



## ***E-Mobility Market Analysis in Montenegro***

Study prepared by Energy Institute Hrvoje Požar | Zagreb | February 2019

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## SUMMARY

Market analysis is a starting point in creating any public policy, including the policy to promote e-mobility. The market situation can usually be assessed in three stages: 1) underdeveloped market; 2) developing market and 3) developed market. The level of market development is determined on the basis of a market assessment, which must include different stakeholders both on the supply side and on the demand side. For this purpose, it is necessary to answer two questions:

- What is the current supply of products and services related to e-mobility, and
- Are the consumers in different end-user sectors ready to buy products and services related to e-mobility?

**On the supply side** of the e-mobility market, there is a distinction between the supply of services related to electric vehicles and the supply of services related to the construction and management of publicly available infrastructure for charging electric vehicles. In Montenegro, both segments are still in the initial stage of development, which is confirmed by the results of survey research, interviews with market entities and a desk research. In the segment of supply related to electric vehicles, dealers/distributors, maintenance technicians and financial institutions are the most important market entities and this part of the market is extremely competitive. Accordingly, it is evident that all these entities are already preparing for the increase in demand for electric vehicles and adjusting their business accordingly. In the context of incentives, the biggest incentive for this market segment will be an increased demand for electric vehicles, and in that sense no special incentives are needed for them. In the segment of services related to the construction and management of publicly available infrastructure for charging electric vehicles, the market is also beginning to develop encouraged by practices from European and neighboring countries and the desire of the entities to be better positioned on the market as soon as possible. Nevertheless, with the goal of faster infrastructure development and the overall concept of e-mobility, the engagement of the state and the public sector in general, as an initiator of infrastructure construction in their respective areas, would be helpful in this market segment.

**On the demand side of the e-mobility market,** there is a distinction between legal persons and citizens, but both of these segments have some common characteristics, which are limited awareness of e-mobility and very limited use of e-vehicles. In public institutions, a moderate interest in e-mobility issues prevails. An analysis of the vehicle fleet found that it was relatively old, and given the clearly defined tasks, and thus the routes of vehicle movements, and the fact that public institutions generally have their own parking places, this segment of the market represents a significant potential. Cost and benefit analyses and confirmation of these analyses through the implementation of pilot projects as well as certain regulatory shifts (green public procurement or public sector commitment to introduce a certain number of electric vehicles) would certainly be a positive example and accelerate the development of demand in other segments of the market. As far as public transport is concerned, until now, operators have generally not considered the introduction of electric buses or conducted the necessary financial analysis. However, they are willing to participate in pilot projects, which should certainly include financial assistance for the procurement of buses, with the aim of familiarizing themselves with technology, determining whether such buses meet the needs and can be used more widely. In the business sector, the key criterion for deciding on the purchase of an electric vehicle is its economic or financial profitability. In the business sector, the interest in new technologies in transport is higher than in the previous two, and the improvement of the image of the company is also one of the key motives for considering electric vehicles. It is expected that for this reason, in this segment, and especially in its part related to tourism, the first projects for the introduction of electric cars will soon be implemented. Examples of good practice will further boost demand in this competitive sector. As far as citizens are concerned, the results of survey research show that there

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is interest in electric vehicles, but it is necessary to further inform citizens about electric vehicles and how to fill them. Financial incentives for their purchase will be a decisive factor for a wider use of electric vehicles among citizens.

**In conclusion, the e-mobility market in Montenegro is at an early stage of development.** Under such market conditions, the available products, technical knowledge and experiences are sufficient and able to cover the current demand, which is very low. Therefore, demand should be driven by information policy instruments, dominated by campaigns and examples of good practice. Through regulatory actions, especially tax and customs policies and criteria for placing vehicles on the market, it is necessary to ensure that electric vehicles are placed in a better position than conventional ones. Financial subsidies are imposed as a necessary and crucial mechanism for stimulating demand. Increased demand will be the best stimulus for the supply side, which can already now be said to be conscious of the changes that follow and undertakes certain activities to meet an increase in demand, in line with their business interests.

# INTRODUCTION

## *Purpose and objective of the document*

Market analysis is a starting point in creating any public policy, including the policy to promote e-mobility. The market situation can usually be assessed in three stages: 1) underdeveloped market; 2) developing market and 3) developed market. The level of market development is determined on the basis of a market assessment, which must include different stakeholders both on the supply side and on the demand side. For this purpose, it is necessary to answer two questions:

- What is the current supply of products related to e-mobility, and
- Are the consumers in different end-user sectors ready to buy products and services related to e-mobility?

On the supply side, it is necessary to determine the following:

- Availability of electric vehicles on the market;
- Availability of electric vehicle servicing;
- Availability of commercial financing (bank lending programs and leasing offers), and
- Availability of companies that provide complete e-mobility services (construction and management of publicly available infrastructure for charging electric vehicles).

Therefore, the key target groups for the analysis of the market supply side are: vehicle dealers/ distributors; vehicle repairers, financial institutions and e-mobility service providers. The most appropriate analytical methods for these target groups are survey research and structured interviews. Namely, there is not a large number of stakeholders in these target groups in Montenegro (with the exception of vehicle servicing) and through a relatively small sample of respondents one can get a good picture of the situation in this segment of the market. In order to gain a fuller picture of the market, independent surveys of the supply side have been carried out on the basis of publicly accessible data (website of dealers/ maintenance technicians and financial institutions).

An assessment of market demand must be based on the readiness of consumers to accept electric vehicles. In that sense, information is needed about the attitudes and barriers perceived by consumers in relation to electric vehicles. It is important to determine the following:

- Level of awareness and information on electric vehicles and the concept of e-mobility;
- Level of current use of electric vehicles, and
- Available and preferred incentives to increase the use of electric vehicles.

The key target groups for analyzing the demand side of the market are, therefore, decision-makers on the purchase of vehicles. Given the various processes and decision-making criteria, they can be further divided into legal entities and citizens. Among legal entities, decision-making processes may differ significantly between public sector institutions, public transport operators (private companies with concession agreements) and the business sector, so the analysis is done for each subgroup in particular. The analysis of legal entities was based on a conducted survey, conducted interviews and a desk research based on publicly available data and collected documents and data on the structure of the vehicle fleet obtained from entities from this group. Citizens' views on e-mobility are based on a survey, the first one of that kind in Montenegro.

For the final evaluation of the market, an evaluation matrix has been developed (

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*The status (maturity) of **demand***

Sufficient awareness Medium use Sufficient incentives	High			FAIRLY DEVELOPED	DEVELOPED
Sufficient awareness Limited use Some incentives	Medium		DEVELOPING	IN TRANSITION	FAIRLY DEVELOPED
Limited awareness Limited use No incentive	Low	UNDEVELOPED	EARLY DEVELOPMENT PHASE	DEVELOPING	
No awareness No use No incentive	Very Low	UNDEVELOPED	UNDEVELOPED		

Very Low	Low	Medium	High
Unavailable e-vehicles Limited knowledge and experience No e-mobility services No customized commercial funding	Some e-vehicles available Some knowledge and limited experience No e-mobility services No customized commercial funding	Most e-vehicles available Sufficient knowledge and experience Limited e-mobility services Limited customized commercial funding	Most advanced e-vehicles available Advanced knowledge and vast experience Sufficient e-mobility services Available commercial funding

*The Status (maturity) of **supply***

Figure **Error! No text of specified style in document.-1**). The matrix matches the evaluation of supply and demand according to the above criteria. Each quadrant in the matrix is further subdivided to allow for a more accurate assessment of the market maturity. Four rating grades are used on each side of the market (matrix), the combination of which gives the final assessment of the market maturity. The market development assessments range from 'underdeveloped' via 'early development stage', 'developing', 'in transition', 'fairly developed' to 'developed', as the highest level. Gray areas represent an impossible situation because supply and demand are closely related and it is not realistic to assume that for example the supply maturity will be high while at the same time the demand is very low.

*The status (maturity) of **demand***

Sufficient awareness Medium use Sufficient incentives	High			FAIRLY DEVELOPED	DEVELOPED
Sufficient awareness Limited use	Medium		DEVELOPING	IN TRANSITION	FAIRLY DEVELOPED

[Type here]

<i>Some incentives</i>						
<i>Limited awareness</i> <i>Limited use</i> <i>No incentive</i>	<i>Low</i>	<i>UNDEVELOPED</i>	<i>EARLY DEVELOPMENT PHASE</i>	<i>DEVELOPING</i>		
<i>No awareness</i> <i>No use</i> <i>No incentive</i>	<i>Very Low</i>	<i>UNDEVELOPED</i>	<i>UNDEVELOPED</i>			
		<i>Very Low</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>	<i>The Status (maturity) of supply</i>
		<i>Unavailable e-vehicles</i> <i>Limited knowledge and experience</i> <i>No e-mobility services</i> <i>No customized commercial funding</i>	<i>Some e-vehicles available</i> <i>Some knowledge and limited experience</i> <i>No e-mobility services</i> <i>No customized commercial funding</i>	<i>Most e-vehicles available</i> <i>Sufficient knowledge and experience</i> <i>Limited e-mobility services</i> <i>Limited customized commercial funding</i>	<i>Most advanced e-vehicles available</i> <i>Advanced knowledge and vast experience</i> <i>Sufficient e-mobility services</i> <i>Available commercial funding</i>	

Figure **Error! No text of specified style in document.**-1: E-mobility market assessment matrix

Based on the analysis of all identified target groups, using the evaluation matrix, the current level of maturity of the e-mobility market in Montenegro will be ultimately determined, which will be the basis for further definition of policy instruments with a view to moving the market into the next maturity phase.

## Document Structure

**Chapter 2** includes an analysis of the supply side of the market. The analysis covers the supply of electric vehicles, servicing and financing (lending) of such vehicles, as well as the supply of services for the construction and management of infrastructure for charging electric vehicles.

**Chapter 3** includes an analysis of the demand side of the market which is divided into two distinct groups: legal persons and citizens. Three distinct sub-groups have been identified among the legal entities: the public sector, public transport operators and the business sector, each of which having their own specifics and potentially different motives for the introduction of electric vehicles into their fleet of vehicles.

Each chapter ends with the main conclusions based on the conducted analyzes, with recommendations for the following activities. In **Chapter 4** a final assessment of the e-mobility market status matrix is additionally provided.

The Annexes include the survey questionnaires for each group of respondents (**Annex I**) and the minutes of meetings held in Podgorica with the aim of obtaining additional information on the market situation and the overall framework for e-mobility in Montenegro (**Annex II**).

# OFFERING OF PRODUCTS AND SERVICES RELATED TO E-MOBILITY

## VEHICLE DEALERS AND DISTRIBUTORS

Authorized vehicle dealers and distributors are key intermediaries between manufacturers and buyers of new vehicles. They have a significant impact on the price and availability of vehicles, as well as on the time of appearance of certain models on the market. They also provide additional vehicle purchase services as well as initial training on the vehicle, thus forming the overall experience of purchasing and meeting with the new vehicle. Therefore, dealers and distributors will play an important role in accepting electric vehicles by private individuals and business entities.

A survey questionnaire was prepared for vehicle dealers and distributors, whose aim was to:

- 1) Analyze the current state of electric vehicle supply, and
- 2) Determine the interest, technical and financial capacity of dealers and distributors for the development of electric vehicle offering.

The survey questionnaires were answered by 7 dealers/ distributors. Prior to submitting the questionnaire, it was determined that most of the market in Montenegro was covered by 12 dealers/ distributors, so the survey results of this group of respondents are considered representative.

Information provided by dealers/distributors regarding the current state of the electric vehicle supply is shown in **Error! Not a valid bookmark self-reference.** below.

*Table Error! No text of specified style in document.-1:* The results of a survey on the availability of electric vehicles by dealers/distributors

<b>Question</b>	<b>Number of respondents with a positive response</b>	<b>The percentage of respondents with a positive response in the total number of respondents (%)</b>
<b>Availability of electric vehicles in offerings</b>	3	42.86%
<b>Availability of plug-in hybrid vehicles in offerings</b>	3	42.86%
<b>Availability of hybrid vehicles in offerings</b>	3	
<b>Availability of special electric vehicles in offerings</b>	1	14.29%
<b>Previous sales of electric vehicles</b>	2	28.57%
<b>Offering of home electric vehicle charging stations</b>	3	42.86%
<b>Possibility of buying used electric vehicles</b>	1	14.29%

A more detailed analysis of responses to the survey questionnaire reveals that 2 respondents do not have either electric or hybrid vehicles in their offering, and 2 respondents offer only hybrid vehicles. Although the sample is relatively small, the responses indicate that purchases of some of the most recognizable models of electric and plug-in hybrid vehicles, such as Renault Zoe, Twizy, Kangoo ZE, Nissan Leaf, Volkswagen e-up, Toyota Prius plug-in, are possible in Montenegro. In addition, special electric vehicles are also offered, especially for tourist purposes such as the Ativa 6LC.5, manufactured by Italcara. Also, the KIA automotive corporation on its Montenegrin web site offers an electric car KIA Soul EV, citing the possibility of scheduling a trial run.

All dealers/distributors who offer electric vehicles also offer home charging stations. The purchase of used electric vehicles is limited, which is expected because market development is expected in the segment of new vehicles.

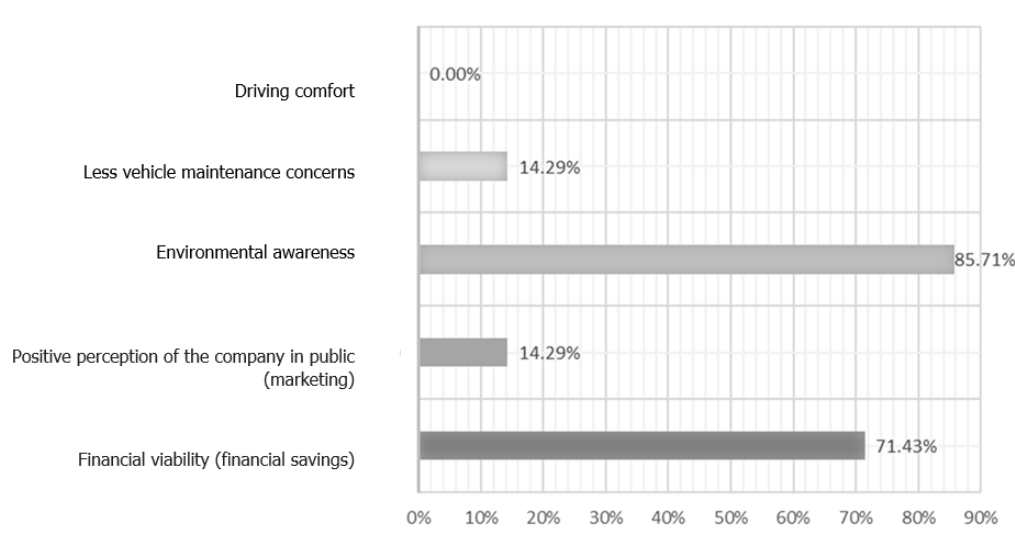
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Additional information was also collected through interviews with vehicle dealers/distributors (**Annex II**) and based on this information and the survey results it can be concluded that the offer of electric vehicles in Montenegro exists but is still limited. This situation is expected and is in line with the lack of demand. Dealers/distributors can quickly respond to market demands, and some of them have already started activities on the promotion of electric vehicles in terms of purchasing their own and adapting their own sales (and service) sites for the promotion of electric vehicles (installation of charging stations at vehicle showrooms and in service workshops).

In the second part of the survey questionnaire, positions of dealers/distributors on e-mobility were examined. The vast majority of respondents (6 out of 7 or 85.71%) believe that it is necessary to amend the existing provisions on technical conditions for vehicles to be imported or placed on the market for the first time in Montenegro. However, a more detailed review of the answers reveals that the dealers/distributors actually refer to the **taxes and customs duties** when purchasing vehicles, and that amendments are required in this segment, not in the segment of technical conditions for vehicles.

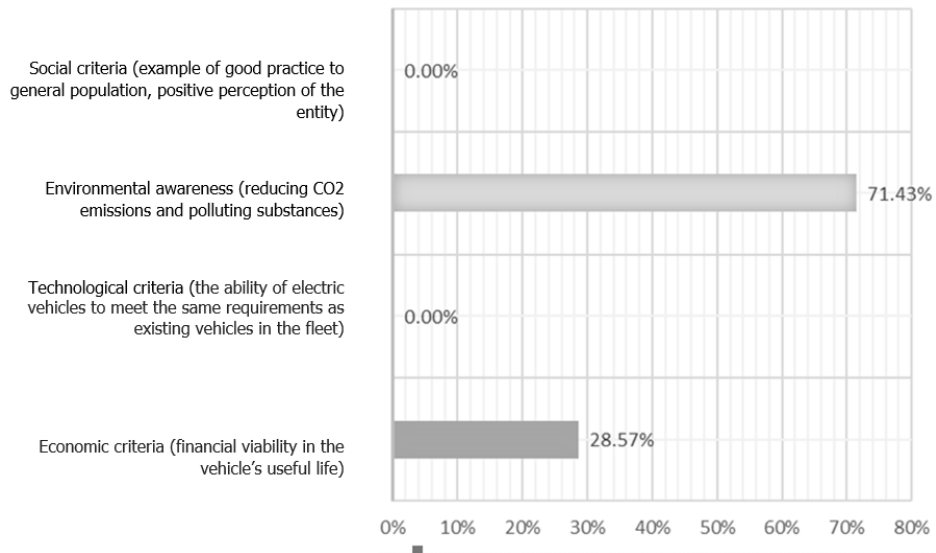
Given that dealers/distributors are familiar with the habits of vehicle buyers, they also had a set of questions on the motives and criteria for purchasing electric vehicles, factors that can stimulate interest in electric vehicles and barriers preventing the significant use of electric vehicles in Montenegro. The results are shown in the following charts.

KEY MOTIVES FOR BUYING ELECTRIC VEHICLES –  
DEALERS/DISTRIBUTORS OF VEHICLES

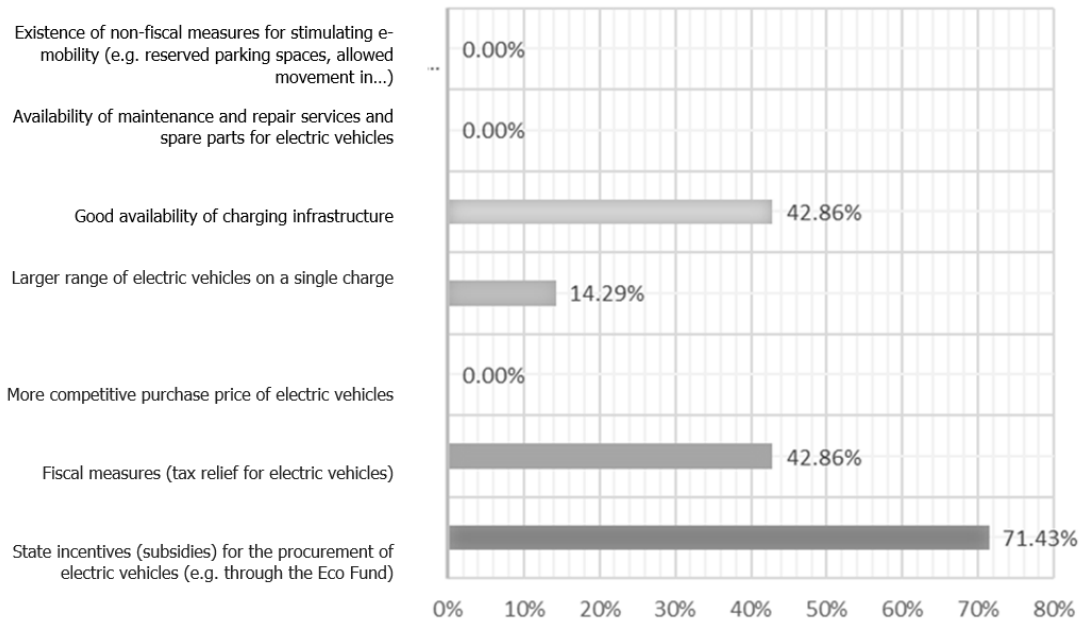


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## KEY CRITERIA FOR MAKING DECISIONS ON ELECTRIC VEHICLE PROCUREMENT – VEHICLE DEALERS/DISTRIBUTORS



## KEY FACTORS FOR A WIDER USAGE OF ELECTRIC VEHICLES – DEALERS/DISTRIBUTORS OF VEHICLES



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## KEY BARRIERS FOR WIDER USAGE OF ELECTRIC VEHICLES – VEHICLE DEALERS/DISTRIBUTORS

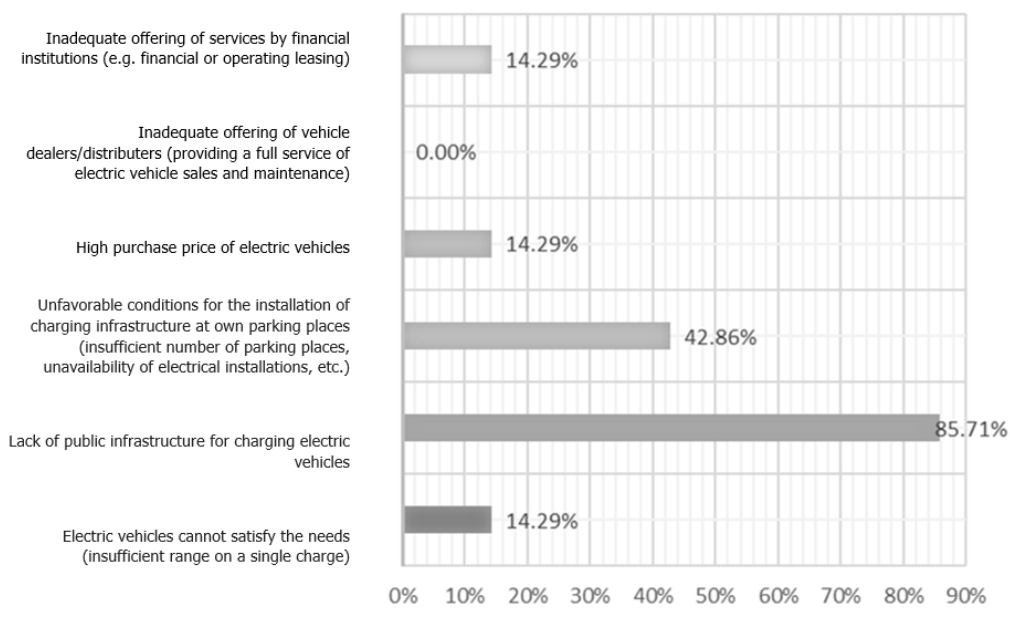


Figure **Error! No text of specified style in document.**-2: Positions of dealers/distributors on key motives, criteria, incentive factors and barriers for electric vehicles in Montenegro

Dealers/distributors have not yet participated in promotional activities related to electric vehicles and e-mobility (only one respondent has experience in such activities), which certainly represents the opportunity to be positioned on the market through such activities.

According to the respondents' responses, most distributors (5 out of 7 or 71.43%) consider that their staff are familiar with the features of electric vehicles.

Most dealers/distributors (5 out of 7 or 71.43%) are also authorized for vehicle servicing. Their responses in this segment are integrated in Chapter 2.2.

## VEHICLE REPAIRERS

Operating costs related to basic maintenance of electric vehicles are, as a rule, significantly lower in comparison with those for maintaining internal combustion engine vehicles. This fact ought to be one of the key generators to reduce the total electric vehicle ownership costs, and their wider use in Montenegro in the near future. Maintenance and servicing of electric vehicles is a challenge, but also an opportunity for existing service providers to open up the possibility of developing a new type of service in that context.

A survey questionnaire was prepared for vehicle repairers, aimed at determining a general attitude of the owners of vehicle repair workshops on electric vehicles and their readiness to adopt new business models in the context of e-mobility.

The survey questionnaire was answered by 5 vehicle repairers. In addition, the responses of 5 dealers/distributors who are also vehicle repairers were taken into account. Given that car servicing is a vocational-entrepreneurial activity, the number of entities performing this activity is large and it cannot be correctly identified. The questionnaire was sent to more than 30 addresses. The survey results of this group of survey respondents can only be considered as indicative, but with the help of the dealers/distributors who are also authorized to provide vehicle repair services, these results have been confirmed.

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Information regarding the current state of the electric vehicle repair offering is shown in Table Error! No text of specified style in document.-2 below. From the above results it can be concluded that the vehicle repairers are following the trends and that some of them are already ready to provide electric vehicle repair services. There is certainly room for improvement and it is expected that the service providers will quickly adapt to demand with the further promotion of e-mobility.

