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Demand determinants for electric vehicles in Poland

Determinanty popytu na pojazdy elektryczne w Polsce

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Abstract. Transportation is one of the main sectors of any country's economy. The development of transportation positively influences changes in industrial activity, and the growth of population mobility. An important feature of responsible transport development is the formation of legally established, technical and economic conditions consistent with the idea of sustainable development. Electric cars are a solution that fits into this idea. The increase in the number of electric vehicles can significantly improve the environment, taking into account the use of renewable energy to power them. The purpose of this article is to identify the factors affecting the demand for electric vehicles among individuals in Poland. A hypothetical assumption was made that the factors affecting demand for electric vehicles are mainly economic in nature. The realization of the above objective involved the use of several research methods. In the theoretical part, the methods used were: analysis of literature and source documents. In the research part, the diagnostic survey method was used. Frequency indicators were used to analyze the results. Based on the research conducted, it can be concluded that: few people own electric cars and only 1/3 of respondents are considering the purchase of such a car. According to the respondents, these cars are too expensive and are not suitable for long-distance travel, while the advantages are their economy and environmental friendliness. Among the respondents, few had knowledge of subsidies for the purchase of electric vehicles. Factors that could influence the purchase of vehicles among individuals were mentioned: the possibility of using free parking spaces, bus lanes intended for public transportation, entry into the city's clean transportation zones, and subsidies. The results of the study help fill the research gap relating to economic issues related to the development of electormobility.
Keywords: electromobility, demand, electric vehicles, customer, charging infrastructure

Abstrakt. Transport jest jednym głównych sektorów gospodarki każdego państwa. Rozwój transportu wpływa pozytywnie na zmiany w działalności przemysłowej oraz wzrost mobilności ludności. Ważną cechą odpowiedzialnego rozwoju transportu jest kształtowanie ustanowionych prawem, technicznych oraz ekonomicznych warunków zgodnych z ideą zrównoważonego rozwoju. Rozwiązaniem wpisującym się w tę ideę są samochody z napędem elektrycznym. Wzrost liczby pojazdów elektrycznych może znacząco wpłynąć na poprawę środowiska naturalnego, przy uwzględnieniu wykorzystywania do ich napędu energii ze źródeł odnawialnych. Celem artykułu było zidentyfikowanie czynników wpływających na popyt na pojazdy elektryczne wśród osób indywidualnych Polsce. Przyjęto hipotetyczne założenie, że czynniki mające wpływ na popyt na pojazdy elektryczne mają głównie charakter ekonomiczny. Realizacja powyższego celu polegała na zastosowaniu kilku metod badawczych. W części teoretycznej wykorzystano metody: analizę literatury i dokumentów źródłowych. W części badawczej wykorzystano metodę sondażu diagnostycznego. Do analizy wyników wykorzystano wskaźniki częstotliwości. Na podstawie przeprowadzonych badań można stwierdzić, że: niewiele osób posiada samochody z napędem elektrycznym i tylko 1/3 badanych bierze pod uwagę zakup takiego samochodu. Według respondentów samochody te są zbyt drogie i nie nadają się na dalekie podróże natomiast zaletami tego typu pojazdów jest ich ekonomiczność i ekologiczność. Wśród badanych niewiele osób miało wiedzę na temat dopłat do zakupu pojazdów elektrycznych. Czynnikami które mogłyby wpłynąć na zakup pojazdów wśród osób indywidualnych wymieniono: możliwość korzystania z: darmowych miejsc parkingowych, buspasów przeznaczonych dla komunikacji miejskiej, wjazdu do stref czystego transportu w mieście oraz dofinansowanie zakupu pojazdu. Uzyskane wyniki badań pozwalają na wypełnienie luki badawczej odnoszącej się do kwestii ekonomicznych związanych z rozwojem elektormobilności.
Słowa kluczowe: elektromobilność, popyt, pojazdy elektryczne, klient, infrastruktura ładowania

Introduction

Each countries' efforts to generate the lowest possible level of greenhouse gas emissions into the atmosphere and the social awareness are creating the challenges of this century, and among these challanges is electromobility. Electromobility is defined as the overall issues relating to vehicle technology, charging infrastructure, and the social and economic issues (Kosmala, Sledzik, Skalski, 2020, p. 11, Schumann in. 2017, p. 2). It does not refer only to cars, but also to electric bicycles, urban streetcars, electric buses or scooters, which are powered by electricity stored in a battery (Dróżdż, 2018, p. 11). As Janczewski points out, electromobility as a concept implies the use of clean, emission-free electric cars instead of fossil-fuel powered cars and can be considered in the dimension of a city, region, country, continent or much more broadly (Janczewski, 2017, p. 205).

