



GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET



CRNA GORA
MINISTARSTVO ODRŽIVOG RAZVOJA
I TURIZMA



Empowered lives.
Resilient nations.



E-Mobility Market Analysis in Montenegro

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



[Type here]



GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

The GEF unites 182 countries in partnership with international institutions, non-governmental organizations (NGOs), and the private sector to address global environmental issues while supporting national sustainable development initiatives. Today the GEF is the largest public funder of projects that improve the global environment. As an independently operating financial organization, the GEF provides grants for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants. Since 1991, GEF has achieved a strong track record both with developing countries and with countries whose economies are in transition, and has provided \$9.2 billion in the form of grants and leveraging worth \$40 billion in the co-financing of more than 2,700 projects in over 168 countries. www.thegef.org.



*Empowered lives.
Resilient nations.* UNDP partners with people at all levels of society to help build nations that can withstand crisis, and that can drive and sustain the kind of growth that improves the quality of life for everyone. On the ground, in some 170 countries and territories, we offer a global perspective and local insight that helps to empower lives and build resilient nations.

This study was prepared for the needs of the project 'Towards Carbon Neutral Tourism in Montenegro' implemented by UNDP in cooperation with the Ministry of Sustainable Development and Tourism, the Ministry of Economy and the Ministry of Transport and Maritime Affairs and was funded by the Global Environment Facility (GEF).

This is an independent publication commissioned by UNDP. The views expressed in this paper are those of the authors and do not necessarily represent the views of UNDP.

Short extracts from this publication may be reproduced, unaltered, without authorization, on condition that the source is indicated.

The team of authors from the Energy Institute Hrvoje Požar comprises:

Jurica Brajković

Vesna Bukarica

Tomislav Čop

Karmen Stupin

Bruno Židov

Local expert support: Radoje Vučadinović

UNDP team:

Aleksandra Kiković

Ana Pajević Tošić

TABLE OF CONTENTS

TABLE OF CONTENTS	3
SUMMARY	5
INTRODUCTION	7
PRODUCTS AND SERVICES RELATED TO E-MOBILITY	10
VEHICLE DEALERS AND DISTRIBUTORS	10
VEHICLE REPAIRERS.....	13
FINANCIAL INSTITUTIONS	18
PROVIDERS OF OTHER SERVICES RELATED TO E-MOBILITY	22
CONCLUSIONS AND PROPOSED ACTIVITIES	23
DEMAND FOR E-MOBILITY PRODUCTS AND SERVICES	26
LEGAL PERSONS.....	26
3.1.1. Public Sector	26
3.1.2. Public Transport	35
3.1.3. Business Sector	40
CITIZENS	44
CONCLUSIONS AND PROPOSED ACTIVITIES	56
4. ANALYZES OF THE CURRENT SITUATION OF E-MOBILITY IN MONTENEGRO	59
5. LIST OF FIGURES	61
6. LIST OF TABLES	63

7. ANNEXES

64

ANNEX I – SURVEY QUESTIONNAIRES	64
ANNEX II – REPORT ON THE MEETINGS HELD IN PODGORICA (12-14 MARCH 2018)	
.....	64

SUMMARY

Market analysis is a starting point for creating any public policy; this includes 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 a publicly available infrastructure for charging electric vehicles. In Montenegro, both segments are still in their initial stages of development; this situation is confirmed by the results of survey research, by interviews with market entities and by desk research. In the segment of supply relating to electric vehicles, dealers/distributors, maintenance technicians and financial institutions are the most important market entities; this part of the market is extremely competitive. Accordingly, it is evident that all of these entities are already preparing for an increase in demand in electric vehicles and are adjusting their businesses accordingly. In the context of incentives, the biggest incentive for this market segment will undoubtedly be an increased demand in the number of electric vehicles required; however, no special incentives are needed for this. In the segment of services relating to the construction and management of a publicly available infrastructure for charging electric vehicles, the market is also beginning to develop, encouraged by practices from European and neighboring countries, and by a desire to be better positioned on the market as soon as possible. Nevertheless, with the goal of developing infrastructure more quickly and with the aim of achieving a comprehensive concept of e-mobility, the engagement of both the state and the public sector would be helpful in this market segment to initiate the construction of infrastructure in their respective areas.

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; these comprise a limited awareness of e-mobility and a 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. Given the fact that these vehicles have clearly defined tasks and routes, along with the fact that public institutions generally have their own parking places, this segment of the market represents significant potential. Cost and benefit analyzes, along with confirmation of these analyzes through the implementation of pilot projects and certain regulatory shifts (green public procurement or public sector commitment to introduce a certain number of electric vehicles), would certainly provide a positive example and would 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 nor have they conducted the necessary financial analyzes. However, when approached, they were willing to participate in pilot projects, which would certainly include financial assistance for the procurement of buses, with the aim of familiarizing themselves with new technology, and to determine whether such buses would adequately meet needs and whether they could be used more widely. In the business sector, the key criterion for deciding on the purchase of an electric vehicle was its economic or financial profitability. In the business sector, interest in new transport technology was greater than in the previous two sectors; here company image was also a key motive for considering electric vehicles. It is expected that for this reason that this sector, particularly due to its strong connection with tourism, will pilot the first projects

[Type here]

implementing the introduction of electric cars. 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 is interest in electric vehicles, but that it is necessary to further inform citizens about electric vehicles and how best to use them. Financial incentives for their purchase will undoubtedly be a decisive factor for achieving the wider use of electric vehicles by 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 current demand, which is very low. Therefore, demand should be driven by informative policy instruments, dominated by campaigns and examples of good practice. Through regulatory actions, especially tax and customs policies and the criteria required for placing vehicles on the market, it would also be necessary to ensure that electric vehicles were given an advantageous position over conventional ones. The provision of financial subsidies should be imposed as a necessary and crucial mechanism to stimulate demand. Increased demand would be the best stimulus for suppliers; suppliers are already conscious of future changes and many have already started to undertake certain activities to meet a potential increase in demand to maximise their business interests.

INTRODUCTION

Purpose and objective of the document

Market analysis is a starting point in creating any public policy; this includes 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 of customers and about the barriers they perceive in relation to electric vehicles. It is important to determine the following:

- Level of awareness and information about electric vehicles and the concept of e-mobility;
- Current level of 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 the results of a survey, interviews and desk research based on publicly available data and collected documents; data on the structure of the vehicle fleet was obtained from entities within this group. Citizens' views on e-mobility were based on a survey, the first one of its type in Montenegro.

For the final evaluation of the market, an evaluation matrix was developed.

[Type here]

The status (maturity) of demand

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

Figure-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', 'early development stage', 'developing', 'in transition', 'fairly developed' to 'developed', the highest level of all. Gray areas represent an impossible situation because supply and demand are closely related and it is not realistic to assume that, for example, supply maturity will be high while at the same time demand will be very low.

The status (maturity) of demand

				<i>FAIRLY DEVELOPED</i>	<i>DEVELOPED</i>
<i>Sufficient awareness</i>	<i>High</i>				
<i>Medium use</i>					
<i>Sufficient incentives</i>					
<i>Sufficient awareness</i>	<i>Medium</i>				
<i>Limited use</i>					
<i>Developing</i>		<i>IN TRANSITION</i>	<i>FAIRLY DEVELOPED</i>		

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

Figure-1-1: E-mobility market assessment matrix

Based on the analyzes of all of the identified target groups, and by using the evaluation matrix, the current level of maturity of the e-mobility market in Montenegro could ultimately be determined; this would then form a basis on which to further define policy instruments with a view to moving the market into its next phase of maturity.

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 an 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 has its own specific and potentially different motives for the introduction of electric vehicles into its fleet of vehicles.

Each chapter ends with main conclusions based on the conducted analyzes and with recommendations for the future action. Additionally, in **Chapter 4**, a final assessment of the e-mobility market status matrix is provided.

The annexes include the survey questionnaires for each group of respondents (**Annex I**) and the minutes of the meetings, held in Podgorica, which aimed to obtain additional information on the market situation and on the overall framework regarding e-mobility in Montenegro (**Annex II**).

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 that certain models appear on the market. They also provide additional vehicle purchase services as well as initial vehicle training; thus they create a comprehensive experience for a new owner starting from the moment of purchase to actually seeing the new vehicle for the first time. Therefore, dealers and distributors would play an important role if they were to introduce electric vehicles to 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 introducing offers on electric vehicles.

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 the table (The results of a survey on the availability of electric vehicles by dealer/distributor) below.

Table 2-1: The results of a survey on the availability of electric vehicles by dealer/distributor

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

A more detailed analysis of responses to the survey questionnaire revealed that 2 respondents did not include either electric or hybrid vehicles in their offers, and that 2 respondents only offered hybrid vehicles. Although the sample is relatively small, the responses indicated that the purchase of some of the most recognized models of electric and plug-in hybrid vehicles, including Renault Zoe, Twizy, Kangoo ZE, Nissan Leaf, Volkswagen e-up, Toyota Prius plug-in, was possible in Montenegro. In addition, special electric vehicles, such as the Ativa 6LC.5 manufactured by Italcar, were also available, particularly for tourist purposes. Also, the KIA automotive corporation offers an electric car, KIA Soul EV, on its Montenegrin web site; the possibility of scheduling a trial run is cited.

All dealers/distributors who offer electric vehicles also offer home charging stations. The purchase of used electric vehicles is limited; this is to be expected because market development is only expected in the segment of new vehicles.

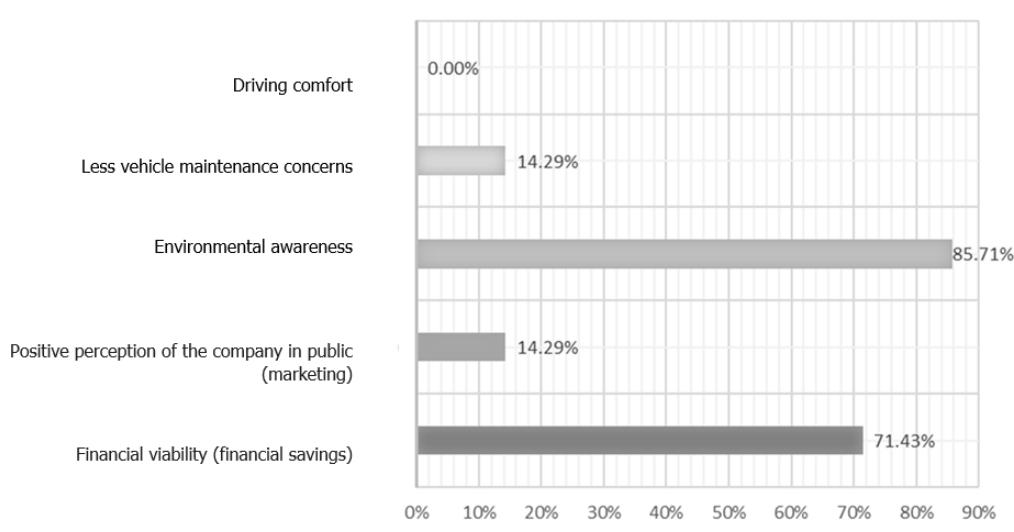
Additional information was also collected through interviews with vehicle dealers/distributors (**Annex II**). Based on this information, along with the results of the survey, it can be concluded that an offer of electric vehicles exists in Montenegro, but that it is still very limited. This situation is the one that 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 to do this through their own activities, by promoting electric vehicles in terms of purchasing their own and by 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, the position of dealers/distributors regarding e-mobility was examined. The vast majority of respondents (6 out of 7 or 85.71%) believed that it was 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 their answers revealed that the dealers/ distributors were actually referring to **taxes and customs duties** when purchasing vehicles; that amendments were required in this segment but not in the segment of regarding technical conditions for vehicles.

Given that dealers/distributors are familiar with the habits of vehicle buyers, they were also given a set of questions on customers' motives and criteria for purchasing electric vehicles, and on factors that could stimulate interest in electric vehicles. They were also asked about barriers that could potentially prevent the significant use of electric vehicles in Montenegro. The results are shown in the following charts.

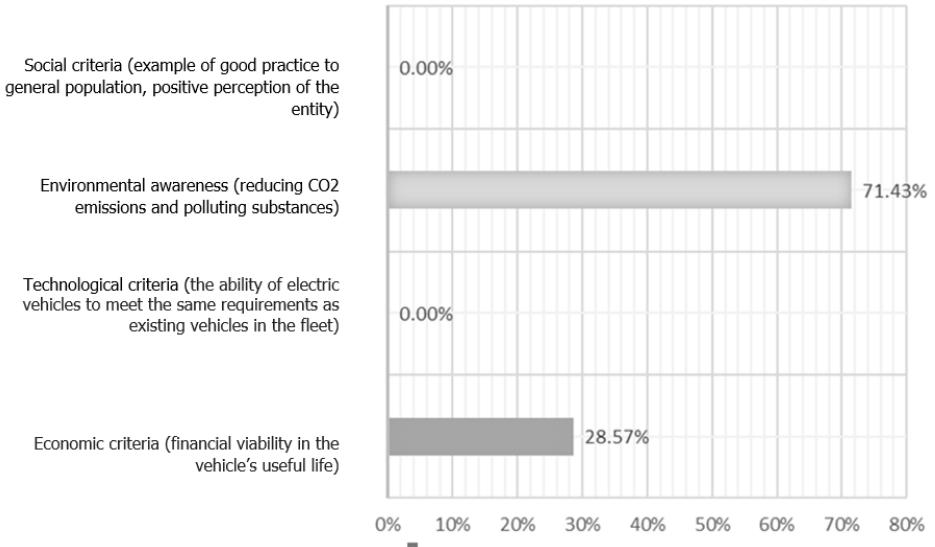
KEY MOTIVES FOR BUYING ELECTRIC VEHICLES –

DEALERS/DISTRIBUTERS OF VEHICLES

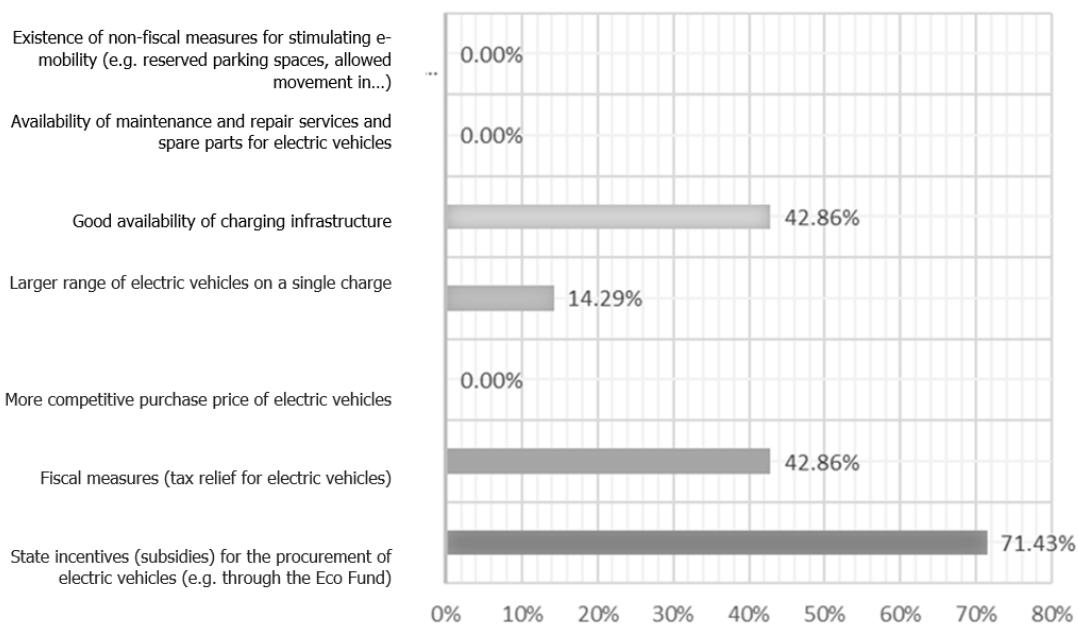


[Type here]

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



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



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

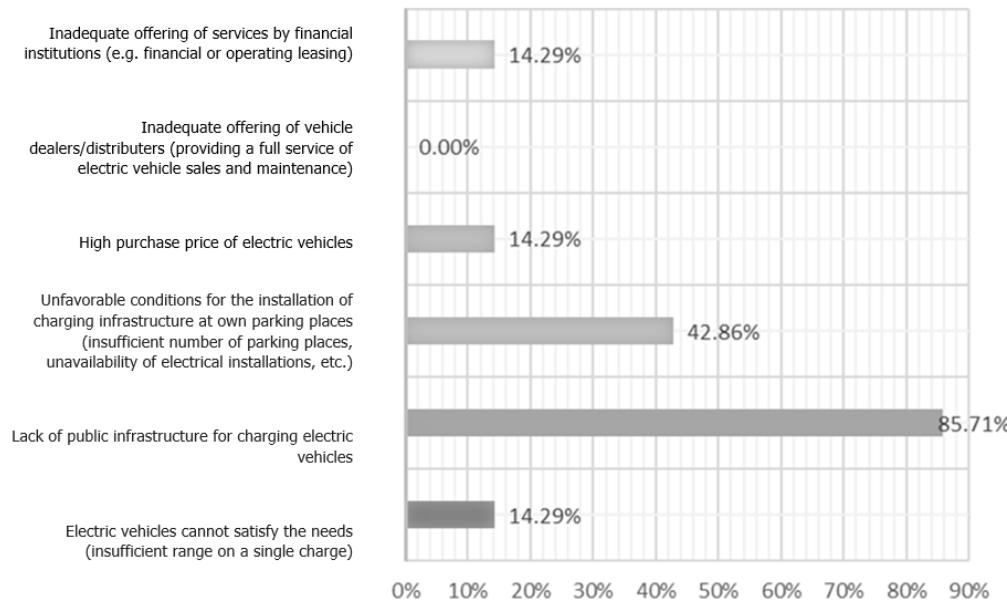


Figure 2-1: Position of dealers/distributors on key motives, criteria, incentive factors and barriers regarding electric vehicles in Montenegro

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

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

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

VEHICLE REPAIRERS

Operating costs relating to the basic maintenance of electric vehicles are, as a rule, significantly lower than those for maintaining internal combustion engine vehicles. This fact should be one of the key generators for reducing the total costs of electric vehicle ownership, and for encouraging their wider use in Montenegro in the near future. The maintenance and servicing of electric vehicles is a challenge, but is also an opportunity for existing service providers to open a new type of service.

A survey questionnaire was prepared for vehicle repairers, aimed at determining the general attitude of vehicle repair workshop owners regarding electric vehicles and to assess 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; however, with the help of

dealers/distributors who are also authorized to provide vehicle repair services, the results have been confirmed as accurate.

Information about the current state regarding repairing electric vehicles is shown in Table below. From the above results it can be concluded that vehicle repairers are following current trends and that some of them are already ready to provide electric vehicle repair services. There is certainly room for improvement in this area and it is expected that service providers will quickly adapt to meet demand with the further promotion of e-mobility.