Table Error! No text of specified style in document.-2: The results of a survey on the availability of electric vehicle repair services

<i>Question</i>	<i>Number of respondents with a positive response</i>	<i>The percentage of respondents with a positive response in the total number of respondents (%)</i>
<i>Experience with electric vehicle servicing</i>	5	50.00%
<i>Familiarity with electric vehicle technology</i>	8	80.00%
<i>Completed training for electric vehicle servicing</i>	5	50.00%

The responses of vehicle repairers on the required additional investments related to the servicing of electric vehicles are shown in Figure Error! No text of specified style in document.-3 below. Adjustment of electrical installations and additional training and/or recruitment of electric vehicle specialists is cited as a key additional investment. This is also confirmed in interviews with dealers/distributors who are also authorized to provide vehicle repair services (**Annex II**).

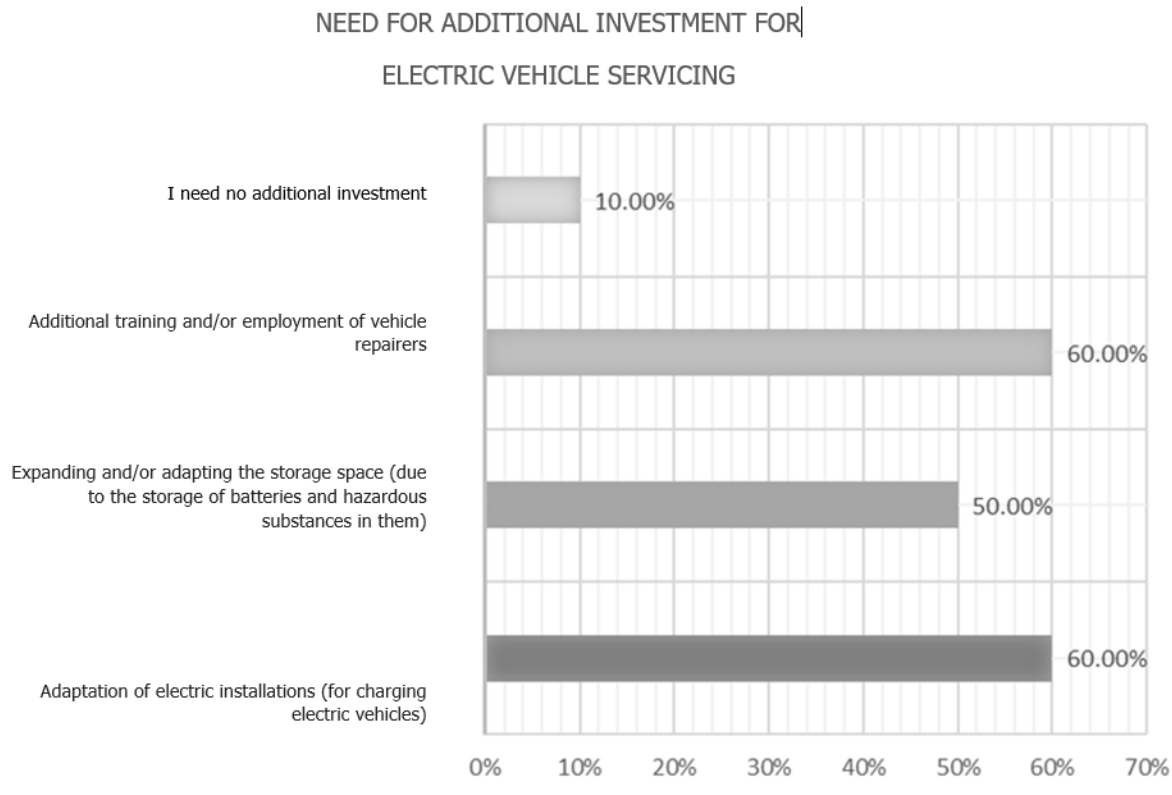


Figure Error! No text of specified style in document.-3: The results of a survey on the need for additional investments for the electric vehicle repair services

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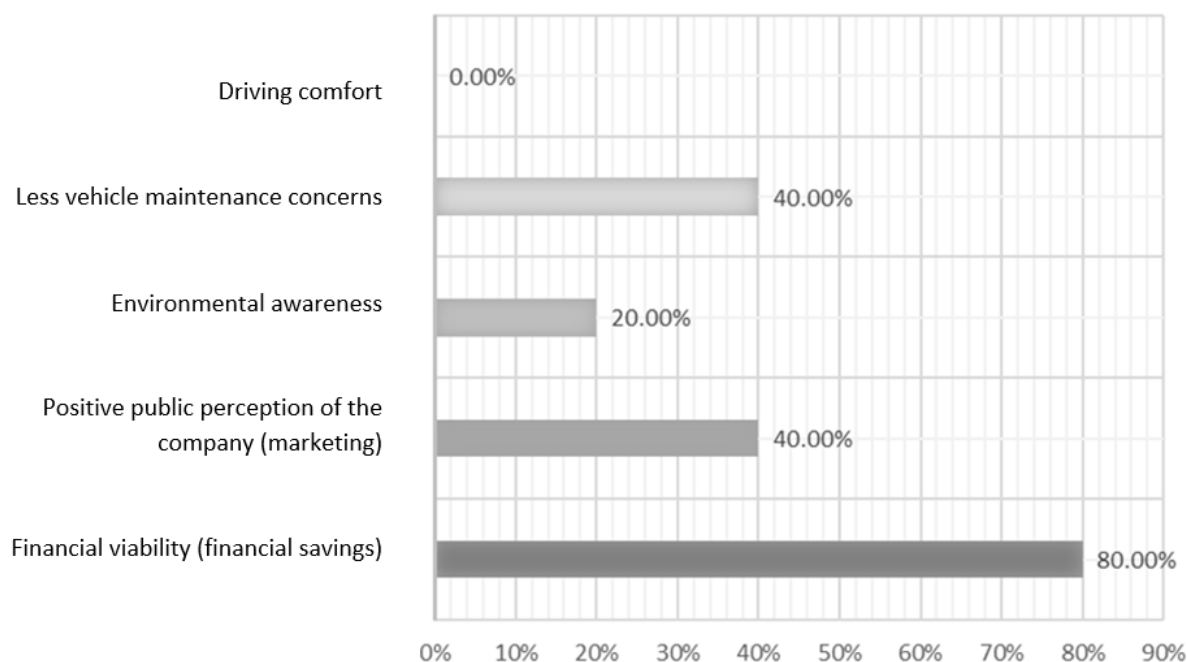
When asked whether they were interested in expanding their services to the maintenance of electric vehicle charging stations, 60% of vehicle repairers answered positively, which demonstrated that they were in principle interested in business expansion in that area as well. In principle, the practice so far is such that the supplier of charging stations (the entity performing the installation, commissioning and diagnostic and functional testing) ensures regular maintenance/servicing within the offered warranty period. Maintenance/servicing means a one-year inspection of charging stations including visual control and inspection of mechanical/electrical components, and if necessary, upgrading of existing versions of software to new versions or remote diagnostics. As a rule, charging station suppliers also offer an emergency response service in the event of a failure.

Low-power AC charging stations require minimal maintenance (cable and connector inspection), while the maintenance of DC charging stations is more demanding (additional inspection of the cooling system, filters, and other components).

Upon expiry of the warranty period, the charging station operator signs a maintenance contract with the same or another entity or self-maintains them (own authorized personnel). There are already entities in the EU market that offer charging station maintenance services (other than the suppliers).

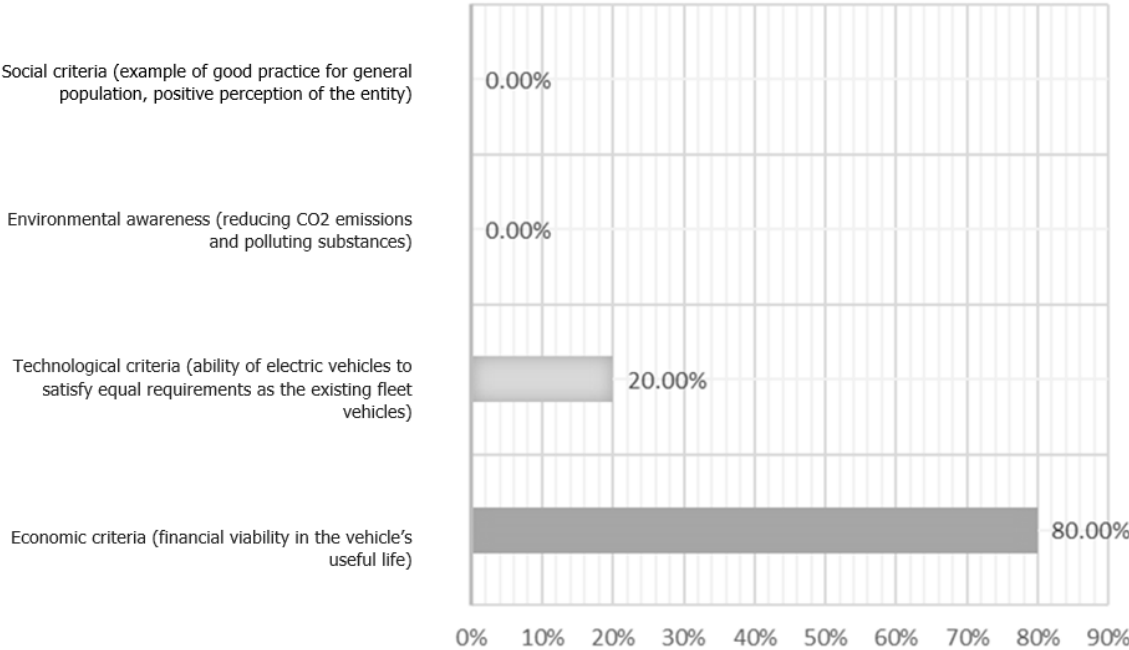
Vehicle repairers were also asked a set of questions about the motives and criteria for purchasing electric vehicles, factors that might trigger interest in electric vehicles and barriers that prevented significant use of electric vehicles in Montenegro. The results are shown in the following charts.

#### KEY MOTIVES FOR ELECTRIC VEHICLE PURCHASING – VEHICLE REPAIRERS |



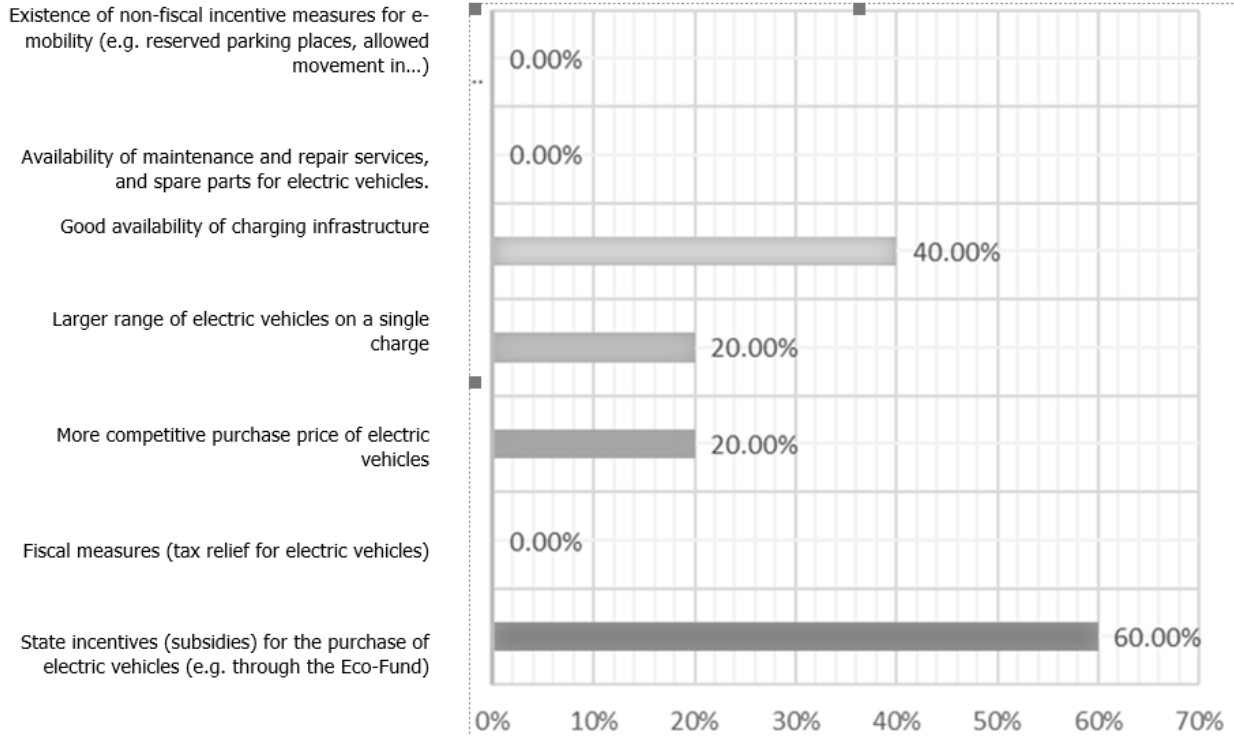
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KEY CRITERIA FOR DECIDING ON ELECTRIC  
VEHICLE PURCHASING | – VEHICLE REPAIRERS



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## KEY FACTORS FOR A WIDER USAGE OF ELECTRIC VEHICLES – VEHICLE REPAIRERS



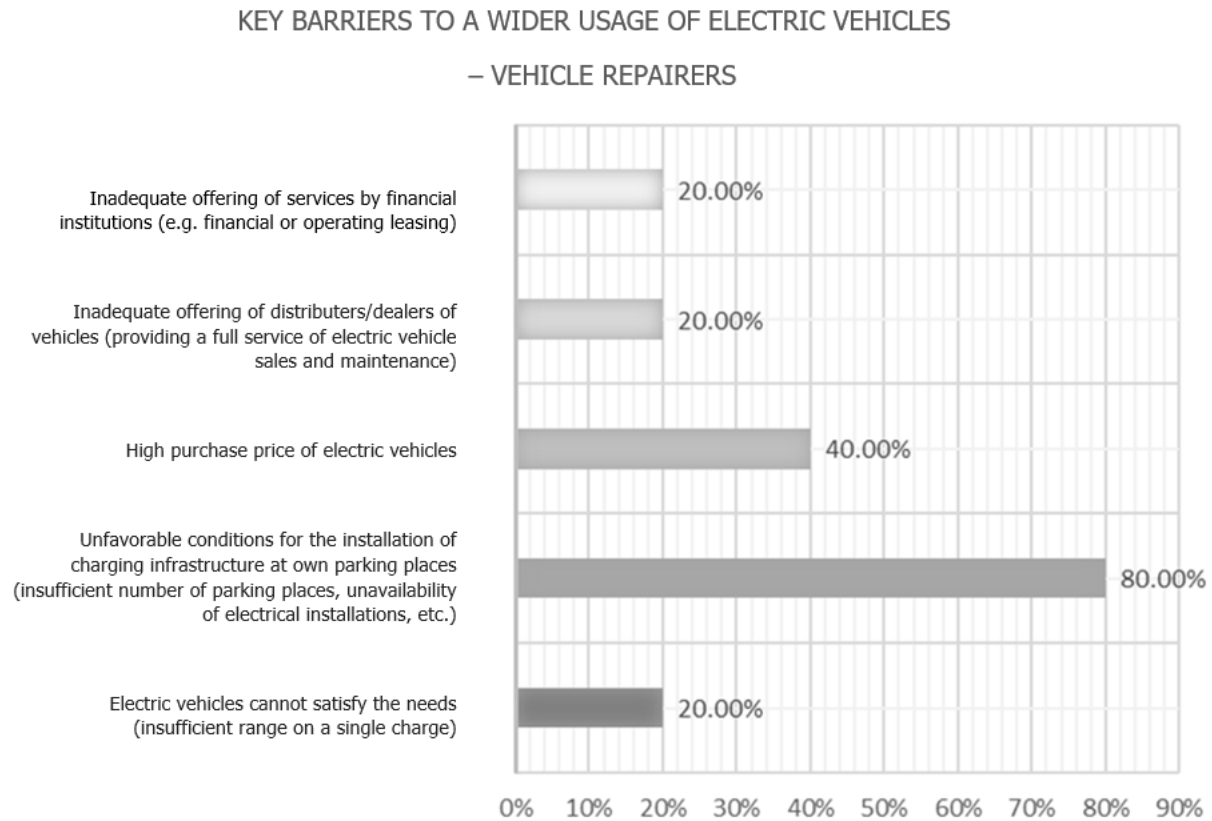


Figure **Error! No text of specified style in document.**-4: The views of vehicle repairers on the key motives, criteria, incentive factors and barriers for electric vehicles in Montenegro

## FINANCIAL INSTITUTIONS

The financial and operational leasing are models that have registered a significant popularity among vehicle users in recent years. Leasing of electric vehicles for a period of several years will enable the end user to avoid potential risks of ownership over the electric vehicle (obsolete technology and battery degradation already after several years of use). A survey questionnaire was prepared for financial institutions, whose aim was to establish the current policy of commercial banks and leasing houses, in the context of financial lines for end users of vehicles, or the readiness of these institutions to introduce new models that apply exclusively to electric vehicles.

**Four** financial institutions responded to the survey questionnaire. Prior to submitting the questionnaire, 15 most important financial institutions in Montenegro were identified and the survey results of this group of respondents are considered only indicative. Nevertheless, it should be commented that the financial sector has well-established business models of lending for vehicle purchasing and that in these business models the type of engine power makes no significant difference. Surveying was intended to investigate the familiarity of financial institutions with electric vehicles and their possible readiness to specially treat such vehicles in their financial products with the aim of creating a green image.

Information regarding the current state of supply of special credit lines/leasing conditions for electric vehicles is shown in Table below. Although the survey results show that banks are paying attention to eco-lines as an integral part of their business, reviewing the websites of banks revealed that special offers

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regarding the green/eco-lines of credit were not clearly highlighted. Almost every bank has credit lines for car purchase, but there is currently no mention of any special conditions for electric vehicles, which is expected due to low demand.

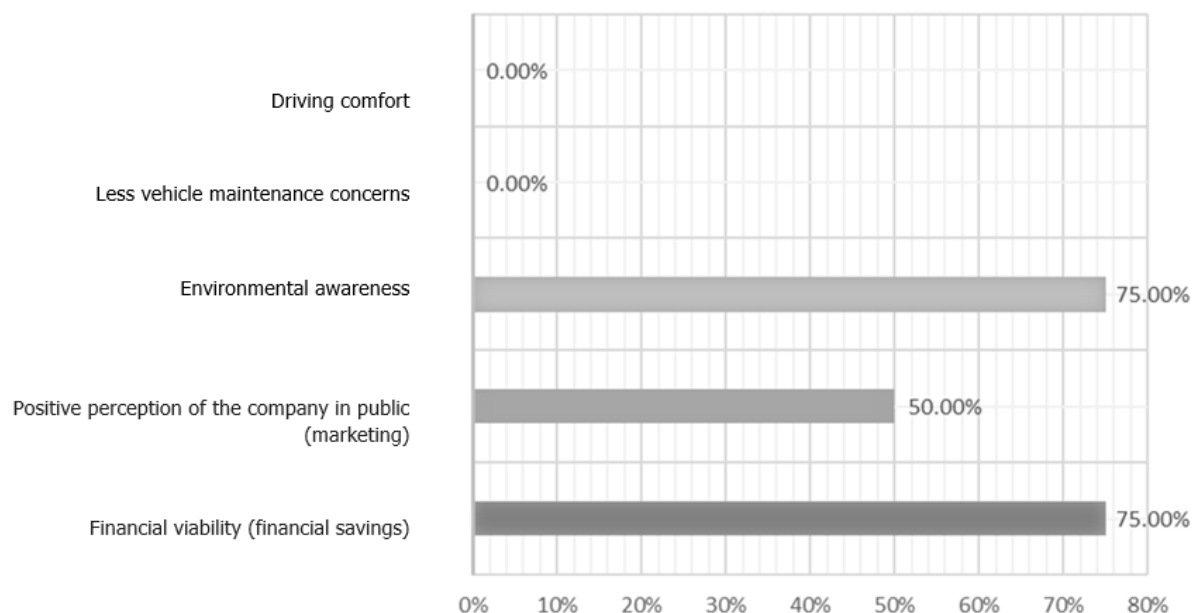
Table **Error! No text of specified style in document.**-3: The results of a survey on the availability of financial products for electric vehicles

<b>Question</b>	<b>Number of respondents with a positive response</b>	<b>The percentage of respondents with a positive response in the total number of respondents (%)</b>
<b>Access to 'eco' credit lines</b>	3	75.00%
<b>Consideration of the possibility of introducing special credit lines/leasing conditions for electric vehicles for natural persons</b>	2	50.00%
<b>Consideration of the possibility of introducing special credit lines/leasing conditions for electric vehicles for legal entities</b>	2	50.00%

Financial institutions were also asked about the risks and barriers they recognized in loan or leasing contracts, and few answers pointed to the standard risks in any lending, such as termination of contract and insurance.

Financial institutions were asked a set of questions on the motives and criteria for purchasing electric vehicles, factors that could stimulate interest in electric vehicles and barriers that prevented the significant use of electric vehicles in Montenegro. The results are shown in the following charts.