Electromobility in practical terms is becoming a global trend and a test of the automotive industry's strength. Experts predict that electric vehicles will replace vehicles powered by traditional energy sources. According to a KPMG report, in 2020 the number of combustion-powered vehicles purchased decreased significantly, but 43% more electric cars were registered compared to the previous year (Karpiesiuk, Kozerski, 2021, p. 20). Initially, electric vehicles were not very popular due to the high price and lack of adequately available infrastructure, so market growth was slow. The situation changed dramatically in 2016, when the number of electric-powered vehicles began to grow exponentially (Dróżdż, 2018, p. 20).

By 2021, more than 16.5 million electric cars were on the road, a threefold increase in just three years (IEA, 2022), but electromobility globally is not growing at the same pace. Highly developed and industrialized countries have achieved a significant lead in this area. Many countries have incentive systems to convince people to buy an electric car (Karpiesiuk, Kozerski, 2021, p. 20). Among European countries, Norway (86%), Iceland (72%), Sweden (43%) and the Netherlands (30%) had the highest market share in new electric car sales in 2021. Netherlands (30%), followed by France (19%), Italy (9%) and Spain (8%) (IEA, 2022). Poland ranked within the lowest among the European countries (autoEXPERT, 2022).

Taking into account the above results, the goal of the study was the identification of factors influencing demand for electric vehicles among individuals in Poland.

The realization of the above objective involved the use of several research methods. In the theoretical part, the methods used were: analysis of literature and source documents. In the research part, the diagnostic survey method was used. Frequency indicators were used to analyze the results.

Selected activities for the development of electromobility in Poland

In the first instance, the development of electromobility in Poland requires policy changes and appropriate structural adjustments in the economy through the adoption of a proper strategy of action that outlines both the goals and the means of achieving them over an à priori timeline. The strategy itself is a necessary condition, though not the only one. Without adequate financial resources and adequate technological facilities, it is difficult to implement ambitious plans (Murawski, Szczepański, 2014, pp. 2249 – 2258, Tomaszewski, 2019 p. 155). Speaking of Polish electromobility, reference should be made to the Strategy for Responsible Development (Strategi ana Rzecz Odpowiedzialnego Rozwoju, 2017). The Strategy›s specific goals are sustainable economic growth, socially sensitive and territorially balanced development, and the creation of an effective state. Among the measures supporting the implementation of the strategy is the Electromobility Development Program, which aims to reduce the amount of pollutants emitted into the atmosphere. The plan was created to support the development of electromobility in Poland. It assumes the cooperation of a number of institutions, which are expected to influence the perception of electric cars by users, create a mechanism of benefits for EV owners, support the development of the electromobility industry in Poland, introduce a legal framework allowing the development of the electromobility sector and adapt the electricity grid (Gajewski, Paprocki, Pieriegud, 2019, p. 9). In the first phase, the preparatory work was divided into five action areas: awareness, demand, supply, regulation and the infrastructure network. Each area was divided into three phases

implemented in 2016 - 2018, 2018 - 2020 and 2020 - 2025. The first phase was a preparatory phase involving the creation of information projects, the introduction of electromobility issues into the school curriculum so that future generations are educated in this area from the earliest years. At the same time, the gradual development of the market for electric vehicles and the construction of their prototypes by the Polish industry was established. The legal area established the creation of a law on electromobility. The next step was to introduce the created projects into public life and offer financial incentives. The optimal placement of charging stations was planned to meet demand in accordance with that indicated by consumers. The final phase was the culmination of the work and the creation of a Polish market with an adapted and fully functioning infrastructure to meet the demand for green vehicles among an informed public, and a domestic industry that will be able to supply vehicles and the necessary components for their manufacture and use (ME, 2017).

One of the entities implementing the assumptions of the Eletromobility Development Program in Poland is the Polish Alternative Fuels Association. The activities of this organization are aimed at creating favorable conditions for manufacturers of electric cars, manufacturers of charging infrastructure and electricity distributors. The organization works with 170 entities to jointly shape the economic and legal environment that will enable the rapid development of the electric car market. Since its inception, the association has supported participants in the electromobility market by implementing a number of projects aimed at market research and public education (PSPA, 2023). As part of the campaign, electromobilni.pl, together with EV Klub Polska, Autoplay and Wallbox Charges, they launch the «Highway to Electromobility» program every year. The goal of the program is to support the development of the electric vehicle market (electromobilni.pl, 2022). The project is aimed at people who have chosen electric vehicles out of concern for the climate. Thanks to this project, EV users belonging to EV Klub Poland were able to use toll sections of highways without any charges. In 2021, sections of the A1 (Gdansk - Torun) and A4 (Katowice - Krakow) routes were subject to the program. In 2022, on the other hand, electric vehicle users could use 5 freeway sections covered by the video-tolling system, i.e. the Gdańsk - Torun section of the AmberOne A1 freeway (Rusocin interchange - Nowa Wieś interchange), the Katowice - Kraków section of the A4 freeway (Murckowska interchange - Balice interchange) and Wrocław - Sośnica interchange, as well as the A2 Motorway (Stryków - Konin). In practice, this meant that drivers of cars equipped with traction batteries, who taveled to the sea and back saved nearly 60 zlotys, and if they used the A4 highway, the savings amounted to almost 50 zlotys. Driving the remaining several hundred kilometers of the national highway network meant savings several more zlotys (for A2 Konin - Stryków in both directions it is a little over 22 zlotys) (Elektromobilni.pl, 2022). The project was modeled on the Czech Republic, where any electric vehicle can enjoy such concessions.