Table 2-2: The results of a survey on the availability of electric vehicle repair services

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

The responses of vehicle repairers on the required additional investments related to the servicing of electric vehicles are shown in Figure below. The adjustment of electrical installations and additional training and/or recruitment of electric vehicle specialists was cited as a key additional investment. This was also confirmed in interviews with dealers/distributors that are also authorized to provide vehicle repair services (**Annex II**).

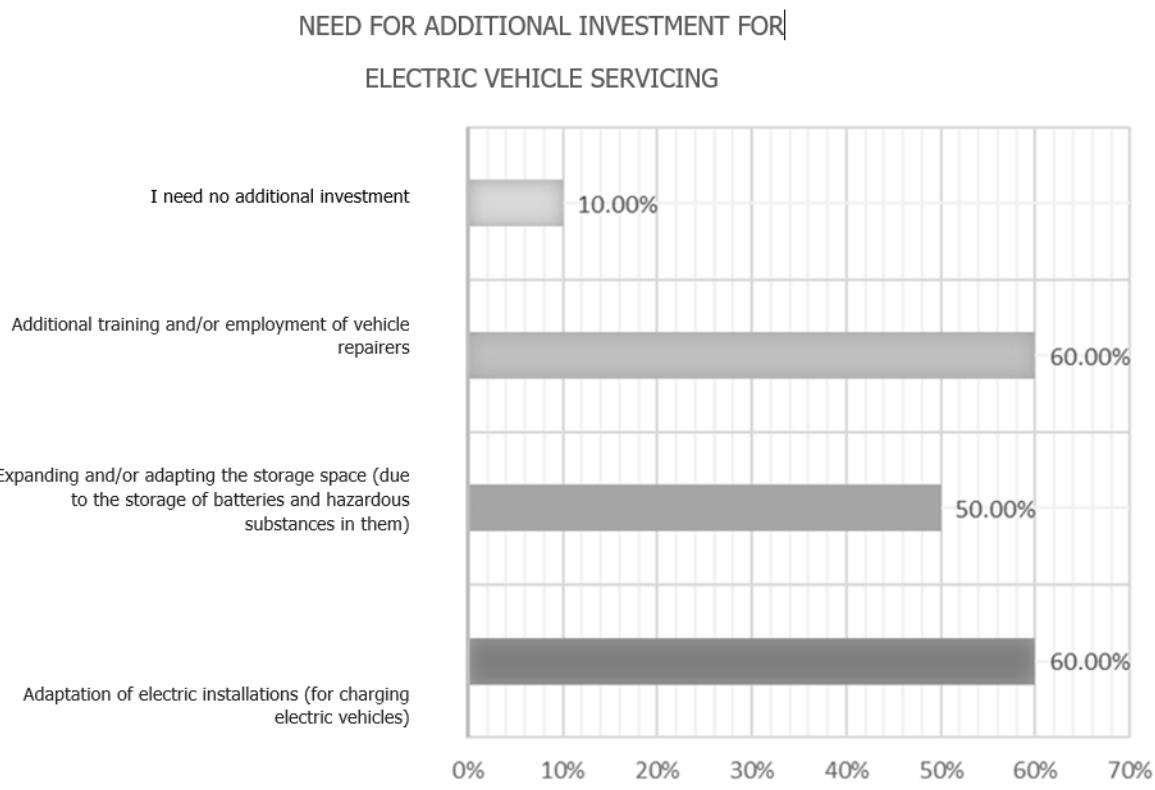


Figure 2-2 results of a survey on the need for additional investment in electric vehicle repair services

When asked whether they were interested in expanding their services to include the maintenance of electric vehicle charging stations, 60% of vehicle repairers answered positively; this demonstrates that they were, in principle, also interested in expanding their business operations. In principle, the supplier of a charging station (the entity performing the installation, commissioning and diagnostic and functional testing) ensures that it is regularly maintained/serviced during the agreed warranty period. Maintenance/servicing means a one-year inspection of charging stations including the visual control and inspection of mechanical/electrical components, and if necessary, the upgrading of existing versions of software to new versions and the upgrading of remote diagnostics. As a rule, charging station suppliers also offer an emergency response service in the event of a failure.

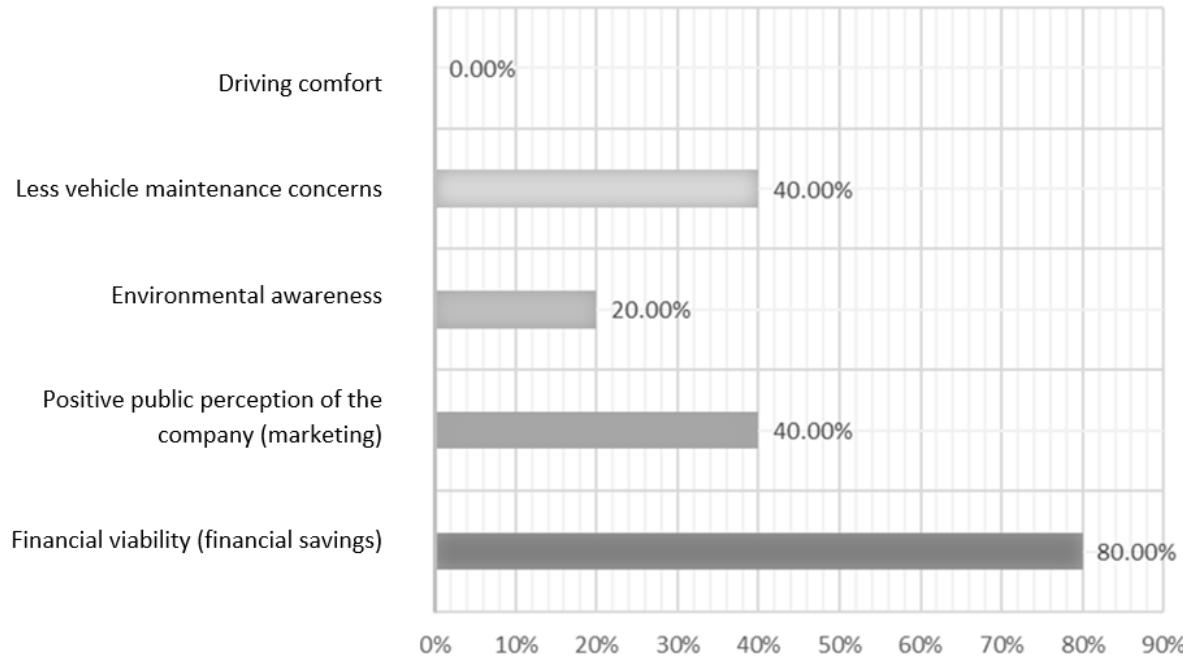
Low-power AC charging stations require minimal maintenance (cable and connector inspection), while the maintenance of DC charging stations is more demanding (additional inspection of the cooling system, filters, and other components).

Upon the expiry of the warranty period, the charging station operator has three choices: to sign a maintenance contract with the same supplier, to sign a maintenance contract with another entity or to self-maintain the charger (own authorized personnel). There are already entities in the EU market that offer charging station maintenance services (other than suppliers).

Vehicle repairers were also asked a set of questions about the motives and criteria affecting the purchase of electric vehicles, about factors that could stimulate interest in electric vehicles and about the barriers that they perceived as preventing the significant use of electric vehicles in Montenegro. The results are shown in the following charts.

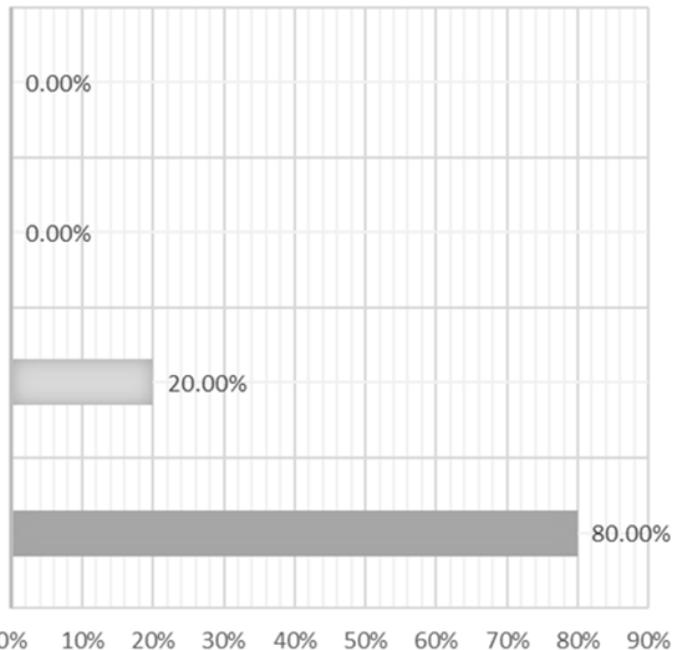
KEY MOTIVES FOR ELECTRIC VEHICLE PURCHASING –

VEHICLE REPAIRERS |



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

Social criteria (example of good practice for general population, positive perception of the entity)



Environmental awareness (reducing CO2 emissions and polluting substances)

Technological criteria (ability of electric vehicles to satisfy equal requirements as the existing fleet vehicles)

Economic criteria (financial viability in the vehicle's useful life)

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

Existence of non-fiscal incentive measures for e-mobility (e.g. reserved parking places, allowed movement in...)

Availability of maintenance and repair services, and spare parts for electric vehicles.

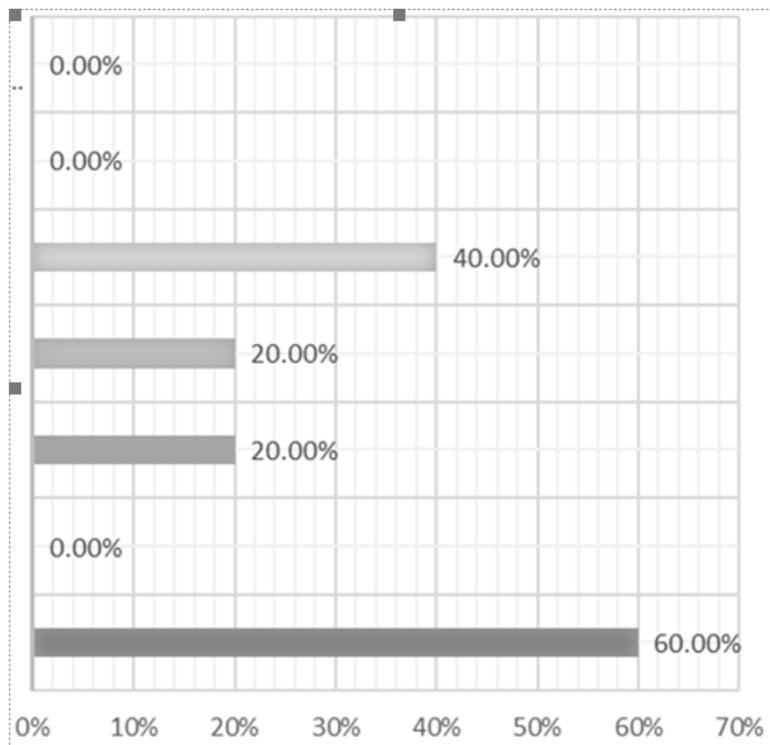
Good availability of charging infrastructure

Larger range of electric vehicles on a single charge

More competitive purchase price of electric vehicles

Fiscal measures (tax relief for electric vehicles)

State incentives (subsidies) for the purchase of electric vehicles (e.g. through the Eco-Fund)



KEY BARRIERS TO A WIDER USAGE OF ELECTRIC VEHICLES – VEHICLE REPAIRERS

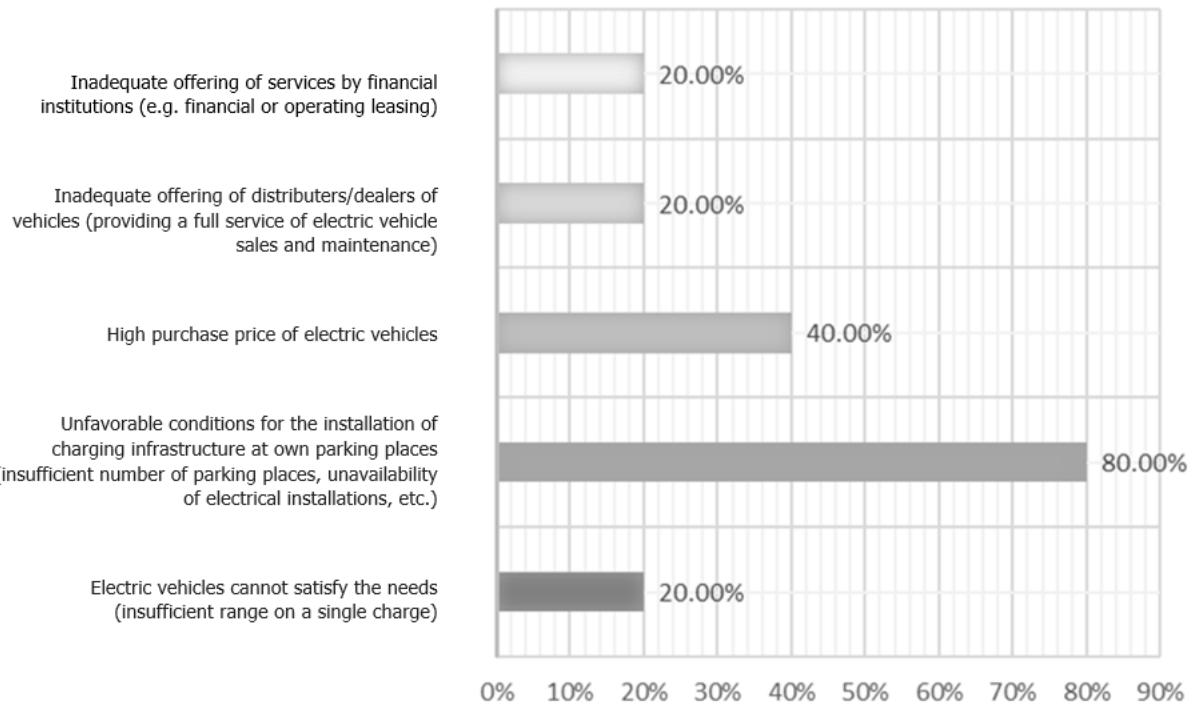


Figure 2-3: The views of vehicle repairers on the key motives, criteria, incentive factors and barriers regarding electric vehicles in Montenegro

FINANCIAL INSTITUTIONS

Financial credit and operational leasing are models that have gained significant popularity among vehicle users in recent years. The leasing of an electric vehicle for a period of several years would enable the end user to avoid potential risks regarding ownership of the electric vehicle (obsolete technology and battery degradation already after several years of use). A survey questionnaire was prepared for financial institutions; the aim was to establish the current policy of commercial banks and leasing houses, within the context of financial offers for vehicle users, and to examine the readiness of these institutions to introduce new models that would apply exclusively to electric vehicles.

Four financial institutions responded to the survey questionnaire. Prior to submitting the questionnaire, the 15 most important financial institutions in Montenegro were identified, thus the survey results of this group of respondents are considered only as being indicative. Nevertheless, it should be noted that the financial sector has well-established business models for lending money for the purchase of vehicles and that these business models do not differentiate between engine power or type. The survey was intended to investigate the familiarity of financial institutions with electric vehicles, their possible readiness to treat such vehicles as special exceptions in their financial products, and their concern about creating a green image.

Information regarding current special credit/ leasing offers for electric vehicles is shown in the table below. Although the survey results show that banks do pay attention to ecology as an integral part of

their business operations, a review of most of their websites revealed that special offers regarding green/eco credit opportunities were not clearly highlighted. Almost every bank offered credit for car purchase, but there is currently no mention of any special conditions for electric vehicles; it is expected that this is due to low demand.

Table:2-3The results of a survey on the availability of financial products for electric vehicles

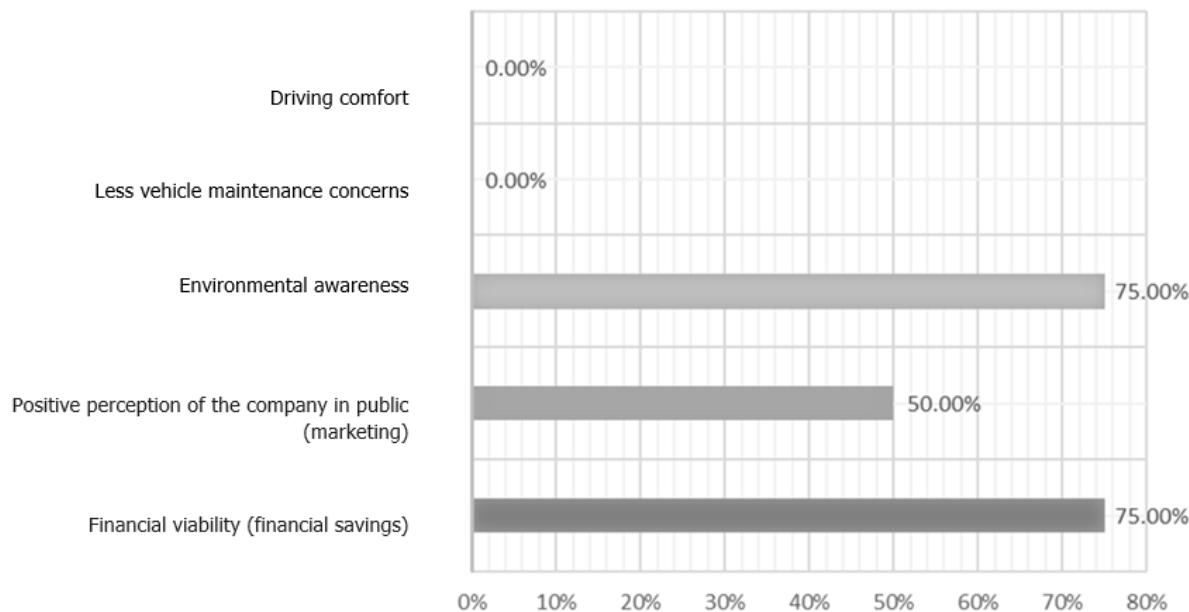
Question	Number of respondents with a positive response	The percentage of respondents with a positive response within the total number of respondents (%)
Access to 'eco' credit	3	75.00%
Consideration of the possibility of introducing special credit/leasing conditions for electric vehicles for citizens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

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

Financial institutions were asked a set of questions about the motives and criteria affecting the purchase of electric vehicles, about factors that could stimulate interest in electric vehicles and about the barriers that they perceived as preventing the significant use of electric vehicles in Montenegro. The results are shown in the following charts.