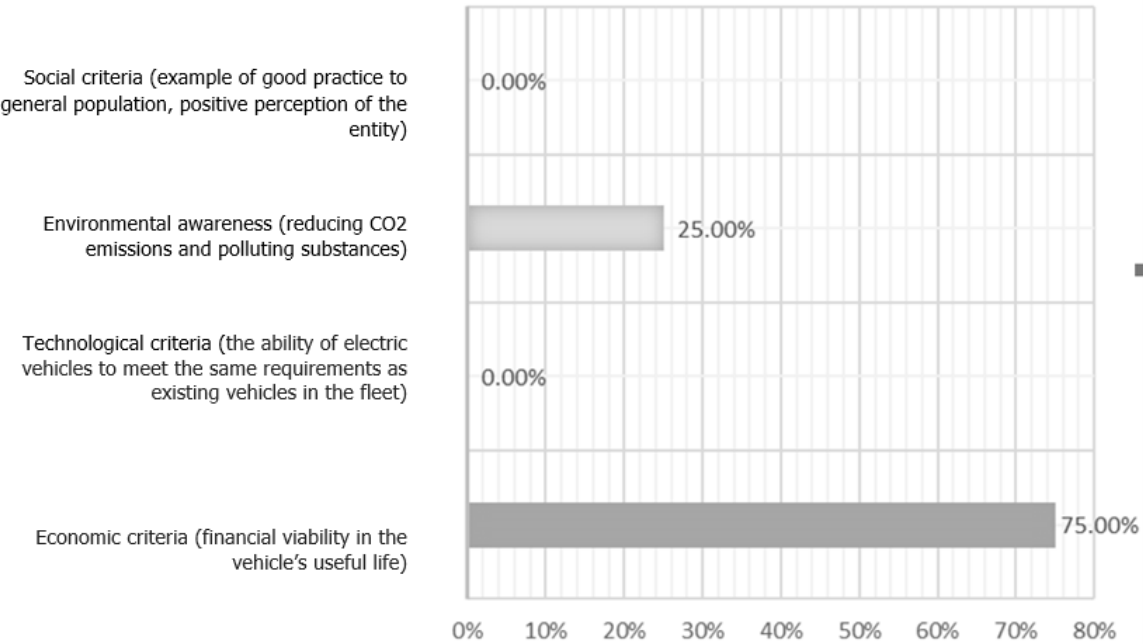
#### KEY MOTIVES FOR BUYING ELECTRIC VEHICLES – FINANCIAL INSTITUTIONS



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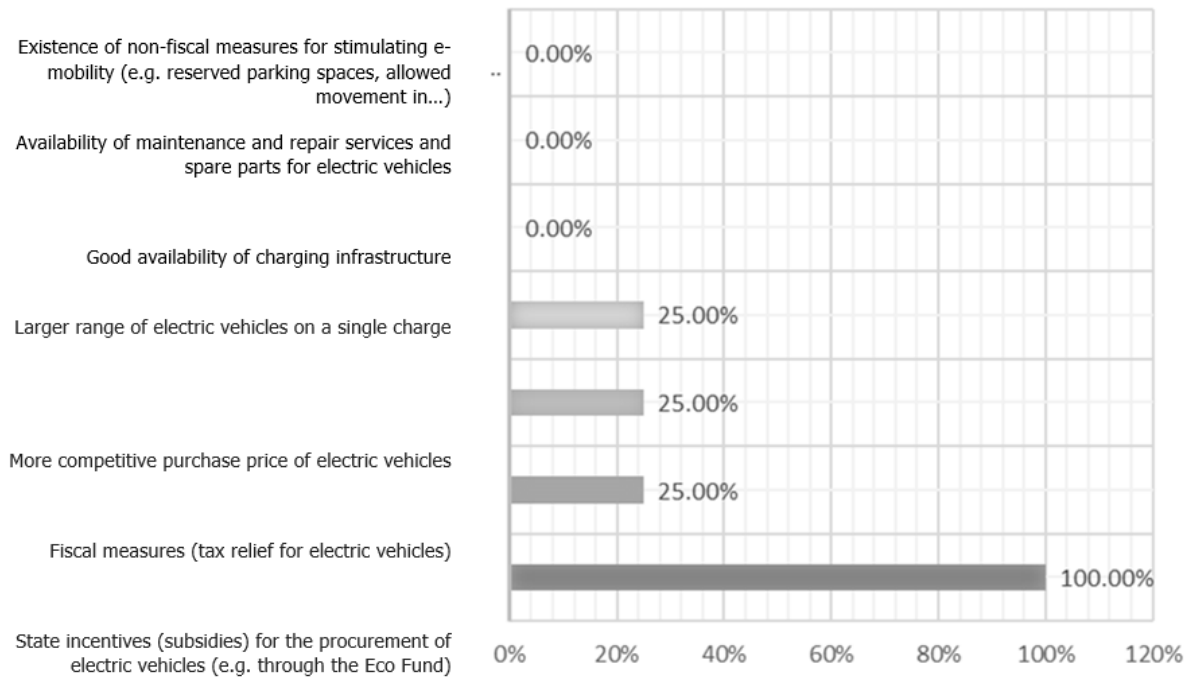
KEY CRITERIA FOR MAKING DECISIONS ON ELECTRIC VEHICLE PROCUREMENT

└ FINANCIAL INSTITUTIONS



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## KEY FACTORS FOR A WIDER USAGE OF ELECTRIC VEHICLES – FINANCIAL INSTITUTIONS



## KEY BARRIERS TO A WIDER USAGE OF ELECTRIC VEHICLES – FINANCIAL INSTITUTIONS

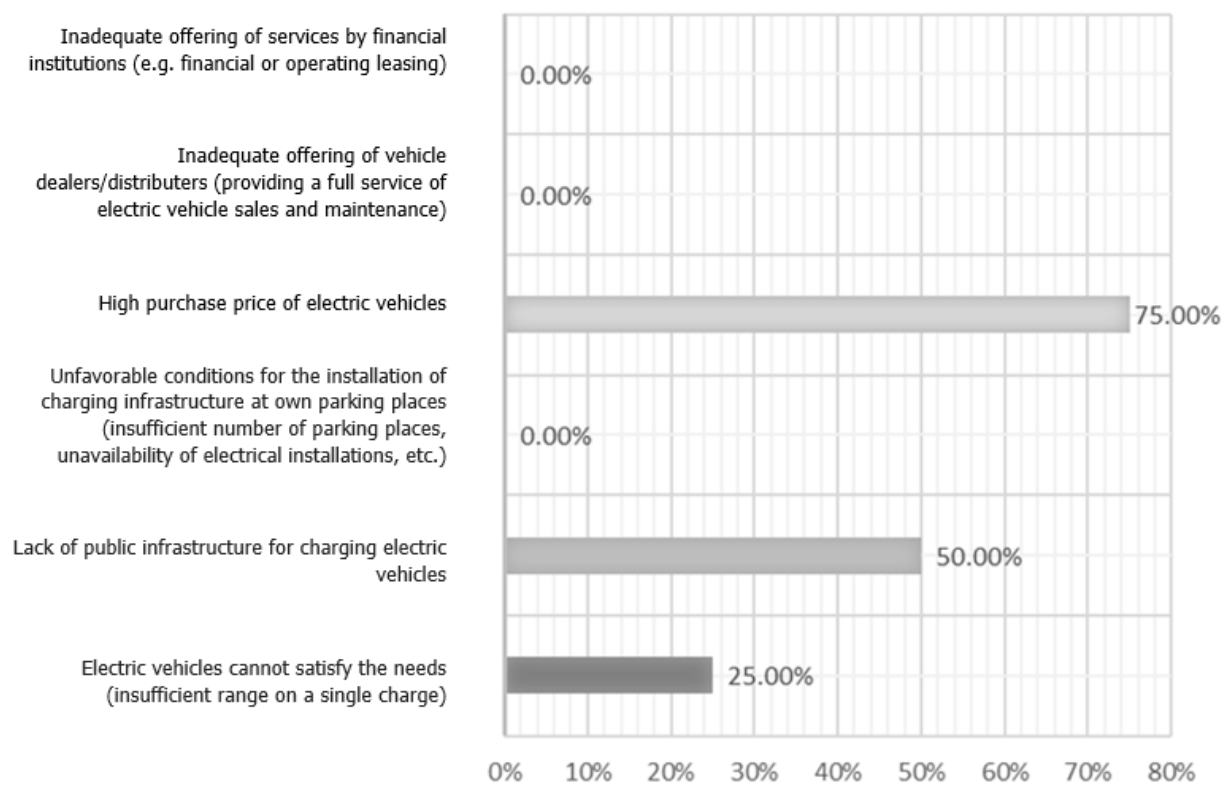


Figure **Error! No text of specified style in document.**-5: Views of financial institutions on the key motives, criteria, incentive factors and barriers for electric vehicles in Montenegro

## PROVIDERS OF OTHER SERVICES RELATED TO E-MOBILITY

In the e-mobility concept, on the supply side, apart from electric vehicles, it is necessary to consider the complete service of charging electric vehicles in public places, which includes charging of electric vehicles, user identification, subscription service, billing, etc. Each new activity in the field e-mobility opens up space for business of new and independent business entities. However, at the initial stage of the development of e-mobility, it often happens that one business entity simultaneously carries out more activities. So, a common example is that a business entity that owns a charging station is at the same time its operator (maintenance, data management) and a provider of e-mobility services (relationship with electric vehicle users). With the development of this market area, it is expected that more and more business entities will emerge, dealing with only one element of e-mobility, and some new ones will also appear (e.g. aggregators).

Despite the currently undeveloped e-mobility sector in Montenegro, certain market entities have already started to undertake certain activities to timely position themselves on the market. Two types of entities currently stand out among them: telecommunications service providers and petroleum product distributors.

Telecommunication services operators, in accordance with their corporate policies crossing the borders of Montenegro, offer solutions for installing electrical chargers (up to 2x22 kW) and their commissioning, integration with the central regional portal for the appearance of charging stations in searches, user authorization and billing (**Annex II**) and already have plans to build new charging stations throughout Montenegro in the current year.

Distributors of petroleum products see e-mobility primarily as a marketing activity, which fits in their strategic concepts of gas station development as a place where not only fuel is sold but the entire service is provided. In this respect, some of the biggest players in the market already have plans to build charging stations at their gas stations (**Annex II**), which will certainly have a positive effect on the further development of e-mobility in Montenegro.

Among the other market participants involved in offering e-mobility solutions, it is certainly important to point out the producers of charging stations such as the Electric Power Industry of Montenegro. The Electricity Power Industry of Montenegro currently has no specific plans for e-mobility services, but given the good practices in the region, this potential engagement should certainly not be neglected. Examples from the EU are shown in the table below.

*Table **Error! No text of specified style in document.**-4: Examples of the engagement of electric power companies in developing e-mobility*

Country	Description
<b>Czech Republic</b>	"E-mobilita" is an organization within the ČEZ Group, the largest energy conglomerate in the Central and South-Eastern Europe. The group has been more significantly devoted to electro-mobility since 2009, and is currently managing the largest network of charging stations in the Czech Republic. As part of their network, there are 108 fast charging stations whose installation was funded from EU Funds (CEF). Since they are engaged in the production, distribution and sales of electricity, the ČEZ Group believes that e-mobility is their logical business focus, given that e-mobility is a new segment of the electricity market and related products. Thus, in their long-term vision, the main objective is to build a functional and affordable network of electric charging stations which will ensure optimum coverage throughout the Czech Republic, thus ensuring the possibility of traveling on short and long distances.
<b>Croatia</b>	The national power company in Croatia (HEP dd) is actively implementing the project of e-mobility including the development of a network of charging stations for electric vehicles, while emphasizing that the basis of the project is the idea that renewable energy from electricity is used as propulsion fuel for electric vehicles, which fits into the vision of infrastructure development for charging of electric vehicles based on the concept of advanced power grids. HEP has also recognized the potential of European projects as a significant source of funding for the installation of fast charging stations, as well as conducting expert analyzes.

## CONCLUSIONS AND PROPOSED ACTIVITIES

On the supply side of the e-mobility market there is a distinction between the services that are linked to electric vehicles and the supply of services that are linked to the development and management of a publicly available infrastructure for charging electric vehicles. Both segments in Montenegro are still in the initial stages of development, as confirmed by the survey results, marketplace interviews and independent research. According to the evaluation matrix (Figure 1-1), the characteristics of the e-mobility market on the supply side in Montenegro are as follows:

- Some e-vehicles available
  - The offer of electric vehicles is certainly not at the level of more developed markets
- Some knowledge and limited experience

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- Dealers/distributors and VEHICLE REPAIRERS demonstrate that they follow the trends and are informed and getting prepared for increased demand for electric vehicles, and yet, due to the extremely low number of such vehicles in Montenegro, they lack experience
- No e-mobility services -> Limited e-mobility services
  - It cannot be said that e-mobility services are not available in Montenegro because this segment of the market is still developing and there are already some installed and publicly available electric vehicle chargers
- No customized commercial funding -> Limited customized commercial funding
  - Although there are no special credit lines or leasing conditions for financing electric car procurement, it cannot be said that customized commercial financing is completely absent in Montenegro - namely, financial institutions offer their vehicle purchase financing products, which are applicable to electric vehicles.

Based on the above, it can be said that the **maturity of e-mobility product and service offerings in Montenegro is low**, but it is certainly **moving towards the middle**.

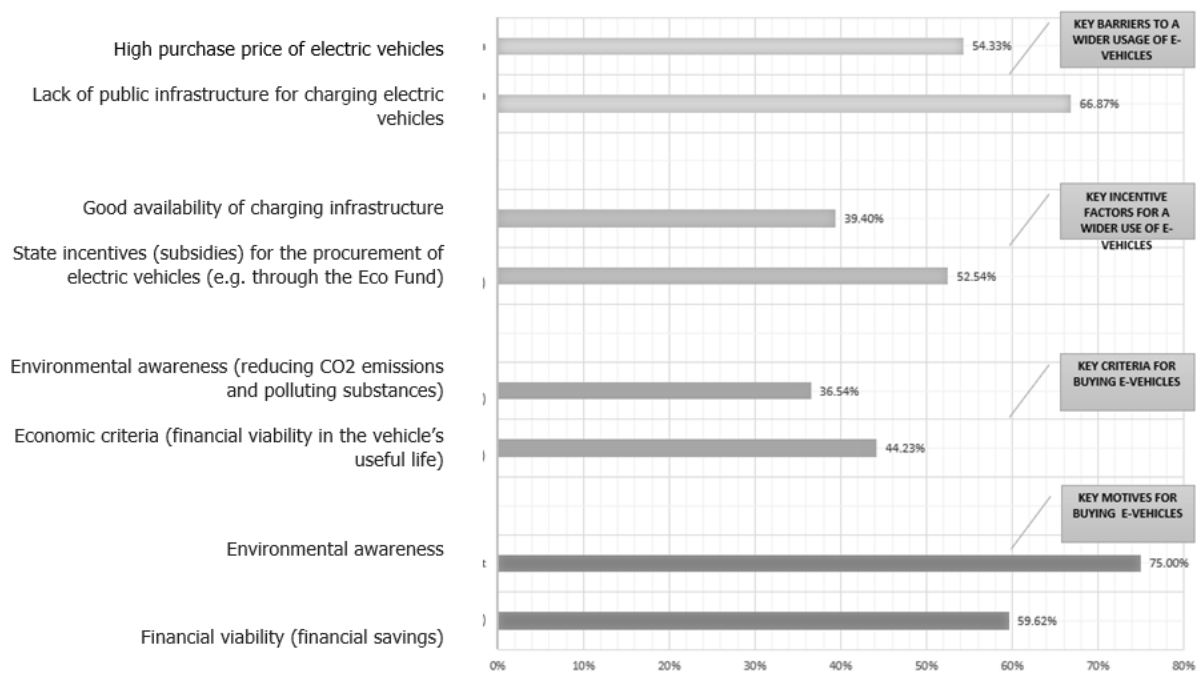
In the market segment related to electric vehicles, the dealers/distributors, repairers and financial institutions are the most significant market participants and this part of the market is extremely competitive. Accordingly, it is evident that all these entities are already preparing to increase demand for electric vehicles and adapt their business. In the context of encouragement, the biggest incentive for this market segment will be an increased demand for electric vehicles and in that sense no special incentives are necessary for them.

In the segment of services linked to the development and management of publicly accessible infrastructure for the charging of electric vehicles, the market is also beginning to develop, driven by practices from European and neighboring countries, and the desire to get the entities better positioned on the market the soonest possible. However, in order to speed up the development of infrastructure and the overall concept of e-mobility, in this segment of the market it would be helpful to have the state and public sector engagement in general, as the initiator of developing infrastructure in their respective areas.

One part of the conducted survey referred to general views of the entities on this side of the market about the motives, criteria, incentives and barriers for procurement of electric vehicles in Montenegro. Given that the entities on this side of the market know their customers well, these results are certainly useful for the future definition of incentive measures in Montenegro. Summarized results are shown in

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## VIEWS OF ENTITIES ON THE DEMAND SIDE OF THE E-MOBILITY MARKET IN MONTENEGRO



. It is interesting to note that respondents see the most significant barriers to (non) availability of charging infrastructure, which is also considered to be the other most important factor for wider use of electric vehicles. Motives and criteria for deciding on purchasing an electric vehicle are primarily seen on the side of financial viability, and only then on the side of ecological awareness. **Such results provide guidelines for e-mobility communication activities in Montenegro, which should be calibrated primarily for highlighting the financial benefit of purchasing electric vehicles and then the environmental benefits.**

## VIEWS OF ENTITIES ON THE DEMAND SIDE OF THE E-MOBILITY MARKET IN MONTENEGRO

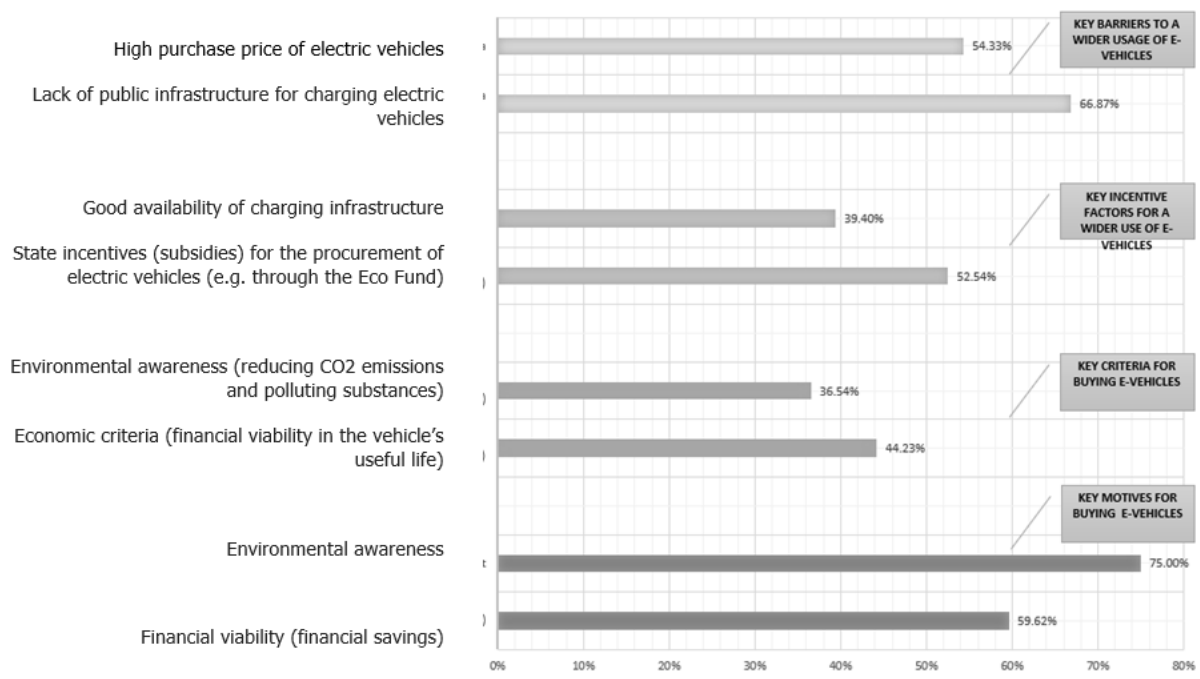


Figure **Error! No text of specified style in document.**-6: Views of the entities on the supply side of e-mobility market on the key motives, criteria, incentive factors and barriers for electric vehicles in Montenegro

To conclude, it can be determined that the positioning of business entities in the sector of e-mobility takes place in the expected sequence and appropriately in relation to the market development level. Namely, the views of business entities are aimed at concurrently carrying out several activities (installation of charging stations, management of charging stations, providing the service of e-mobility), and focusing on only one segment of e-mobility is expected only at a later stage when the entire e-mobility will be well developed and the market activities will be clearly segregated. Additionally, when the number of electric vehicles occupy a significant share in the total fleet, a space will be opened for completely new market opportunities and business models that are currently unavailable.

# DEMAND FOR E-MOBILITY PRODUCTS AND SERVICES

## LEGAL PERSONS

### 3.1.1. Public Sector

The state and local authorities, as well as other public institutions, have the opportunity to be examples of good practice of introducing electric vehicles in their fleets. By analyzing the status of their fleet, it is possible to establish the potential for the introduction of electric vehicles and to encourage them to make investment decisions that are in accordance with the environmental protection policy at the national and global level.

As part of a survey of the potential market in the public sector context, data on the number and age of passenger and light freight vehicles were collected from a total of 58 entities (shown in **Error! Reference source not found.**). The total number of vehicles in the public sector vehicle fleets is more than 700, with some public institutions having only one vehicle available and others more than 100. The average age at the level of the analyzed fleet is 10.2 years, while the average annual mileage is 20,100 km (average mileage data received from only 9 entities).

The analysis of the size of vehicle fleets of public institutions showed that almost half of them had up to 5 vehicles available. 13 institutions (22%) have 6 to 10 vehicles available, 15 institutions (26%) have between 11 and 50 vehicles, and only 2 institutions (4%) have more than 50 vehicles available. Such an analysis is very important since it is necessary to apply different approaches to the introduction of electric cars in small, medium-sized and large vehicle fleets.

Table **Error! No text of specified style in document.**-5: Size of vehicle fleets of public institutions

Number of Fleet Vehicles	Number of Vehicle Fleets
1-5	28
6-10	13
11-50	15
51-115	2
Total	58

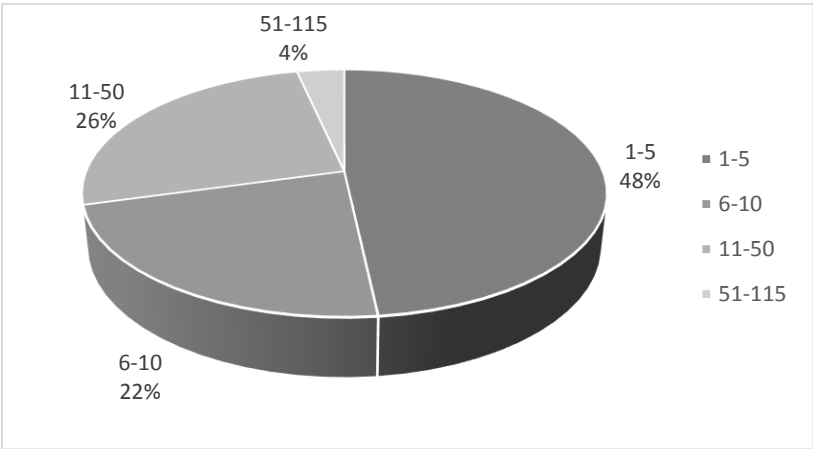


Figure **Error! No text of specified style in document.**-7: Size of vehicle fleets of public institutions

Due to the limited availability of data on kilometers traveled, it is not possible to carry out a more detailed analysis of individual fleets. In order to determine the vehicle fleets that are most suitable for the introduction of electric vehicles, it is necessary to analyze several elements for which it is necessary to have annual mileage data, average fuel consumption, engine power, fuel type, and daily and weekly use patterns for each vehicle.

It can be presumed principally that the fleet of the Administration for Inspection Affairs has a great potential for the introduction of electric vehicles, given the use patterns in carrying out the day-to-day inspection duties. In addition, this would have a significant impact on the positive perception of e-mobility, as this is a large number of vehicles used throughout the entire territory of Montenegro.

Apart from direct positive environmental impacts, the introduction of electric vehicles in vehicle fleets of public institutions has a significant direct impact on the positive example of accepting and adapting to new technologies and concepts, while at the same time increasing the public interest for electric vehicles and creating a positive image of the institution itself.

This research was envisaged to recognize public sector views in general according to the concept of e-mobility. However, when recognizing the potential for the introduction of electric vehicles in the fleet of a particular institution, it is recommended to carry out detailed research of the attitudes and views of the vehicle users themselves in order to identify possible barriers and to prepare training activities.

*Table **Error! No text of specified style in document.**-6: Passenger and light commercial vehicles in the public sector*

<b>Public institution</b>	<b>Number of Vehicles</b>	<b>Average Age</b>	<b>Average Mileage</b>
<b>Library for the blind</b>	3	7.3	/
<b>Mediation Center</b>	1	9	/
<b>State Election Commission</b>	2	3.5	/
<b>Secretariat for Development Projects</b>	2	1.5	/
<b>PI Center for Contemporary Art of Montenegro</b>	2	3.5	/
<b>Public Institution the Official Gazette of Montenegro</b>	2	15.5	/
<b>Secretariat for Legislation</b>	1	19	/
<b>Maritime Museum of Kotor</b>	1	9	/
<b>Audit Authority of Montenegro</b>	1	3	/
<b>Montenegrin National Theater</b>	6	8.3	/
<b>Metrology Office</b>	4	1.5	/
<b>Ministry of Justice</b>	5	4.2	/
<b>Education Office</b>	4	9.5	/
<b>Statistical Office</b>	3	12.3	/
<b>Protector of Human Rights and Freedoms</b>	3	8.7	/
<b>PI Music Centre</b>	3	/	/
<b>Administration for Food Safety, Veterinary and Phytosanitary Affairs</b>	38	8.7	/
<b>Directorate for Transport</b>	13	10.5	/
<b>PI Centre for Conservation and Archeology</b>	5	6.8	/
<b>PI Nature Museum of Montenegro</b>	3	11.3	/
<b>Montenegrin Academy of Sciences and Arts</b>	4	10	/
<b>Center for Vocational Education</b>	3	11	/
<b>Faculty for Montenegrin Language</b>	2	10.5	/
<b>Pension and Disability Insurance Fund</b>	8	11.9	/
<b>General Secretariat of the President of Montenegro</b>	3	21	/
<b>Ministry of Public Administration</b>	7	10.2	/
<b>Constitutional Court of Montenegro</b>	9	5.7	/
<b>State Audit Institution</b>	8	/	/

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<b>Administration for Games of Chance</b>	2	11	/
<b>Hydrometeorology and Seismology Office</b>	14	12.4	/
<b>Ministry of Labor and Social Welfare</b>	10	6.7	18,800
<b>Nature and Environmental Protection Agency</b>	8	9.3	/
<b>Institution for the Enforcement of Criminal Sanctions</b>	44	9.3	/
<b>Employment Office of Montenegro</b>	17	12.5	/
<b>Administration for the Prevention of Money Laundering and Terrorism Financing</b>	6	11.9	/
<b>Real Estate Administration</b>	23	4.7	/
<b>Maritime Safety Administration of Montenegro</b>	17	12.1	/
<b>Tax Administration</b>	49	10.2	/
<b>Supreme Court of Montenegro</b>	4	5.3	/
<b>Port Authority</b>	2	8.5	/
<b>Administration for Inspection Affairs</b>	115	/	/
<b>Ministry of Health</b>	6	7.9	/
<b>Agency for the Peaceful Settlement of Labor Disputes</b>	1	8	/
<b>Property Administration</b>	19	/	/
<b>Police Academy</b>	13	16.2	/
<b>Forest Administration</b>	68	12.3	/
<b>Railway Directorate</b>	2	9	/
<b>Herceg Novi Municipality</b>	28	9.4	/
<b>Podgorica City Sanitation Facility</b>	18	12.2	17,300
<b>Airports of Montenegro</b>	30	12.4	26,800
<b>Airport Podgorica</b>	11	9.6	17,000
<b>Airport Tivat</b>	10	9.8	/
<b>Golubovci Municipality</b>	3	12	16,300
<b>Zabljak Municipality</b>	6	10.3	11,200
<b>Water and Sewer Works Tivat</b>	6	8	15,000
<b>Communal Police</b>	9	10.4	14,100
<b>Gusinje Municipality</b>	3	6.3	22,300
<b>Niksic Water Works</b>	29	13.3	/

In order to identify the interests of these public and technical and financial capacities of the public sector for the introduction of electric vehicles into their fleet, a survey was conducted. Responses from 39 respondents were received. Taking into account that in Montenegro there are 45 state administration bodies (17 ministries and 28 administration authorities) and 23 local government units (municipalities), this sample is considered relevant.