The initiatives aimed at subsidizing the purchase of an electric vehicle. Thus, under the «My Electrician» program, it is possible to purchase or lease an electric car. The program was introduced by the National Fund for Environmental Protection and Water Management in response to growing interest in low-emission cars, which provides financing for the purchase of 35,000 vehicles. The program began on July 12, 2021 and had an initial budget of 500 million PLN in non-reimbursable subsidies. Table 1 shows the amount of subsidies for the entities involved and additional assumptions.

Table 1. Amount of subsidies for the entities concerned

Entity receiving the subsidy	**Maximum price of an electric car (PLN)**	**Maximum annual mileage (km)**	**subsidy amount (PLN)**
Individual	225,000	-	18,750
individual + Large Family Card	-	-	27,000
Entity settles VAT at 50%	248,205	-	18,750
Entity settles VAT at 100%	276,750	30,000	27,000

Source: (Portal GOV.pl., 2022)

Individuals, upon application, can expect to receive a refund of PLN 18,750 for a vehicle with a gross price not exceeding 225,000 PLN. Higher concessions will be given to holders of the Large Family Card in the amount of 27,000 PLN without price restrictions.

The main recipients of the project are individuals, entrepreneurs and leasing companies in cooperation with banks. To apply for the subsidy, one must submit an online application. This is then sent to Bank Ochrony Środowiska, which manages the program›s budget. The requirements to be met for the grant are:

- the electric car must be registered in the territory of the Republic of Poland,
- the electric car must have an insurance policy,
- the owner undertakes to own the car for the next two years after receiving the subsidy.

A person whose application is successful will receive a refund of part of the costs incurred in connection with the purchase of an electric car (Portal GOV.pl., 2022).

Meanwhile, in order to enable the efficient movement of electric cars, the National Fund for Environmental Protection and Water Management - has adopted the „Support for electric vehicle charging infrastructure and hydrogen refueling infrastructure" program. Thanks to this program - as part of the electromobility development strategy outlined by the government - a network of more than 17,000

charging points for electric cars and 20 hydrogen stations will be set up throughout Poland. The program's budget is 870 million PLN. Non-refundable grants for infrastructure construction were available to local governments, companies, housing cooperatives and communities, and individual farmers. The program envisaged subsidizing projects involving: the creation of charging points with a capacity of no less than 22 kW, exclusively for individual use, which will not be used to provide charging service (budget 70 million PLN), the construction of charging stations with a capacity of no less than 22 kW, other than publicly available charging stations (budget 70 million PLN), the construction of public charging stations with a capacity of no less than 50 kW or reconstruction of public charging stations resulting in an increase in its capacity to no less than 50 kW (budget 630 million PLN), as well as the construction or reconstruction of public hydrogen stations (budget 100 million PLN). A total of 17,760 different types of electric vehicle charging points and stations and 20 hydrogen refueling stations are planned to be created or rebuilt as part of the program's implementation (Portal GOV.pl., 2022).

Research methodology

A survey was conducted using a questionnaire to determine factors that may influence individuals to purchase an electric car. The survey was conducted in an online format. The questionnaire was created using Google Forms and shared on Facebook groups of people interested in automobiles and electric cars. The survey was conducted from 01.08.2022 - 30.09.2022. The questionnaire was divided into four parts. The first part covered demographic variables (gender, age, education, property situation and place of residence). The second group of questions asked respondents to answer about their use of motor vehicles. The third group of questions addressed the purchase of motor vehicles and factors influencing the decision, including respondents' knowledge of electric vehicles. The fourth section of the questionnaire referred to charging infrastructure and its impact on the purchase of electric vehicles. Descriptive statistic tools were used to analyze the results obtained.

Respondents' characteristics

The survey involved 124 people whose responses were checked and verified for completeness, as well as for correctness and accuracy of information. This was to eliminate irregularities in the completed questionnaires. As a result of the verification, 122 responses were admitted for further study (Table 2).