KEY MOTIVES FOR BUYING ELECTRIC VEHICLES –

FINANCIAL INSTITUTIONS



KEY CRITERIA FOR MAKING DECISIONS ON ELECTRIC VEHICLE PROCUREMENT

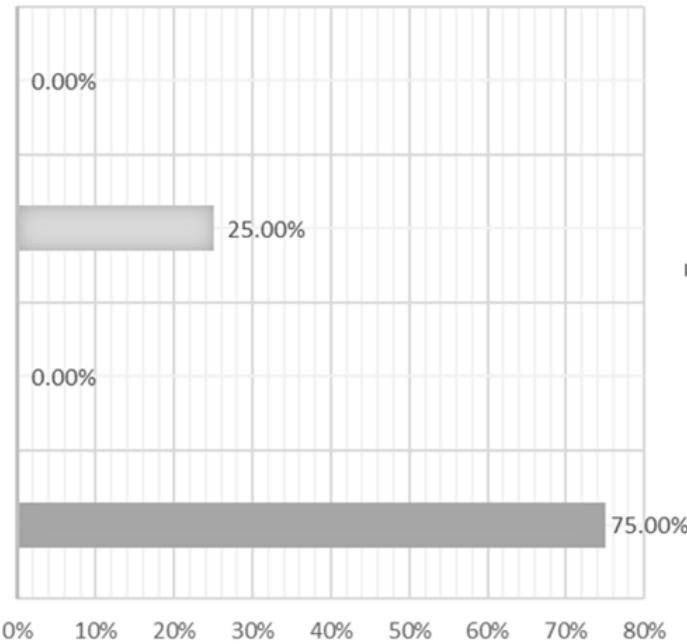
– FINANCIAL INSTITUTIONS

Social criteria (example of good practice to general population, positive perception of the entity)

Environmental awareness (reducing CO2 emissions and polluting substances)

Technological criteria (the ability of electric vehicles to meet the same requirements as existing vehicles in the fleet)

Economic criteria (financial viability in the vehicle's useful life)



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

Existence of non-fiscal measures for stimulating e-mobility (e.g. reserved parking spaces, allowed movement in...)

Availability of maintenance and repair services and spare parts for electric vehicles

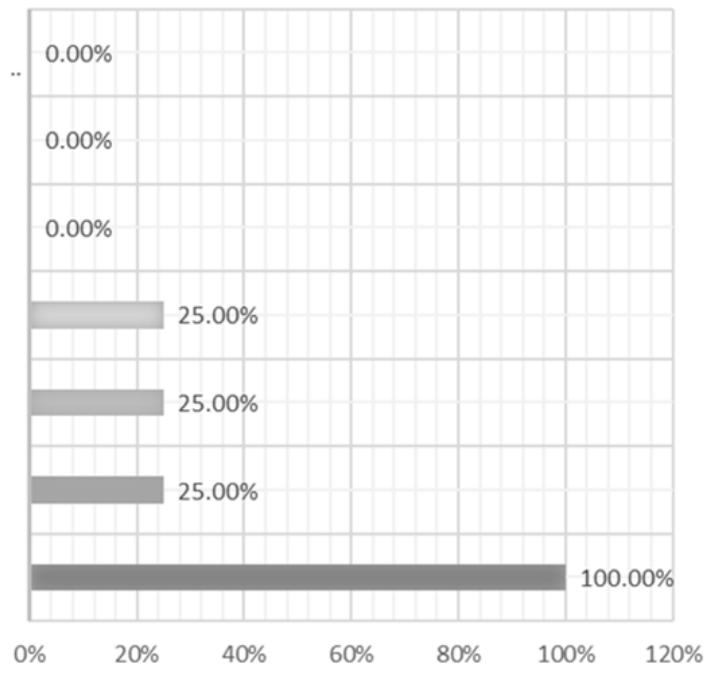
Good availability of charging infrastructure

Larger range of electric vehicles on a single charge

More competitive purchase price of electric vehicles

Fiscal measures (tax relief for electric vehicles)

State incentives (subsidies) for the procurement of electric vehicles (e.g. through the Eco Fund)



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

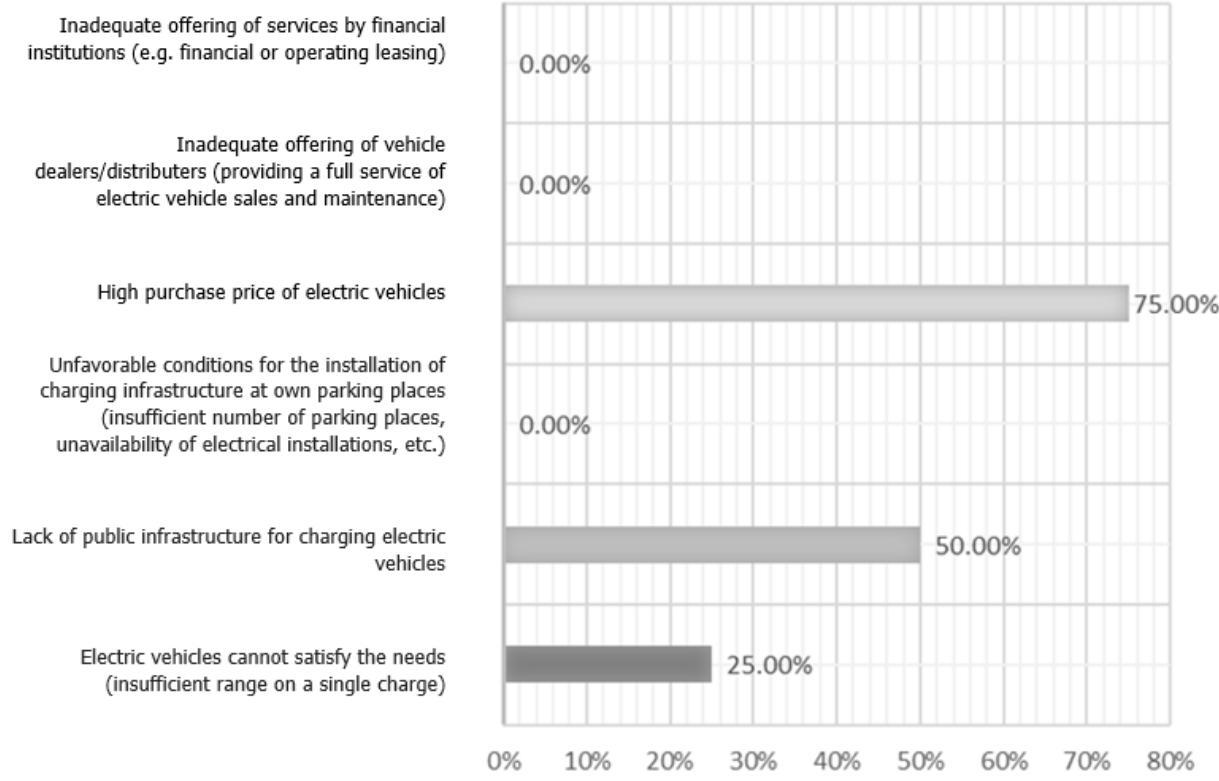


Figure 2-4: Views of financial institutions on the key motives, criteria, incentive factors and barriers regarding electric vehicles in Montenegro

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; this includes the charging of electric vehicles, user identification, subscription service, billing, etc. Each new activity in the field of e-mobility opens up new and independent business opportunities. However, in the initial stages of the development of e-mobility, one business entity frequently has to carry out several activities simultaneously. One such example is that a business entity that owns a charging station is also the operator (maintenance, data management) and the 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 that 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 position themselves in a timely manner on the market. Two types of entities currently stand out among these: telecommunication 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**). They already have plans to build new charging stations throughout Montenegro during the current year.

Distributors of petroleum products see e-mobility primarily as a marketing activity; this fits into their strategic concept of gas station development being a place where not only fuel is sold, but an 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 good practice in the region, this potential engagement should certainly not be neglected. Examples from the EU are shown in the table below.

Table 2-4:Examples of electric power companies engaging in developing e-mobility

Country	Description
Czech Republic	"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 electromobility 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.
Croatia	The national power company in Croatia (HEP dd) is actively implementing a 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; this 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 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 their 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

- Dealers/distributors and VEHICLE REPAIRERS demonstrate that they follow trends, are informed and are getting prepared for an increase in the demand for electric vehicles; however, 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; 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 a range of vehicle purchase financing products which are also applicable to electric vehicles.

Based on the above information, it can be said that the **maturity of e-mobility products and associated service offers in Montenegro is low**; it is, however, **making progress**.

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

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 a desire to better position entities on the market as soon as possible. However, in order to speed up the development of infrastructure and the overall concept of e-mobility, this segment of the market would benefit greatly from the engagement of the state and public sector to initiate the development of infrastructure in their respective areas.

One part of the conducted survey referred to the general views of entities on this side of the market; about the motives, criteria, and incentives for the procurement of electric vehicles in Montenegro and about the barriers that might potentially discourage the use of electric vehicles in Montenegro. Given that 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. The summarized results are shown in the Figure 2-5 below.

It is interesting to note that respondents see the most significant barriers as the (non) availability of a charging infrastructure; this is also considered to be the other most important factor for the wider use of electric vehicles. Motives and criteria for deciding on the purchase of an electric vehicle are primarily seen as financial viability, and only after these issues comes ecological awareness. **Such results provide guidelines for communication activities concerning e-mobility in Montenegro; such activities should be calibrated primarily to highlight the financial benefits of purchasing an electric vehicle followed by the environmental benefits.**

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

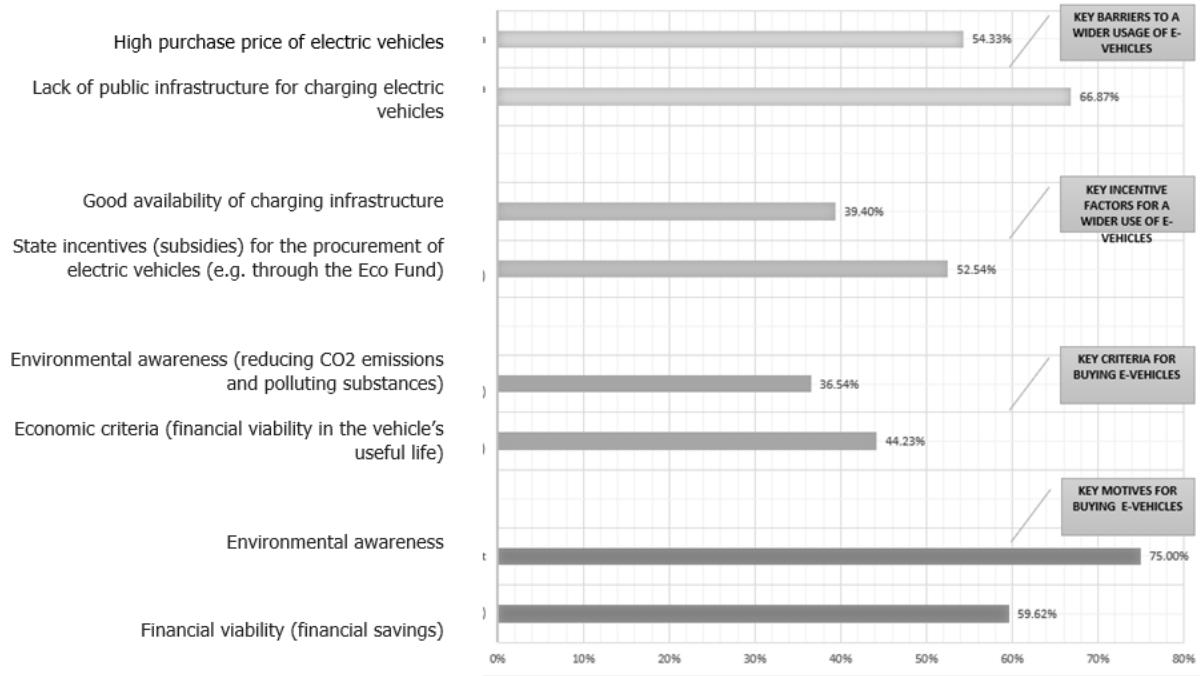


Figure 2-5: Views of entities on the supply side of the e-mobility market on the key motives, criteria, incentive factors and barriers regarding electric vehicles in Montenegro

To conclude, it can be determined that the positioning of business entities in the sector of e-mobility took place in the expected sequence and that it was at an appropriate level in relation to the level of market development. Namely, business entities aimed at concurrently carrying out several activities (installation of charging stations, management of charging stations, providing the service of e-mobility); the option of focusing on only one segment of e-mobility can only be expected at a later stage when e-mobility has become well developed in practice to such an extent that market activities will be clearly segregated. Additionally, when the number of electric vehicles represent a significant percentage of a total fleet, completely new market opportunities will open up along with 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 by introducing electric vehicles into 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 both national and global levels.

As part of the survey of the potential market in the context of the public sector, data on the number and age of passenger and light freight vehicles was collected from a total of 58 entities (shown in Table 3-2). The total number of vehicles in the public sector vehicle fleets is more than 700; some public institutions have only one vehicle and others have more than 100. The average vehicle age in the fleets analyzed was 10.2 years, while the average annual mileage was 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. 13 institutions (22%) had 6 to 10 vehicles, 15 institutions (26%) had between 11 and 50 vehicles, and only 2 institutions (4%) had more than 50 vehicles. Such analysis was very important since it was necessary to apply different approaches for introducing electric cars into small, medium-sized and large vehicle fleets.

Table 3-1: 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

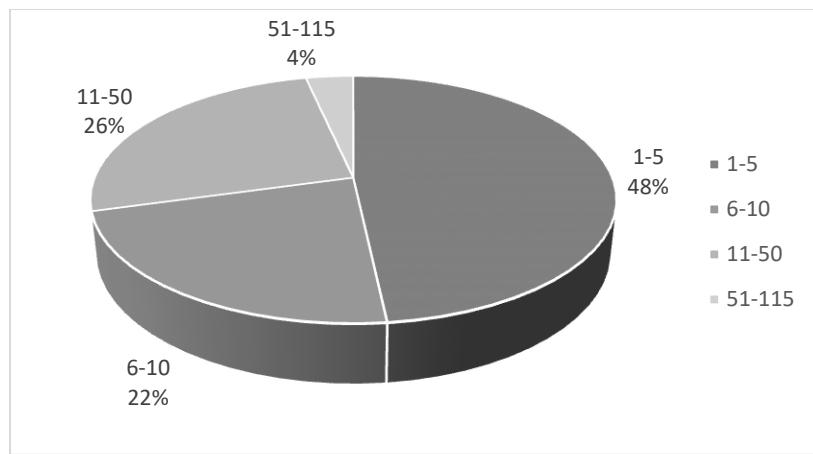


Figure 3-1: Size of vehicle fleets of public institutions

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

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

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

This research envisaged recognizing public sector views as being in general accordance with the concept of e-mobility. However, it was recognized that as part of the potential of introducing electric vehicles into the fleet of a particular institution, detailed research on the attitudes and views of vehicle users could also be carried out in order to identify possible barriers and to prepare training activities.

Table 1-2 : Passenger and light commercial vehicles in the public sector

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

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

In order to identify the interests, as well as the technical and financial capacities of the service providers, should electric vehicles be introduced into their fleets, 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%) stated that there was an average interest in new transport technologies within their institution, 15.39% of them said that no such interest, or a small interest, existed, and 17.95% (7 respondents) had a great interest. It was assumed that those with a great interest were the institutions (state administration bodies, faculties) in the fields of environmental protection, energy and transport. A similar share of respondents (89.74%) to those who had a medium or high level of interest in new transport technologies was willing to participate in a pilot project to introduce electric vehicles into their fleet.

There was relatively low interest regarding the introduction of electric vehicles and new transport technology; this was probably due to the current low level of development in e-mobility. Namely, it was expected that with the first signs of a publicly available charging infrastructure, along with the emergence of electric cars on urban roads, the general interest for e-mobility would increase considerably, and that the public sector would also become more interested. This lack of interest would be combated through an increased level of attention on this subject in the media.

However, the questionnaire results also indicated that there was definitely a significant percentage of people who followed development trends and were ready to accept new technology.

The survey also sought to establish the interest of public institutions in actively participating in the process of adopting strategic and legal documents and in defining implementing measures for the faster development of e-mobility in Montenegro. The results are shown in Figure3-1.

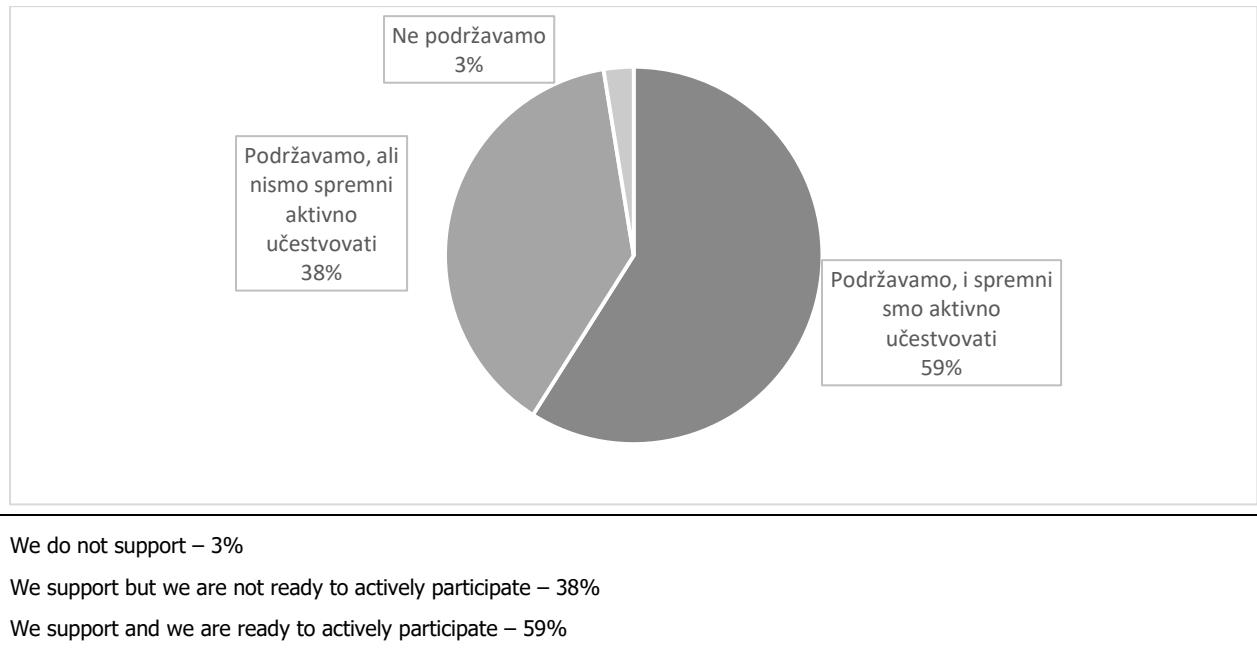


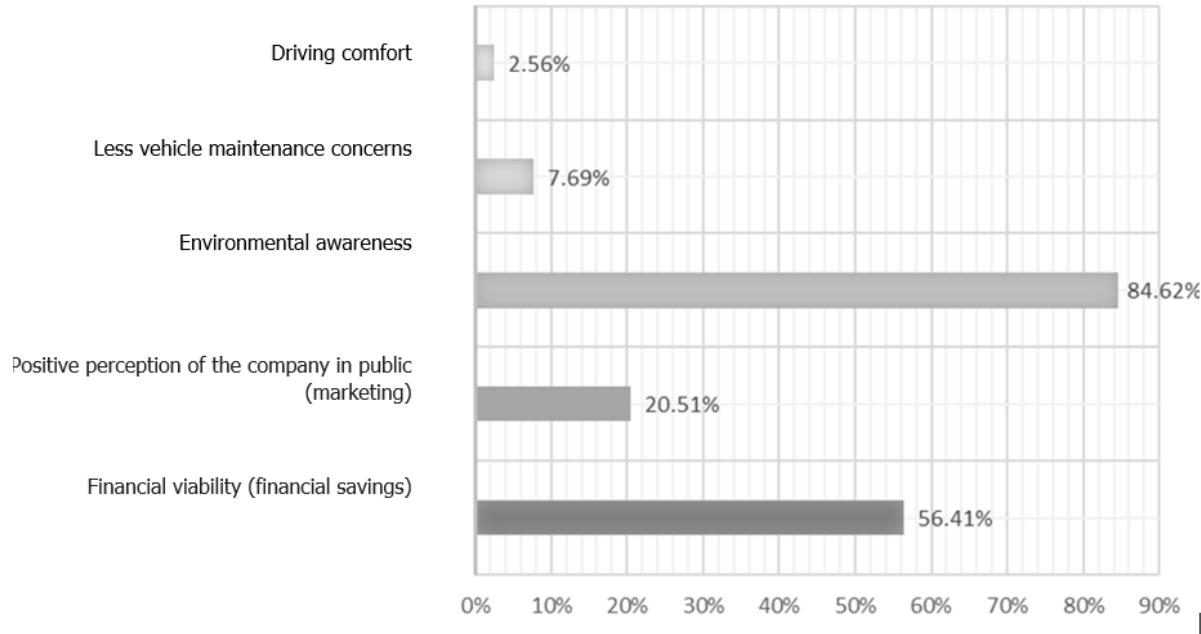
Figure 3-2: Readiness of public institutions to participate in the adoption of strategic and legal documents and in the definition of implementing measures for the faster development of e-mobility in Montenegro

Respondents also submitted their proposals for the most important strategic, legal and other measures for the faster development of e-mobility in Montenegro; this generally referred 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 obligations for e-mobility.

