts:

> *"Workplace charging certainly has a role to play in making electric cars more attractive, but perhaps it alone will not make a big difference."*

> *"Supporting the use of private vehicles as a factor runs counter to the goals of urban mobility, which aim at increasing the use of sustainable transport modes."* (Comments from first round of Delphi study)

4.3. Other Factors

Respondents were asked if there were other factors that could affect the adoption of BEVs in Finland by the year 2025, either positively or negatively. One of the most frequently mentioned factors was the power of setting an example, by, for instance, government and municipalities focusing their car purchases towards BEVs whenever possible. The respondents also mentioned a need for more specific information about the use and costs of BEVs in general to support the purchase decision; information about upcoming policies that might affect the pricing or availability; and easier solutions for charging. There are currently many charging service providers; therefore, there are many apps and different forms of payment. Related to charging, respondents also mentioned the need to continue to support the development of the charging network to make it more widely available. Regarding BEV prices, in addition to the new car purchase subsidy, there were various comments regarding used car purchase subsidies and scrapping bonuses, which could be used for second-hand BEV purchases. Additionally, the importance of continuing the taxation that supports EV purchases was stressed. There were also some comments regarding the supply of new cars, which may cause some challenges in the future, as well as comments about the possibility of levying road charges for ICE cars to support BEVs in the future.

Unfortunately, since the other factors mentioned by the respondents in the first round of the study could not be quantified, they were not included in the second round of the study. Additionally, some of the other factors mentioned were neither specific to Finland nor could they be addressed by Finnish policies (for example, supply of new cars), or would require a longer timeframe to be implemented than the year 2025 (for example, road charges).

4.4. Combinations of Factors

The second round of the study also considered combinations of factors that would affect purchase interest in BEVs. Table 4 indicates the values of the factors (purchase subsidy, home charging possibility with at least 3.6 kW power, public fast charging per 100 BEVs, and price difference in use costs) chosen by the respondents to have 40%, 60% and 80% probabilities of a petrol or diesel car owner choosing a BEV in the year 2025.

Table 4. Values of factors to achieve the probability of a BEV being chosen to replace ICE car.

Factor	40% Probability (n = 17)		60% Probability (n = 17)		80% Probability (n = 13)	
	Value	Number of YES Responses	Value	Number of YES Responses	Value	Number of YES Responses
Purchase subsidy	EUR 5400	12	EUR 7900	10	EUR 7111	9
Home charging possibility (at least 3.6 kW power)	55%	13	70%	11	84%	11
Public fast charging per 100 BEVs	15	6	25	7	18	7
Price difference in use costs	25 c/km	9	36 c/km	10	29 c/km	7

When given the option of a EUR 5500 purchase subsidy and 55% of car-owning households that have home charging possibility of at least 3.6 kW, an average probability of 63% was obtained for an owner of a petrol or a diesel car purchasing a BEV when choosing a new car in 2025. Similarly, when given the option of a EUR 5500 purchase subsidy and 16 public fast charging for every 100 BEVs, an average probability of 56% was obtained. For the third option, a purchase subsidy of EUR 5500 and a 26 c/km difference in use costs between petrol and BEVs, a 68% probability was calculated based on the responses.

4.4.1. 40% Probability of BEV Adoption with a Combination of Factors

Most respondents considered that a 40% probability was possible. Thirteen respondents chose home charging, and 12 respondents chose purchase subsidy as important factors to achieve the 40% shift. In most cases, these factors were both chosen by the same respondents. Use cost difference was chosen by nine respondents and public fast charging by six. However, it should be noted that when fast charging or use cost difference were selected, no respondents selected only one or both without choosing either purchase subsidy or home charging, as well. In most of the answers, use cost difference or public fast charging were only chosen with both the purchase subsidy and home charging. Thus, for the 40% probability, purchase subsidy and home charging are, together, the two most important influencing factors, which can be partially backed by the other factors, such as public fast charging or use cost difference.

4.4.2. 60% Probability of BEV Adoption with a Combination of Factors

Home charging and purchase subsidy were considered as the top influencing factors by 11 and 10 respondents, respectively. Additionally, use cost difference was also seen as an important factor, receiving 10 responses. Seven respondents chose public fast charging. As with the previous question, home charging and purchase subsidy were mostly chosen together (in eight responses), whereas fast charging was never the only chosen option and the use cost difference was considered as the only factor only by one respondent. As with the previous question about the 40% probability, use cost difference and public fast charging were always chosen along with either purchase subsidy, home charging or both. Based on the comments, one respondent acknowledged that instead of a 36 c/km use cost difference, a 26 c/km difference would be enough, just as in this case of the 40% probability question. Another respondent argued that a 60% probability would not be possible to achieve in this short timeframe.