Table 2. Characteristics of study participants (N=122)

Variables	Frequency	Percentage [%]
Gender		
women	64	52.5
men	58	47.5
Age		
18 – 24	44	36.1
25 – 30	18	14.8
31 - 45	43	35.2
46 – 60	10	8.2
over 60	7	5.7
Education		
higher	76	62.3
secondary	38	31.2
vocational	7	5.7
primary	1	0.8
Average monthly net income (PLN)		
under 2500	25	20.5
2501 – 5000	45	36.9
5001 – 10,000	36	29.5
over 10,001	16	13.1
Place of residence		
village	25	20.5
city up to 50 thousand residents	16	13.1
city with up to 100 thousand residents	14	11.5
city with more than 100 thousand residents	67	54.9

Source: Own study

As can be seen from the data included in Table 2, the survey, taking into account gender, was slightly dominated by women (52.5%). In terms of age, the largest group of respondents were those in two age ranges - 18 to 24 (36.1%) and 31 to 45 (35.2%). Respondents mainly had a higher education. The most frequently indicated average income in the surveyed group was an amount in the range of 2501 - 5000 net PLN. The most common place of residence indicated by respondents was a city with a population of more than 100,00.

Principles of vehicle use by respondents

The first group of questions concerned the type and previous use of motor vehicles by individual users (Table 3).

Table 3. Characteristics of respondents in terms of car use (N=122)

Variables	Frequency	Percentage [%]
Frequency of car use		
several times a day	80	65.6
several times a week	32	26.2
several times a month	4	3.3
not at all	6	4.9
Number of cars in the household		
three and more cars	35	28.7
two cars	41	33.6
one car	43	35.2
no	3	2.5
Covered distance per day [km]		
over 50	30	24.6
41 - 50	12	9.8
21 - 40	39	32.0
up to 20	32	26.2
not applicable	9	7.4

Source: Own study

The majority of respondents use a car daily (65.6%) or several times a week (26.2%). Only 4.9% do not use a car at all. This group consists mainly of people living in cities with more than 100,000 residents and in the 18 - 24 and 25 - 30 age range. This means that these people have the option of using public or other form of transportation. Only 2.5% of respondents do not own a car in their household and more than 68% of respondents have one or two cars. Among respondents, 3 or more cars are owned by 68% of surveyed rural residents. The most common distance traveled in a day by respondents is up to 40 kilometers (58.2%). The vast majority of vehicles owned by respondents are traditionally driven (Fig. 1).

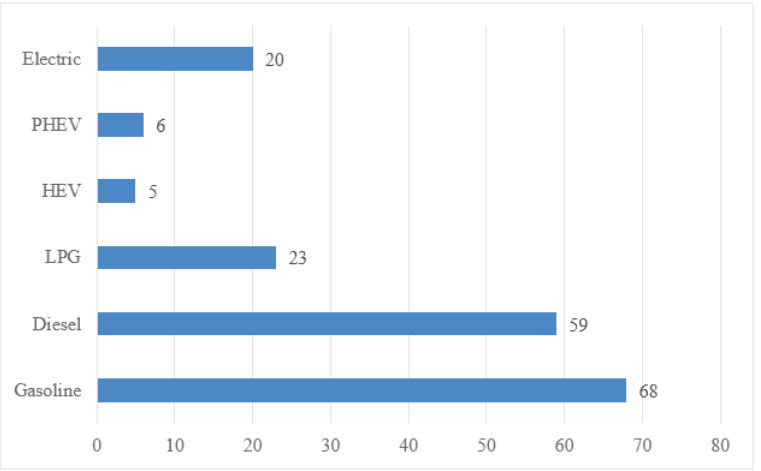

Fig. 1. Type of drive
Source: Own study

Over 55% of respondents have cars with gasoline engines, 48.5% of respondents have diesel cars, and 18,9% with LPG installation. Analyzing the share of low-emission cars in the respondents' households, it can be seen that among respondents owning one car, only two people meant that they are hybrid cars. For respondents with 2 or more cars, only 4 people owned low-emission cars. In the group of people who own 3 or more cars, only two people have only electric cars.

Demand for electric cars and the incentive system

Taking into account that the development of electromobility involves, among other things, the introduction of various systems to promote the purchase of electric vehicles, respondents were asked to answer questions about vehicle purchase planning, vehicle type, taking into account the drive and indications of factors that would affect the purchase of an electric vehicle. The answers are summarised in Table 4.