Most of the respondents (64.10%) did not consider introducing electric vehicles into their fleet. Most of the respondents (66.67%) state that there is an average interest in new transport technologies in the institution, 15.39% of them say that no such interest or a small interest exists, and 17.95% (7 respondents) have a great interest. It is assumed that the latter ones are exactly the institutions (state administration bodies, faculties) in the field of environmental protection, energy and transport. A similar share of respondents (89.74%) and those who have medium or high interest in new transport technologies is willing to participate in a pilot project for the introduction of electric vehicles into their fleets.

Relatively low interest in consideration of the introduction of electric vehicles and new transport technologies is expected due to the current low level of development of e-mobility. Namely, it is expected that at the first appearance of publicly available charging infrastructure as well as the emergence of electric cars on urban roads, the general interest for e-mobility will increase considerably, and thus the public sector's interest. This will be significantly contributed by an increasing attention paid to this issue in the media.

However, the questionnaire results also indicate that there is already an undeniable share of those who follow the development trends and are ready to accept new technologies.

The survey also sought to establish the interest of public institutions to actively participate in the process of

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adopting strategic and legal documents and defining implementing measures for the faster development of e-mobility in Montenegro. The results are shown in Figure Error! No text of specified style in document.-8.

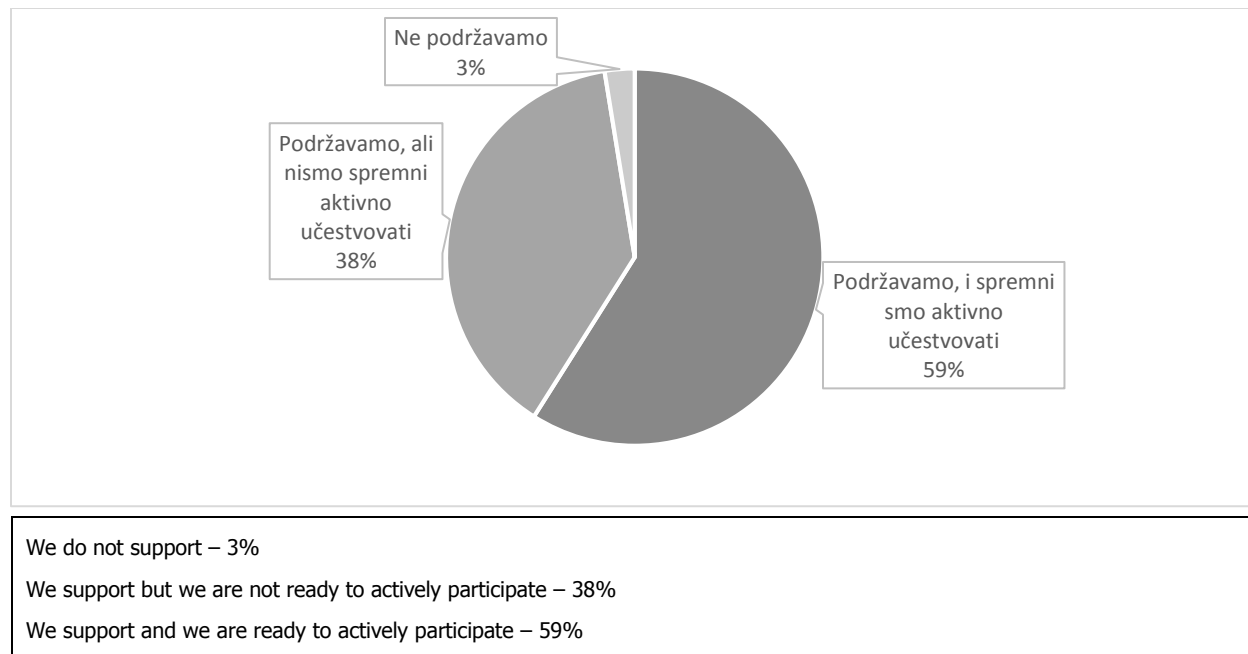


Figure Error! No text of specified style in document.-8: Readiness of public institutions to participate in the adoption of strategic and legal documents and definition of implementing measures for faster development of e-mobility in Montenegro

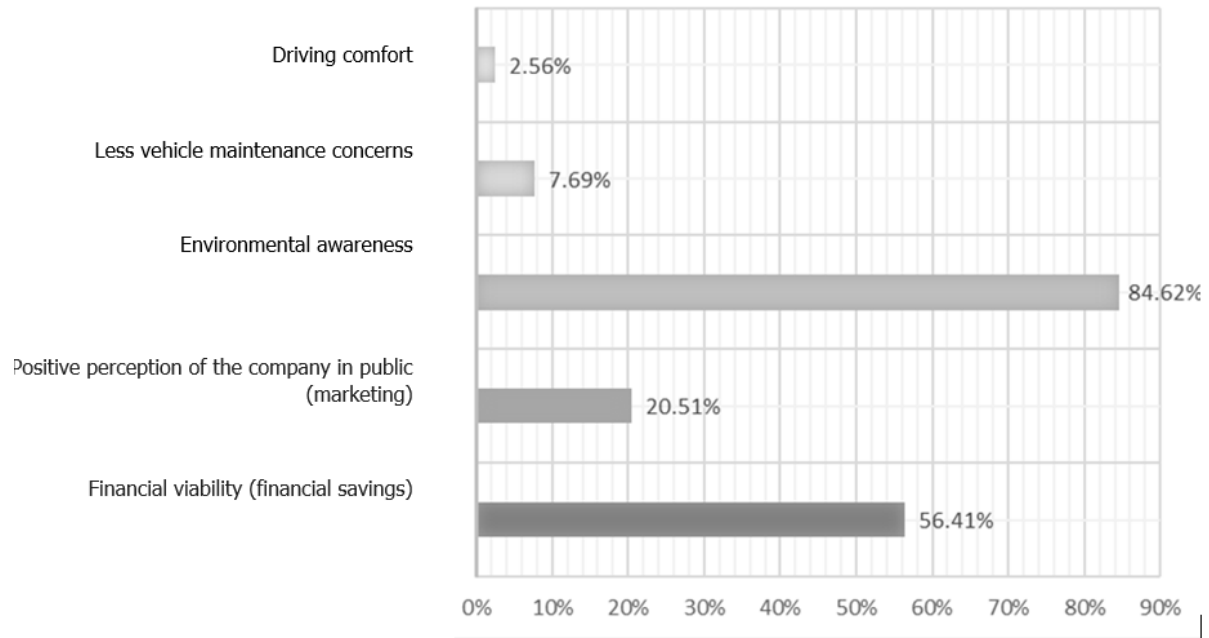
Respondents also submitted their proposals for the most important strategic, legal and other measures for faster e-mobility development in Montenegro, which generally refer to the following:

- Establishment of state incentives for the purchase and use of electric vehicles (subsidies and tax incentives);
- Adoption of statutory provisions for state bodies for reducing the use of vehicles on liquid fuels;
- Compulsory application of green public procurement, and
- Legal definition of infrastructure development obligation for e-mobility.

The public sector representatives were asked a set of questions on the motives and criteria for buying electric vehicles, factors that could foster their interest in electric vehicles and the barriers that significantly impeded the use of electric vehicles in their fleets. The results are shown in the following charts. Responses indicate that ecological awareness is a key motive and criterion for deciding on purchasing an electric vehicle, which is significantly different than in all other groups of respondents where the criterion of financial viability prevails. State incentives are the absolutely dominant factor that would stimulate the procurement of electric vehicles, and the barriers pointed out are the lack of public infrastructure for vehicle charging and inability to meet the needs, i.e. an insufficient single-charge vehicle autonomy on a single-charge.

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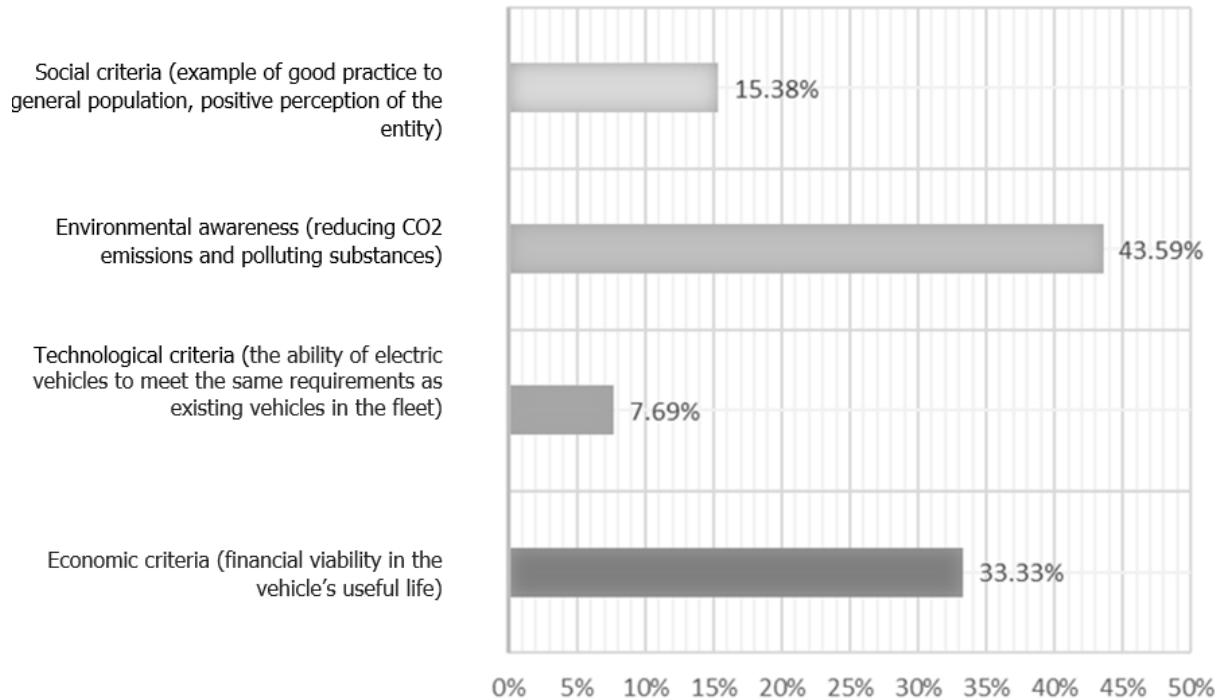
## KEY MOTIVES FOR BUYING ELECTRIC VEHICLES – PUBLIC SECTOR



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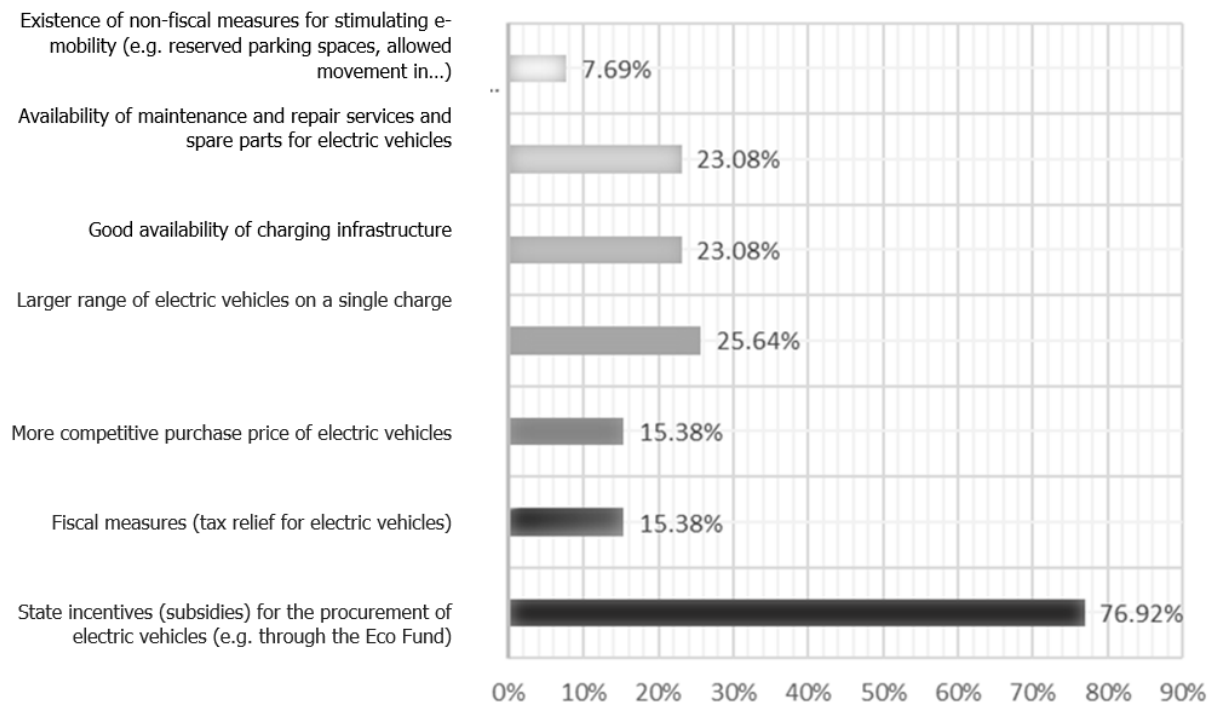
## KEY CRITERIA FOR MAKING DECISIONS ON ELECTRIC VEHICLE PROCUREMENT

– PUBLIC SECTOR |



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## KEY FACTORS FOR A WIDER USAGE OF ELECTRIC VEHICLES – PUBLIC SECTOR



## KEY BARRIERS FOR A WIDER USAGE OF ELECTRIC VEHICLES – PUBLIC SECTOR

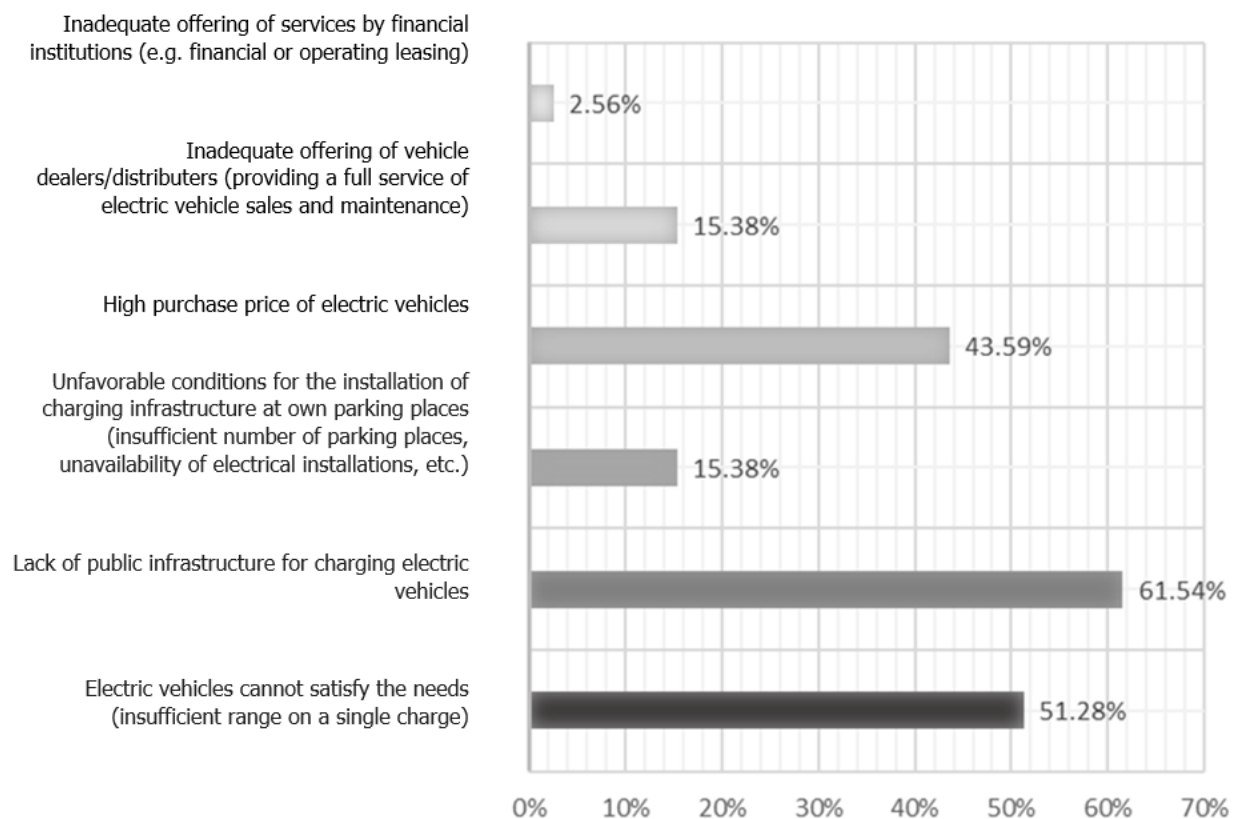


Figure **Error! No text of specified style in document.**-9: Public sector views on the key motives, criteria, incentive factors and barriers for the introduction of electric buses into their fleets in Montenegro

Regarding the perception that electric cars cannot meet the needs, representatives of public institutions state the following:

- The minimum acceptable range (autonomy) of electric vehicles on a single charge to meet the requirements of the business activities of public institutions varies significantly among the respondents: <100 km (7.69%); 100-200 km (20.51%); 200-300 km (33.33%); 300-400 km (20.51%); > 400 km (17.95%) - it can be established that the majority, i.e. half of them, believe that their activities require autonomy of **200 to 400 km**;
- The maximum acceptable charge time varies significantly among the respondents: <1 hour (25.64%); 1-2 hours (43.59%); 2-4 hours (15.38%); 4-6 hours (7.69%); <6 h (7.69%) - it can be established that most of them, i.e. more than 1/3 believe that their activity requires fast charging **up to 2 hours**;
- Most of the respondents (82.05%) have their own parking spaces, and only 5.13% of them do not have their own parking spaces - the rest have own parking spaces that cover only part of their needs, and most of these respondents indicated a problem of not having both garage and parking spaces next to the outdoor parking spaces;
- Most of the respondents (69.23%) have a person in charge of maintaining the vehicles in their respective institutions.

According to the response to the question on the minimum acceptable range, it can be concluded that the lower- and middle-class electric cars that are already available on the European market could fully meet

the needs of about 30% of public institutions (range <200 km). For those institutions that point out the need for a larger range, additional analyzes can determine the possibility of partial introduction of electric vehicles in the fleets, and with the future development of technology that will lead to a greater range of cars, it will be possible to introduce an increasing share of electric vehicles in the fleets of all public institutions.

With regard to the acceptable charging time, it is likely that a certain number of cars actually perform such tasks where quick charging is required during daily use of the vehicle. However, for the full acceptance of the concept of e-mobility, apart from the changes brought about by the development of technology, it is inevitable to accept changes in habits when using transport. Namely, the principles of e-mobility, which include advanced intelligent network charging management and the integration of electric cars into the power system, assume such charging patterns for electric vehicles that are subject to control. In other words, the goal of each charge is to last as long as possible. It is expected that the maximum number of charging will occur during the night and at times of minimum loads of the power system. Therefore, the collected answers to this question point to the need to inform and meet all potential users with different elements of e-mobility so that each individual has a clearer picture of what to expect and how to optimally utilize the capabilities of electric vehicles.

The high proportion of respondents stated that they had their own parking spaces, which is a very important prerequisite for the introduction of electric vehicles in their fleet with the possibility of their optimal use (flexible planning of charging and use of vehicles).

As far as the financial viability of electric vehicles is concerned, although the financial criterion is mentioned as the second most important issue in making investment decisions, only 2 respondents (5.13%) produced long-term economic and financial analysis of electric vehicle procurement. Therefore, it would be useful to make an analysis of the costs and benefits for a case study for introducing an electric vehicle into an existing fleet and on an existing route, as an alternative to purchasing a new or replacement of an existing vehicle.

The following is a framework review of the characteristics and cost structure for three comparable passenger car classes, with conventional vehicles, electric vehicles, and plug-in hybrid vehicles being compared. With regard to the purchase price of vehicles, it is clear that conventional-powered vehicles are still significantly more favorable compared to electric vehicles, but electric vehicles generate significantly less annual operating costs. For calculating the operating costs shown in the table below, the assumption was that the vehicles exceeded **16,500 km** per year, approximately the average mileage generated by public passenger vehicles (calculated on the basis of available data collected within the project). In order to define the feasibility of introducing electric-powered vehicles in public sector institutions, it is necessary to analyze the costs and benefits for each particular case, which must take into account the specifics of the route of transport and the needs of each individual entity.

*Table **Error! No text of specified style in document.**-7: Structure of electric vehicle costs compared to conventional or hybrid vehicles*

	General Characteristics		
<b>Manufacturer</b>	Volkswagen	Volkswagen	Volkswagen
<b>Model</b>	Golf VII	Golf VII GTE	e-Golf
<b>Engine power [kW]</b>	86	152	101
<b>Price</b>	<b>€21,300</b>	<b>€37,600</b>	<b>€40,300</b>
	<b>Driving parameters</b>		
<b>Average annual mileage (km)</b>	16,500	16,500	16,500
<b>Fuel/energy consumption</b>	5.5 L/100 km	3 L/100 km	0,162 kWh/km
<b>Fuel tank/ battery capacity</b>	50 L	40 L / 8,7 kWh	35,8 kWh
<b>Autonomy [km]</b>	900	1000	220
<b>Fuel price</b>	1.3 €/L	1.3 €/L – 0.073 €/kWh	0.073 €/kWh*
	<b>Maintenance</b>		
<b>Tire change</b>	100 €/year	100 €/year	100 €/year
<b>Oil change</b>	50 €/year	50 €/year	/
<b>Other costs (spare party, cleaning)</b>	700 €/year	600 €/year	200 €/year
<b>Annual operating costs (maintenance and energy)</b>	<b>€2,030</b>	<b>€1,400</b>	<b>€500</b>

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	General characteristics		
Manufacturer	KIA	Toyota	Hyundai
Model	Cee'd	Prius Plug-in	IONIQ
Engine power[kW]	85	90	88
Price	€17,800	€37,430	€36,000
	Driving parameters		
Average annual mileage (km)	16,500	16,500	16,500
Fuel/energy consumption	5.5 L/100 km	2.8 L/100 km	0.157 kWh/km
Fuel tank/ battery capacity	50 L	43 L / 8,8 kWh	28 kWh
Autonomy [km]	900	1000	180
Fuel price	1.3 €/L	1.3 €/L – 0.073 €/kWh	0.073 €/kWh*
	Maintenance		
Tire change	100 €/year	100 €/year	100 €/year
Oil change	50 €/year	50 €/year	/
Other costs (spare party, cleaning)	700 €/year	600 €/year	200 €/year
Annual operating costs (maintenance and energy)	€2,030	€1,350	€500

	General characteristics		
Manufacturer	Toyota	Mitsubishi	Hyundai
Model	RAV4	Outlander PHEV	KONA
Engine power[kW]	129	99/70	150
Price	€30,000	€40,700	€36,500
	Driving parameters		
Average annual mileage (km)	16,500	16,500	16,500
Fuel/energy consumption	8.0 L/100 km	2 L/100 km/ 169 kWh/km	0.169 kWh/km
Fuel tank/ battery capacity	55 L	45 L / 13,8 kWh	64 kWh
Autonomy [km]	700	750	400
Fuel price	1.3 €/L	1.3 €/L – 0.073 €/kWh	0.073 €/kWh*
	Maintenance		
Tire change	200 €/year	200 €/year	200 €/year
Oil change	80 €/year	80 €/year	/
Other costs (spare party, cleaning)	1,200 €/year	1,000 €/year	300 €/year
Annual operating costs (maintenance and energy)	€3,200	€2,250	€700

\* charging with power less than 34.5 kW - Distributing customers 0.4 kV for which power is not measured, two-meter measurements - includes network capacity engagement, network losses for NT, market operator compensation and OIE compensation, and the price of active electricity for a basic model in NT

As far as vehicle procurement itself is concerned, the vast majority of respondents (87.18%) said that they self-financed the purchase of vehicles (planned budget funds). Only 10.26% of the respondents said that their usual procurement model was operating leasing, and 2.56% financial leasing.