4.4.3. 80% Probability of BEV Adoption with a Combination of Factors

For an 80% probability, the question was set differently, as the respondents were asked about potential values that would be needed for achieving an 80% probability. Contrary to the two previous questions, more respondents were unsure of their answers based on the comments given to this question. Some commented that achieving an 80% probability in the year 2025 would not be possible or a viable goal. On the other hand, respondents who answered that the probability could be reached selected home charging as the key factor. This factor was chosen by 11 of the 13 respondents. The average value of car-owning households who should have a home charging possibility of at least 3.6 kW of power rose from 70% (in the previous question) to 84%. The other key factor from the previous rounds—purchase subsidy—was chosen by nine respondents. However, the average value was lowered to EUR 7111 from EUR 7900. Both public fast charging and use cost difference were chosen by seven respondents, and the values of these factors provided by the respondents were lower than the values in the question related to a 60% probability.

In questions related to the three different probabilities, home charging was always the factor most often chosen. Additionally, it was the only factor estimated to have a higher value for reaching the highest probability (reaching 80% probability compared to 60% probability). For lower probabilities, home charging and purchase subsidy were clearly the most important factors, whereas higher probabilities would require a combination of all factors. Based on the comments of the respondents, the actual selection of vehicles available for purchase was also seen as one of the factors that would cause an effect:

> *"The most significant and clearest conversions of the factors to BEVs are achieved by enabling home charging for everyone. Workplace charging could serve as a home-like charging place on weekdays."* (Comment from second round of Delphi study)

> *"Much wider selection of BEVs, than what is currently available, would have a model for every need (and at the same time, smaller selection of PHEVs)".* (Comment from second round of Delphi study)

5. Discussion

The discussion is presented based on the results of the study. Sections 5.1 and 5.2 describe the outcomes and evaluation of the study conducted to understand the effects of factors on BEV adoption, respectively.

5.1. Outcome of the Delphi Study

Based on the findings from previous research, correctly placed subsidies increase EV sales. However, the size of the subsidies and their effects are varied in different studies and in different study contexts (geographical area, time of study) [34,36]. Based on the Delphi study, the purchase subsidy is seen to increase the probability of purchasing a BEV, and this probability increases with the size of the subsidy. Subsidies higher than EUR 7000 were suggested to reach high probabilities, which raises the question of how high the subsidy should be and what is viable? Sweden has had a subsidy in place of up to EUR 7000 for a zero-emission car [19]. This represents a EUR 5000 greater subsidy than Finland has had and could represent a financial burden for the national budget, with several economic constraints.

When discussing subsidies, future price development of BEVs and their batteries should also be considered; therefore, the size of the subsidy could be lowered when BEV prices decrease, since high subsidies would no longer be needed to make the price of BEVs competitive. Based on the results, estimates of the effects of some levels of purchase subsidy can be presented. However, as subsidies are not the only thing that affect purchase decisions for BEVs, other factors should also be considered at the same time and holistically.

This was also noticed in the feedback received while analysing the results of the first round of the study. One comment especially noted the systemic nature of the transition:

> *"This shows that (the) transition to a sustainable system of mobility is not just about replacing ICE vehicles with EVs. A very large part of the system needs to change."* (Comment from second round of Delphi study)

Taxation that favours vehicles with lower CO_2 levels was also identified as a factor that increases EV sales. In addition to taxation, it should be noted that other savings, such as savings in use costs, are also considered as influencing factors [34,42]. In this study, lowering annual taxation was not among the top four factors causing the most impact. This may be because annual car taxation already favours low-emission vehicles in Finland. However, currently, the annual tax for a mid-sized petrol-powered car is somewhat lower than the tax of a similar-sized BEV, and there would be cost savings with lower annual taxation for BEV owners in Finland. The annual tax for a BEV is paid based on the weight of the car. Therefore, the heavier the BEV (larger size car, larger capacity of batteries), the higher the annual tax. When the tax for registering a new car with zero emissions was removed (cars registered from October 2021 onwards) in Finland, the future annual tax was raised (EUR 65) to compensate for the fiscal situation of the Finnish state [61].

Lower use costs related to driving powers were seen to be more important than changes in annual taxation in Finland. However, the use cost difference was not ranked as a top factor but was instead seen as a factor that has a supportive role for car owners when they make a purchase decision for a BEV. Based on the results, the effects of use cost differences for the probability of choosing a BEV can be estimated, as can the use cost difference in terms of differences in fuel prices. The current use cost difference between a petrol-powered car and a BEV estimated and presented in the study was 11 cents/km, and for a considerable effect on the purchase probability, the cost difference was 26 cents/km. This would mean 3.4 euro/litre price for petrol if the electricity price remained at the current level, calculated based on home charging instead of the usually more expensive public charging. Related to fuel prices and the use cost difference, it should be noted that this study was carried out in autumn 2021; since then, there has been steep rise in both fuel and electricity prices in Finland, which affect, for example, the use cost difference between ICE cars and BEVs. In spring 2022, there was a sharp rise in fuel prices due to the war in Ukraine [62]. This rise in fuel prices has led to increased interest in BEVs globally and in Finland [63,64].