Taking into account the planning of buying a new car and the income of respondents, as many as 80% of respondents with an income of up to 2,500 net PLN indicated a negative answer. The purchase of a new car is most often considered in the group of people with an income of 5001 –10,000 net PLN (44.5% of responses). At the same time, 47.5% of respondents did not consider buying a low-emission vehicle at all, 32.8% considered the possibility of buying this type of vehicle and only 4.1% are at the purchase stage. Since the issue of low interest in low-emission

vehicles may result from the lack of access to this type of car, it was checked whether people participating in the study had ever had the opportunity to drive an electric car. According to the list (Table 4), 46.7% of respondents did not have such a possibility, and people who drove an electric car most often indicated that it was a friend's car, e-carsharing service or a test drive at the dealer. People interested in buying an electric car are usually willing to spend no more than 50,000 PLN for it (45% of responses). Unfortunately, it is currently not possible to purchase a new electric car on the market at this amount. List prices of the cheapest models on the Polish market are presented in Table 5.

Table 4. Factors influencing the purchase of an electric car

Variables	Frequency	Percentage [%]
	Planning to buy a new car	
yes	31	33.6
no	81	66.4
	Planning the purchase of an electric vehicle/hybrid	
people who own electric cars	19	15.6
People planning to buy in the near future	5	4.1
People thinking about buying an electric car but have not yet made a decision	40	32.8
People who have never considered buying an electric vehicle	58	47.5
	Driving an electric car	
yes	31	33.6
no	81	66.4
	Amount respondents are willing to spend on an electric/ hybrid vehicle [PLN]	
less than 50,000 PLN	55	45.0
50,001 – 100,000 PLN	30	24.6
100,001 – 150,001 PLN	14	11.5
above 150,000 PLN	23	18.9

Source: Own study

Table 5. List price of selected electric car models

Car model	List price PLN
Smart EQ fortwo	100,896
Dacia Sprong Cargo	101,490
Fiat 500e	135,500
Nissan Leaf Acenta	155,900
Peugote- 200 Active	156,600
Opel Corsa – e Edition	160,300
Mazda M – X 30	161,100

Source: (Rankomat.pl, 2023)

The electric cars shown in Table 5 are small vehicles belonging to the A segment of vehicles, dedicated to move around the city. The prices of the 5 cars listed in the table significantly exceed the amount that respondents want to spend on the purchase of the vehicle. Since not only the price affects the purchase of the vehicle, the respondents were asked to answer what other factors could affect their willingness to purchase an electric vehicle. The respondents' answers are summarized in Figure 2.

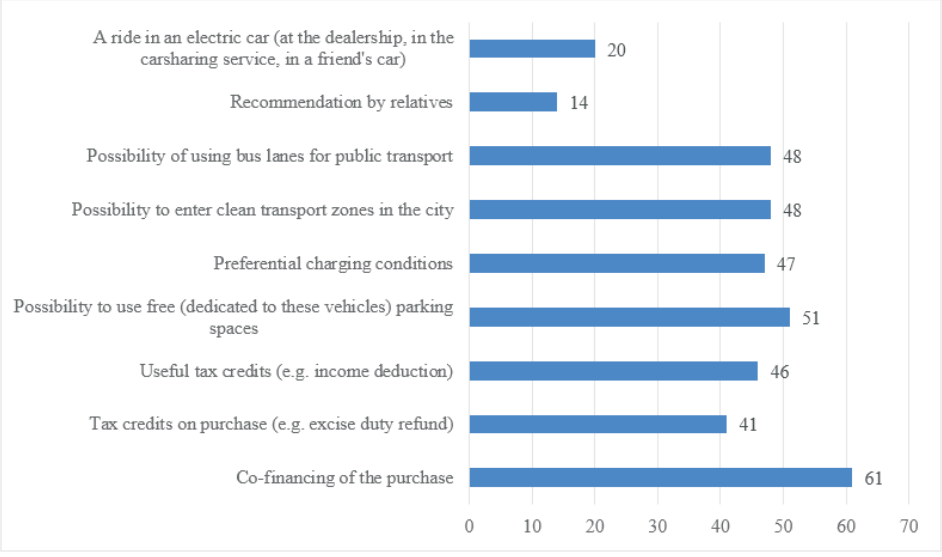

Fig. 2. Factors that may affect the purchase of an electric vehicle
Source: Own study

As the main factor that may affect the purchase of an electric vehicle, the respondents indicated co-financing of the purchase, then the possibility of using free parking spaces and ex aequo the possibility of using bus lanes and entering clean transport zones, and preferential conditions for charging vehicles. The recommendations of friends and loved ones and driving an electric car have the smallest impact.

Another group of factors influencing the purchase of a vehicle is its perception. The respondents' opinions on this subject are summarized in Figure 3.