The majority of respondents (69.23%) consider that there is no limitation in public procurement procedures that prevents the purchase of electric vehicles. Those who believe that there are limitations almost unanimously mention the lowest price criterion as the biggest problem.

### 3.1.2. Public Transport

Public transport is an important segment for improving energy efficiency in Montenegro and among the most promoted ones in the European Union policy. According to current legislation in Montenegro, public transport is defined as a transport that is available to all potential users, under the same conditions and offered on a commercial basis. Public transport services are provided at local level in cooperation with local self-government units and are often offered by private companies. For local public transport, the most commonly used means of transport are vehicles, buses and cabs. Intercity public transport is a type of

service offered to passengers traveling from one city to another and it is most commonly carried out by means of a van, bus, train, and taxi.

Public transport of passengers or cargo in road transport shall be carried out by the carrier on the basis of a public passenger or freight transport license. The authority responsible for issuing the license is the Directorate for Transport and the oversight body is the Ministry of Transport and Maritime Affairs. Licenses are issued with a validity period of 5 years.

Intercity public transport in Montenegro is regulated by the Law on Roads. Intercity bus services are currently provided by several private carriers (over 100 carriers operate from the main bus station in Podgorica only). The main bus station is located in Podgorica with over 300 bus departures per day; buses connect daily the capital city with larger and smaller cities in the country as well as with international destinations. The bus station in Podgorica annually provides services to over 1 million passengers.

The main data on road and local road traffic for the year 2017, collected during the regular quarterly and annual survey of reporting units whose main activity is the transport of passengers and goods in road and local road transport, as shown in the following table:

*Table **Error! No text of specified style in document.**-8: Road transport statistics for 2017 (Source: MONSTAT)*

	<b>Road Passenger Transport</b>
<b>Number of buses</b>	369
<b>Transported passengers, in thousands</b>	7,575
<b>Kilometers travelled by passengers, in thousands</b>	114,196
<b>Kilometers travelled by vehicles, total in thousands</b>	17,944

*Table **Error! No text of specified style in document.**-9: Local road transport statistics for 2017 (Source: MONSTAT)*

	<b>Road Local Transport</b>
<b>Number of buses</b>	68
<b>Number of bus lines</b>	24
<b>Length of bus lines, km</b>	601
<b>Transported passengers, in thousands</b>	964
<b>Kilometers travelled by vehicles, total in thousands</b>	4,350

According to the data on the number of registered motor and towed vehicles according to the year of manufacture, the average age of buses registered in Montenegro is 16 years.

Given the share of public transport in total CO<sub>2</sub> emissions and polluting substances from the transport sector, as well as a significant contribution with respect to noise pollution, electric vehicles will play an increasingly important role in this segment. While individuals, when selecting a vehicle, mostly take initial investment into account and attach much greater importance to non-monetary factors such as style or status, the purchase of buses intended for public urban and interurban transportation is thoroughly evaluated financially. Since operating costs constitute a much bigger share of total cost of ownership compared to individual passenger vehicles, buses are a potentially good market for the use of electric vehicles.

For the purpose of making future estimates of the financial sustainability of electric buses in public transport, there was a survey of representatives of companies engaged in public transport, city and intercity transport. A survey questionnaire was sent to all public transport operators in urban transport in Montenegro: BLT Bulatović Transport - Podgorica; Glušica transport - Nikšić; Mediteran Express - Bar/Budva and Blue Line - Tivat/Kotor/Herceg Novi. In addition, a questionnaire was sent to other carriers through the Transport Association of the Montenegrin Chamber of Commerce.

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The questionnaire was structured in two parts. The first relates to the fleet data and the other is about the preconditions and attitudes related to the introduction of electric vehicles in their own bus fleets. Unfortunately, **none of the public transport operators has provided data on the fleet, so the fleet analysis cannot be carried out.**

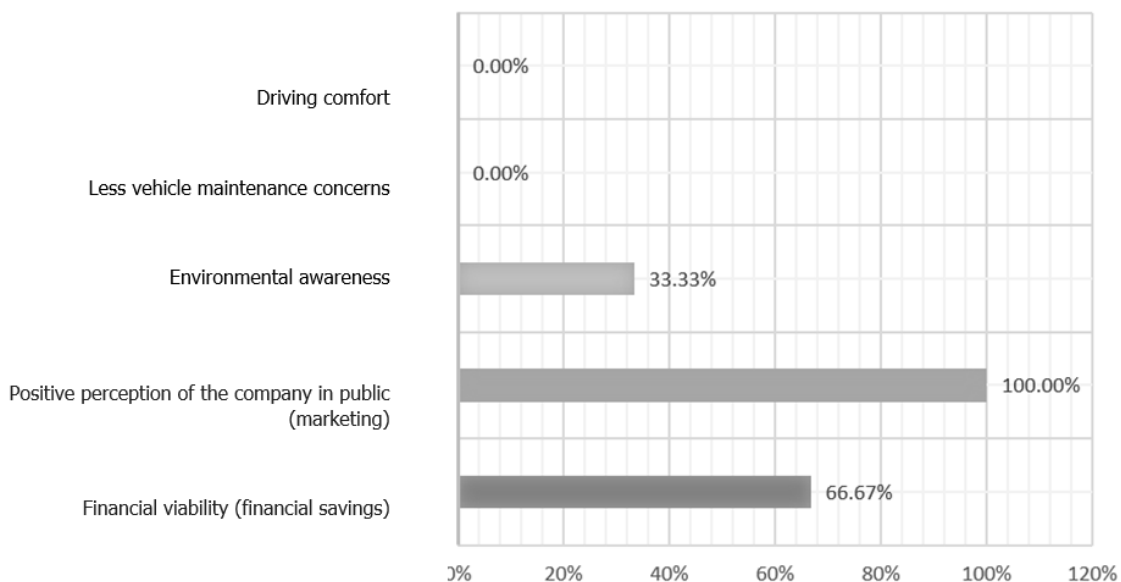
Below are the results of the second part of the survey questionnaire, for which **3** responses were received. Since 4 public transport operators in Montenegro have been identified, the survey results can be considered representative.

Most of the respondents (66.67%) have not yet considered the introduction of electric buses into their fleet, and only one respondent has. Also, most respondents (66.67%) said that their company had no or little interest in the new transport technologies. Nevertheless, most respondents (66.67%) would be ready to take part in a pilot project for the introduction of electric buses into their fleets.

The willingness of the respondents to participate in the pilot project for the introduction of electric buses while saying at the same time that they have not independently considered their introduction points to the openness of the public transport operator to the concept of e-mobility, however they need to be provided with adequate information and familiarization with the possibilities offered by electric buses as well as the basis for cost and profit analysis.

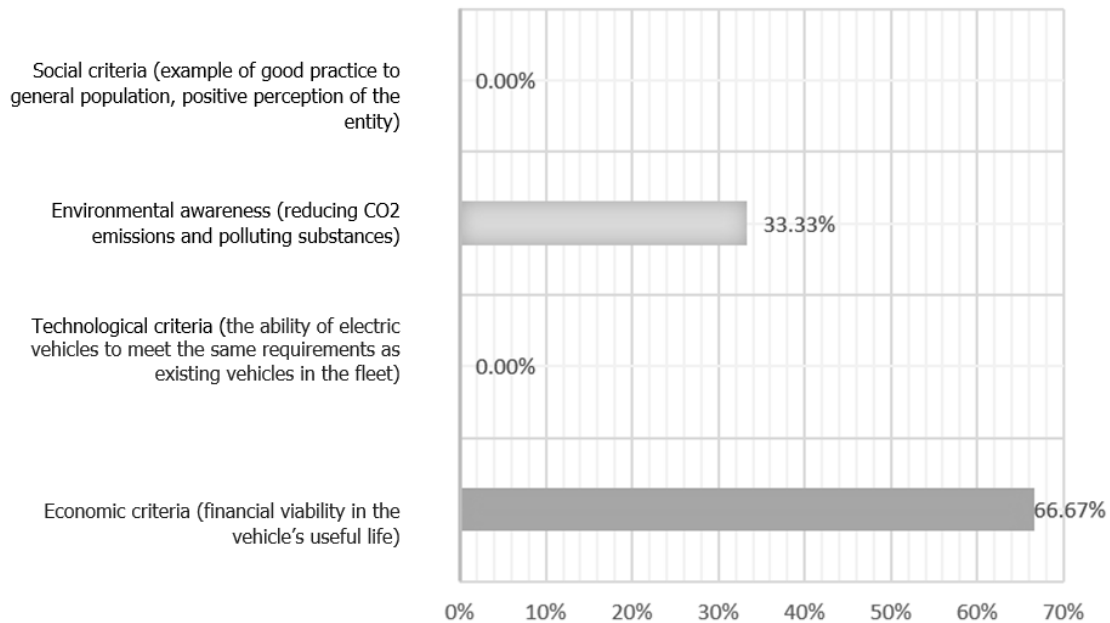
The public transport operators were asked a set of questions about the motives and criteria for purchasing electric buses, factors that could foster their interest in electric buses and barriers that prevented a more significant use of electric buses in their fleets. The results are shown in the following charts. Responses show that in addition to the financial viability of an electric vehicle, it is very important for the public transport operators that the vehicles can satisfy their job requirements, i.e. to have a sufficient range that ensures the smooth provision of public transport services.

#### KEY MOTIVES FOR BUYING ELECTRIC BUSES – PUBLIC TRANSPORT OPERATORS

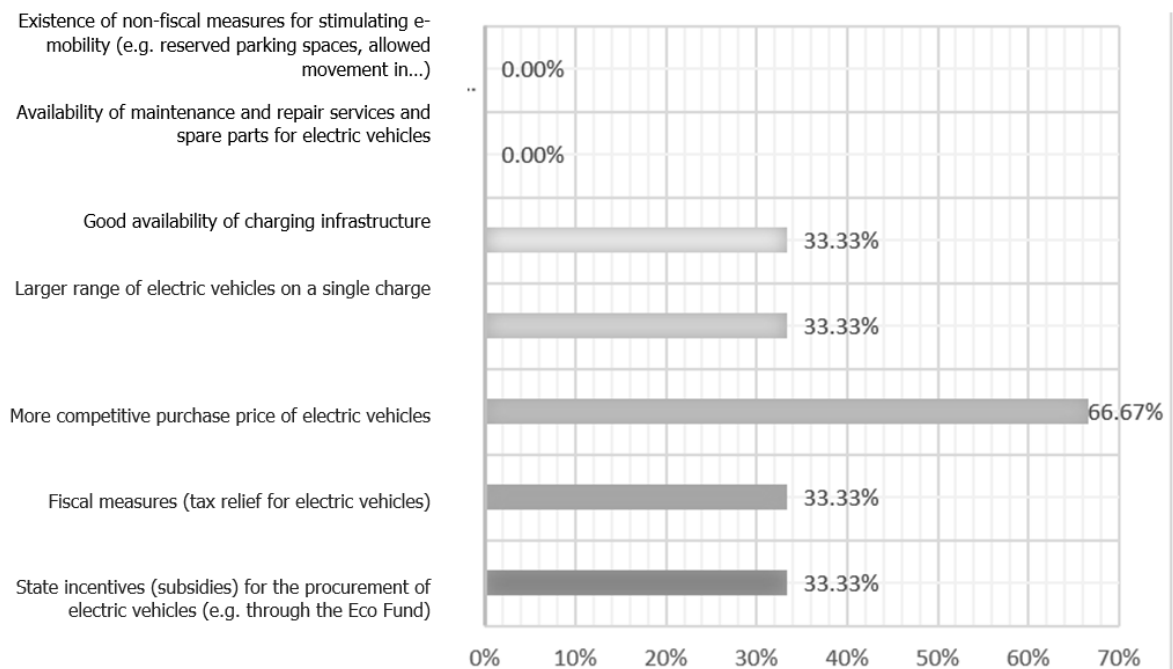


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## KEY CRITERIA FOR MAKING DECISIONS ON THE PURCHASE OF ELECTRIC BUSES – PUBLIC TRANSPORT OPERATORS



## KEY FACTORS FOR A WIDER USAGE OF ELECTRIC BUSES – PUBLIC TRANSPORT OPERATORS



## KEY BARRIERS TO A WIDER USAGE OF ELECTRIC BUSES – PUBLIC TRANSPORT OPERATORS

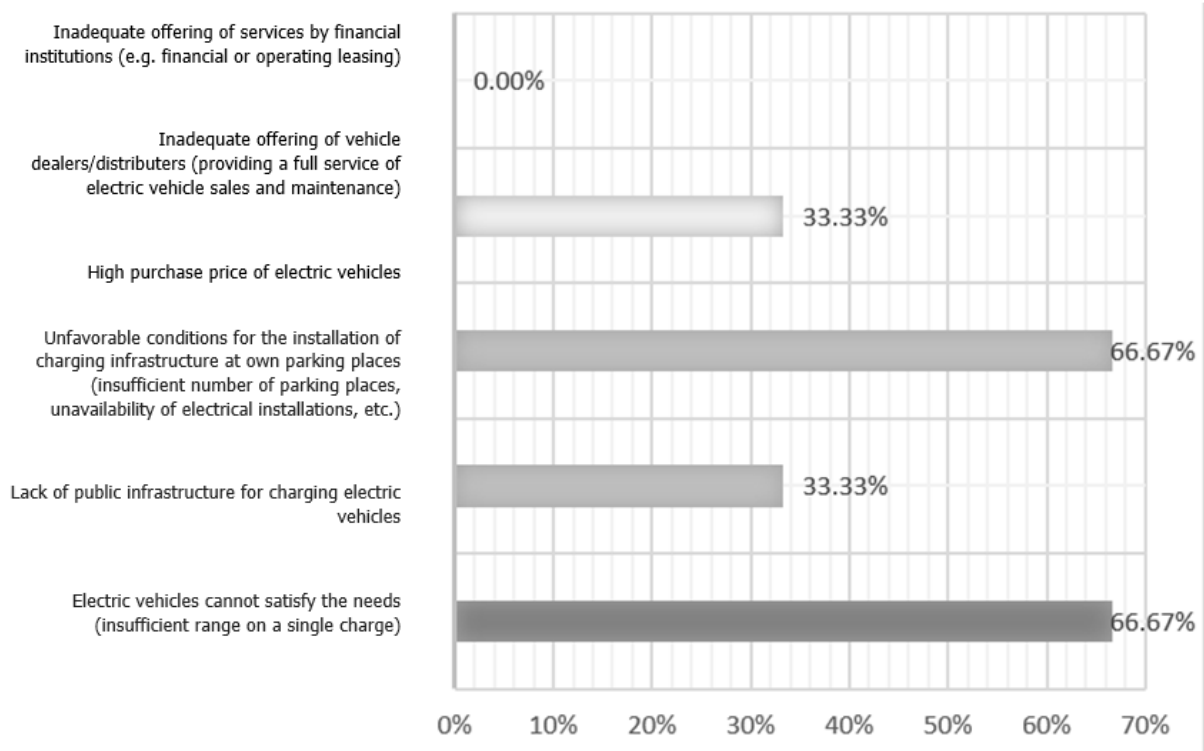


Figure **Error! No text of specified style in document.**-10: Public transport operators' views on key motives, criteria, incentive factors and barriers for the introduction of electric buses into their fleets in Montenegro

In line with these results and the need for electric buses to meet the needs of smooth service provision, public transport operators state the following:

- The minimum acceptable range (autonomy) of electric buses on a single charge that would meet business requirements for most of them is **>400 km** (66.67% of respondents) or between **300 and 400 km** (33.33% of respondents);
- Maximum admissible charging time for a bus is **3 to 4 hours** (66.67% of respondents) or **1 hour** (33.33% of respondents);
- All respondents have their own parking spaces available, with only one respondent not having enough space available for all vehicles.

The autonomy stated by the respondents as the minimum to enable them to fulfill their daily tasks is greater than what most electric buses can offer today. Therefore, in order to introduce e-mobility in this segment of road transport, it is possible to consider the following solutions:

- Reconfiguring the existing bus routes to adjust to the capacity of electric buses,
- Introducing plug-in hybrid buses with greater autonomy.

As far as the financial viability of electric buses is concerned, no respondent has produced any long-term economic-financial analysis of electric buses. Therefore, it would be useful to produce an analysis of costs and benefits for the case study of introducing an electric vehicle into an existing fleet and on an existing route as an alternative to purchasing a new diesel bus or replacing an existing one.

Below is a framework overview of the characteristics and cost structure for the comparable bus class, comparing a diesel bus and an electric bus. With regard to the purchase price of a vehicle, it is clear that the diesel bus is significantly more favorable than the electric bus, but the electric bus generates significantly less annual operating costs (assuming charging as explained in the table below). For the calculation of operating costs, the assumption was that buses travelled **72,000 km** annually. In order to define the feasibility of introducing electric buses by public transport entities, it is necessary to analyze costs and benefits for each case, which must take into account the specificity of the transport route and the needs of each individual entity.

*Table **Error! No text of specified style in document.**-1: Structure of buses on electric drive compared to the diesel-powered bus*

	<b>General characteristics</b>	
<b>Manufacturer</b>	Mercedes-Benz	SOR Libchavy
<b>Model</b>	Merkavim pioneer	SOR NS 12 electric
<b>Engine power [kW]</b>	220	160
<b>Number of seats</b>	40	33
<b>Price</b>	<b>234,000 €</b>	<b>577,000 €</b>
	<b>Driving parameters</b>	
<b>Average annual mileage, in km</b>	72,000	72,000
<b>Energy consumption</b>	33 L/100 km	1.27 kWh/km
<b>Fuel tank/battery capacity</b>	300 L	225 kWh
<b>Autonomy [km]</b>	1000	200
<b>Fuel price</b>	1.3 €/L	0.073 €/kWh*
	<b>Maintenance</b>	
<b>Tire change</b>	3.300 €/year	3.300 €/year
<b>Oil change</b>	900 €/year	/
<b>Other costs (spare parts, cleaning)</b>	5.000 €/year	2.000 €/year
<b>Annual operating costs (maintenance and energy)</b>	<b>€40,000</b>	<b>€12,000</b>
* charging with power less than 34.5 kW - Distributing customers 0.4 kV for which power is not measured, two-meter measurements - includes network capacity engagement, network losses for NT, market operator compensation and OIE compensation, and the price of active electricity for a basic model in NT		

As for the model of financing the purchase of new buses, each respondent indicated a different model used most often (financial leasing, loan or own funds) and no respondent identified any barriers to the purchase of electric cars in this segment, as expected. The 15 most important tourist and rent-a-car agencies in Montenegro and taxi companies were identified, and a survey questionnaire was sent to the members of the Association of Tourism and Hospitality Management of the Chamber of Commerce of Montenegro.

### 3.1.3. Business Sector

Vehicle fleets that provide services such as transportation, taxi, rent-a-car, travel agencies and similar, can be a very interesting area for the introduction of electric vehicles. Given the current trends in the development of battery systems that enable an increasing range of electric vehicles while reducing the cost of batteries per unit of capacity, and with the parallel development of the appropriate charging infrastructure, an increasing interest in the use of electric vehicles in this segment of the market is expected, especially from the point of view of realizing the green image and attracting customers whose ecological aspect of their activities is extremely significant.

In order to identify the interests as well as technical and financial capacities of service providers that also include transport for the introduction of electric vehicles into their fleet, a survey was conducted. The questionnaire was structured in two parts. The first one included the data on the fleet, and the other one on the preconditions and opinions related to the introduction of electric vehicles into their own fleet. The

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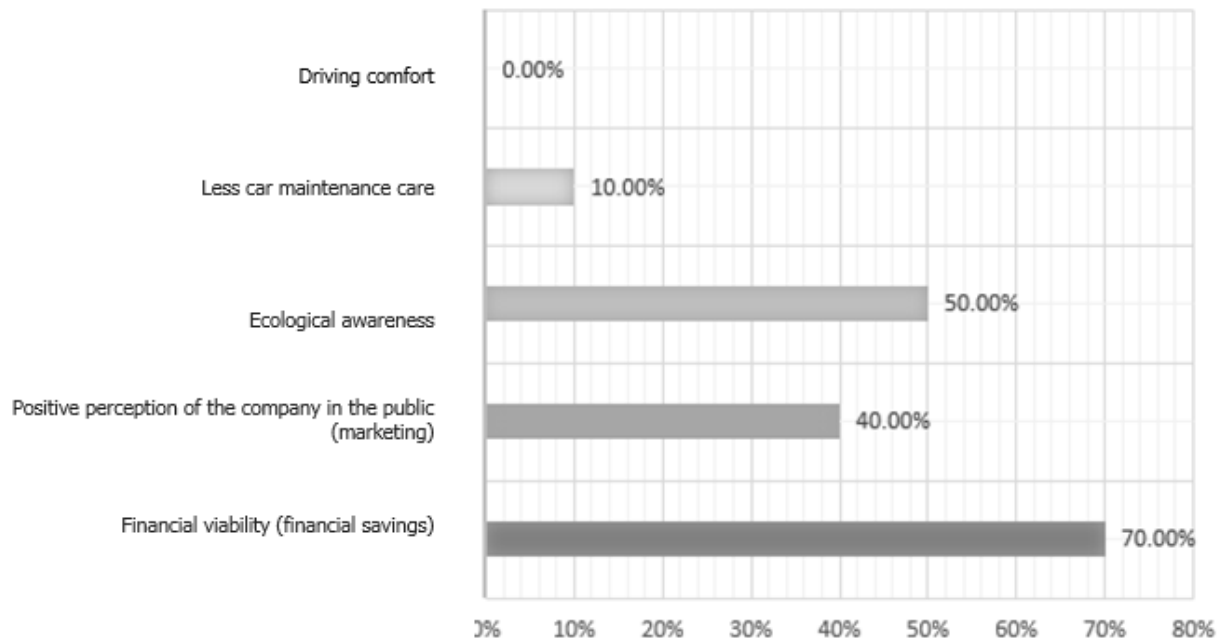
data on the fleet was received from 6 respondents, while 10 respondents answered the survey questionnaire. Results of the second part of the questionnaire are shown below, while vehicle data shall be used to select a case study for cost-benefit analysis.

Half of the respondents (50.00%) have considered the introduction of electric vehicles into their fleet. Most of the respondents (60.00%) state that there is an average interest in their company for new transport technologies, and 40% of respondents say that no such interest or a small interest exists. The same share of respondents (60.00%) is willing to participate in a pilot project for the introduction of electric vehicles into their fleets. In addition, 80% of respondents believe that the introduction of electric vehicles would improve the company's image.

It can be concluded from these responses that the private sector is relatively quick to react to potentially opening up opportunities to achieve financial benefits and to improve the image of the company. This is accompanied by the results of oral interviews with a number of private companies that have shown a strong readiness to introduce new electric vehicles into their fleets and even when the total financial benefit equals zero.