The use cost difference in driving powers could be affected by changes in the taxation of fuels and electricity. But with record-high prices, such as in 2022, there was no evidence of political interest in affecting these in Finland. Because the income from fuel taxes is very important for the Finnish state economy, it is not likely that the taxes will be lowered. However, some countries, including Germany and Sweden, decided to lower their fuel taxes because of the high fuel prices in spring 2022 [65]. In addition to differences in the prices of driving powers, differences in use costs can be affected by, for example, favouring policies for EVs in parking fees or by road user charges.

The results of this study indicate that the possibility of home charging is one of the key factors when considering buying a BEV, as BEVs are most often charged overnight at home. A noteworthy issue from the results was that providing 11 kW home charging compared to 3.6 kW home charging would not notably increase the purchase probability of a BEV in the year 2025. For most EV users, 3.6 kW home charging was considered sufficient, and only a small share of EV users would benefit from a higher home charging power. According to the results, the role of public charging and workplace charging is mainly to enable longer driving distances with BEVs and provide relief from range anxiety. However, public charging locations are essential for the BEV owners who do not have access to their own home charging point. These findings seem to be consistent with earlier research, as homes have been widely recognised as the most important charging location [44].

Regarding the regional aspects of the factors, use cost difference is a factor of the utmost importance in rural areas, as car mileage per day usually tends to be higher there.

In the case of purchase subsidies, there was not a large difference in the level of importance in these areas, but the importance of a purchase subsidy was a little lower in urban areas.

In our study, it was estimated that there is a 30% probability for a petrol or diesel car owner to choose a BEV when purchasing a new car in the year 2025 in Finland if there are no changes in the factors or policies which affect the purchase decision. The probability could be increased to 60% if a purchase subsidy of over EUR 7000 were to be put in place and if over two thirds of the car-using households would have access to home charging. Some advancements for both public fast charging and use cost differences would be needed as well. The values of the factors mentioned in the 60% probability question were higher than what was needed. This was ascertained from the values obtained from the respondents for the 80% probability question, which were lower than those of the 60% probability question. The reason for this could be that some of the respondents considered that reaching an 80% probability would not be feasible to achieve by the year 2025. Of those respondents who considered that that 80% probability could be achieved, most considered the ability to charge at home and purchase subsidy to be the main factors influencing the purchase of BEVs.

It should also be noted that there are several other factors that can affect people's decisions for choosing BEVs and these were not included in the Delphi study. They include, for example, growing awareness of the technology, environmental concerns, improved charging infrastructure and a larger portfolio of BEV models. Because of the large number of factors, it is difficult to analyse the precise importance and role of the different factors considered in the study and the effects of the other factors on the purchase interest towards BEVs. As the market is developing rapidly and the policies are also changing in accordance with the tightening climate change policies and the market development, the challenge of making future projections is even larger.

5.2. Evaluation of the Study

There were 30 and 19 respondents in the first and second round of study, respectively, resulting in response rates of 65.2% and 41.3%, respectively. Both response rates are sound, although a larger number of responses and higher response rate would have been good to highlight different perspectives related to the issues in the open-ended questions. The respondents were active in writing their justifications and arguments, which provided a good base for analysing the data. It is typical that the response rate drops in the second round, as respondents who did not answer the first round of the study, are not likely to engage in the study and there is some drop-out of respondents. Lower response rates in Delphi studies have been associated with larger panels and studies with more items included [66]. In this study, we focused on specific issues in the second round based on the results of the first round of the Delphi study to limit the length of the study and the items included. We also paid attention to the item order, length of time between the rounds, length of time each round was open for responses, format of the feedback, and details of reminders, which have also been recognised as the issues that affect the response rates [66]. Notwithstanding the lower number of respondents, we were able to achieve a good distribution among respondents from different types of organisations and a diverse range of expert views.

The most common issue in the open comments of the first round of the Delphi study was that the respondents felt that answering the questionnaire took more time than had been indicated in the beginning, and that the types of questions presented (change of probability) were challenging to answer. However, in general, the respondents commented that the Delphi study questionnaire gave them enough information about the questions' topics and the present state in Finland. In their comments, respondents also suggested that providing a bit more background information would have been useful for some questions. In general, the respondents felt that the second round of the Delphi study was challenging, too. One specific comment mentioned that, in future, the aspect of price elasticity of demand could be used.