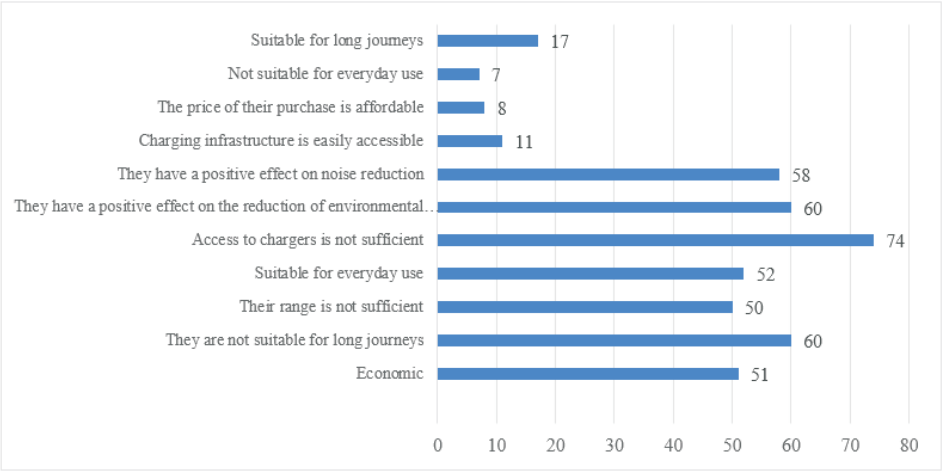

Fig. 3. Perception of electric vehicles by respondents
Source: Own study

Taking into account the positive features of electric vehicles, the respondents indicated their economy and environmental friendliness (Figure 3). On the other hand, they considered insufficient access to charging infrastructure and that they are not suitable for long journeys as negative.

The purchase of a car is associated with the costs of its use at a later date. On the cost of maintaining electric vehicles, the answers are summarized in Figure 4.

According to the data in Figure 4, a slight majority of respondents believe that electric cars are more expensive to maintain than traditional ones. Almost half of the respondents believe that they are less prone to break down than with an electric drive and the vast majority of respondents indicate that they are more expensive to buy.

As presented, in the earlier part of the study, there are programs in Poland promoting the purchase and use of electric vehicles. Respondents were asked about their knowledge of programs supporting the purchase and use of electric vehicles. The answers of respondents are summarized in Figure 5, they were divided taking into account the criterion - interest in buying an electric car.