Public sector representatives were asked a set of questions on the motives and criteria for buying electric vehicles, on factors that could foster their interest in electric vehicles and about 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 was a key motive and criterion for deciding on purchasing an electric vehicle, which was significantly different from all of the other groups of respondents where the criterion of financial viability prevailed. State incentives were the absolutely dominant factor that would and could stimulate the procurement of electric vehicles; the barriers pointed out were a lack of public infrastructure for vehicle charging and the inability of an electric vehicle to meet their needs, i.e. insufficient single-charge vehicle autonomy on a single-charge.

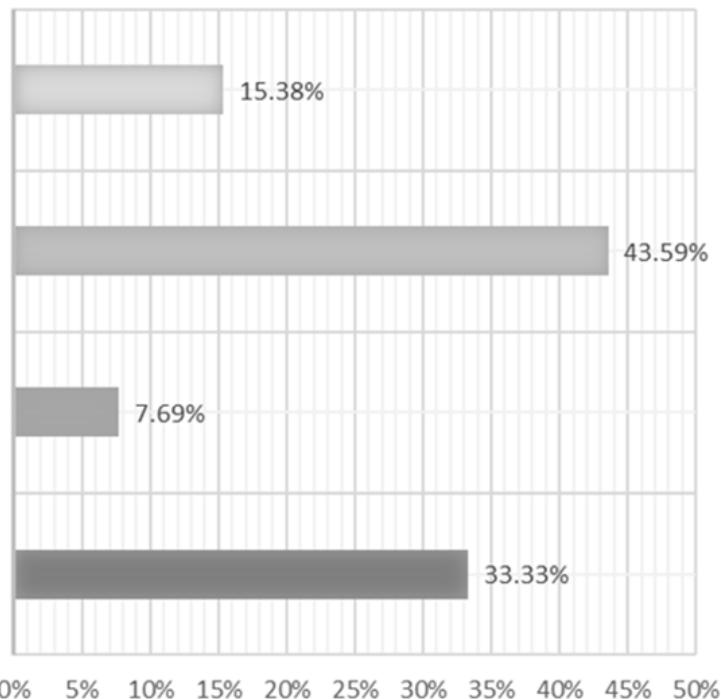
KEY MOTIVES FOR BUYING ELECTRIC VEHICLES – PUBLIC SECTOR



KEY CRITERIA FOR MAKING DECISIONS ON ELECTRIC VEHICLE PROCUREMENT

– PUBLIC SECTOR |

Social criteria (example of good practice to general population, positive perception of the entity)



Environmental awareness (reducing CO2 emissions and polluting substances)

Technological criteria (the ability of electric vehicles to meet the same requirements as existing vehicles in the fleet)

Economic criteria (financial viability in the vehicle's useful life)

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

Existence of non-fiscal measures for stimulating e-mobility (e.g. reserved parking spaces, allowed movement in...)

Availability of maintenance and repair services and spare parts for electric vehicles

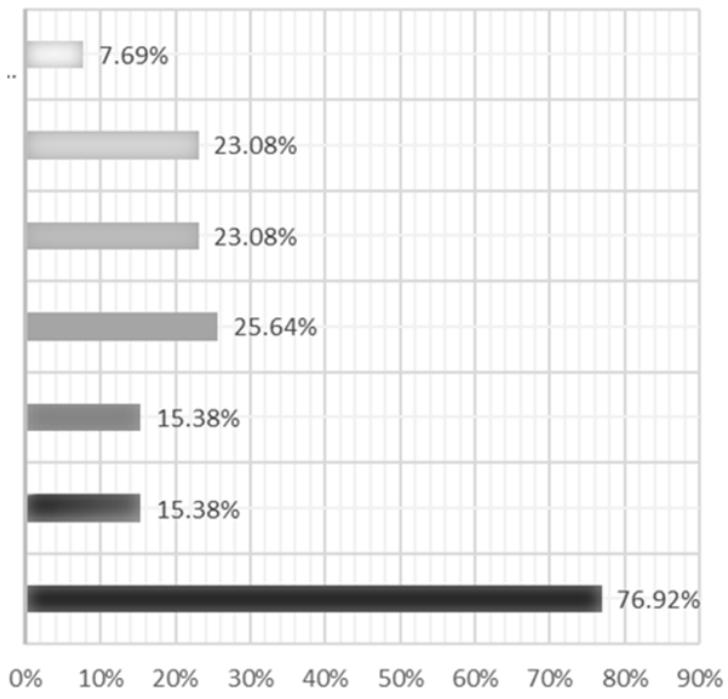
Good availability of charging infrastructure

Larger range of electric vehicles on a single charge

More competitive purchase price of electric vehicles

Fiscal measures (tax relief for electric vehicles)

State incentives (subsidies) for the procurement of electric vehicles (e.g. through the Eco Fund)



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

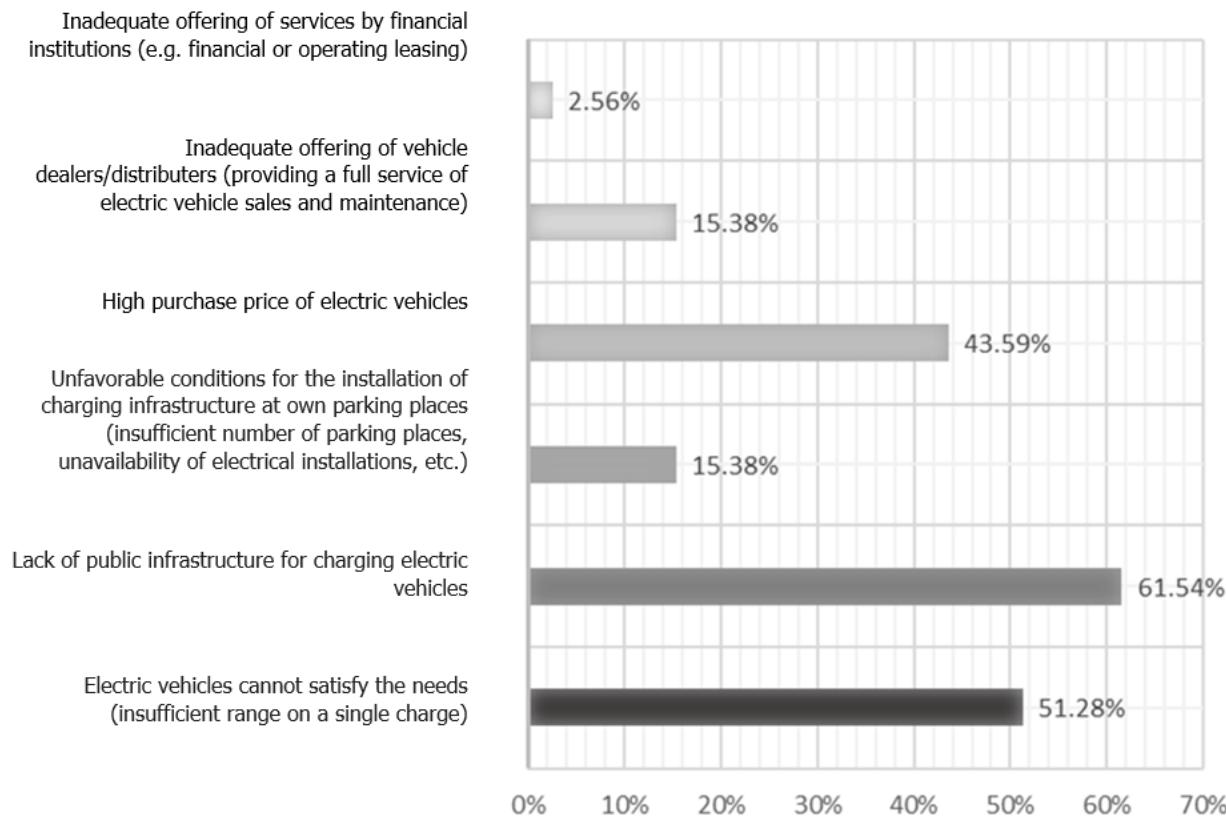


Figure 3-3: Public sector views on the key motives, criteria, incentive factors and barriers regarding the introduction of electric cars into their fleets in Montenegro

Regarding the perception that electric cars could not meet their needs, representatives of public institutions stated 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 varied 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, believed that their activities required an autonomy of **200 to 400 km**;
- The maximum acceptable charge time varied significantly among 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 believed that their activities required fast charging **up to 2 hours**;
- Most of the respondents (82.05%) had their own parking spaces, and only 5.13% of them did not have their own parking spaces - the rest had their own parking spaces that covered only part of their needs, and most of these respondents indicated a problem of not having both garage and parking spaces next to their outdoor parking spaces;
- Most of the respondents (69.23%) had a person in charge of maintaining 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 pointed out the need for a larger range, additional analyzes could determine the possibility of partial introduction of electric vehicles into their fleets, and with the future development of technology that would lead to a greater range of cars, it would be possible to introduce an increasing share of electric vehicles into the fleets of all public institutions.

With regard to acceptable charging times, it is likely that a certain number of cars actually perform such tasks where quick charging would be required during the 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 would be inevitable that some changes in transportation habits would have to be accepted. Namely, the principles of e-mobility, which include advanced intelligent network charging management and the integration of electric cars into the power system, assume that charging patterns for electric vehicles would be subject to control. In other words, the goal of each charge is to last as long as possible. It is expected that the maximum length of charging would occur during the night and at times of minimum load on the power system. Therefore, the answers collected in response to this question pointed to the need to inform and to meet with all potential users affected by the different elements of e-mobility, to enable each individual to have a clearer picture of what to expect and how to optimally utilize the capabilities of electric vehicles.

A high proportion of respondents stated that they had their own parking spaces. This was a very important prerequisite for introducing electric vehicles into their fleets and for being able to use them optimally (flexible planning of charging and use of vehicles).

As far as the financial viability of electric vehicles was concerned, and although financial criterion was mentioned as the second most important issue when making investment decisions, only 2 respondents (5.13%) produced long-term economic and financial analyzes 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 vehicle.

The following is a framework review of the characteristics and a cost structure for three comparable passenger car classes: conventional vehicles, electric vehicles, and plug-in hybrid vehicles. 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 electrically-powered vehicles in public sector institutions, it would be necessary to analyze the costs and benefits for each particular case, which would have to take into account the specifics of the route of transport and the needs of each individual entity.

Table 3-3: Structure of electric vehicle costs compared to conventional or hybrid vehicles

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

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 parts, 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 parts, 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 operational leasing, and 2.56% financial leasing.

The majority of respondents (69.23%) considered that public procurement procedures did not limit or prevent the purchase of electric vehicles. Those who believed that there were limitations almost unanimously stated that the criterion of the lowest price was the biggest problem.

3.1.2. Public Transport

Public transport is an important segment for improving energy efficiency in Montenegro and is among the ones most promoted in the European Union policy. According to current legislation in Montenegro, public transport is defined as transport that is available to all potential users, under the same conditions, and that is offered on a commercial basis. Public transport services are provided at a 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 for passengers or cargo going by road transport should be carried out by a carrier on the basis of a public passenger or freight transport license. The authority responsible for issuing such a 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 daily connect the capital city with larger and smaller cities within 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, is shown in the following table:

Table 3-4: Road transport statistics for 2017 (Source: MONSTAT)

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

Table 3-5: Local road transport statistics for 2017 (Source: MONSTAT)

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

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

Given the percentage of total CO₂ emissions and polluting substances generated by public transport within the overall transport sector figures, as well as creating significant noise pollution, electric vehicles could 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 the 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, a survey of representatives of companies engaged in public transport, city and intercity transport was carried out. 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.

The questionnaire was structured in two parts. The first related to fleet data and the second was about preconditions and attitudes relating to the introduction of electric vehicles into bus fleets. Unfortunately, **none of the public transport operators provided data on their fleets, so a 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 were identified, the survey results can be considered as representative.

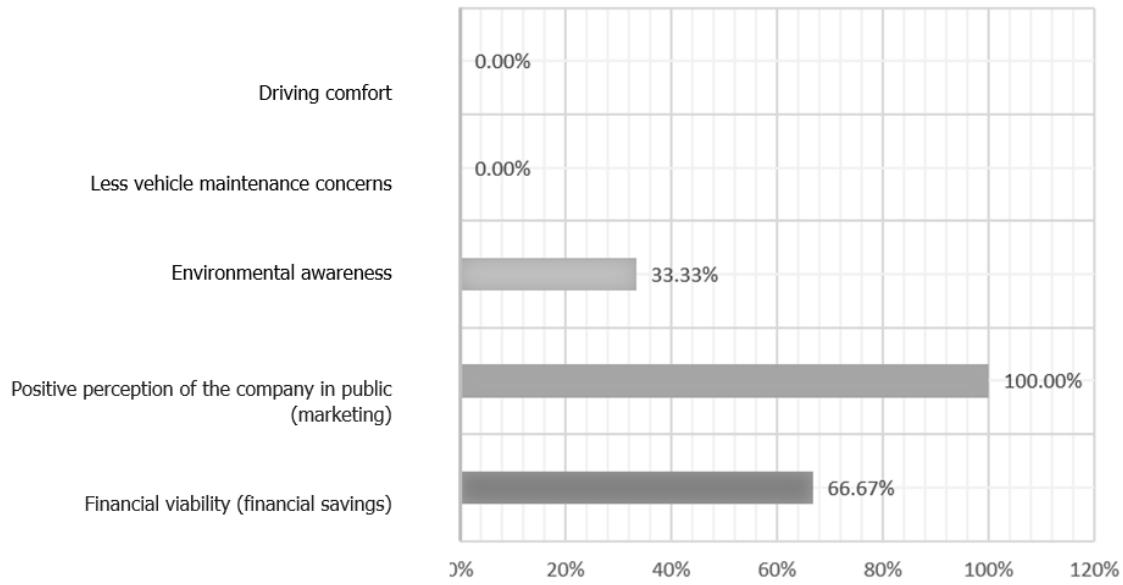
Most of the respondents (66.67%) had not yet considered the introduction of electric buses into their fleet; only one respondent had. Also, most respondents (66.67%) said that their companies had little or no interest in new transport technology. Nevertheless, most respondents (66.67%) would be ready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

The willingness of the respondents to participate in a pilot project for the introduction of electric buses, whilst at the same time saying that they had not independently considered their introduction, pointed to the openness of public transport operators to consider the concept of e-mobility. However, they need to be provided with adequate information and to be familiarized with the potential of electric buses as well as considering the content of a cost and profit analysis.

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

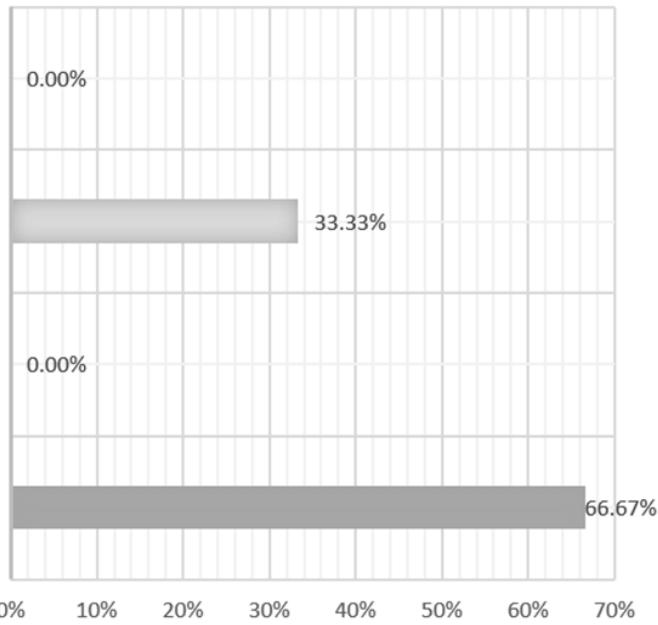
KEY MOTIVES FOR BUYING ELECTRIC BUSES –

PUBLIC TRANSPORT OPERATORS



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

Social criteria (example of good practice to general population, positive perception of the entity)



Technological criteria (the ability of electric vehicles to meet the same requirements as existing vehicles in the fleet)

Economic criteria (financial viability in the vehicle's useful life)

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

Existence of non-fiscal measures for stimulating e-mobility (e.g. reserved parking spaces, allowed movement in...)