It was possible to recognise the most important factors that should be studied more closely in the second round. However, based on this study, it is not possible to draw conclusions about the uncertainty about the baseline probability, or about the precise value for different factors, e.g., a purchase subsidy, which would be needed for a certain change in probability to purchase a BEV.

There have also been new government decisions after the Delphi study, as the purchase subsidy has been discontinued and the subsidies for charging infrastructure build-up have been continued in Finland. As the BEV market is currently changing rapidly, the different policies related to BEV adoption, such as the amount of the purchase subsidy and different subsidies for the build-up of charging infrastructure, should be constantly evaluated. The structured group communication process deployed in the Delphi method could be used regularly to assess experts' views related to the BEV adoption to support reaching policy objectives related to climate change and electrification of transport. During the evaluation of the results, it was observed that the data obtained were the views of the experts and the stakeholders.

6. Conclusions

This paper presented a Delphi study regarding the effects of different factors affecting the probability of a petrol or diesel car owner purchasing a BEV when choosing a new car in Finland in the year 2025. As the process in the Delphi study was iterative, with two survey rounds, the study presented in detail how the questions were developed and selected for both rounds of the Delphi study.

The research questions in this paper were:

RQ1: What are the factors that affect purchase interests towards BEVs?
RQ2: How do these factors affect purchase decisions?
RQ3: What are the most potent factors that affect purchase interests towards BEVs in Finland in the year 2025, and what policies can be implemented in Finland, if there is a will to support BEV adoption in future?

The first two research questions were answered based on previous studies. The literature review provided knowledge on which factors should be focused on for the Delphi study presented in this paper. Based on the previous studies, the most important factors affecting the adoption of BEVs are related to overall costs of the vehicles (such as purchase subsidies and lowered tax rates) and the aspects related to charging the vehicles, with home charging as the most important factor. Although there are many other factors, such as information needed on electric vehicles and their service and maintenance stations and lower parking prices, they are not particularly important, based on previous research. Therefore, the specific focus of this paper is on cost- and charging-related factors.

In general, it was found that subsidies can increase the EV market share when placed correctly. But it should be noted that changes in battery prices should be considered when deciding on the amount of purchase subsidy. If the price gap between ICE cars and BEVs decreases, there will be less need for subsidies to tackle BEVs' higher up-front costs. CO_2 based taxation was seen to have an effect as well, though the consumers prefer measures that provide immediate monetary benefits instead of overall lifecycle benefits. It was also observed that an increase in fuel costs and other use costs of ICE cars would increase the BEV share. With respect to BEV charging, home charging was seen to deliver both convenience and financial benefits, thus, making it a critical factor. The main role of public charging, on the other hand, is to give options to those who cannot charge at home or for those on long journeys. However, public charging does not have a large effect on EV share development. To conclude, the two most important factors were the purchase subsidy and home charging availability.

The third research question focused on the Finnish perspective, and the results were obtained from the two-round Delphi study. Home charging and purchase subsidies were seen as the factors that would affect the purchase decisions towards BEV adoption for ICE owners who are considering buying a new car in the year 2025. Lower use cost would have only a minor effect on interest towards BEVs. Although public fast charging would alleviate range anxiety, it was not assessed as being important either.

Generally, the two main factors with a major effect on BEV adoption were home charging and purchase subsidies, both in the literature and in the Delphi study conducted in Finland. In the Delphi study, these two factors were also typically chosen together when the respondents were asked to combine different factors that would allow for the higher probability of a BEV purchase. The results indicate that, for developing policies, these two factors should be considered together instead of choosing one over the other. Other factors (such as factors that affect use costs or the development of public fast charging) are important too, but they should be considered as supportive factors. These can increase interest in BEV adoption and should be considered together with policies related to purchase subsidies and home charging.

One limitation of the study is the fact that this study is based on the views of transport experts; the public may have different opinions. Another point to note is that this study was carried out in autumn 2021, after which the market has seen a rise in fuel and electricity prices in Finland; additional BEV models entering the market; and a rising inflation and interest rate level. In a study among Finnish citizens in June 2023, the number one factor affecting the purchase of an EV was the higher purchase price, whereas the factor was number four in a similar study in 2021 [67]. About half of the respondents estimate that a purchase subsidy would affect their car choice, and of these, the estimated purchase subsidy would need to be about 6000 euros [67]. These factors highlight that change in the market is rapid, and follow-up studies are needed.