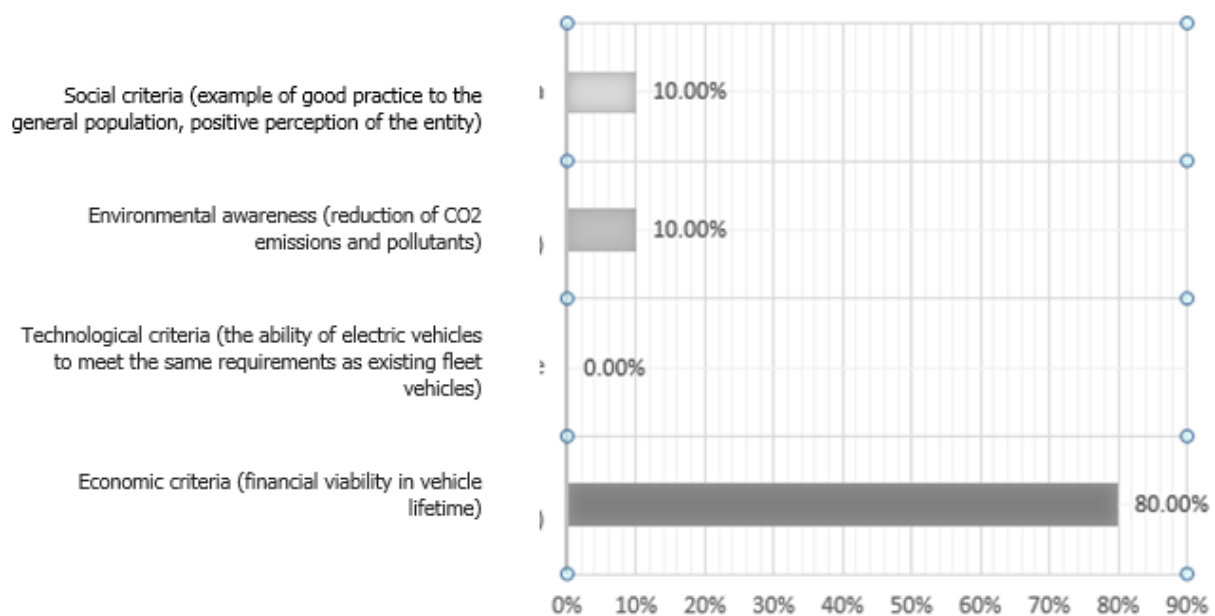
Service providers that include transportation were asked a set of questions on rationale and criteria for purchasing electric vehicles, on factors that can boost their interest in electric vehicles and on barriers that prevent significant use of electric vehicles in their fleets. The results are shown in the following graphs. Responses show that financial viability of an electric vehicle is absolutely crucial rationale and decision-making criterion, but ecological awareness and marketing also play a significant role. Financial aspects also prevail in favored incentive factors and perceived barriers to the procurement of electric vehicles.

#### KEY RATIONALE FOR BUYING AN ELECTRIC VEHICLE - SERVICE PROVIDERS THAT INCLUDE TRANSPORTATION

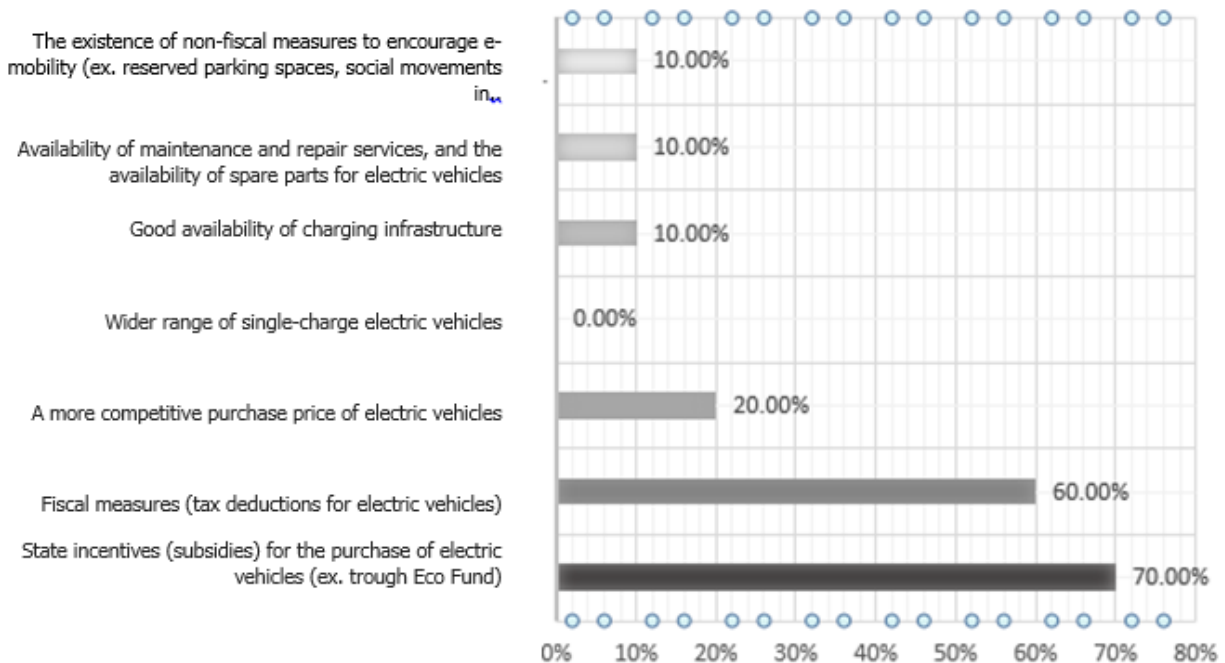


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### KEY CRITERION WHEN DECIDING ON PURCHASING AN ELECTRIC VEHICLE - SERVICE PROVIDERS THAT INCLUDE TRANSPORTATION



### KEY FACTORS FOR WIDER USE OF ELECTRIC VEHICLES - SERVICE PROVIDERS THAT INCLUDE TRANSPORTATION



|

### KEY BARRIERS TO WIDER USE OF ELECTRIC VEHICLES - SERVICE PROVIDERS THAT INCLUDE TRANSPORTATION

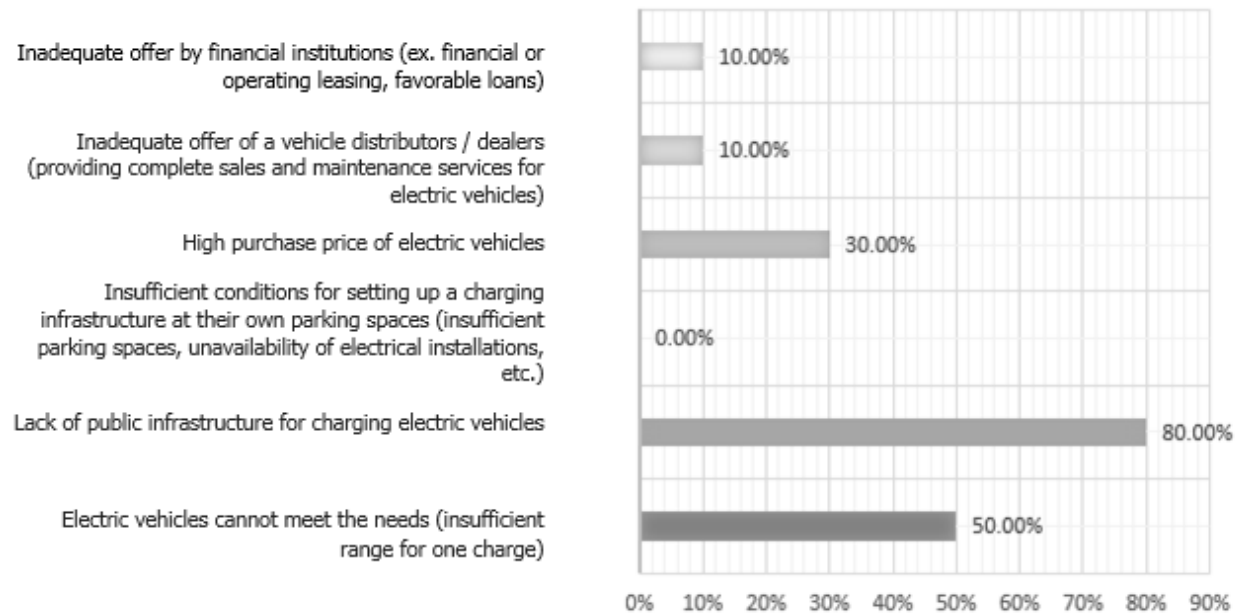


Figure 3-4: The views of service providers that include transportation on key rationale, criteria, incentive factors and barriers to introduction of electric buses in their fleet in Montenegro

Although the financial aspect was identified as crucial, only one respondent (10%) made a long-term economic and financial analysis of electric vehicle procurement. Therefore, it would be useful to make an analysis of the costs and benefits of a case study for introducing one electric vehicle into an existing fleet and on common routes, as an alternative to purchasing a new or replacing an existing vehicle.

One of the common features of a service providers, which includes transportation (such as taxi), is a relatively large number of kilometers generated by their vehicles. Based on data collected by the business sector within the project, an average annual mileage of **43,000 km** was determined. Therefore, as shown in the table below, the estimated annual operating costs for vehicle models are shown in the table above (Table 3-1). Due to the large differences in operating costs, the introduction of a fleet of electric vehicles, this respective sector could have significant financial benefits. Before deciding on purchasing electric vehicles, it is definitely suggested to make a detailed cost-benefit analysis, taking into account the actual traffic routes and the specific needs of existing ones.

Table 3-4 Structure of costs of electric vehicles compared to conventional or hybrid vehicles - business sector

	Characteristics		
<b>Manufacturer</b>	Volkswagen	Volkswagen	Volkswagen
<b>Model</b>	Golf VII	Golf VII GTE	e-Golf
<b>Average annual mileage/km</b>	43.000	43.000	43.000
<b>Price</b>	<b>21.300 €</b>	<b>37.600 €</b>	<b>40.300 €</b>
<b>Annual operating costs (maintenance and energy)</b>	<b>4.100 €</b>	<b>2.600 €</b>	<b>1.000 €</b>
<b>Manufacturer</b>	KIA	Toyota	Hyundai
<b>Model</b>	Cee'd	Prius Plug-in	IONIQ
<b>Price</b>	<b>17.800 €</b>	<b>37.430 €</b>	<b>36.000 €</b>
<b>Annual operating costs (maintenance and energy)</b>	<b>4.100 €</b>	<b>2.300 €</b>	<b>900 €</b>

<b>Manufacturer</b>	Toyota	Mitsubishi	Hyundai
<b>Model</b>	RAV4	Outlander PHEV	KONA
<b>Price</b>	<b>30.000 €</b>	<b>40.700 €</b>	<b>36.500 €</b>
<b>Annual operating costs (maintenance and energy)</b>	<b>6.200 €</b>	<b>4.100 €</b>	<b>1.200 €</b>

As for the model of financing the purchase of new vehicles, most of the respondents (60.00%) use the loans for the purchase of electric cars, financial leasing uses 20% of them, while operating leasing use 10% of the respondents, the same share as those who self-financed the purchase of vehicles. Only one respondent stated that the offer by the financial institutions was inadequate and therefore this cannot be considered as an obstacle to the purchase of electric vehicles.

Inadequate range of single-charge electric vehicles is a barrier for 50% of respondents. In this regard, service providers that also include transportation stated the following:

- the minimum acceptable range (autonomy) of a single-charge electric vehicle that meets the requirements of business activity for half of the respondents (50%) is **between 200 and 300 km**, 30% require autonomy between **300 and 400 km**, while 20% require autonomy between **100 and 200 km**;
- the maximum acceptable charging time for a vehicle is usually **1 to 2 hours** (70.00% of respondents), 20% charging time is required for **<1 hour**, and 10% accepts **4 to 6 hours** as acceptable charging time;
- most respondents (70%) have their own parking spaces available for all vehicles, while the rest do not have their own parking spaces;
- most respondents (80.00%) have a person in charge of maintaining the fleet.

From the analysis of respondents' responses, there is a similar conclusion as to the public sector, where private sector respondents still require a somewhat larger vehicle range. Most electric cars currently available on the European market are realistic to meet the needs in terms of minimum range requirements (> 300 km). It is therefore necessary, for each business entity in particular, to consider a partial replacement of the part of the fleet which serves to carry out tasks that could be met by electric cars. Alternatively, introducing plug-in hybrid vehicles that can achieve a much larger range might be considered.

Regarding vehicle charging, it is a positive fact that a large share of respondents claim to have their own parking places for all vehicles available. For acceptable charging time, a large proportion of respondents state the requirements for fast charging of vehicles. In this regard, a wide range of information and education activities need to be implemented to better familiarize the private sector and get a clearer picture of the concept of e-mobility including all the advantages and disadvantages. Namely, it is inevitable that some changes and adjustments will have to be made in the habit of using the vehicle, given the limited availability and cost of building an infrastructure for fast charging of electric vehicles (charging shorter than two hours).

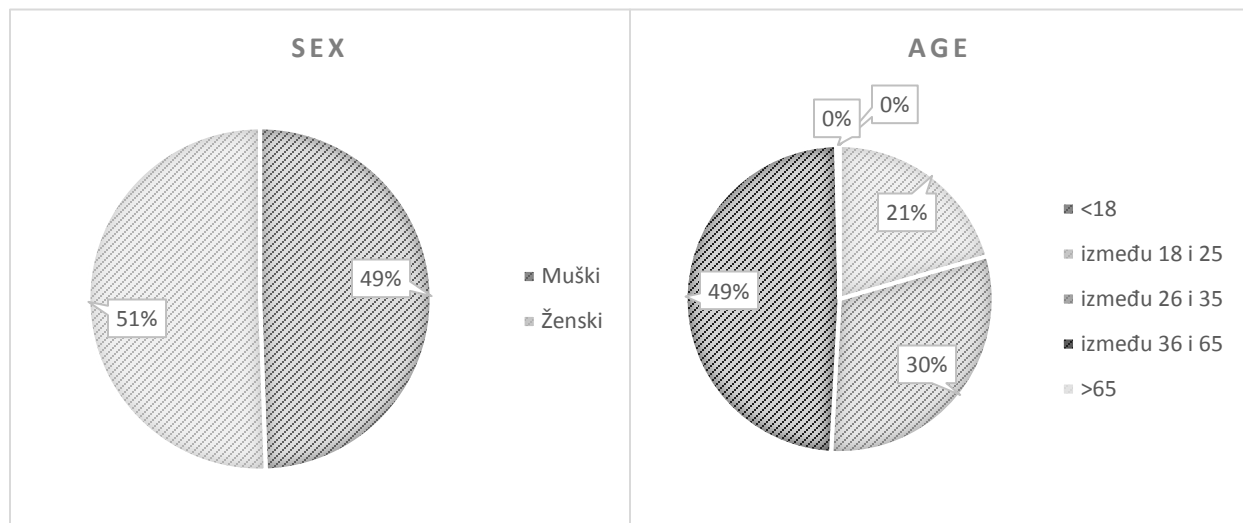
## CITIZENS

### General data on respondents

The general data on respondents are shown in Figure 3-5. 49.47% of respondents (140 respondents) are males and 50.53% (143) females, which represents good gender balance. Nearly half of the respondents (48.76%) are in the age group of 36 to 65 years old, and almost 80% (79.15%) are in the age group of 26 to 65 years old, which is a target group of citizens or groups of citizens who buy cars. The vast majority of respondents (78,80%) are highly qualified, which does not reflect the real situation in Montenegro where, according to the latest census of 2011, there are about 17% of people who have high education. This may be a result of a form of survey (an online survey, and this group of citizens are using Internet more) on one hand or greater interest in high-powered electric vehicles on the other hand. The respondents are mostly employed (75.97%), followed by students (16.25%), which is also convenient because they are

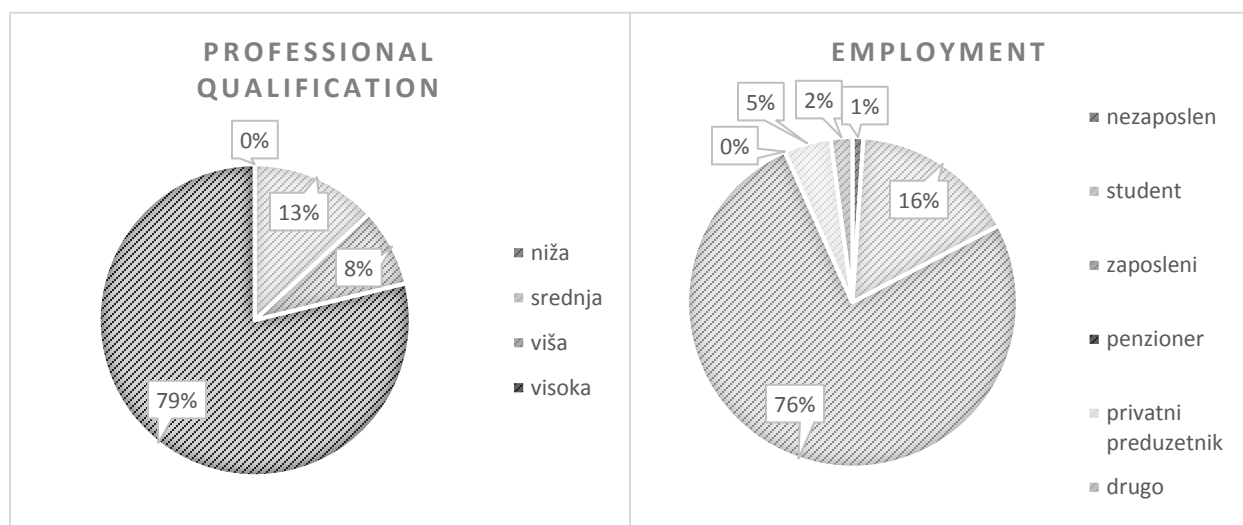
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current or future decision-makers on buying a new car. With regard to the total monthly income, more than half of the respondents (51.59%) have income higher than € 1,000 and 83.75% of the respondents have monthly income over € 500 corresponding to the structure of the respondents according to the professional qualification.



\*Male  
\*Female

\* between 18 and 25  
\* between 26 and 35  
\* between 36 and 65



\* Primary education  
\* Secondary education  
\* Higher education  
\* University degree

\*Unemployed  
\*Student  
\*Employed  
\*Retired  
\*Private entrepreneur  
\*Other

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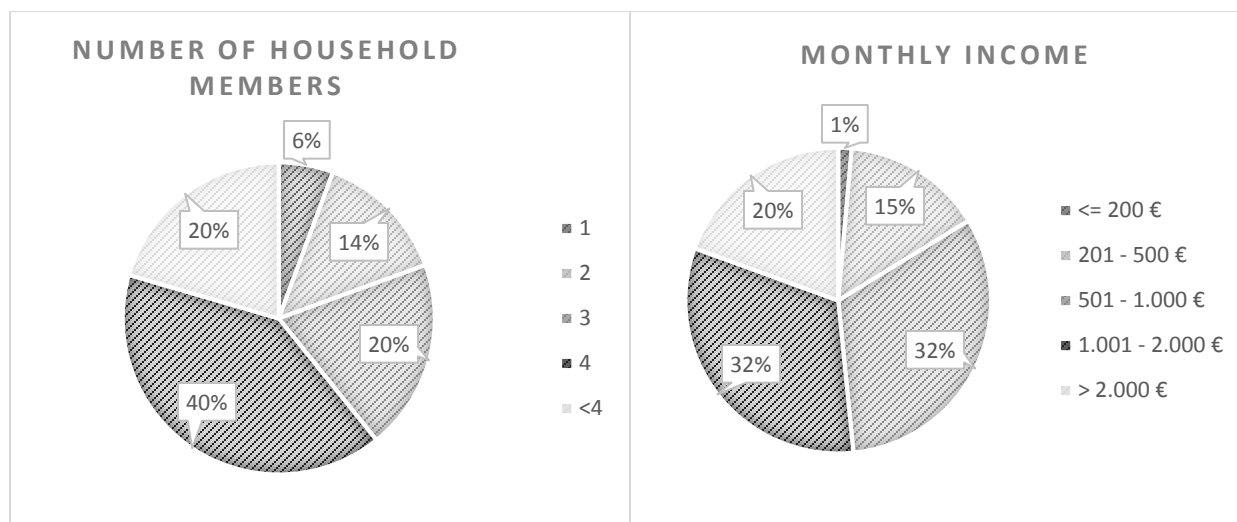


Figure 3-5: General data on respondents - survey for citizens

Figure 3-6 shows geographic distribution of respondents. As expected, the majority of respondents come from Podgorica, while it is interesting to notice that also a large number of respondents come from Budva and Tivat as major tourist centers.

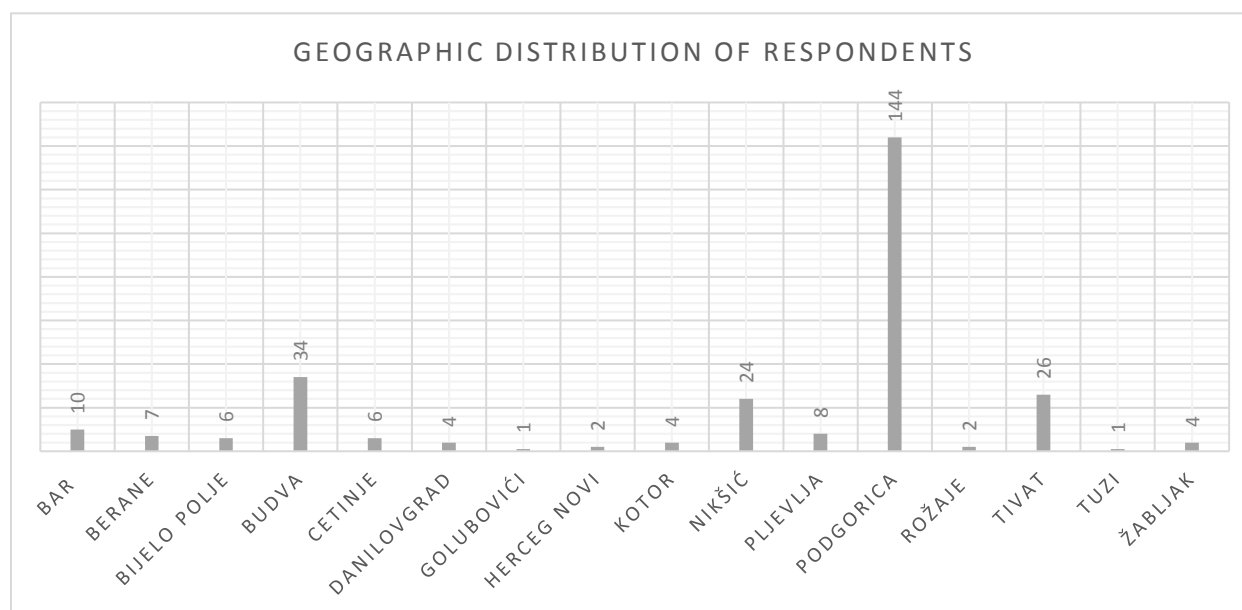
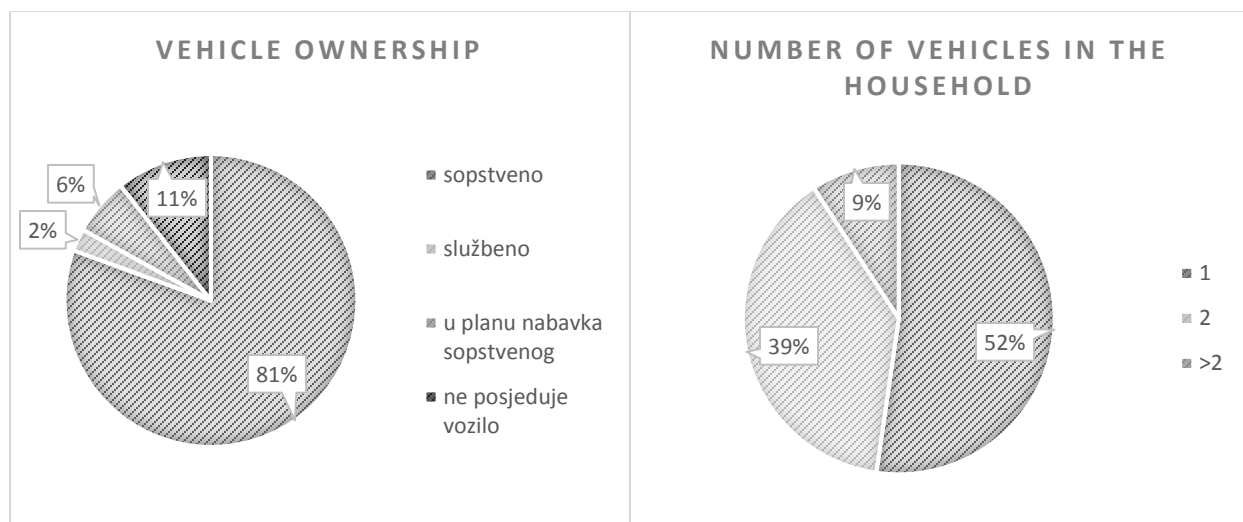


Figure 3-6: Geographic distribution of respondents - survey for citizens

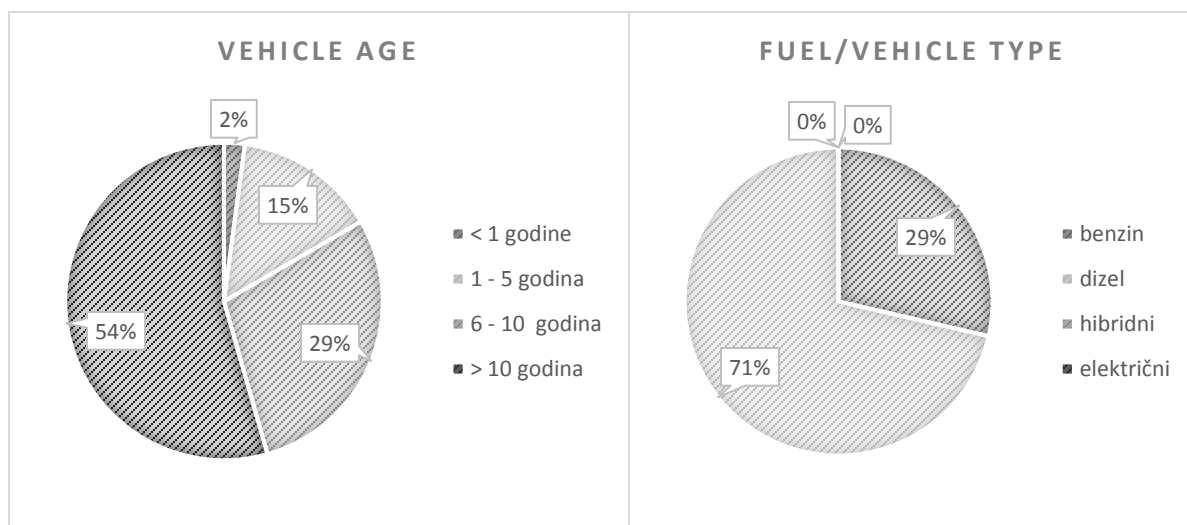
### Respondents' transport habits

Most of the respondents (80.57%) own a car, while 10.60% of the respondents do not have a car available. Most of these respondents belong to the category of students. More than half of the respondents (52.30%) have only one car in the household, which is mostly parked or in an outdoor public parking lot (41.34%) or in a private parking lot in front of the house (35.69%), which generally corresponds to the geographical distribution of respondents, i.e. the fact that most respondents live in Podgorica. Majority of vehicles are older than 10 years (54.42%) and are diesel-powered vehicles (71.38%), reflecting the overall structure of the fleet in Montenegro.