Availability of maintenance and repair services and spare parts for electric vehicles

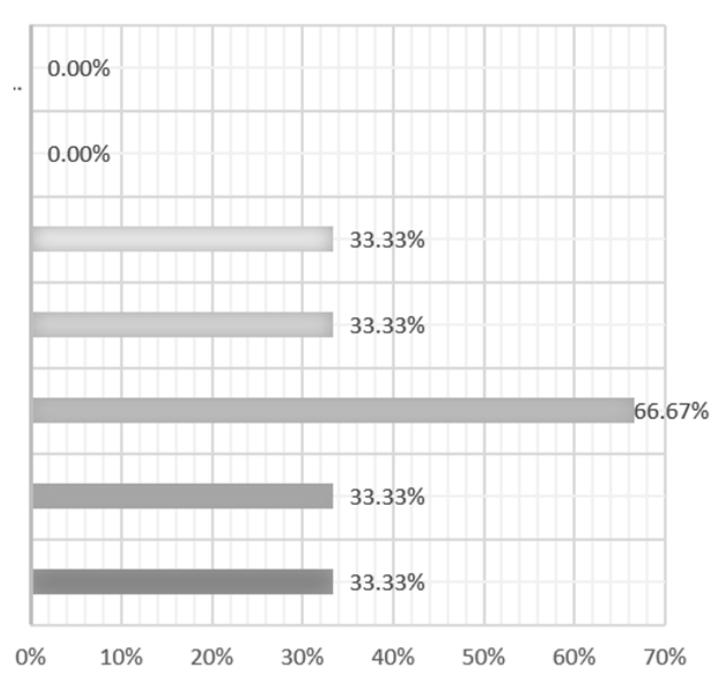
Good availability of charging infrastructure

Larger range of electric vehicles on a single charge

More competitive purchase price of electric vehicles

Fiscal measures (tax relief for electric vehicles)

State incentives (subsidies) for the procurement of electric vehicles (e.g. through the Eco Fund)



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

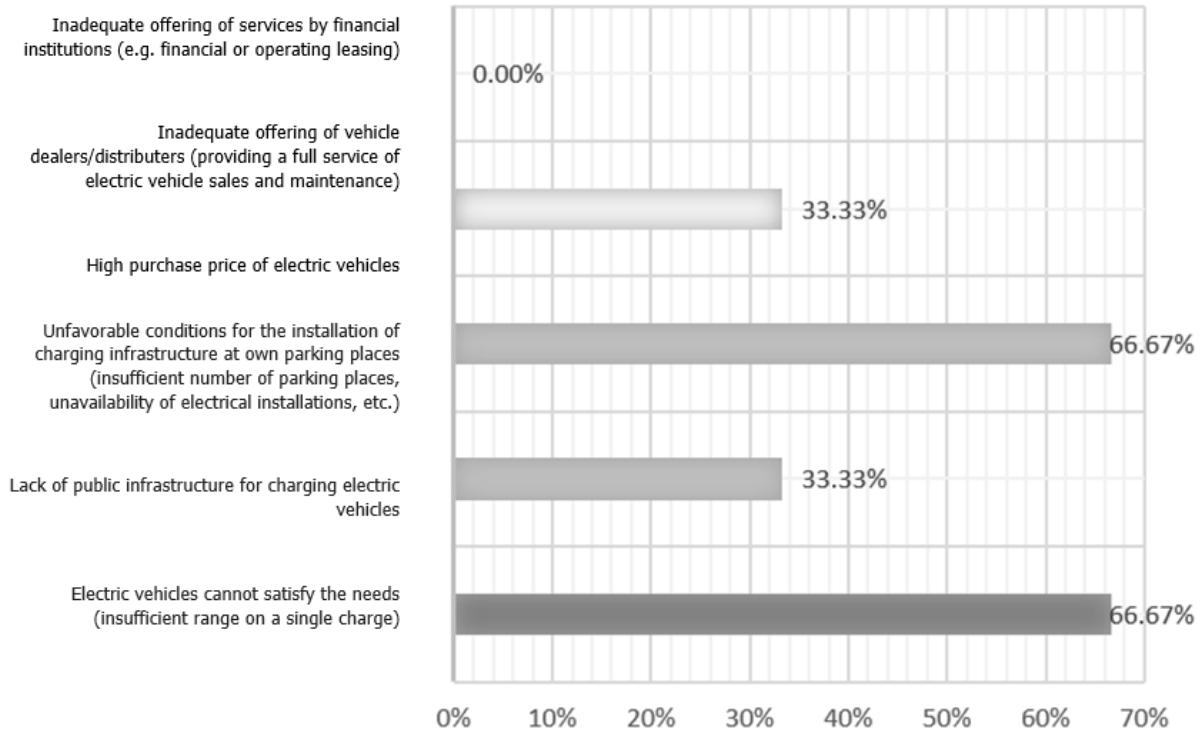


Figure 3-3: Public transport operators' views on key motives, criteria, incentive factors and barriers regarding the introduction of electric buses into their fleets in Montenegro

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

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

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

- 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, on an existing route, as an alternative to purchasing a new diesel bus or to replacing an existing one.

Below is a framework overview of the characteristics and cost structure for comparable bus classes; comparing a diesel bus with 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 a bus travelled **72,000 km** annually. In order to define the feasibility of public transport entities introducing electric buses, it would be necessary to analyze the costs and benefits for each case, which would have to take into account the specific nature of the transport route and the needs of each individual entity.

Table 3-6: Structure of an electric bus compared to a diesel bus

General characteristics		
Manufacturer	Mercedes-Benz	SOR Libchavy
Model	Merkavim pioneer	SOR NS 12 electric
Engine power [kW]	220	160
Number of seats	40	33
Price	234,000 €	577,000 €
Driving parameters		
Average annual mileage, in km	72,000	72,000
Energy consumption	33 L/100 km	1.27 kWh/km
Fuel tank/battery capacity	300 L	225 kWh
Autonomy [km]	1000	200
Fuel price	1.3 €/L	0.073 €/kWh*
Maintenance		
Tire change	3.300 €/year	3.300 €/year
Oil change	900 €/year	/
Other costs (spare parts, cleaning)	5.000 €/year	2.000 €/year
Annual operating costs (maintenance and energy)	€40,000	€12,000

* 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

Regarding a model about financing the purchase of a new bus, each respondent indicated a different model (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, could 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 for electric vehicles, the reduction in the cost of batteries per unit of capacity and parallel developments concerning an appropriate charging infrastructure, it is expected that there will be increased interest in the use of electric vehicles from this segment of the market. Additionally, it would be attractive for this sector to realize a green image and to attract customers to whom the ecological aspect of their activities is extremely significant.

In order to identify the interests, as well as the technical and financial capacities of service providers, should electric vehicles be introduced into their fleets, a survey was conducted. The questionnaire was structured in two parts. The first one included data on the fleet, and the second part considered the preconditions and opinions relating to the introduction of electric vehicles into their own fleets. Data on

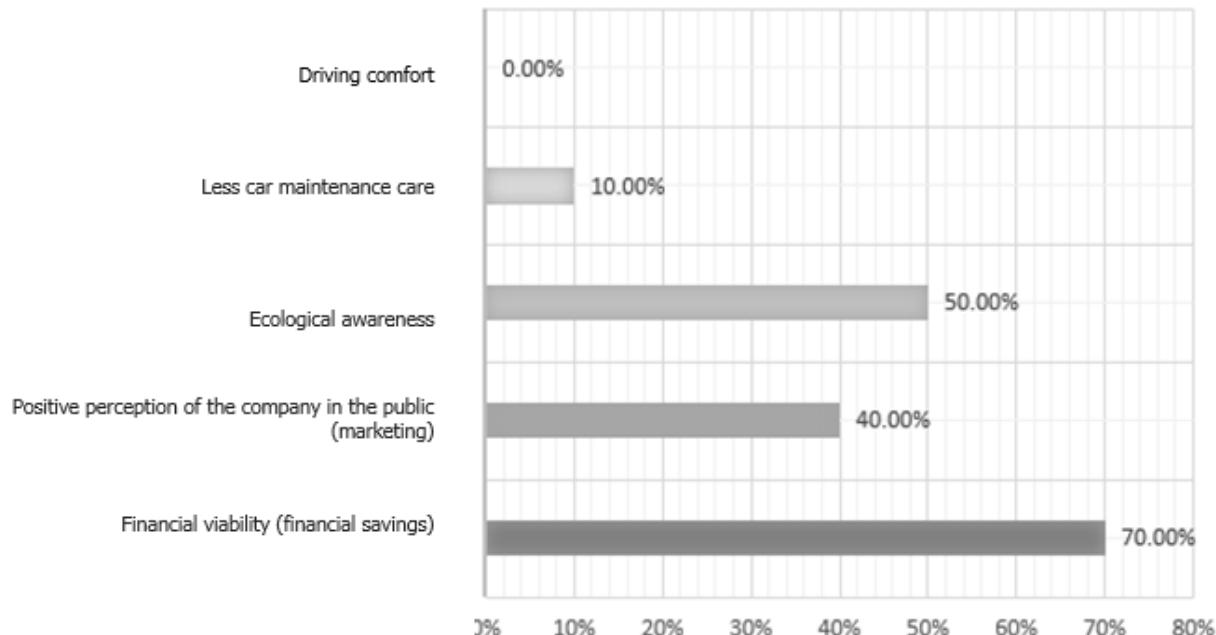
fleets was received from 6 respondents, while 10 respondents answered the survey questionnaire. Results from the second part of the questionnaire are shown below; vehicle data shall be used to select a case study for cost-benefit analysis.

Half of the respondents (50.00%) considered the introduction of electric vehicles into their fleet. Most of the respondents (60.00%) stated that there was average interest in their company for new transport technologies, and 40% of respondents said that there was either no such interest or very low interest. The same share of respondents (60.00%) was willing to participate in a pilot project for the introduction of electric vehicles into their fleets. In addition, 80% of respondents believed that the introduction of electric vehicles would improve their company's image.

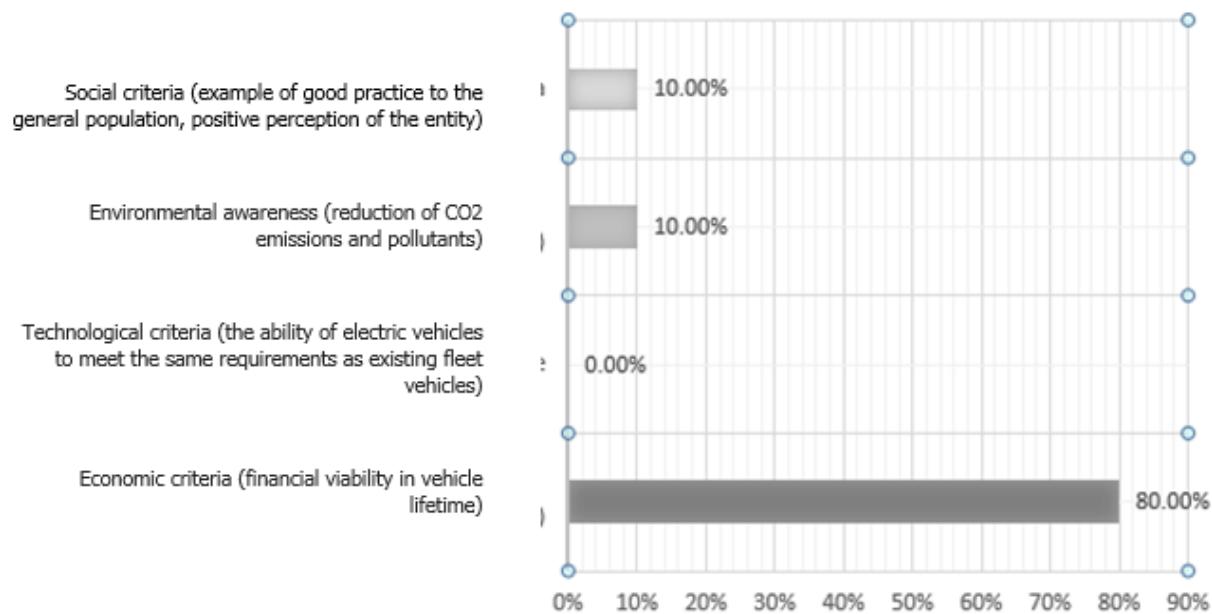
It can be concluded from these responses that the private sector is relatively quick to react to potentially interesting opportunities which will result in either financial benefits or an improved image of the company. These results were accompanied by the results of oral interviews with a number of private companies; they all showed a strong readiness to introduce new electric vehicles into their fleets, even when the total financial benefit was zero.

Transport service providers were asked a set of questions on rationale and criteria for purchasing electric vehicles, on factors that could boost their interest in electric vehicles and on the barriers that might prevent them from significantly using electric vehicles in their fleets. The results are shown in the following graphs. Responses showed that the financial viability of an electric vehicle was of critical importance in the decision-making criterion, but that ecological awareness and marketing also played a significant role. Financial aspects also prevailed regarding favored incentive factors and perceived barriers to the procurement of electric vehicles.

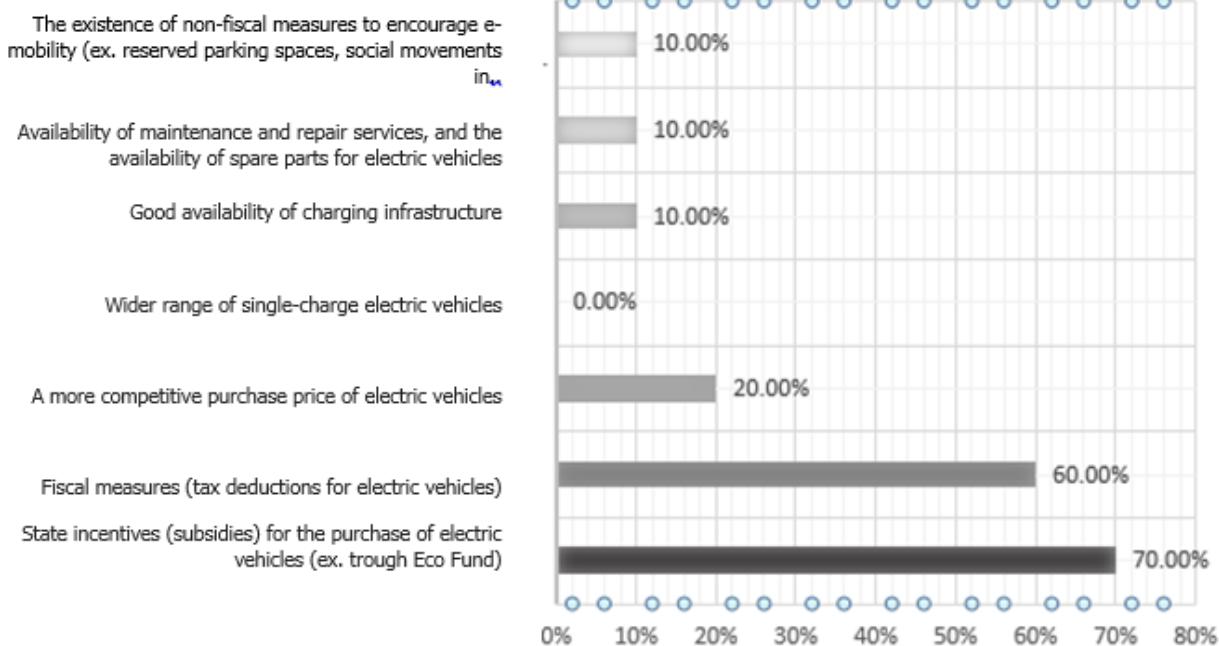
KEY RATIONALE FOR BUYING AN ELECTRIC VEHICLE - SERVICE PROVIDERS THAT INCLUDE TRANSPORTATION



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

- Inadequate offer by financial institutions (ex. financial or operating leasing, favorable loans)
- Inadequate offer of a vehicle distributors / dealers (providing complete sales and maintenance services for electric vehicles)
- High purchase price of electric vehicles
- Insufficient conditions for setting up a charging infrastructure at their own parking spaces (insufficient parking spaces, unavailability of electrical installations, etc.)
- Lack of public infrastructure for charging electric vehicles
- Electric vehicles cannot meet the needs (insufficient range for one charge)

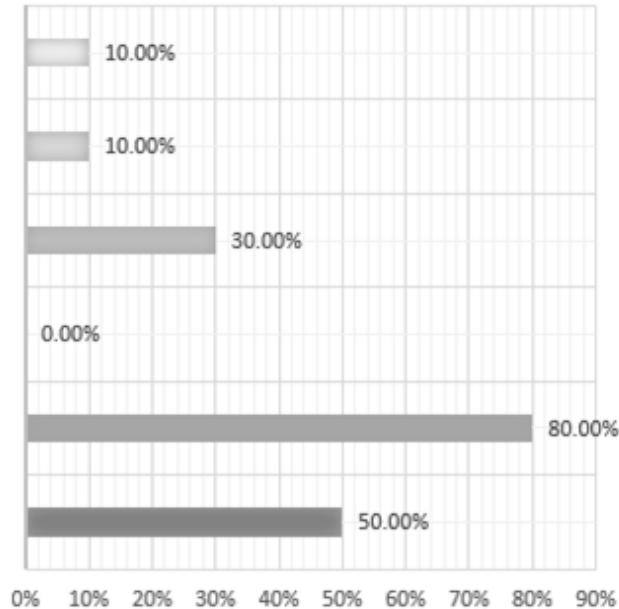


Figure 3-4: The views of service providers, including transport service providers, on key rationale, criteria, incentive factors and barriers regarding the introduction of electric buses into the fleet in Montenegro

Although the financial aspect was identified as crucial, only one respondent (10%) made a long-term economic and financial analysis for 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, on a common route, as an alternative to purchasing a new or to replacing an existing vehicle.

One of the common features of transport service providers (such as taxis), is the 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 resulting from the introduction of a fleet of electric vehicles, this sector could see significant financial benefits. Before deciding on purchasing any electric vehicle, it is recommended that a detailed cost-benefit analysis should be made, taking into account the specific needs of actual existing traffic routes.

Table 3-7 Structure of costs of electric vehicles compared to conventional or hybrid vehicles - business sector

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

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

Regarding the model about financing the purchase of new vehicles, most of the respondents (60.00%) used loans to purchase electric cars; 20% used financial leasing, while operating leasing was used by just 10% of the respondents, the same percentage as those who self-financed the purchase of vehicles. Only one respondent stated that offers made by financial institutions were inadequate; this option cannot, therefore, be considered as an obstacle to the purchase of electric vehicles.

The inadequate range of single-charge electric vehicles was a barrier for 50% of respondents. In this regard, transport service providers stated the following:

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

From the analysis of respondents' responses, the conclusion was similar to that of the public sector; private sector respondents required a somewhat larger vehicle range than what was currently available. Most electric cars currently available on the European market realistically meet the needs of minimum range requirements (> 300 km). It would therefore be necessary for each business entity to consider a partial replacement of its fleet; the part which carries out tasks that could be met by electric cars. Alternatively, the introduction of plug-in hybrid vehicles that could achieve much larger ranges could be considered.