For future research, we plan to take this research forward by conducting the same Delphi study with the public, to get their opinion. The results of this study will also be used to estimate the development of the Finnish car fleet in the future under different policy scenarios. As this study provides some information on what kind of change is expected through a policy change, the complete effect of these can be assessed. Additionally, due to changes in car fleet composition, changes in emissions can be estimated. Furthermore, the financial effects, and thereby, the cost efficiency, of different policies can also be calculated. Another possible future research study could be an analysis on perceptions of the differences between BEVs and fuel cell electric vehicles (with hydrogen).

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/futuretransp4010005/s1, S1: Delphi questionnaire in the first round, S2: Delphi questionnaire in the second round, S3: Additional information which was given to the respondents related to the first round of the Delphi study, S4: Key values of the results of the first and second rounds of Delphi study.

Author Contributions: Conceptualization, S.N., R.V., J.M., M.P. and H.L.; Methodology, S.N., R.V., J.M. and M.P.; Formal analysis, S.N., R.V. and J.M.; Investigation, S.N., R.V. and J.M.; Data curation, S.N., R.V. and J.M.; Visualization, R.V.; Writing—Original Draft, S.N., R.V., J.M. and M.P.; Writing—Review and editing, S.N., R.V., J.M., M.P., H.L. and S.O.; Validation, S.N., H.L. and S.O.; Supervision, H.L.; Funding acquisition, S.N. and H.L.; Project administration, H.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the Kone Foundation's personal grant (Grant No. 202009549) and the LIFE Programme of the European Union (LIFE17 IPC/FI/000002 LIFE-IP CANEMURE-FINLAND). The work reflects only the author's view, and the EASME/Commission is not responsible for any use that may be made of the information it contains.

Institutional Review Board Statement: Ethical review and approval were waived for this study, due to the reason that the survey did not deviate from the principle of informed consent, nor contain any of the criteria for ethical review by the Finnish National Board on Research Integrity and Ethics Committee of the Tampere Region.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author, S.N. The data are not publicly available due to the data containing information that could compromise the privacy of research respondents.

Acknowledgments: The authors wish to thank all respondents of the Delphi study questionnaires and the people, who contributed by helping the authors find the right people within their organisations to participate in the Delphi study.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Broadbent, G.H.; Metternicht, G.; Drozdzewski, D. An Analysis of Consumer Incentives in Support of Electric Vehicle Uptake: An Australian Case Study. *World Electr. Veh. J.* **2019**, *10*, 11. [CrossRef]
2. European Commission. Stepping up Europe's 2030 Climate Ambition—Investing in a Climate-Neutral Future for the Benefit of our People. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0562 (accessed on 27 October 2022).
3. Climate Act (423/2022). Finnish Legislation. Available online: https://ym.fi/en/climate-change-legislation (accessed on 1 July 2022).
4. Wang, S.; Ge, M. *Everything You Need to Know About the Fastest-Growing Source of Global Emissions: Transport*; WRI—World Resources Institute: Washington, DC, USA, 2019.
5. European Commission. CO_2 Emission Performance Standards for Cars and Vans. Available online: https://ec.europa.eu/clima/eu-action/transport-emissions/road-transport-reducing-co2-emissions-vehicles/co2-emission-performance-standards-cars-and-vans_en (accessed on 3 November 2022).