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\*Own a vehicle  
\*Company car  
\*Planning to purchase a car  
\*Do not own a car

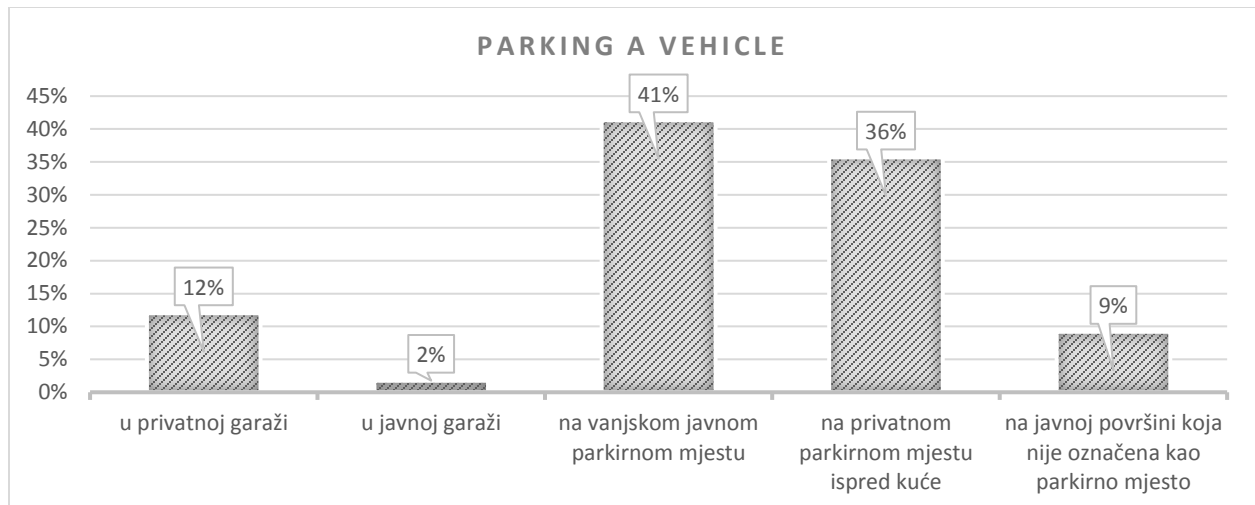


\*Petrol  
\*Diesel  
\*Hybrid  
\*Electric

Figure 3-7: vehicle ownership - survey for citizens

Cars are mostly used for going to/coming from work and also in leisure time. Most of the respondents generate up to 25 km (68.55%) on the daily basis and up to 10,000 km (52.30%) on a yearly basis. Nearly half of the car drivers in the city have only two passengers.

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\*private garage

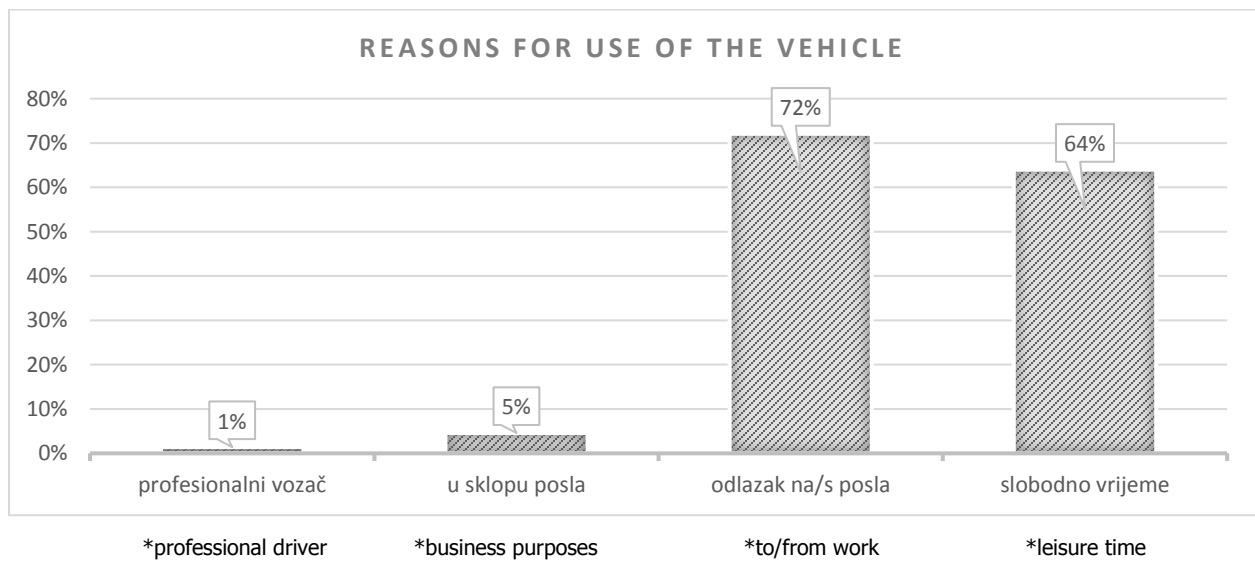
space which is not marked as a parking space

\*public garage

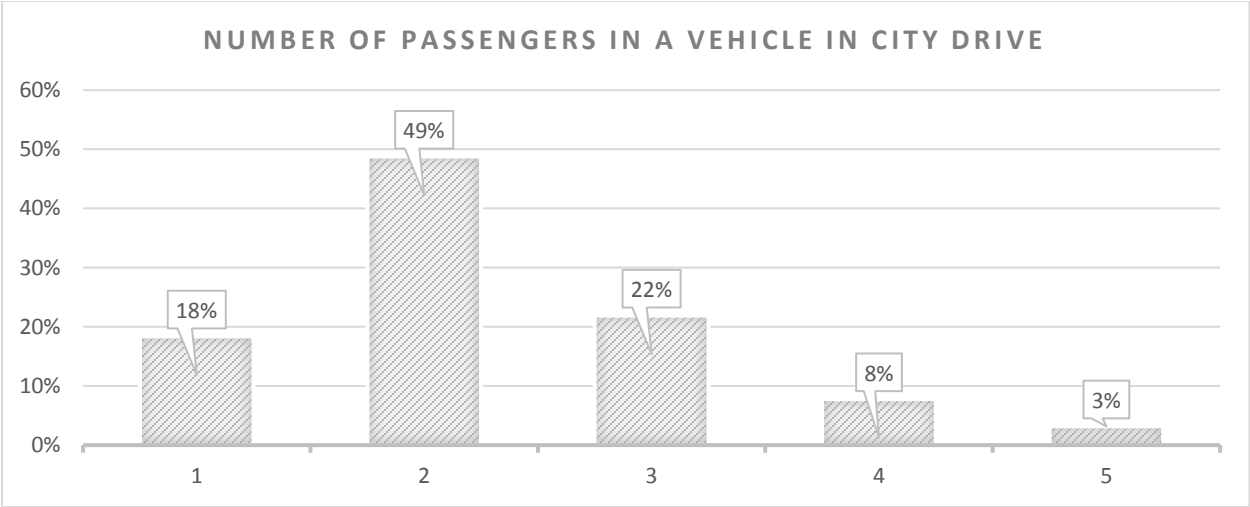
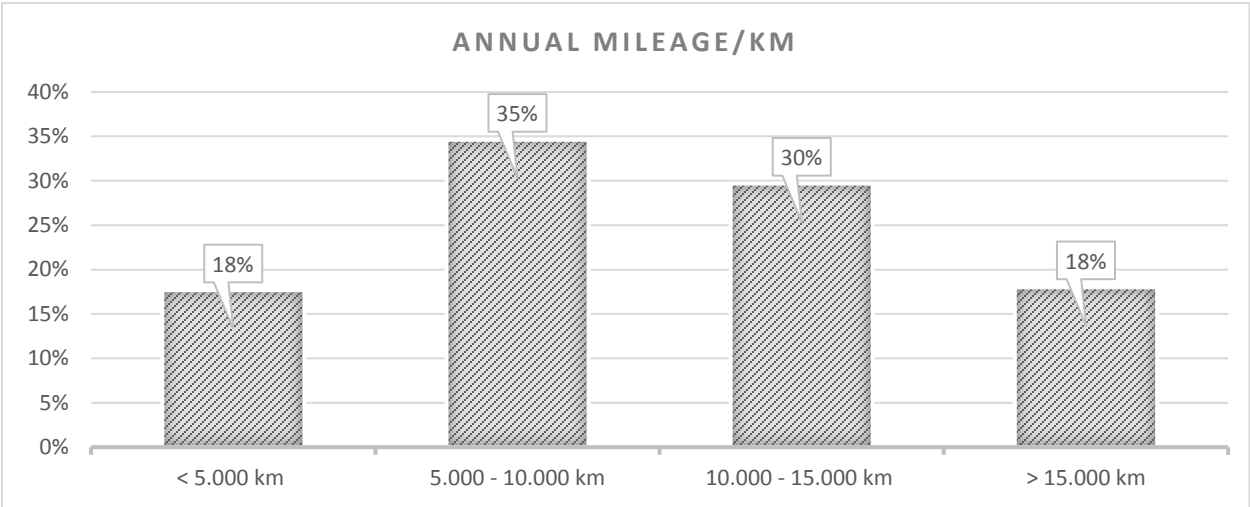
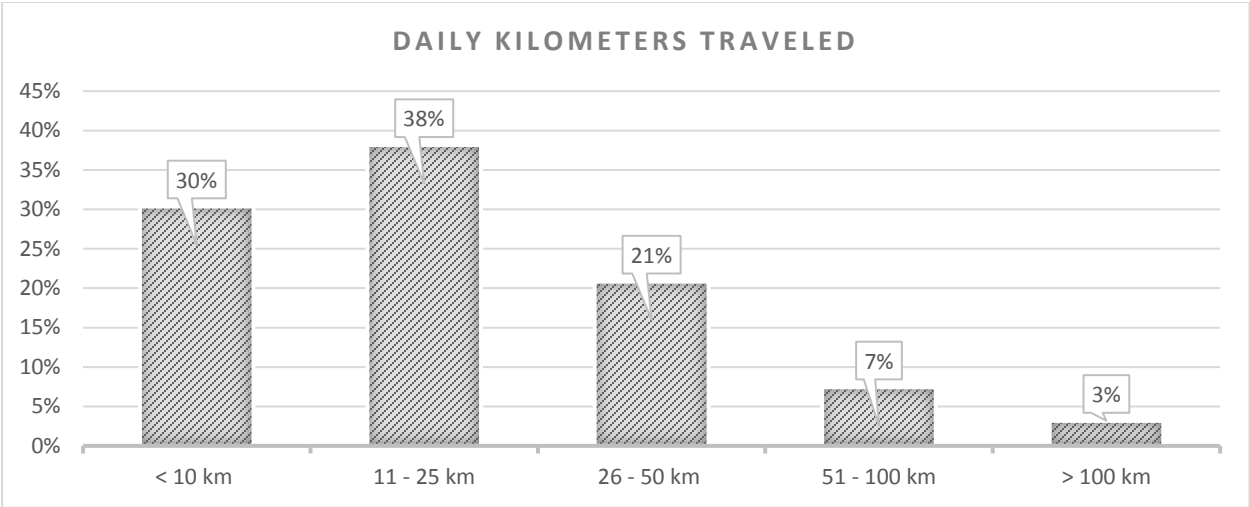
\*outdoor public parking space

\*private parking space in front of the house

\*public



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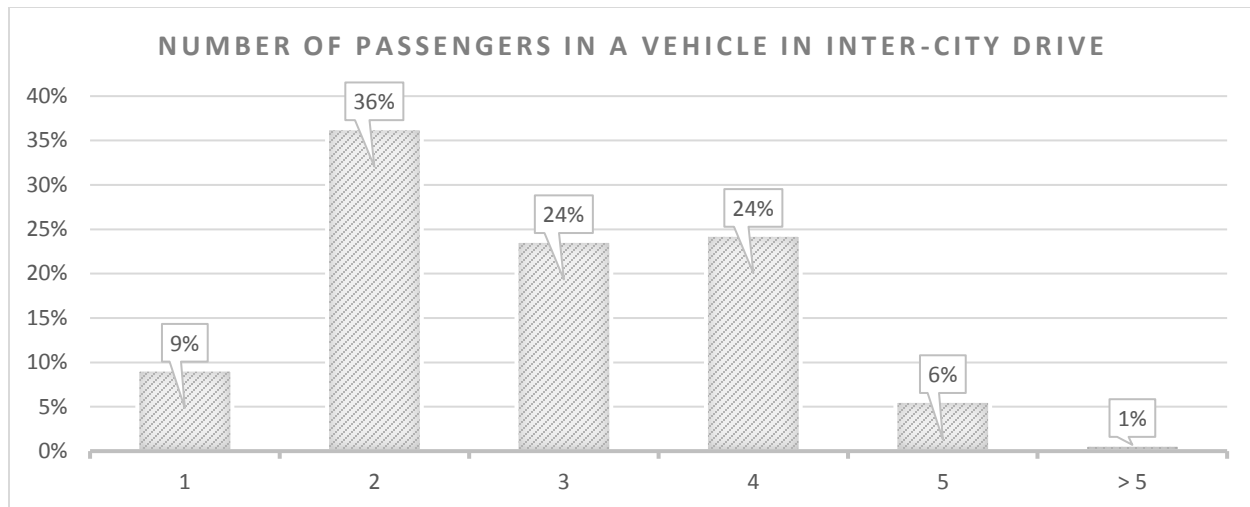


Figure 3-8: Vehicle use – survey for citizens

From the analysis of the current state of the market, it is evident that there are established foundations for a more significant development and implementation of electrical mobility within the context of general citizenship. In this regard, it is necessary to emphasize the importance of promotional activities in which it is necessary to emphasize the ecological, social and economic advantages and benefits of e-mobility. Urbanization entails an increase in the intensity of traffic activities that are intensively developed in cities and inevitably affect the quality of the air, and therefore the quality of life. *Car-sharing* service would have a certain effect on reducing the number of vehicles on the roads, and consequently on reducing traffic congestion. Namely, in the expert literature,<sup>1</sup> the researches illustrate that one car in a car-sharing system replaces 11 privately owned cars. The added value in this context would be the introduction of a fleet of electric vehicles that would directly affect the reduction of the concentration of exhaust gases in the city area, noise reduction, as well as the visibility of the electric vehicles themselves (which would directly stimulate the interest of citizens to use new technologies).

From the analysis of respondents' responses, it should be noted in particular that only 3% of respondents stated that the car exceeds 100 km a day. This shows that electric cars are suitable for normal daily use of almost all respondents, and that they can fulfill all daily needs with one battery charge. At the same time, when familiarizing the public with the characteristics of electric cars, it is necessary that they are presented with solutions that will meet mobility needs in cases when they plan to travel in long distances in the form of available fast charging infrastructure as well as other modes of transport.

In regards to the charging availability, about 50% of the respondents stated that they have their own outdoor or garage parking spaces, which is a very important assumption for a relatively fast installation of a private infrastructure for charging electric vehicles (socket plug, wall-box solutions). In addition, about 70% of respondents said that they use car for going to work, therefore it is necessary to analyze the possibility of installing charging infrastructure at the company parking spaces (if any) in order to allow charging for their employees during working hours.

### Views of the respondents related to electric vehicles

Only ¼ of respondents (25.44%) are vastly or well familiar with the characteristics of electric vehicles, which points to the need for greater information and awareness raising of citizens. In line with this is also the answer that only 31.10% of respondents considered purchasing an electric vehicle, while according to the fact on insufficient offer is the answer that only 8.83% of the respondents tried to drive an electric car. However, it is interesting that most respondents (79.51%) are still willing to pay 1,000 € or more for an

<sup>1</sup> Source: <http://its.berkeley.edu/node/12871>

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electric car compared to conventional ones, and in case that there are State incentives at their disposal, 69.611% of the respondents might buy an electric car. Figure 3-9 shows the graphs with results.

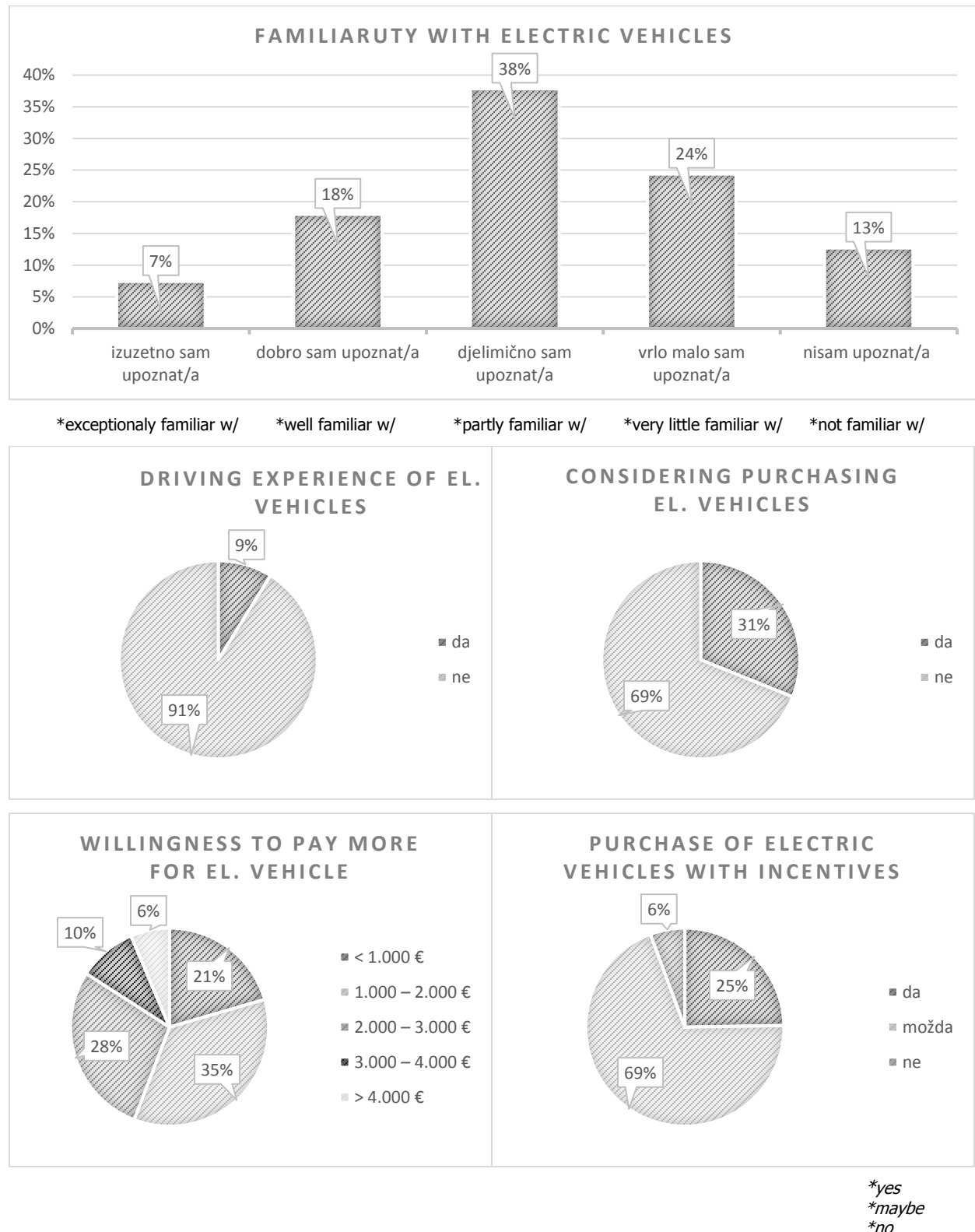
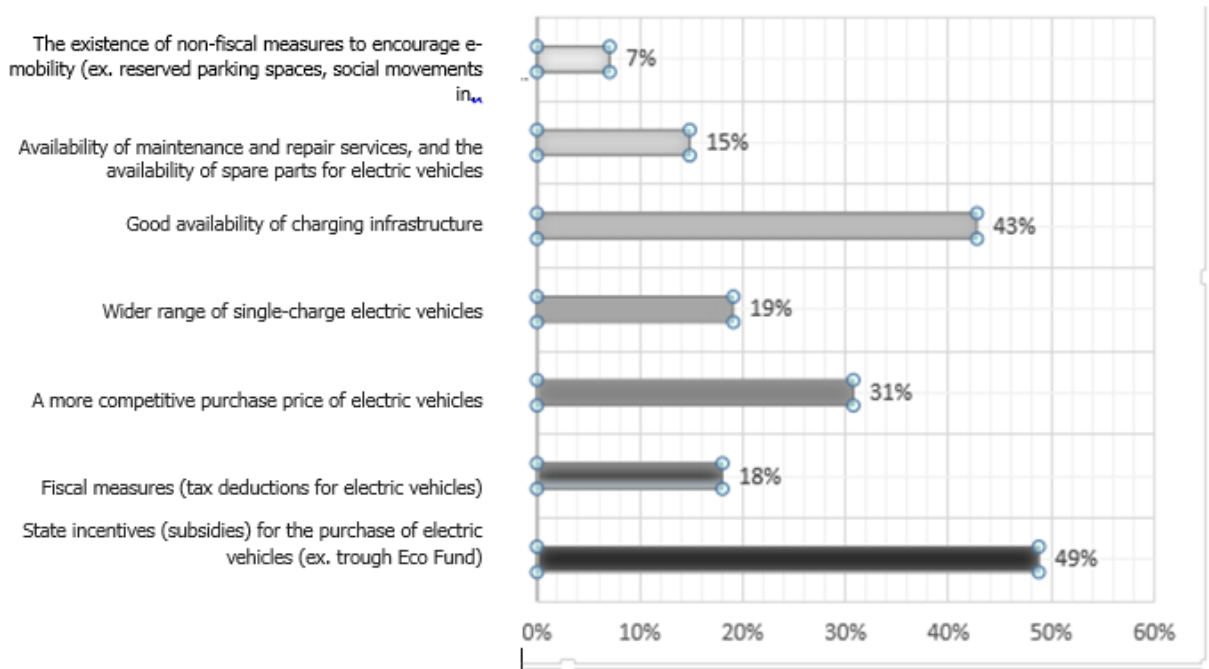


Figure 3-9: Familiarity with and the willingness of the respondents to purchase an electric vehicle - survey for citizens

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It is the State incentives for the purchase of electric vehicles that are recognized as the most important factor contributing to the wider use of electric vehicles and mitigating the other most significant barriers precipitated by the respondents, which is the high purchase price of an electric vehicle (Figure 3-10). As the first significant barrier, the respondents state that there is no public infrastructure for charging electric vehicles.