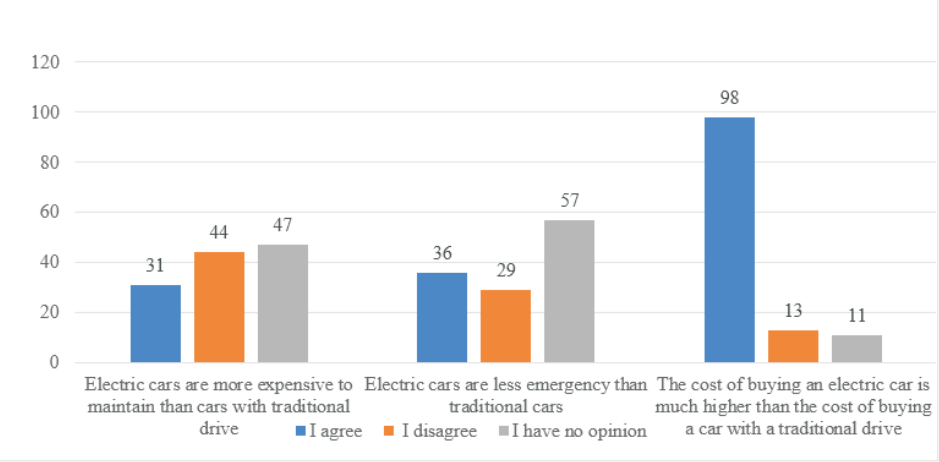

Fig. 4. Costs of using electric vehicles
Source: Own study

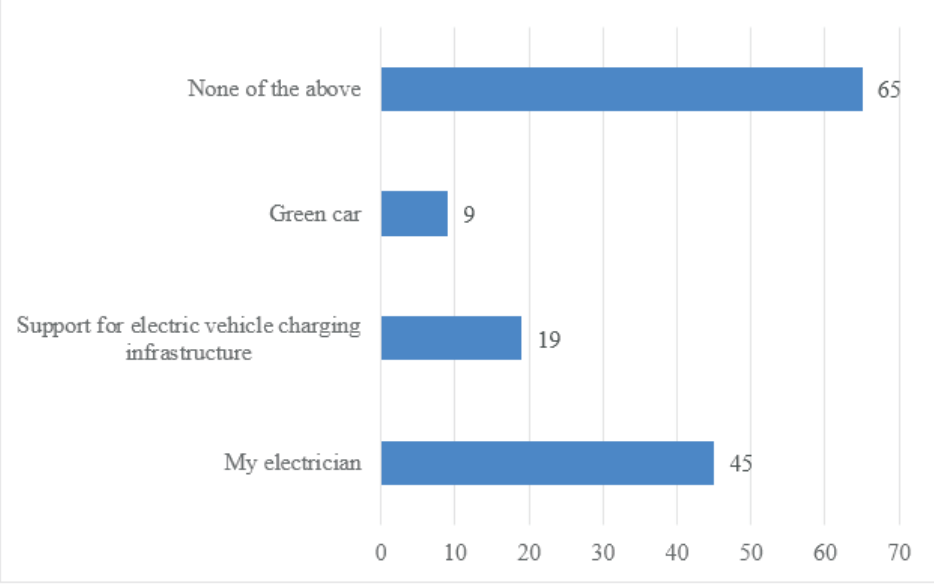

Fig. 5. Respondents' knowledge of electric car subsidy programs
Source: Own study

More than half of the 65 people (53.3% of the total) have not heard of any of these programs. 63% of people who are considering buying an electric car, but have not yet made a final decision, have never heard of subsidy programs before. From the group of people who have never considered buying an electric car, 35.1% of respondents have not heard about the subsidy program. The My Electrician program was known to 45 people (36.9% of the total). 19 people (15.6% of the total) knew about the subsidy system Support for charging infrastructure for electric vehicles. Only 9 people (7.4%) have heard about the Green Car program.

Impact of charging infrastructure on the purchase of an electric vehicle

An important element during the use of an electric vehicle is access to the charging infrastructure. Respondents' responses are summarized in Table 6.

The most common answer regarding the maximum charging time was up to 30 minutes (56% of responses). 24.6% of all respondents could spend a maximum of 1 hour on filling the battery. In third place was the of over 2 hours, which was chosen by 10.7% of respondents. The least responses were in the range of up to 2 hours - this option was chosen by 10.7% of respondents. Among the respondents, the most common minimum distance that an electric vehicle should cover was over 500 km, it was indicated by 29.5% of respondents. The second most numerous answer was the range from 401 - 500 km, which was 22.1% of respondents. The least desirable range is less than 100 km - only 4.1% of respondents chose it. The majority of respondents gave a negative answer about the availability of charging stations - 72.1% of responses. Only 6.6% indicated that the number of stations is sufficient. Since respondents believe that electric cars are economical, they were asked about the average cost of driving 100 km with an electric car. Respondents most often indicated the amount in the range of 11 – 20 PLN, then 31 – 40 PLN, the least people indicated the amount of 31 – 40 PLN. It is worth pointing out that the cost of covering 100 km with an electric car depends on the style, driving conditions and the power source from which the battery is charged. The cost of driving 100 km with an electric car on the example of one of the popular compact models is listed in table 7 for the use of a home charging station and for AC and DC public chargers.

Table 6. Charging infrastructure and the desire to buy an electric car

Variables	**Frequency**	**Percentage [%]**
	How much time should be spent on charging the car at one time	
do 30 minutes	69	56.6
do 1 h	30	24.5
do 2h	13	10.7
more than 2h	10	8.2
	What is the minimum range of an electric car?	
do 100 km	5	4.1
101 – 200 km	12	9.8
201 – 300 km	20	16.5
301 – 400 km	22	18
401 – 500 km	27	22.1
more than 500 km	36	29.5
	Is the number of charging stations in Poland sufficient to be able to move freely?	
yes	8	6.6
no	88	72.1
I have no opinion	26	21.3
	What is the average cost of driving 100 km with an electric car?	
under 10 zł	25	20.5
11 -20	48	39.3
21 -30	27	22.1
31- 40	9	7.4
41 -50	13	10.7

Source: Own study

Table 7. The cost of driving 100 km by electric car [PLN]

Driving conditions	Type of charging method used		
	Home	AC	DC
Urban traffic (14,5 kWh)	10.78	20.86	23.80* 28.56**
Suburban traffic (13,4 kWh)	10.01	19.37	22.01* 26.52**
Motorway (20 kWh)	15.40	29.80	34.00* 40.80**

* up to 40 kW
** charging with power from 40 to 150 kW.

Source: corab.pl [Accessed: 22 April 2023]

For electric cars, suburban traffic is the optimal, in this mode of operation vehicles consume the least energy. In combination with the use of home chargers, this becomes the most favorable and optimal scenario. Covering long distances at a higher speed quickly reduces the energy level in the battery. Comparing the costs of charging batteries to refueling a combustion car, they may correspond to only 2 liters of gasoline per 100 km at the current price of gasoline, which is at the level of 6.94 PLN, and in the case of motorways they may correspond to 7 l / 100 km, depending on the mode of use. Comparing the respondents' responses and the data in Table 7, it can be seen that the most suitable type of charging at home would be best. The cost of charging at home in any case is the lowest. In addition, the indicated amounts for driving 100 km with an electric car are confirmed by real data.