6. United Nations. *Paris Agreement. UNCCC—United Nations Framework Convention on Climate Change*; United Nations: New York City, NY, USA, 2016; 54p.
7. Statistics Finland. Preliminary Population Structure by Area. Statistics Finland's Free-of-Charge Statistical Databases. Available online: https://pxdata.stat.fi/PxWeb/pxweb/en/StatFin/StatFin__vamuu/statfin_vamuu_pxt_11lj.px/ (accessed on 20 April 2023).
8. Traficom. Passenger Cars in Traffic on 31 March 2023 by Area. Traficom Statistics Database. Available online: https://trafi2.stat.fi/PXWeb/pxweb/en/TraFi/TraFi__Liikennekaytossa_olevat_ajoneuvot/ (accessed on 21 April 2023).
9. Ministry of Transport and Communications. *Roadmap to Fossil-Free Transport: Government Resolution on Reducing Domestic Transport's Greenhouse Gas Emissions*; Finnish Ministry of Transport and Communications: Helsinki, Finland, 2021; 56p.
10. Information Centre of Road Transport. New Registrations by Vehicle Group 2022. Available online: https://www.aut.fi/en/statistics/new_registrations/yearly_new_registrations (accessed on 3 November 2022).
11. Information Centre of Road Transport. Vehicle Fleet Age Statistics 2022. Available online: https://www.aut.fi/files/2529/Autokannan_ikatilastoja_2021.pdf (accessed on 3 November 2022).
12. Traficom. Autotiheys Vaihtelee Suomessa—Vaihtoehtoisten Käyttövoimien Nousu Näkyy Uudellamaalla. Available online: https://www.traficom.fi/fi/ajankohtaista/autotiheys-vaihtelee-suomessa-vaihtoehtoisten-kayttovoimien-nousu-nakyy-uudellamaalla (accessed on 20 April 2023).
13. VTT, Technical Research Centre of Finland. Liikenteen Kasvihuonekaasupäästöjen Perusennuste 2020–2045 (In Finnish, Translated: Baseline Forecast of Transport Greenhouse Gas Emissions). 2021. Available online: https://www.lvm.fi/-/ennuste-tieliikenteen-paastot-laskevat-hieman-ennakoitua-nopeammin-syyna-sahkoautojen-yleistyminen-1509917 (accessed on 13 February 2022).
14. Viri, R.; Mäkinen, J.; Liimatainen, H. Modelling car fleet renewal in Finland: A model and development speed-based scenarios. *Transp. Policy* **2021**, *112*, 63–79. [CrossRef]
15. Higueras-Castillo, E.; Kalinic, Z.; Marinkovic, V.; Liébana-Cabanillas, F.J. A mixed analysis of perceptions of electric and hybrid vehicles. *Energy Policy* **2020**, *136*, 111076. [CrossRef]
16. Focas, C.; Christidis, P. Peak Car in Europe? *Transp. Res. Procedia* **2017**, *25*, 531–550. [CrossRef]
17. Robertson, L.; Helveston, J.P. Not all subsidies are equal: Measuring preferences for electric vehicle financial incentives. *Environ. Res. Lett.* **2022**, *17*, 084003. [CrossRef]
18. Watabe, A.; Leaver, J.; Ishida, H.; Shafiei, E. Impact of low emissions vehicles on reducing greenhouse gas emission in Japan. *Energy Policy* **2019**, *130*, 227–242. [CrossRef]
19. Swedish Transport Agency. Bonus—For Low Emission Vehicles. Available online: https://www.transportstyrelsen.se/en/road/Vehicles/bonus-malus/bonus/ (accessed on 3 November 2022).
20. Egner, F.; Trosvik, L. Electric vehicle adoption in Sweden and the impact of local policy instruments. *Energy Policy* **2018**, *121*, 584–596. [CrossRef]
21. Brătucu, G.; Trifan, A.; Dovleac, L.; Chițu, I.B.; Todor, R.D.; Brătucu, R. Acquisition of Electric Vehicles—A Step towards Green Consumption. Empirical Research among Romanian Students. *Sustainability* **2019**, *11*, 6639. [CrossRef]
22. Mendes Lopes, M.; Moura, F.; Martinez, L.M. A rule-based approach for determining the plausible universe of electric vehicle buyers in the Lisbon Metropolitan Area. *Transp. Res. Part A Policy Pract.* **2014**, *59*, 22–36. [CrossRef]