#### KEY FACTORS FOR WIDER USE OF ELECTRIC VEHICLES - CITIZENS



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### KEY BARRIERS TO WIDER USE OF ELECTRIC VEHICLES - CITIZENS

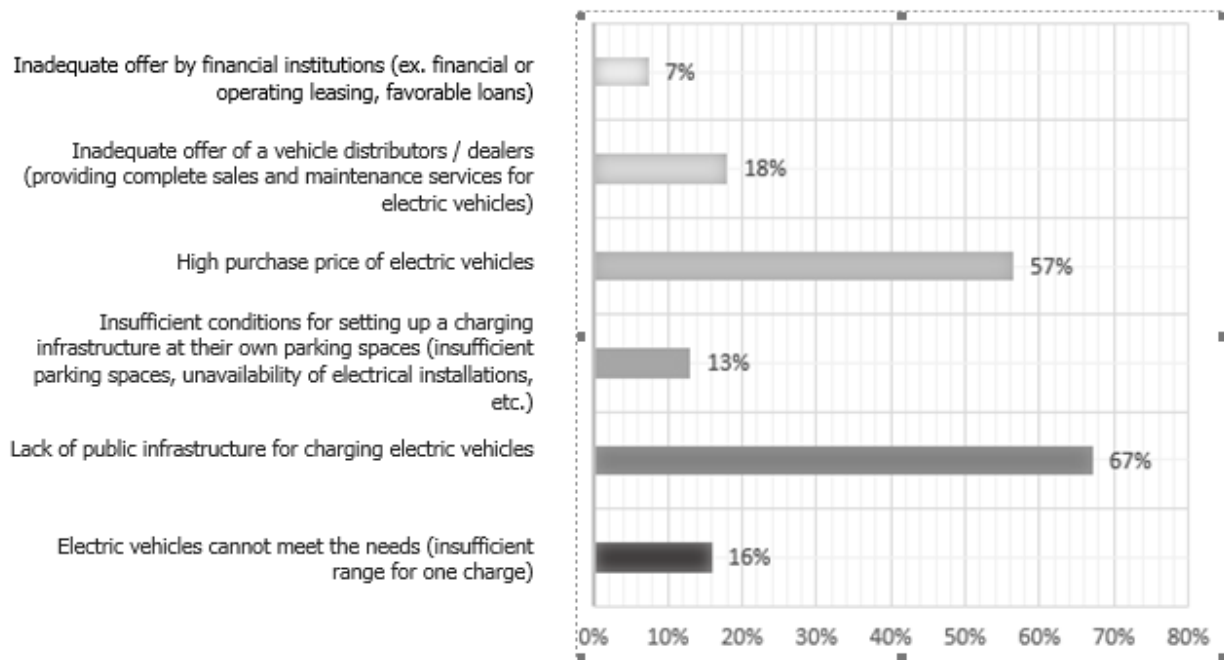
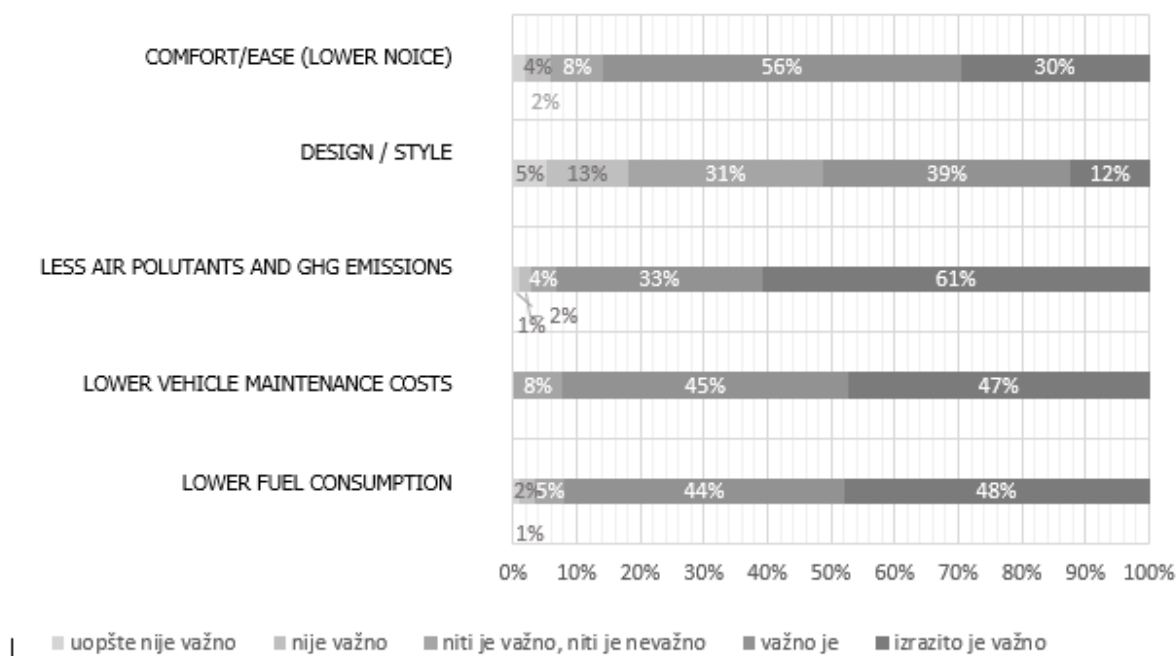


Figure 3-10: Key factors for incentives and barriers to wider use of electric vehicles – survey for citizens

Regarding the characteristics of electric vehicles that are important to the citizens, the majority of respondents point out lower GHG and pollutants emission, while lower maintenance costs and lower consumption of petroleum as the second important characteristics are as equally significant (Figure 3-11).

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### IMPORTANCE OF CERTAIN CHARACTERISTICS OF ELECTRIC VEHICLES



\*not important at all \*not important \* neither important nor unimportant \*important \*extremely important

Figure 3-11: Classification of the importance of electrical vehicle characteristics - survey for citizens

It is also important for the citizens to have enough autonomy/range for a single-charge electric vehicle, and most of them consider autonomy of 100 to 300 km as satisfactory (Figure 3-12: Required autonomy of a single-charge electric vehicles - survey for citizens).

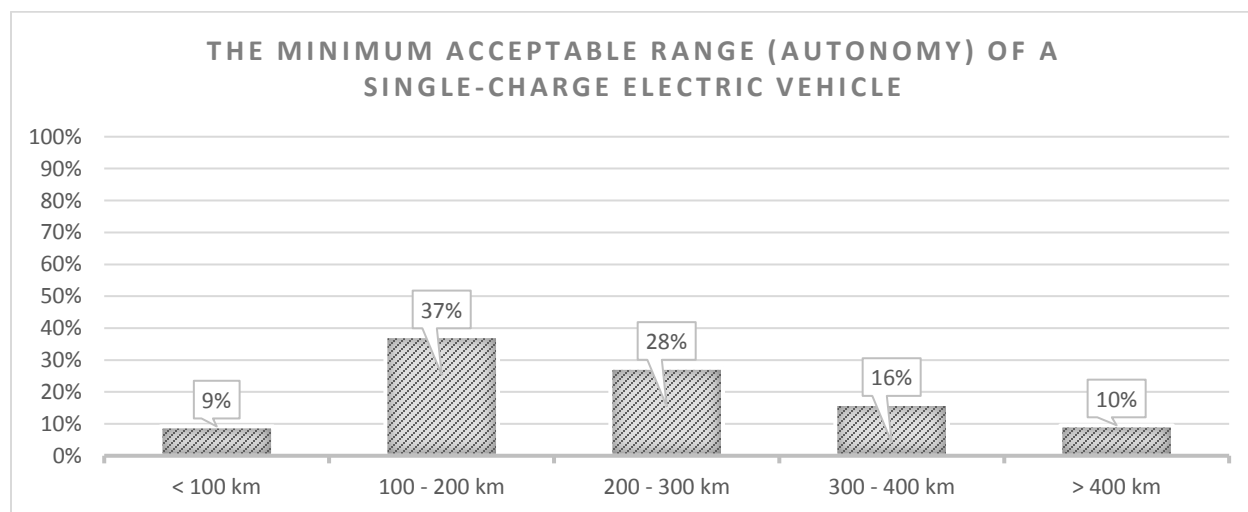


Figure 3-12: Required autonomy of a single-charge electric vehicles - survey for citizens

It can be concluded from the previous two responses that most of the lower and middle class electric cars can fully meet the needs of citizens and that only 16% of citizens recognize the available range as one of the key barriers. This is a very positive fact, since in many countries this exact problem is perceived as one of the key barriers.

As already determined, the respondents as the most significant barrier indicate a lack of charging infrastructure, which is in line with the perception of most respondents (55.48%) that in addition to their home (the same percentage) they would mostly charge their electric cars at the locations of existing petrol stations, i.e. at fast chargers.

In this regard, it is desirable in the forthcoming period to conduct a series of promotional and informative campaigns through which citizens will be informed about the concept of e-mobility. Timely information to the public about the opportunities that e-mobility can provide and the idea of changing the paradigm of mobility will contribute to easier and faster adoption of new technologies and changes in the habit of using personal cars. Namely, citizens need to be informed about what they can expect and where they will be able to carry out fast charging (inter-city routes, future highway, intermodal locations) and when it will be appropriate to use slower places to charge electric cars (shopping centers, public garages, tourist facilities, etc.).

As expected, most respondents (95.05%) would use a lower night-time rate for car charges. This is certainly a good signal and possibly defining a new rate model for charging electric vehicles.

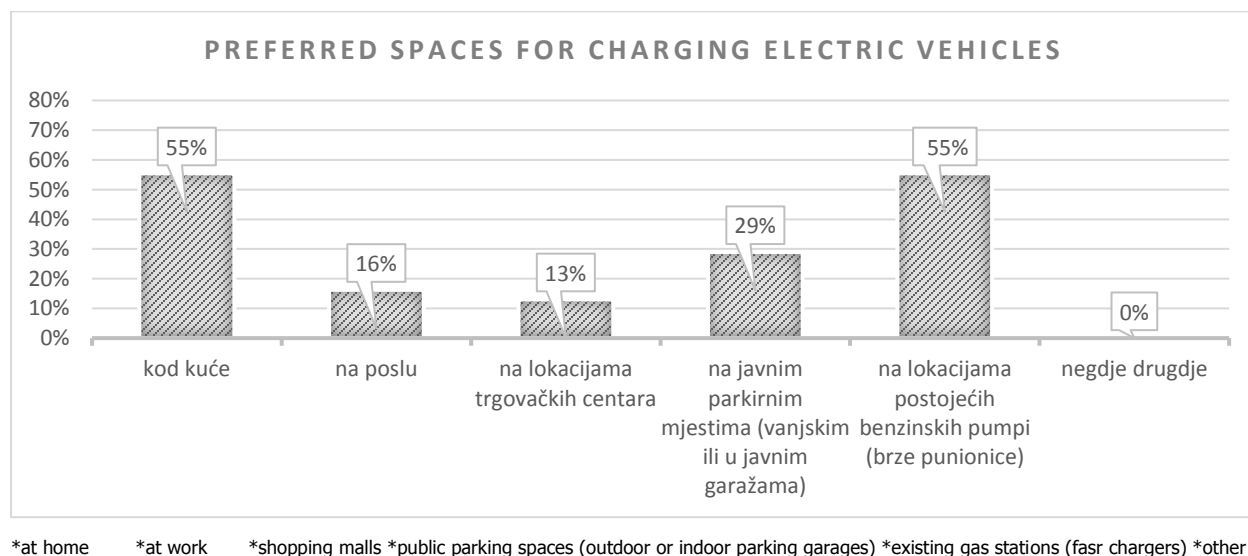
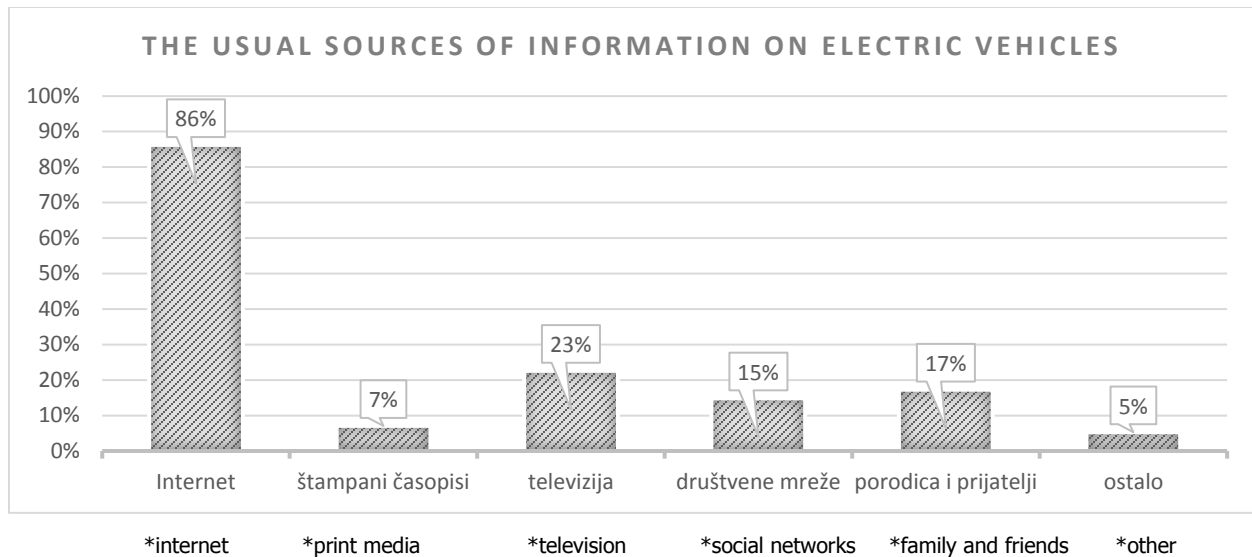


Figure 3-13: Preferred spaces for charging electric vehicles - survey for citizens

The aim of the survey was, inter alia, to establish the level of knowledge of citizens of Montenegro on electric vehicles and e-mobility. The above results show that there is a significant interest in electric vehicles, but that **further information and awareness raising of citizens is needed**. In order to find the preferred information channels, respondents are asked about which sources of information are most used and whether they would be interested in news about electric vehicles. The results are expected, and thus the Internet is pointed as the main media for sharing information (Figure 3-14: Common sources of informing on electric vehicles – survey for citizens), and most respondents (74.56%) are interested in additional news in the field of electric cars and e-mobility. These results can be useful for defining future promotional campaigns for e-mobility in Montenegro.



\* Other sources of information have been dominantly pointed out by students and they stated their professors at the faculties as a significant source of information

Figure 3-14: Common Sources of Information on Electric Vehicles – survey for citizens

And finally, the awareness of the Montenegrin citizens is well spoken by the fact that **61.84% of respondents believe that in 20 years electric cars will have a dominant share in the Montenegrin fleet.**

From the overall analysis of citizens' responses to the questionnaire, it can be concluded that there are exceptionally positive predispositions for the acceptance of electric vehicles by Montenegrin citizens. Particularly important is the attitude of citizens regarding the demanding range of electric cars, which makes it clear that most of the currently available electric cars can meet their needs. However, for the full acceptance of e-mobility, it is necessary to overcome a whole range of barriers, and it can be emphasized that considerable effort is needed in three segments:

- Informing the public, promotional campaigns, etc.;
- Developing publicly available charging infrastructure while designing a clear public perception and realistic expectations;
- Establishing an incentive model for the purchase and use of electric vehicles (financial and non-financial measures).

## CONCLUSIONS AND PROPOSED ACTIVITIES

On the demand side of the e-mobility market, legal entities and citizens can be distinguished, but in both segments we see the common characteristics that would be the following according to the evaluation matrix (Figure 1-1):

- Limited awareness of e-mobility
  - The concept of e-mobility is certainly not unknown in Montenegro and demand-side entities recognize the benefits of this concept; however, the level of knowledge and information is still not sufficient
- No use -> limited use

- Demand-side entities do not use e-vehicles, and in most cases they have no experience in the electric vehicle driving; however, there is a small number of registered electric vehicles in Montenegro, but there are still positive moves in this area
- No incentives
  - As situation analysis has shown, there are no financial incentives in Montenegro for the purchase and use of electric vehicles, and those that exist are not sufficiently attractive to stimulate greater demand

Based on the above, it can be said that **the maturity of demand for e-mobility products and services in Montenegro is low.**

An average interest prevails in the public institutions for e-mobility. The fleet analysis found that the fleet is relatively old (10.2 years), and given the clearly defined tasks and thus the routes of vehicle movement and the fact that public institutions generally have their own parking places, this segment of the market represents a significant potential. So far, the analysis of the introduction of electric vehicles were not conducted as a rule, so the knowledge about the costs and benefits is very limited. Analysis and confirmations of these analysis through the implementation of pilot projects as well as certain regulatory actions taken (green public procurement or public sector commitments to introduce a certain number of electric vehicles) would certainly be a positive example to accelerate the development of demand in other market segments as well.

As far as public transport in Montenegro is concerned, it is operated by private entities on the basis of a public transport license. So far, operators have not considered introducing electric buses or doing the necessary financial analysis. However, they are willing to take part in pilot projects, which should also include financial support for the purchase of buses, all with the aim of getting familiar with technology, determining whether such buses meet the needs and whether they can be used more widely.

In the business sector, the key criterion for deciding on purchasing an electric vehicle is economic i.e. financial viability (note: it is interesting to notice the difference with the public sector, where the dominant criterion is ecological awareness). In the business sector, the interest in new traffic technology in transport is greater than in the previous two, and improving company image is also one of the key motives for considering electric vehicles. It is for this very reason that this segment, and especially in its part related to tourism, is expected to soon reach the first projects of introducing electric cars. Examples of good practice will further boost demand in this competitive sector.

As far as citizens are concerned, the results of the survey show the existence of an interest in electric vehicles, but it is necessary to further inform the citizens about the electric vehicles and how to charge them. A crucial role for wider use of electric vehicles among citizens will have financial incentives for their purchase.

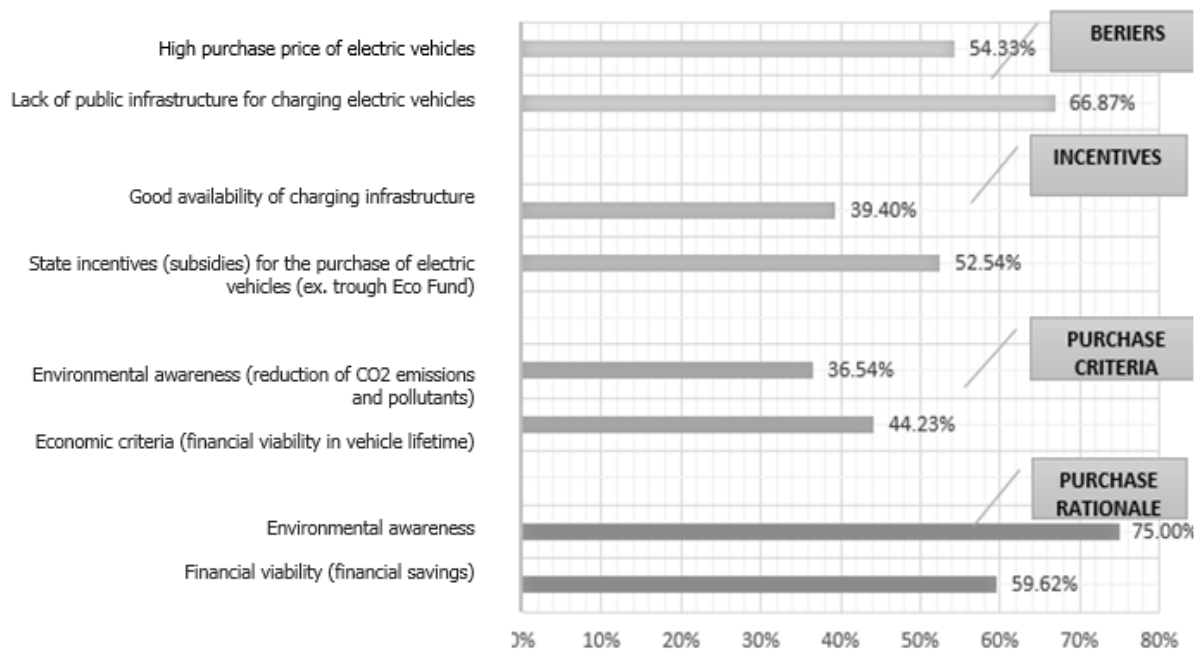
Also, on the supply side, a part of the conducted survey was related to the general opinion of the entities on this side of the market on motives and criteria (for legal entities only) as well as on the incentive factors and barriers for the procurement of electric vehicles in Montenegro. Although there are significant differences between the views of the target groups analyzed, which can be seen in the graphs for each target group, it is also interesting to look at the sum of the results for the total demand side, which is shown in Figure 2-15. It is interesting to note that according to the survey, the ecological awareness was pointed as the most important criterion in deciding on the purchase of an electric vehicle.

Here it should be made clear that such a result is the result of solely public sector response, while in all other cases, especially in the business sector including public transport operators, financial viability is crucial. Equally as on the supply side, respondents see as the most significant barrier the (non) availability of charging infrastructure, which is also considered the second most important factor for wider use of electric vehicles. The first significant factor is the availability of state incentives (which is the result of all target groups), which is in correlation with the perceived barrier of high purchase price of electric vehicles.

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Such results provide guidelines for e-mobility related communication activities in Montenegro, as stated on the supply side, as well as for **defining active policy measures that should primarily focus on improving financial viability of electric vehicles by stimulating and facilitating business model development for the development of infrastructure for charging such vehicles.**

#### KEY BARRIERS TO WIDER USE OF ELECTRIC VEHICLES - CITIZENS



\* Note: motives and criteria are examined only for legal entities, while factors and barriers are shown for all target groups on the demand side

Figure 3-15: The opinion of entities on the demand side of the e-mobility market about key motives, criteria, incentive factors and barriers for electric vehicles in Montenegro

## 4. ANALYSES OF THE CURRENT SITUATION OF E-MOBILITY IN MONTENEGRO

The conducted analysis of the e-mobility market in Montenegro can be summed up in the results in the evaluation matrix.

<i>Sufficient awareness</i> <i>Medium use</i> <i>Sufficient incentives</i>	<i>High</i>			<i>FAIRLY DEVELOPED</i>	<i>DEVELOPED</i>	
<i>Sufficient awareness</i> <i>Limited use</i> <i>Low incentives</i>	<i>Medium</i>		<i>UNDER DEVELOPMENT</i>	<i>UNDER TRANSITION</i>	<i>FAIRLY DEVELOPED</i>	
<i>Limited awareness</i> <i>Limited use</i> <i>No incentives</i>	<i>Low</i>	<i>UNDEVELOPED</i>	<i>EARLY STAGE OF DEVELOPMENT</i>	<i>UNDER DEVELOPMENT</i>		
<i>No awareness</i> <i>No use</i> <i>No incentives</i>	<i>Very low</i>	<i>UNDEVELOPED</i>	<i>UNDEVELOPED</i>			
		<i>Very low</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>	<i>The status (maturity) of the offer</i>
		Unavailable e-vehicles Limited knowledge and experience No e-mobility services No customized commercial funding	Some e-vehicles available Some knowledge and limited experience No e-mobility services No customized commercial funding	Most e-vehicles available Sufficient knowledge and experience Limited e-mobility Services Limited customized commercial funding	The most advanced e-vehicles available Advanced knowledge and wide experience Enough e-mobility services Available commercial funding	

Figure 4-1: Analysis of the status (maturity) of the e-mobility market in Montenegro

The market is at an early stage of development with the observed positive trends in development on the supply side, while the side of demand needs a stronger stimulus for further development. Under such market conditions, the products, technical knowledge and experience available are sufficient and capable of covering current demand, which is very low. For this reason, demand should be driven by information policy instruments, dominant campaigns and examples of good practice. Regulatory means, in particular

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tax and customs policy, and criteria for placing vehicles on the market, should ensure that electric vehicles are placed in a better position than conventional ones. Financial subsidies are imposed as a necessary and crucial mechanism for stimulating demand. Increased demand will be the best stimulus for the supply side, which can already now be said to be conscious of the changes that follow and undertakes certain activities to meet an increase in demand.

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## 7. ANNEXES

### **ANNEX I – SURVEY QUESTIONNAIRES**

### **ANNEX II – REPORT ON THE MEETINGS HELD IN PODGORICA IN THE PERIOD OF 12-14 MARCH 2018**



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