Discussion

The issue addressed in the article is the subject of consideration by many researchers. Thus, Krawiec and Krawiec (2017) pointed out that the development of eletromobility in Poland depends, especially on overcoming social, financial and technical barriers. To achieve the desired effect, it is necessary to coordinate activities at the government, corporate and social levels. The results of the survey indicate that the prices of electric vehicles are high and Poles are not interested in buying them. Confirmation of this opinion is the statement of Tomaszewski (2019), who noted that plans for the development of electromobility may be in jeopardy, despite the fact that buyers of electric cars will receive a refund of such a purchase up to a maximum of PLN 36 thousand. Such compensation, although it seems attractive,

does not change the fact that the prices of electric vehicles still remain significantly higher than the average amount Poles spend on buying a car. This trend does not only apply to buyers of electric cars in Poland. A study by Ogunkunbi et al. (2022) shows that the purchase price of an electric car still has a negative impact on their purchase in many European countries. In addition, the authors of the study indicated that the government incentive system was an important element in the choice to purchase an electric car. With that said, the effectiveness of the incentive system varies from country to country. On the other hand, Christidis and Focas (2019), noted that people with higher incomes express a greater desire to purchase a hybrid or electric vehicle than those with lower incomes. The findings are consistent with those presented in the article. The issue of electric car pricing was also addressed by Brudlak and Pawlak (2021). They noted that although it is planned to allocate about 60 million zlotys over 10 years, i.e. 2018- 2027, for the purpose of electromobility development, this amount is far from sufficient at the current price level of these cars. At the same time, Dereń and Owczarek (2021) point out that when it comes to the cost of purchase, more and more countries are choosing to organize programs to support drivers who decide to buy an electric car. It is still worth citing a study by Klamut (2018), which shows that in the context of a possible purchase of an electric car, the strongest obstacles are excessive prices and technical limitations, especially infrastructure. These results are similar to those obtained in the study. Similar conclusions on the issue of price were also reached by Junquera et al. (2016) and Coffman et al. (2017). On the other hand, the problem addressed in the article of the availability of charging points, which was poorly assessed by respondents from. It was also examined by Falchett and Noussan (2021). Their study shows that although there has been significant development of charging stations in recent years, there are significant differences between countries in terms of availability. They also indicate, the maturity of electric vehicle markets. These levels are strongly correlated with the level of support under national policies, not only with incentives for the purchase of electric cars, but especially with support for a widespread network of publicly accessible charging points. The problem of accessibility to charging infrastructure translates into demand for electric vehicles. LaMonaca and Ryan (2022) noted that transparency of cost information regarding charging for commercial outlets is essential. The variety of pricing structures for charging services - including by the minute, per hour, per kWh or through subscription services - obscures the comparability of charging prices between operators and home charging. Improving consumer protection regulations or introducing standardization can help improve the customer experience when searching for charging points.

Conclusions

The research conducted is not representative, so detailed conclusions can only be applied to the research sample. However, with some probability one can believe that the relationships observed in the sample are directionally consistent with the corelation found among individuals considering the purchase of a car.

Thus, the study found that:

- a small percentage of people own an electric car, and almost half of the respondents have never considered buying an electric car, only ⅓ are thinking about buying one. The same number of respondents have no experience of using an electric car;
- the public perceives electric cars as too expensive and unsuitable for long trips due to insufficient range. In their opinion, electric cars have a range between 200-300 km;
- for the purchase of a new car, respondents are willing to spend a maximum of 50,000 PLN, which is far from the price level of these cars, and factors that could influence such a decision are: the possibility of using free parking spaces and ex aequo the possibility of using bus lanes and entering clean transport zones, preferential charging conditions for vehicles;
- 72% of respondents believe that in Poland the number of charging stations is not sufficient to move freely. They are most likely to use charging infrastructure at home, but they consider the infrastructure available at the workplace, parking lots and shopping malls to be equally convenient. The time for such charging should be up to 30 minutes;
- respondents do not believe that an electric car is cheaper to maintain or less prone to breakdown than an internal combustion vehicle;
- ½ of the respondents have never before heard of current subsidy programs for electric cars, and subsidizing the purchase is important to the same proportion of respondents.

The results obtained include empirical recognitions, contributing to the scientific discussion relating to the concept of electromobility development. At the same time, they are a contribution to further analysis, which should also be carried out among entities owning delivery vehicles up to 3.5 tons.

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