23. Vassileva, I.; Campillo, J. Adoption barriers for electric vehicles: Experiences from early adopters in Sweden. *Energy* **2017**, *120*, 632–641. [CrossRef]
24. Yang, T.; Long, R.; Li, W.; Rehman, S.U. Innovative Application of Public–Private Partnership Model to Electric Vehicle Charging Infrastructure in China. *Sustainability* **2016**, *8*, 738. [CrossRef]
25. Graham-Rowe, E.; Gardner, B.; Abraham, C.; Skippon, S.; Dittmar, H.; Hutchins, R.; Stannard, J. Mainstream consumers driving plug-in battery-electric and plug-in hybrid electric cars: A qualitative analysis of responses and evaluations. *Transp. Res. Part A Policy Pract.* **2012**, *46*, 140–153. [CrossRef]
26. Larson, P.D.; Viáfara, J.; Parsons, R.V.; Elias, A. Consumer attitudes about electric cars: Pricing analysis and policy implications. *Transp. Res. Part A Policy Pract.* **2014**, *69*, 299–314. [CrossRef]
27. Murugan, M.; Marisamynathan, S. Analysis of barriers to adopt electric vehicles in India using fuzzy DEMATEL and Relative importance Index approaches. *Case Stud. Transp. Policy* **2022**, *10*, 795–810. [CrossRef]
28. Gulzari, A.; Wang, Y.; Prybutok, V. A green experience with eco-friendly cars: A young consumer electric vehicle rental behavioral model. *J. Retail. Consum. Serv.* **2022**, *65*, 102877. [CrossRef]
29. National Research Council. Overcoming Barriers to Deployment of Plug-in-Electric Vehicles. Available online: https://nap.nationalacademies.org/catalog/21725/overcoming-barriers-to-deployment-of-plug-in-electric-vehicles (accessed on 15 December 2023).
30. Egbue, O.; Long, S. Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions. *Energy Policy* **2012**, *48*, 717–729. [CrossRef]
31. Lindgren, J.; Lund, P.D. Effect of extreme temperatures on battery charging and performance of electric vehicles. *J. Power Sources* **2016**, *328*, 37–45. [CrossRef]
32. Mruzek, M.; Gajdáč, I.; Kučera, L.; Gajdošík, T. The Possibilities of Increasing the Electric Vehicle Range. TRANSCOM 2017: International scientific conference on sustainable, modern and safe transport. *Procedia Eng.* **2017**, *192*, 621–625. [CrossRef]
33. Kim, S.; Lee, J.; Lee, C. Does Driving Range of Electric Vehicles Influence Electric Vehicle Adoption? *Sustainability* **2017**, *9*, 1783. [CrossRef]
34. Melton, N.; Axsen, 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]
35. Kverndokk, S.; Figenbaum, E.; Hovi, J. Would my driving pattern change if my neighbor were to buy an emission-free car? *Resour. Energy Econ.* **2020**, *60*, 101153. [CrossRef]
36. Brand, C.; Anable, J.; Tran, M. (Accelerating the transformation to a low carbon passenger transport system: The role of car purchase taxes, feebates, road taxes and scrappage incentives in the UK. *Transp. Res. Part A Policy Pract.* **2013**, *49*, 132–148. [CrossRef]
37. Lam, A.; Mercure, J. Which policy mixes are best for decarbonising passenger cars? Simulating interactions among taxes, subsidies and regulations for the United Kingdom, the United States, Japan, China, and India. *Energy Res. Soc. Sci.* **2021**, *75*, 101951. [CrossRef]
38. Sierzchula, W.; Bakker, S.; Maat, K.; van Wee, B. The influence of financial incentives and other socio-economic factors on electric vehicle adoption. *Energy Policy* **2014**, *68*, 183–194. [CrossRef]
39. Lutsey, N.; Cui, H.; Yu, R. *Evaluating Electric Vehicle Costs & Benefits in China in 2020–2035 Time Frame*; White Paper; International Council on Clean Transportation (ICCT): Washington, DC, USA, 2021.
40. Ouyang, D.; Zhou, S.; Ou, X. The total cost of electric vehicle ownership: A consumer-oriented study of China's post-subsidy era. *Energy Policy* **2021**, *149*, 112023. [CrossRef]
41. Danielis, R.; Giansoldati, M.; Rotaris, L. A probabilistic total cost of ownership model to evaluate the current and future prospects of electric cars uptake in Italy. *Energy Policy* **2018**, *119*, 268–281. [CrossRef]
42. Gnann, T.; Plötz, P.; Funke, S.; Wietschel, M. What is the market potential of plug-in electric vehicles as commercial passenger cars? A case study from Germany. *Transp. Res. Part D Transp. Environ.* **2015**, *37*, 171–187. [CrossRef]
43. Scorrano, M.; Danielis, R.; Giansoldatim, M. Dissecting the total cost of ownership of fully electric cars in Italy: The impact of annual distance travelled, home charging and urban driving. *Res. Transp. Econ.* **2020**, *80*, 100799. [CrossRef]
44. Mukherjee, S.C.; Ryan, L. Factors influencing early battery electric vehicle adoption in Ireland. *Renew. Sustain. Energy Rev.* **2020**, *118*, 109504. [CrossRef]
45. Pellegrini, A.; Borriello, A.; Rose, J.M. Assessing the willingness of Australian households for adopting home charging stations for electric vehicles. *Transp. Res. Part C Emerg. Technol.* **2023**, *148*, 104034. [CrossRef]
46. Linstone, H.A.; Turoff, M. *The Delphi Method: Techniques and Applications*; Addison-Wesley Publishing Company: Boston, MA, USA, 2002.
47. Hasson, F.; Keeney, S.; McKenna, H. Research guidelines for the Delphi survey technique. *J. Adv. Nurs.* **2000**, *32*, 1008–1015. [CrossRef] [PubMed]
48. Tapio, P.; Paloniemi, R.; Varho, V.; Vinnari, M. The unholy marriage? Integrating qualitative and quantitative information in Delphi processes. *Technol. Forecast. Soc. Change* **2011**, *78*, 1616–1628. [CrossRef]
49. Hallowell, M.R.; Gambatese, J.A. Qualitative Research: Application of the Delphi Method to CEM Research. *J. Constr. Eng. Manag.* **2010**, *136*, 99–107. [CrossRef]