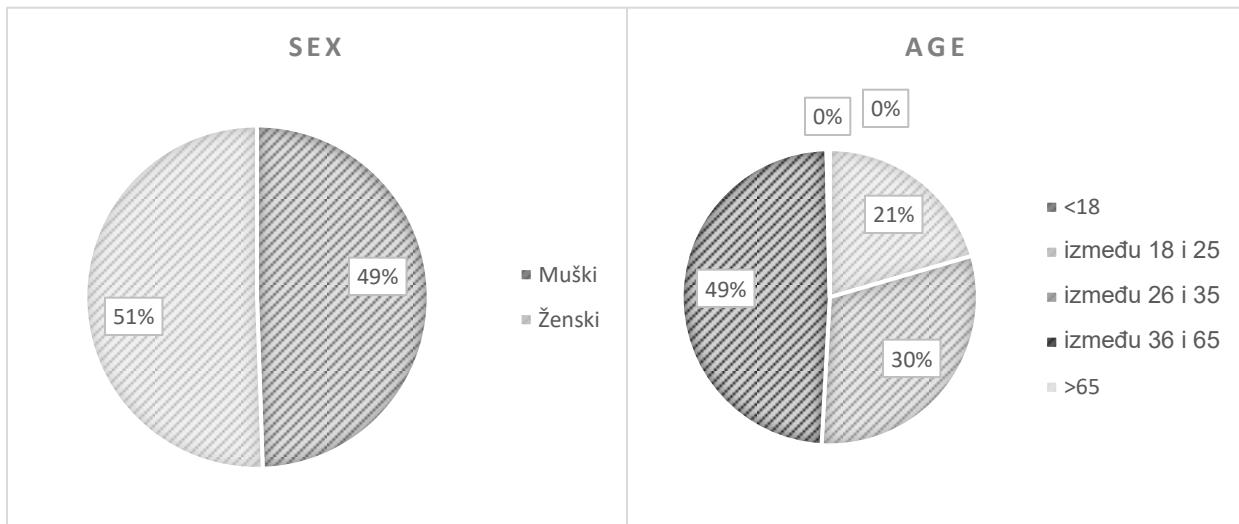
Regarding vehicle charging, it was a positive fact that a large percentage of respondents claimed to have their own parking places for all of their vehicles. Acceptable charging time was defined by a large proportion of the respondents as 'fast charging' of vehicles. In this regard, a wide range of information and educational activities need to be implemented to better familiarize the private sector with available options and also to get a clearer picture of the concept of e-mobility including all advantages and disadvantages. It is inevitable, however, that some changes and adjustments would have to be made regarding the habits of vehicle usage, given limited availability and the cost of building an infrastructure for the fast charging of electric vehicles (charging shorter than two hours).

CITIZENS

General data on respondents

The general data on respondents is shown in Figure 3-5. 49.47% of respondents (140 respondents) were male and 50.53% (143) female; this represents a good gender balance. Nearly half of the respondents (48.76%) were in the age group of 36 to 65 years old, and almost 80% (79.15%) were in the age group of 26 to 65 years old; these are the target groups for buying cars. The vast majority of respondents (78.80%) were highly qualified; this does not, however, reflect the real situation in Montenegro where, according to the latest census of 2011, about 17% of people have completed higher education. This bias may be as a result of the way that the survey was carried out (an online survey; this group of citizens uses the Internet more) or it may just be that this group had a greater interest in high-powered electric

vehicles. The respondents were mostly employed (75.97%), followed by students (16.25%), which is positive as they are the current or future decision-makers regarding the purchase of new cars. With regard to total monthly income, more than half of the respondents (51.59%) had an income higher than € 1,000 and 83.75% of the respondents had a monthly income of over € 500; this corresponded to the structure of the respondents according to their professional qualifications.



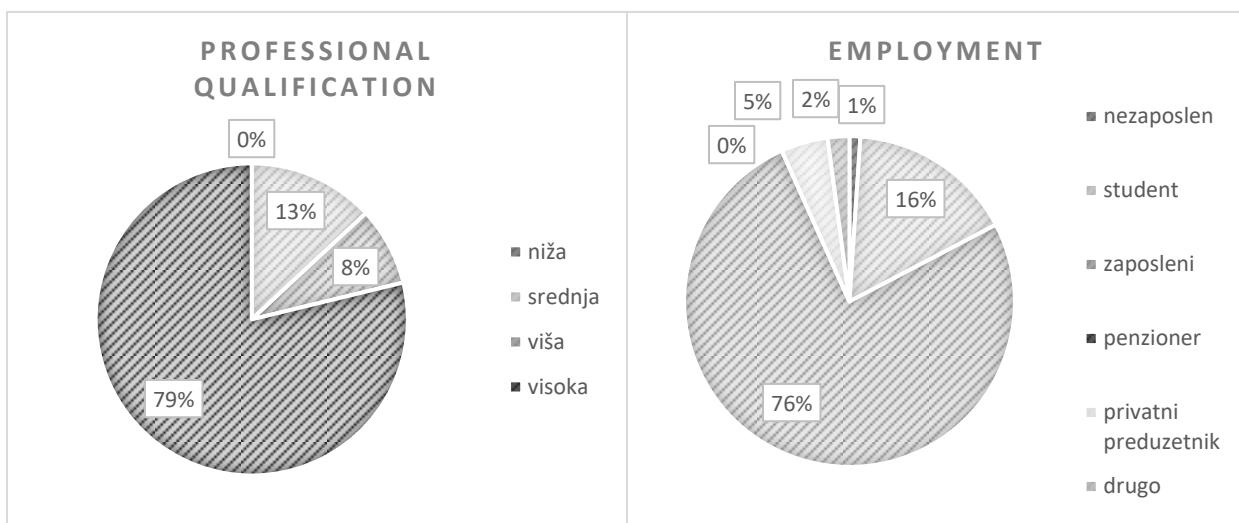
*Male

*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

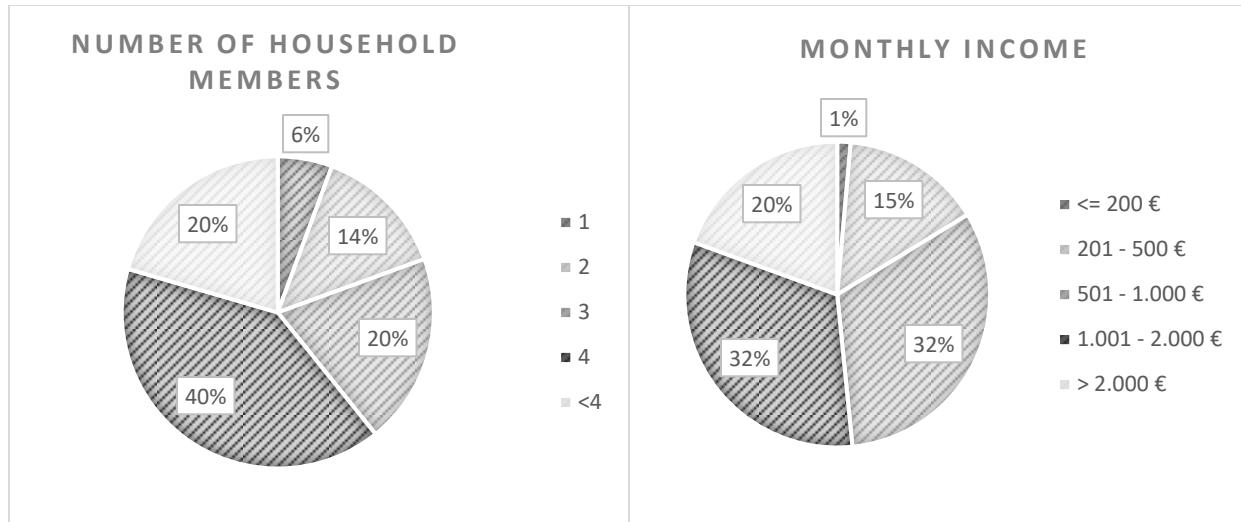


Figure 3-5: General data on respondents - survey for citizens

Figure 3-6 shows the geographic distribution of respondents. As expected, the majority of respondents come from Podgorica; it is interesting, however, that a large number of respondents come from Budva and Tivat which are major tourist centers.

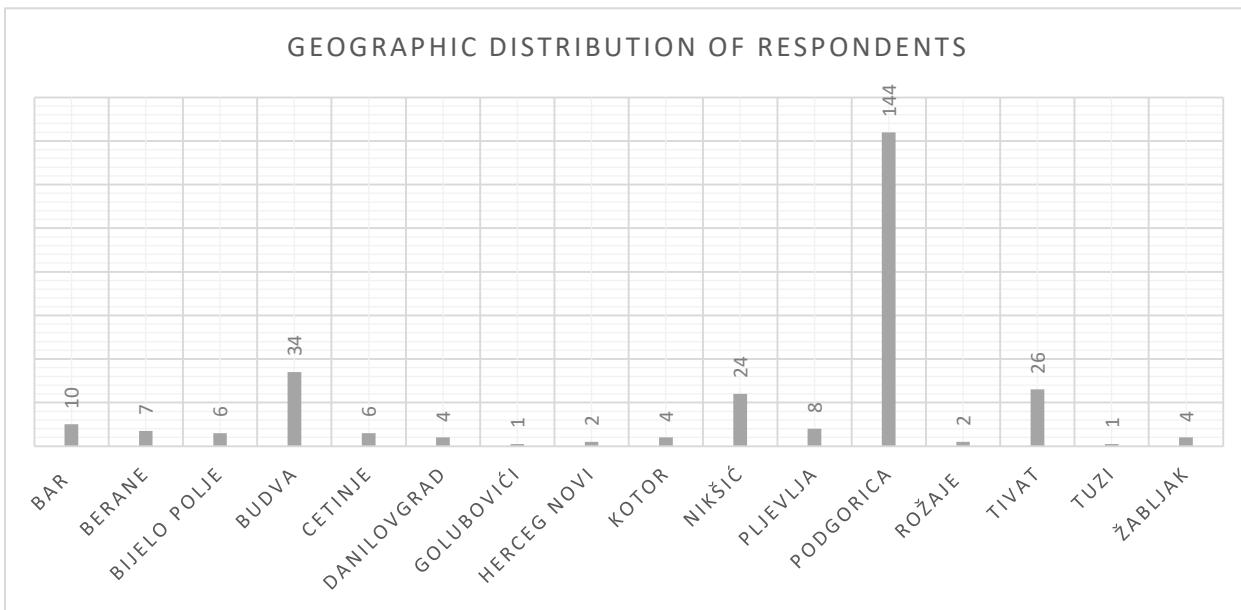
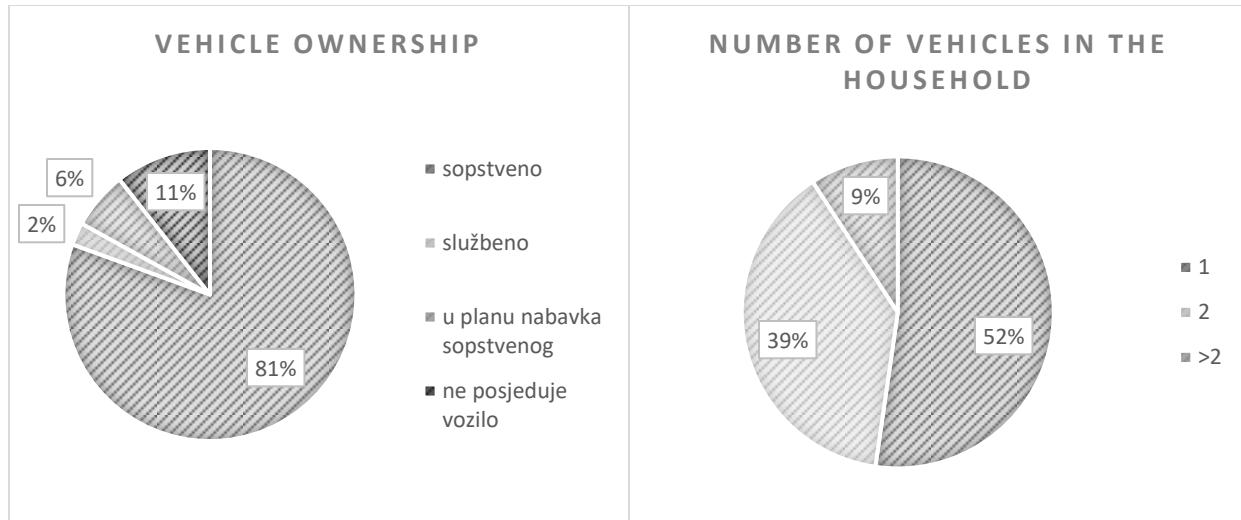


Figure 3-6: Geographic distribution of respondents - survey for citizens

Respondents' transport habits

Most of the respondents (80.57%) owned a car, while 10.60% of the respondents did not have a car. Most of these respondents belonged to the category of students. More than half of the respondents (52.30%) had only one car in the household, which was, in most cases, parked in an outdoor public parking lot (41.34%) or in a private parking lot in front of the house (35.69%); this corresponds to the geographical distribution of respondents, i.e. the fact that most respondents live in Podgorica. The majority of vehicles were older than 10 years (54.42%) and were diesel-powered vehicles (71.38%); this reflects the overall structure of the fleet in Montenegro.

[Type here]

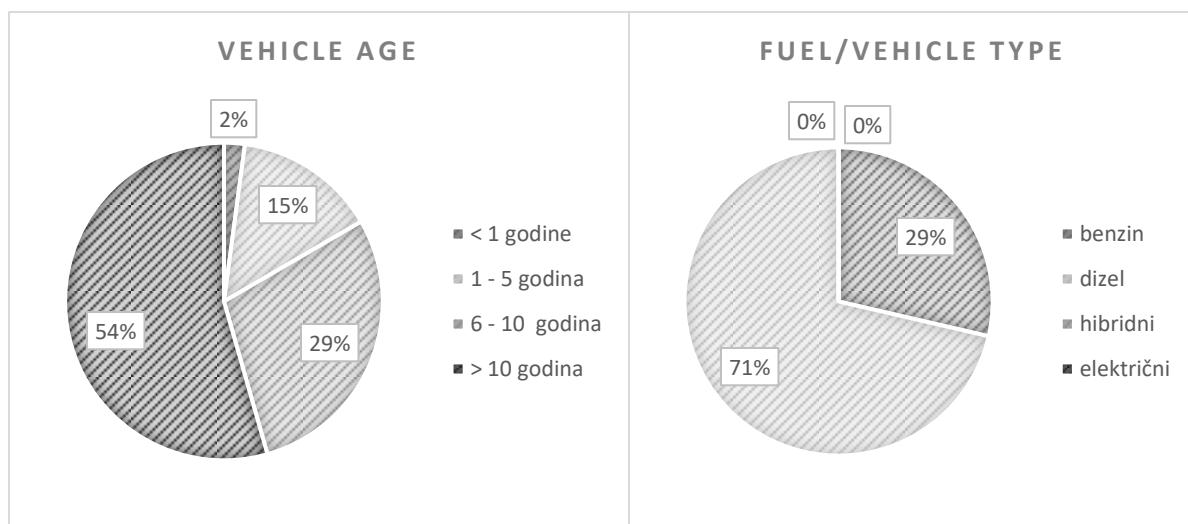


*Own a vehicle

*Company car

*Planning to purchase a car

*Do not own a car



*Petrol

*Diesel

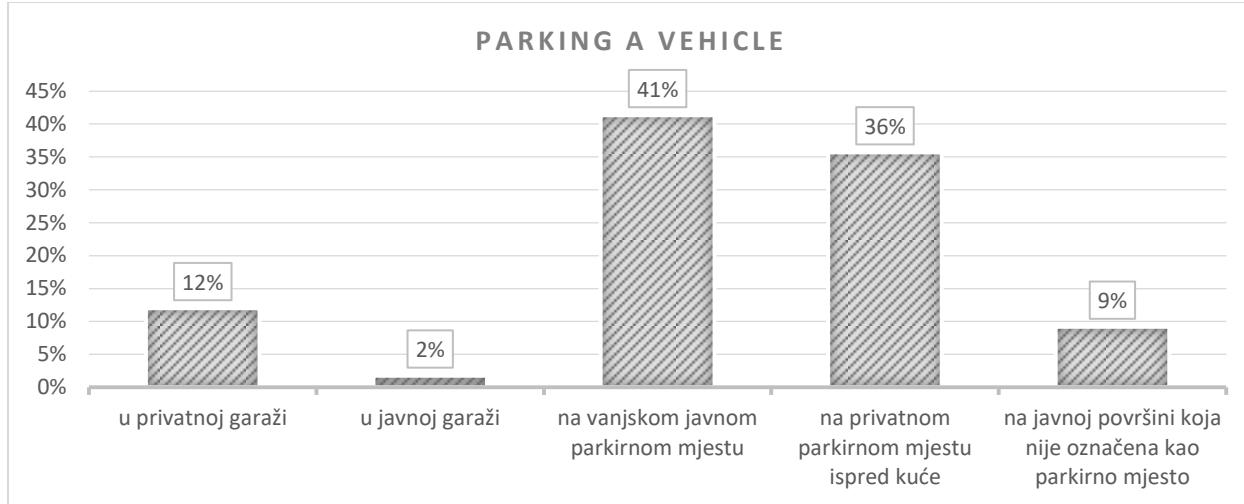
*Hybrid

*Electric

Figure 3-7: vehicle ownership - survey for citizens

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

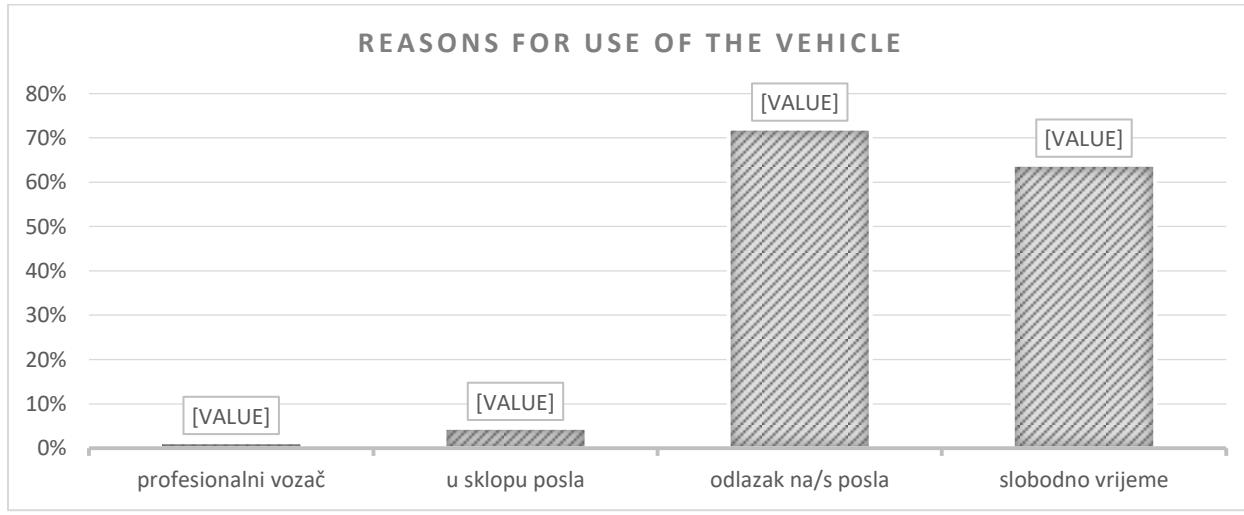
[Type here]



*private garage
space which is not marked as a parking space

*public garage
space

*outdoor public parking space *private parking space in front of the house *public



*professional driver

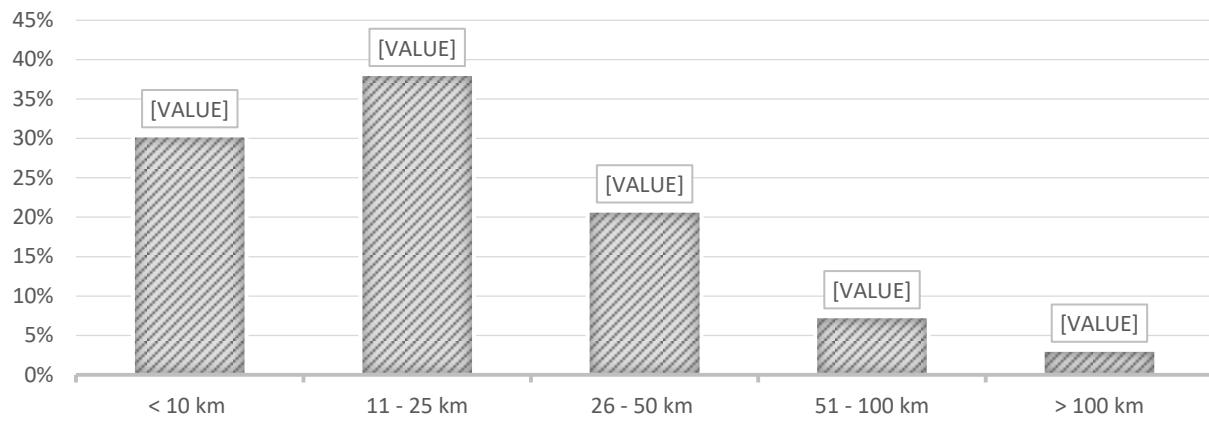
*business purposes

*to/from work

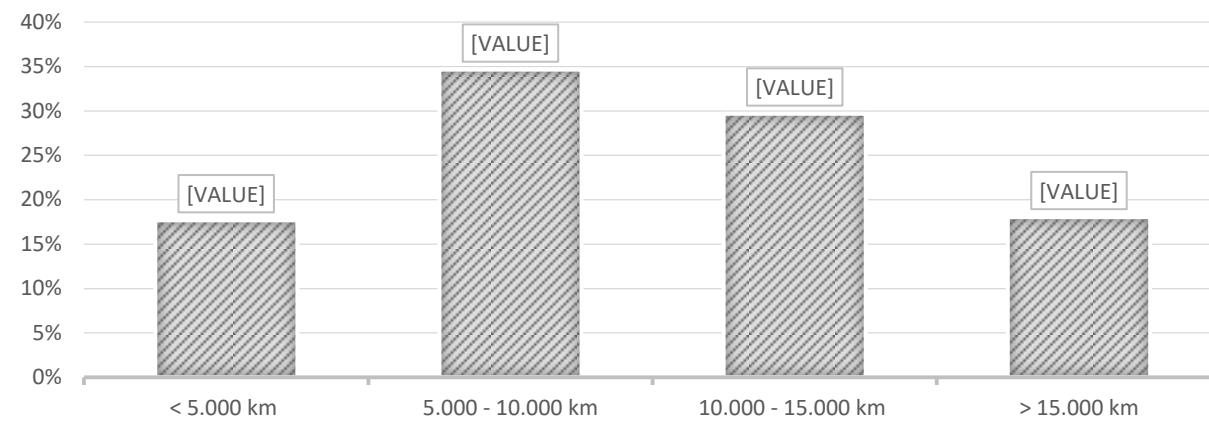
*leisure time

[Type here]

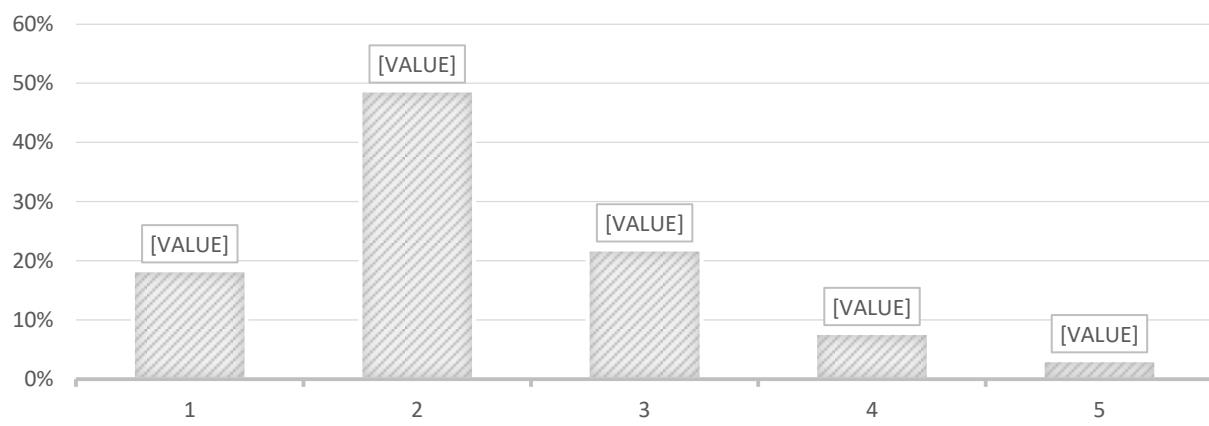
DAILY KILOMETERS TRAVELED



ANNUAL MILEAGE/KM



NUMBER OF PASSENGERS IN A VEHICLE IN CITY DRIVE



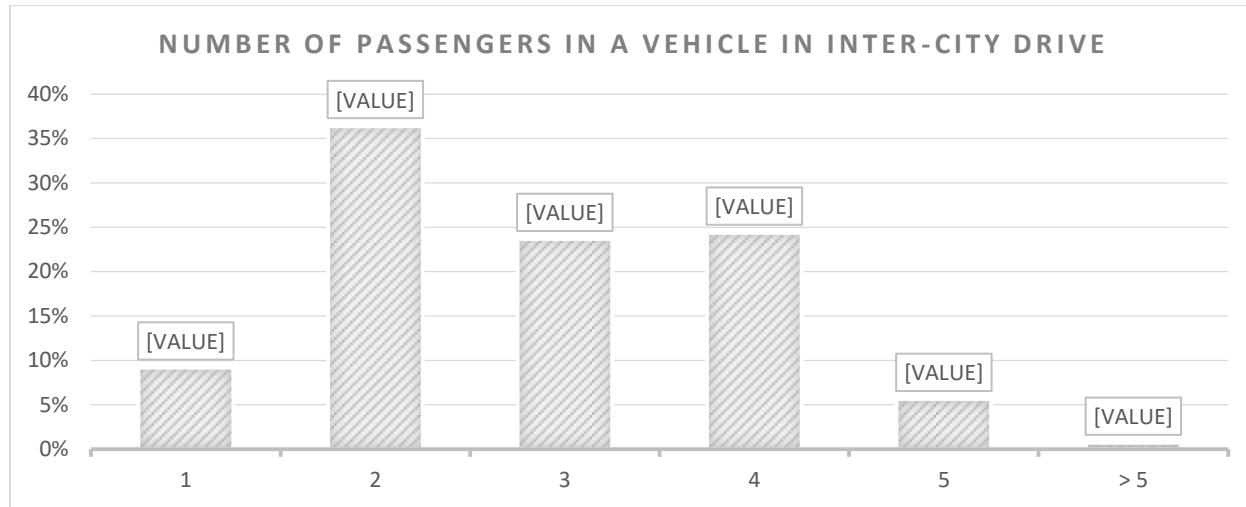


Figure 3-8: Vehicle use – survey for citizens

From the analysis of the current state of the market, it is evident that foundations exist for more significant development and for the implementation of electrical mobility within the context of the general population. In this regard, it is necessary to emphasize the importance of promotional activities; such activities need to emphasize the ecological, social and economic advantages and benefits of e-mobility. Urbanization entails an increase in the intensity of traffic in cities and this inevitably affects air quality and consequently the quality of life. *Car-sharing* services would have a certain effect on reducing the number of vehicles on the roads, and consequently on reducing traffic congestion. Namely, in literature produced by experts,¹ research illustrates that one car in a car-sharing system replaces 11 privately owned cars. Added value, in this context, would be the introduction of a fleet of electric vehicles that would directly reduce the concentration of exhaust gases in a city area, along with reducing noise reduction; the visibility of electric vehicles would also directly stimulate the interest of citizens to use new technology.

From the analysis of respondents' responses, it should be noted that only 3% of respondents stated that they exceeded 100 km a day. This shows that electric cars would be suitable for the normal daily use of almost all respondents, and that they could fulfill all of their daily needs with one battery charge. At the same time, whilst familiarizing the public with the characteristics of electric cars, it would be necessary to present them with solutions for meeting their mobility needs on occasions when they planned to travel long distances; such solutions would include the availability of a fast charging infrastructure as well as other modes of transport.

In regards to the availability of a charging infrastructure, about 50% of respondents stated that they had their own outdoor or garage parking spaces; this is a very important assumption for the 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 used their car for going to work; therefore it would be necessary to analyze the possibility of installing charging infrastructures in company parking spaces (if any) to allow employees to charge their vehicles during working hours.

Respondents' views relating to electric vehicles

Only 1/4 of respondents (25.44%) were very familiar or quite familiar with the characteristics of electric vehicles; this points to a need for the provision of better information and for the awareness raising of citizens. In line with this view, only 31.10% of respondents would consider purchasing an electric vehicle; however, probably due to information already provided in this document regarding insufficient electric car offers in-country, only 8.83% of respondents had test-driven an electric car. However, it is interesting that most respondents (79.51%) would still be willing to pay an additional figure of 1,000€ or more to

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

[Type here]

buy an electric car rather than a conventional one; furthermore, if state incentives were made available, 69.611% of respondents may well decide to buy an electric car. Figure 3-9 shows a graph of the results.

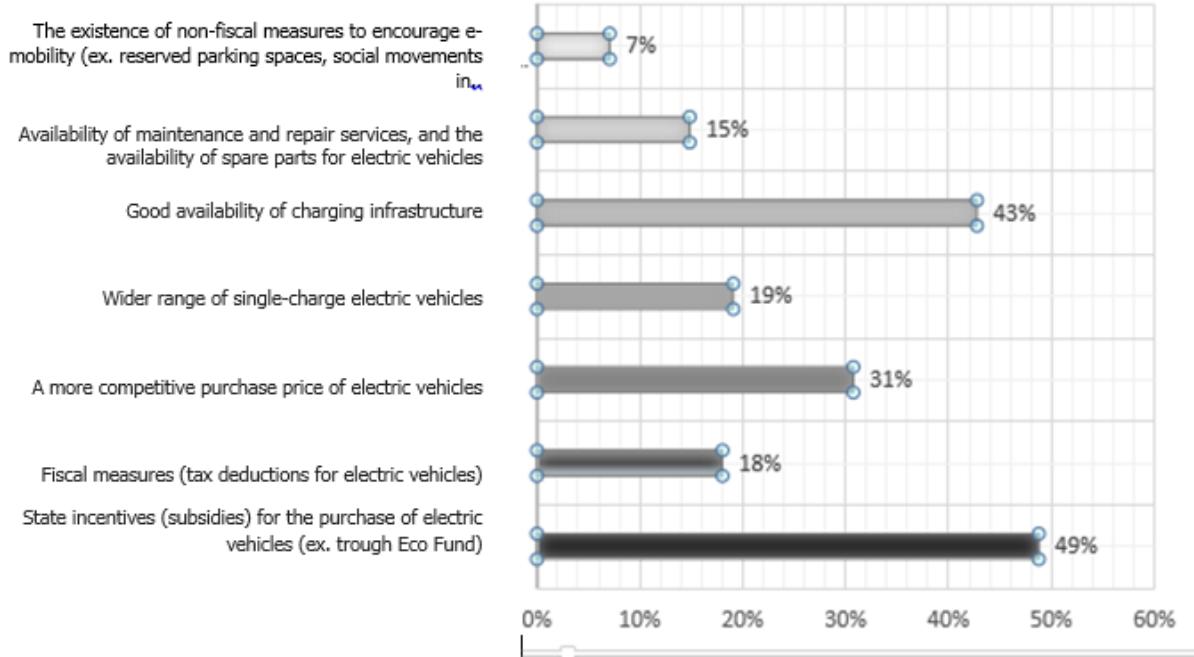


*yes
*maybe
*no

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

State incentives for the purchase of electric vehicles are recognized as the most important factor which will contribute to the wider use of electric vehicles; this would also mitigate one of the most significant barriers raised by respondents, the high purchase price of an electric vehicle (Figure 3-10). However, the first significant barrier that respondents identified was the lack of a public infrastructure for charging electric vehicles.

KEY FACTORS FOR WIDER USE OF ELECTRIC VEHICLES - CITIZENS



KEY BARRIERS TO WIDER USE OF ELECTRIC VEHICLES - CITIZENS

Inadequate offer by financial institutions (ex. financial or operating leasing, favorable loans)

Inadequate offer of a vehicle distributors / dealers (providing complete sales and maintenance services for electric vehicles)

High purchase price of electric vehicles

Insufficient conditions for setting up a charging infrastructure at their own parking spaces (insufficient parking spaces, unavailability of electrical installations, etc.)

Lack of public infrastructure for charging electric vehicles

Electric vehicles cannot meet the needs (insufficient range for one charge)

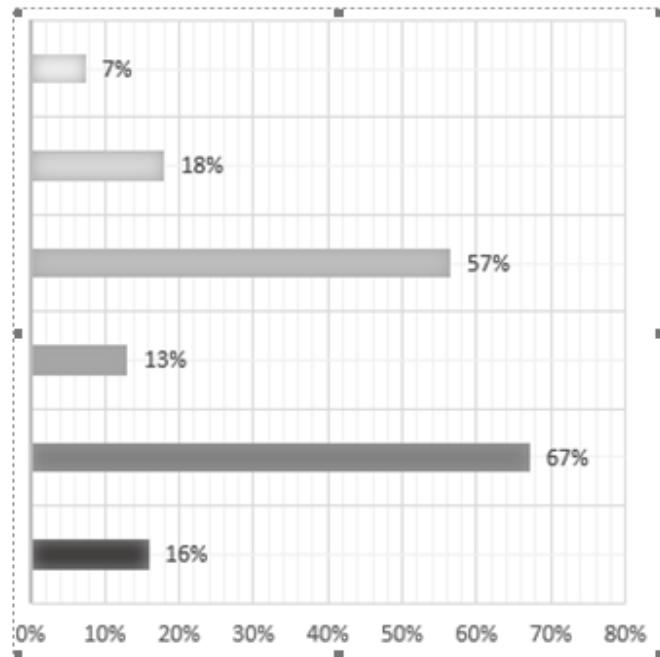
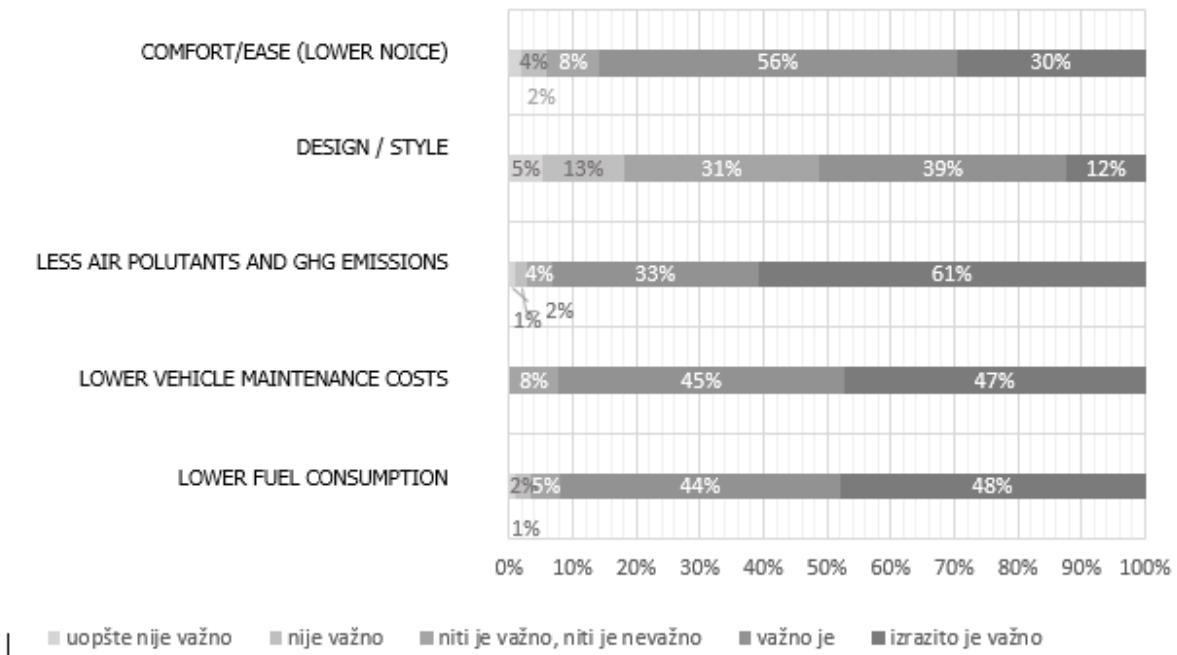


Figure 3-10: Key factors for incentives and barriers to encourage the wider use of electric vehicles – survey for citizens

Most citizens considered the following vehicle characteristics to be important: firstly, lower GHG and pollutant emissions, and secondly, equally ranked, were lower maintenance costs and lower consumption of petroleum (Figure 3-11).