50. Traficom. First Registrations of Passenger Cars by Model and Area, by Month in 2014 to 2022. Traficom Statistics Database. Available online: https://trafi2.stat.fi/PXWeb/pxweb/en/TraFi/TraFi__Ensirekisteroinnit/050_ensirek_tau_105.px/ (accessed on 3 November 2022).
51. Kalenoja, H. *Ladattavien Autojen Käyttötutkimus—Selvitys Ladattavien Hybridien ja Täyssähköautojen Käyttötavoista*; The Finnish Information Centre of Automobile Sector: Helsinki, Finland, 2020; 47p.
52. Chen, C.; Zarazua de Rubens, G.; Noel, L.; Kester, J.; Sovacool, B.K. Assessing the socio-demographic, technical, economic, and behavioral factors of Nordic electric vehicle adoption and the influence of vehicle-to-grid preferences. *Renew. Sustain. Energy Rev.* **2020**, *121*, 109692. [CrossRef]
53. Statistics Finland. Cars by Driving Power, 1990–2021, Statistics Finland's Free-of-Charge Statistical Databases. Available online: https://statfin.stat.fi/PxWeb/pxweb/en/StatFin/StatFin__mkan/statfin_mkan_pxt_11ie.px/ (accessed on 6 November 2022).
54. Mäkinen, J.; Tiikkaja, H. Kadunvarsien asukaspysäköinnin vaikutus täyssähköautojen yleistymiseen Helsingissä. *Liikenne* **2020**, *2020*, 33–54.
55. Statistics Finland. Household-Dwelling Units and Dwelling Population by Tenure Status, Type of Building and Number of Rooms, 2005–2021. Statistics Finland's Free-of-Charge Statistical Databases. Available online: https://pxdata.stat.fi/PxWeb/pxweb/en/StatFin/StatFin__asas/statfin_asas_pxt_115y.px/ (accessed on 20 April 2023).
56. European Commission. Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the Deployment of Alternative Fuels Infrastructure. Official Journal of the European Union. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0094 (accessed on 27 October 2022).
57. Sähkoautoilijat. Latauskartta—Number of Public Charging Stations. Available online: https://latauskartta.fi/ (accessed on 3 November 2022).
58. Finnish Transport Agency. National Travel Survey 2016. Helsinki 2018. Statistics from the Finnish Transport Agency 1/2018. 113p. Available online: https://urn.fi/URN:ISBN:978-952-317-513-6 (accessed on 21 March 2022).
59. Finnish Tax Administration. Luontoisedut Verotuksessa VH/6005/00.01.00/2022 (In Finnish, Translated: Taxation of in-Kind Benefits). Available online: https://www.vero.fi/syventavat-vero-ohjeet/ohje-hakusivu/47886/luontoisedut-verotuksessa12/ (accessed on 9 February 2023).
60. Finnish Environment Institute. *YKR Urban-Rural Classification, Spatial Dataset*; Finnish Environment Institute: Helsinki, Finland, 2018.
61. Finnish Parliament. Government's Proposal (HE 176/2021 vp) for Amendment of Section 10 of the Vehicle Tax Act. Available online: https://www.eduskunta.fi/FI/vaski/HallituksenEsitys/Sivut/HE_176+2021.aspx (accessed on 27 October 2022).
62. BBC Ukraine Conflict: Petrol at Fresh Record as Oil and Gas Prices Soar. Available online: https://www.bbc.com/news/business-60642786 (accessed on 3 November 2022).
63. Time Magazine. High Gas Prices Are Pushing Electric Car Sales to a Tipping Point. Available online: https://time.com/6173178/high-gas-prices-electric-vehicles/ (accessed on 25 November 2022).
64. Yle. In Car Shops, Electric Cars Are Almost Sold Out-a Slightly Used Electric Car Costs Even More than a New One (Original in Finnish). Available online: https://yle.fi/uutiset/3-12410009 (accessed on 25 November 2022).
65. Bruegel. National Fiscal Policy Responses to the Energy Crisis. Available online: https://www.bruegel.org/publications/datasets/national-policies-to-shield-consumers-from-rising-energy-prices/ (accessed on 5 December 2022).
66. Gargon, E.; Crew, R.; Burnside, G.; Williamson, P.R. Higher number of items associated with significantly lower response rates in COS Delphi surveys. *J. Clin. Epidemiol.* **2019**, *108*, 110–120. [CrossRef]
67. The Finnish Information Centre of Automobile Sector. Suomalaisten Autoilu 2023—Kansalaisten Näkemyksiä Liikenteen Sähköistymisestä ja Liikenteen Päästövähennystoimista (In Finnish, Translated: Finns' Driving Habits in 2023—Citizens' Perspectives on the Electrification of Transport and Emission Reduction Measures in Traffic). Internet Study for Citizens. 2023. Available online: https://www.aut.fi/files/2791/Suomalaisten_autoilu_2023.pdf (accessed on 15 December 2023).