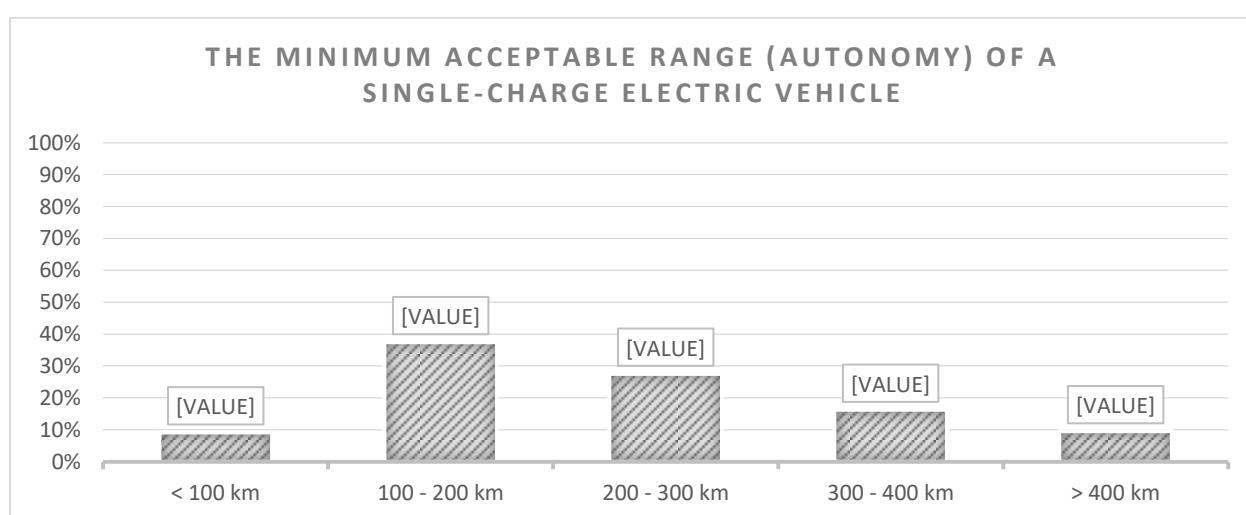
IMPORTANCE OF CERTAIN CHARACTERISTICS OF ELECTRIC VEHICLES



*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 citizens to have sufficient autonomy/range for a single-charge electric vehicle; most consider autonomy of 100 to 300 km to be satisfactory (*Figure 3-12: Required autonomy of single-charge electric vehicles - survey for citizens*).



[Type here]

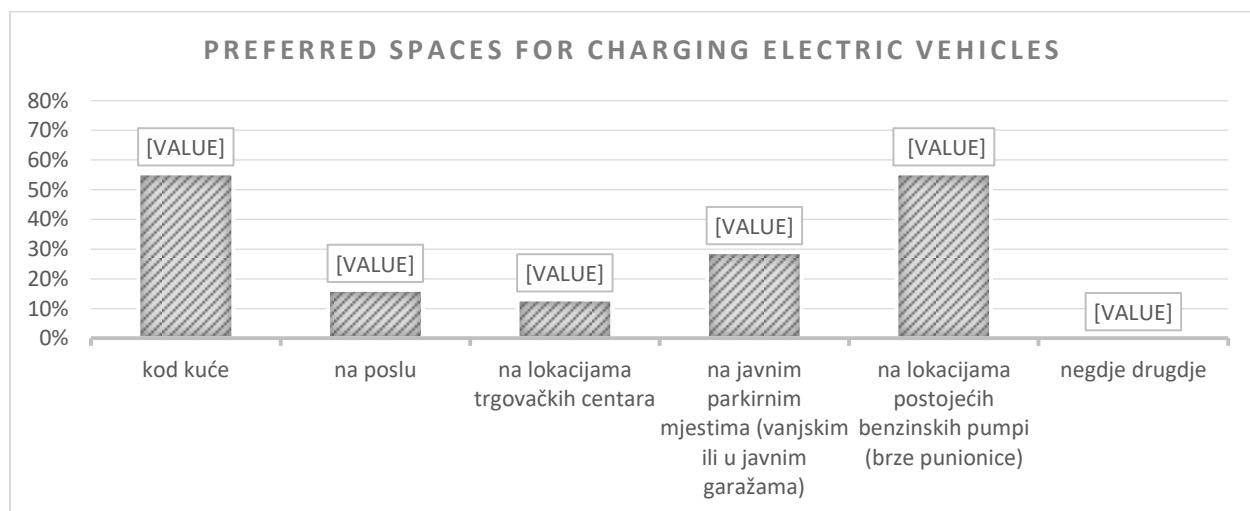
Figure 3-12: Required autonomy of single-charge electric vehicles - survey for citizens

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

As already determined, respondents identified a lack of charging infrastructure as the most significant barrier, which was in line with the viewpoint of most respondents (55.48%); the same percentage also believed that, in addition to charging vehicles at their homes, they would also charge their electric cars at existing locations at petrol stations, i.e. at fast chargers.

It would, therefore, be beneficial in the near future to conduct a series of promotional and informative campaigns to inform citizens about the concept of e-mobility. Timely information provided to the public about the opportunities provided by e-mobility, along with the concept of changing the paradigm of mobility, would contribute to adopting new technology more quickly and easily and would also help to change habits concerning the use of using personal cars. Namely, citizens need to be informed about what they can expect: where they would be able to carry out fast charging (inter-city routes, future highway, intermodal locations) and when it would be appropriate for them to use slower charging devices for their electric cars (shopping centers, public garages, tourist facilities, etc.).

As expected, most respondents (95.05%) would opt to use a lower night-time rate for charging their vehicles. This is certainly a good sign and could possibly result in a new rate being introduced for the charging of electric vehicles.

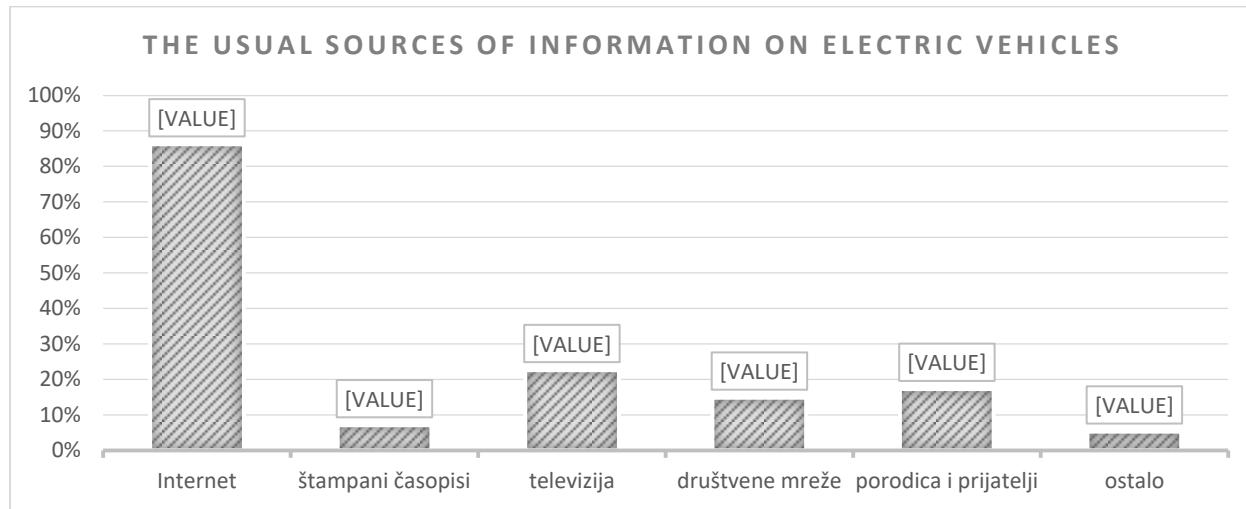


*at home *at work *shopping malls *public parking spaces (outdoor or indoor parking garages) *existing gas stations (fasr chargers) *other

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 significant interest in electric vehicles, but that **further information along with the awareness raising of citizens is needed**. In order to establish the preferred information channels, respondents were asked about which sources of information they used most and whether they would be interested in receiving news about electric vehicles. The results were as expected; the Internet was cited as the main media source for sharing information (Figure 3-14: Common sources of informing on electric vehicles – survey for citizens), and most respondents (74.56%) were interested in receiving additional news about electric cars and e-

mobility. These results could prove useful when defining future promotional campaigns for e-mobility in Montenegro.



*internet

*print media

*television

*social networks

*family and friends

*other

* Other sources of information were predominantly cited by students; they also stated that their faculty professors were a significant source of information

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

Finally, the awareness of Montenegrin citizens was positively expressed in that **61.84% of respondents believed that in 20 years electric cars would represent a dominant percentage of the fleet in Montenegro.**

The conclusions drawn from the complete analysis of citizens' responses to the questionnaire were exceptionally positive; Montenegrin citizens voiced a clear predisposition for the acceptance of electric vehicles. The attitude of citizens regarding the range or autonomy of electric cars was particularly important; their requirements made it clear that most of the currently available electric cars could meet their needs. However, for e-mobility to be fully accepted, it would be necessary to overcome a whole range of barriers. It should be emphasized that considerable effort is needed in the three following areas:

- Informing the public, promotional campaigns, etc.;
- Developing a publicly available charging infrastructure whilst also monitoring public perception and quantifying 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 were clearly able to be distinguished apart; however, in both segments common characteristics were evident, as follows, 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 entities on the demand-side recognized the benefits of this concept; however, their level of knowledge and information was insufficient

- No use -> limited use
 - Entities on the demand-side did not use e-vehicles, and in most cases they had no experience of driving electric vehicles; there was, however, a small number of registered electric vehicles in Montenegro and positive moves are being made in this area
- No incentives
 - As the situation analysis showed, there are no financial incentives in Montenegro for the purchase and use of electric vehicles; 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.**

Average interest prevails in public institutions regarding 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, along with the fact that public institutions generally do have their own parking places, this segment of the market represented significant potential. So far, the analyzes regarding the introduction of electric vehicles were not quantified, so the knowledge about costs and benefits remains very limited. Analyzes and confirmations through the implementation of pilot projects, as well as through certain regulatory actions (green public procurement or public sector commitments to introduce a certain number of electric vehicles), would certainly provide positive examples which would also accelerate demand in other market segments.

Public transport in Montenegro is operated by private entities on the basis of a public transport license. So far, operators have not considered introducing electric buses nor have they carried out the necessary financial analyzes. They are, however, willing to take part in pilot projects, which would include financial support for the purchase of buses, with the aim of familiarizing themselves with technology, and in determining whether such buses met their needs and whether they could be used more widely.

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

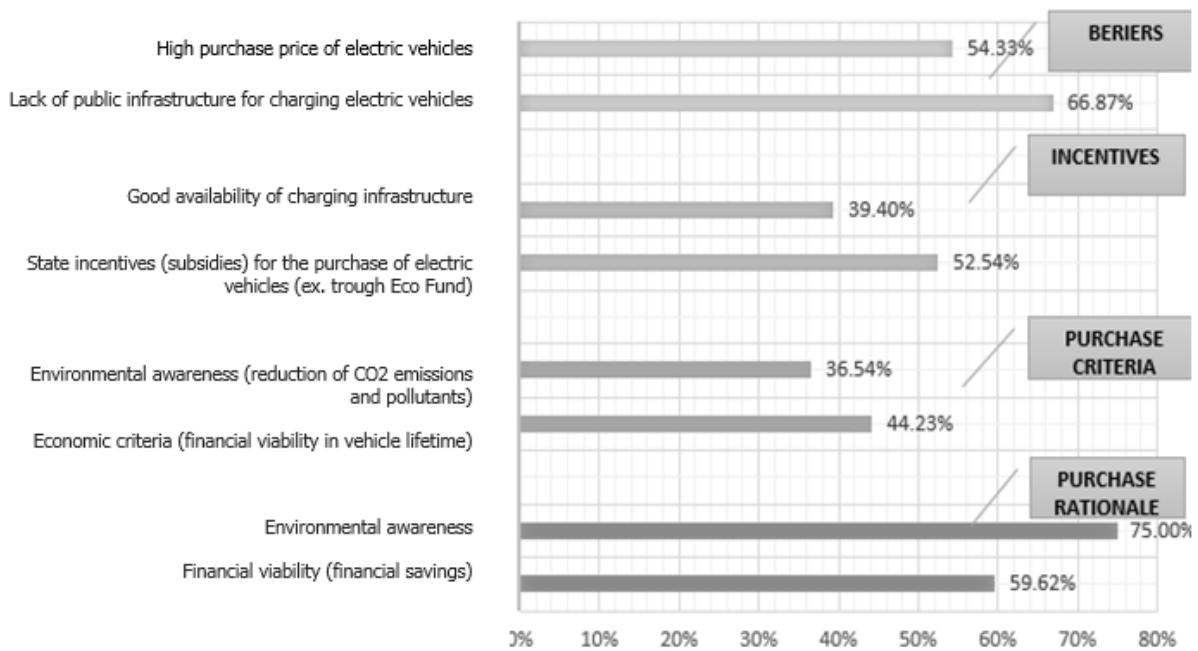
As far as citizens are concerned, the results of the survey showed an interest in electric vehicles, but it is necessary to further inform the citizens about electric vehicles and how to charge them. To achieve the wider use of electric vehicles among citizens, financial incentives will be crucial for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

On the supply side, part of the survey related to the general opinion of entities on this side of the market regarding motives and criteria (for legal entities only) as well as incentive factors and potential barriers for the procurement of electric vehicles in Montenegro. Although there were significant differences between the views of the target groups analyzed, as 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. This is shown in Figure 2-15. It is interesting to note that, according to the survey, ecological awareness was cited as the most important criterion in deciding on the purchase of an electric vehicle.

It should be made clear that such a response was only obtained from the public sector; in all other cases, especially in the business sector, including public transport operators, financial viability was crucial. Equally, as on the supply side, respondents perceived the most significant barrier to be the (non) availability of a charging infrastructure; this was also considered the second most important factor for the

wider use of electric vehicles. The most significant factor was the availability of state incentives (which was the same in all target groups), which correlated with a perceived barrier concerning the high purchase price of electric vehicles. Such results provided guidelines for e-mobility related communication activities in Montenegro, as stated on the supply side, as well as for **defining active policy measures. Such measures should primarily focus on improving the financial viability of electric vehicles by stimulating and facilitating a business model for the development of an infrastructure for charging such vehicles.**

KEY BARRIERS TO WIDER USE OF ELECTRIC VEHICLES - CITIZENS



* Note: motives and criteria were only examined regarding 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 regarding electric vehicles in Montenegro

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

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

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

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

The market is at an early stage of development; positive trends are evident on the supply side, whereas the demand side needs a stronger stimulus to develop further. Under such market conditions, the available products, technical knowledge and experience 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 tax and customs

[Type here]

policies, along with criteria for placing vehicles on the market, should ensure that electric vehicles are more favorably situated than conventional ones. Financial subsidies should be imposed as a necessary and crucial mechanism for stimulating demand. Increased demand would be the best stimulus for the supply side; it can already be said that this sector is conscious of forthcoming changes and has already undertaken certain steps to meet increases in demand.

5. LIST OF FIGURES

<u>Figure 1-1: E-mobility market assessment matrix</u>	9
<u>Figure 2-1: Positions of dealers/distributors on key motives, criteria, incentive factors and barriers regarding electric vehicles in Montenegro</u>	13
<u>Figure 2-2: The results of a survey on the need for additional investments in electric vehicle repair services</u>	
<u>Figure 2-3: The views of vehicle repairers on the key motives, criteria, incentive factors and barriers regarding electric vehicles in Montenegro</u>	
<u>Figure 2-4: Views of financial institutions on the key motives, criteria, incentive factors and barriers regarding electric vehicles in Montenegro</u>	20
<u>Figure 2-5: Views of entities on the supply side of the e-mobility market on the key motives, criteria, incentive factors and barriers regarding electric vehicles in Montenegro</u>	23
<u>Figure 3-2: Size of vehicle fleets of public institutions</u>	
<u>Figure 3-1: Readiness of public institutions to participate in the adoption of strategic and legal documents and the definition of implementing measures for the faster development of e-mobility in Montenegro</u>	
<u>Figure 3-2: Public sector views on the key motives, criteria, incentive factors and barriers regarding the introduction of electric cars into their fleets in Montenegro</u>	
<u>Figure 3-3: Public transport operators' views on key motives, criteria, incentive factors and barriers regarding the introduction of electric buses into their fleets in Montenegro</u>	34
<u>Figure 3-4: The views of service providers, including transport service providers, on key rationale, criteria, incentive factors and barriers regarding the introduction of electric buses into the fleet in Montenegro</u>	
<u>Figure 3-5: General data on respondents - survey for citizens</u>	41
<u>Figure 3-6: Geographic distribution of respondents - survey for citizens</u>	41
<u>Figure 3-7: Vehicle ownership - survey for citizens</u>	42
<u>Figure 3-8: Vehicle use – survey for citizens</u>	44
<u>Figure 3-9: Familiarity with and willingness of respondents to purchase an electric vehicle - survey for citizens</u>	
<u>Figure 3-10: Key factors for incentives and barriers regarding the wider use of electric vehicles – survey for citizens</u>	
<u>Figure 3-11: Classification of the importance of electrical vehicle characteristics - survey for citizens</u>	
<u>Figure 3-12: Required autonomy of single-charge electric vehicles - survey for citizens</u>	
<u>Figure 3-13: Preferred spaces for charging electric vehicles - survey for citizens</u>	
<u>Figure 3-14: Common Sources of Information on Electric Vehicles – survey for citizens</u>	50
<u>Figure 3-15: The opinion of entities on the demand side of the e-mobility market about key motives, criteria, incentive factors and barriers regarding electric vehicles in Montenegro</u>	52
<u>Figure 4-1: Analysis of the status (maturity) of the e-mobility market in Montenegro</u>	

[Type here]

6. LIST OF TABLES

<u>Table 2-1: The results of a survey on the availability of electric vehicles by dealer/distributor</u>	<u>11</u>
<u>Table 2-2: The results of a survey on the availability of electric vehicle repair services</u>	
<u>Table 2-3: The results of a survey on the availability of financial products for electric vehicles.....</u>	
<u>Table 2-4: Examples of the engagement of electric power companies in developing e-mobility</u>	<u>21</u>
<u>Table 3-1: Size of vehicle fleets of public institutions.....</u>	
<u>Table 3-2 : Passenger and light commercial vehicles in the public sector.....</u>	<u>30</u>
<u>Figure 3 3: Public sector views on the key motives, criteria, incentive factors and barriers regarding the introduction of electric cars into their fleets in Montenegro.....</u>	<u>33</u>
<u>Table 3-4: Road transport statistics for 2017 (Source: MONSTAT).....</u>	<u>31</u>
<u>Table 3-5: Local road transport statistics for 2017 (Source: MONSTAT)</u>	<u>36</u>
<u>Table 3 6: Structure of an electric bus compared to a diesel bus.....</u>	<u>40</u>
<u>Table 3-7 Structure of costs of electric vehicles compared to conventional or hybrid vehicles - business sector.....</u>	<u>43</u>

7. ANNEXES

ANNEX I – SURVEY QUESTIONNAIRES

ANNEX II – REPORT ON THE MEETINGS HELD IN PODGORICA (12-14 MARCH 2018)



[Type here]