

**Czech University of Life Sciences Prague**

**Faculty of Economics and Management**

**Department of Economics**



**Diploma Thesis**

**Modern aspects of public-private partnership in the  
Republic of Kazakhstan**

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## DIPLOMA THESIS ASSIGNMENT

Bc. Saniya Batyrbassova

European Agrarian Diplomacy

Thesis title

**Modern aspects of public-private partnership in the Republic of Kazakhstan**

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### Objectives of thesis

The main purpose of the master thesis is to identify perspective and applicable methods and forms of Public-Private Partnership in Kazakhstan in the development of electric vehicles, to determine the global involvement in the future of electric vehicles as well as provide recommendations on the next steps that are necessary for the development of electric vehicles in Kazakhstan. Practical part reveals the analysis of the development dynamics and approach of world statistics on the automotive industry.

### Methodology

The methodology is based on the relevant literature, data from articles and internet publications, SWOT and PESTEL analysis. Information base consists of the materials related to the topic, scientific and analytical documents, world statistics of the automotive industry, surveys and a comparative analysis conducted by the author.

## The proposed extent of the thesis

60 – 80 pages

## Keywords

Public-private partnership, Kazakhstan, development, electric vehicles, progress

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## Recommended information sources

- Delmon J. Public-Private Partnership Projects in Infrastructure: An Essential Guide for Policy Makers, 2011, ISBN-10: 0521152283 ISBN-13: 978-0521152280
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- Yescombe E.R. Public-private partnership. Fundamental Funding Principles, 2015, ISBN:978-5-9614-1700-5
- 

## Expected date of thesis defence

2019/20 SS – FEM

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## **Declaration**

I declare that I have worked on my diploma thesis titled "Modern aspects of public-private partnership in the Republic of Kazakhstan" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 27.03.2019

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## **Acknowledgement**

I would like to thank everyone who supported me during this time. Special thanks to my family and friends. And I am very grateful to my supervisor Tomas Maier for guidance, advance and support during the work on my thesis.

# Modern aspects of public-private partnership in the Republic of Kazakhstan

## Abstract

Diploma thesis focuses on the issue of formation of public-private partnership modern aspects in the Republic of Kazakhstan.

The main idea of the work is to identify applicable methods of public-private partnership for Kazakhstan and its' forms in the development of electro mobile transport, as well as to provide recommendations on further steps for the future progress of this industry in Kazakhstan. Diploma thesis consists of two parts: theoretical and practical. Theoretical part highlights economic relations of interaction between state and business and its current development in Kazakhstan. The practical part proposes a model of public-private partnership in creating the required infrastructure for electro mobile transport in Kazakhstan, using strategy tools such as SWOT and PESTEL analyses, it also involves statistical method to evaluate the development of dynamics of this area, includes survey methods and financial analysis for implementation of electric vehicles car-sharing project.

The work concludes that the country needs a significant advance of infrastructure industries to develop PPP and provides recommendations on further steps necessary for the growth of electro mobile transport in Kazakhstan.

**Keywords:** Public-private partnership, Kazakhstan, development, electric vehicles, progress, infrastructure, recommendations, world statistics

# Moderní aspekty partnerství veřejného a soukromého sektoru v Kazachstánu

## Abstrakt

Diplomová práce se zabývá problematikou utváření moderních aspektů partnerství veřejného a soukromého sektoru v Kazašské republice.

Hlavním cílem práce je identifikovat aplikovatelné metody partnerství veřejného a soukromého sektoru v Kazachstánu a jeho formy v rozvoji elektromobilové dopravy, jakožto i poskytnout doporučení pro další možné kroky pro budoucí rozvoj tohoto odvětví v Kazachstánu. Diplomová práce se skládá ze dvou částí, teoretické a praktické. Teoretická část poukazuje na ekonomické vztahy a interakce mezi státem a podnikatelskou sférou a její současný vývoj v Kazachstánu. V praktické části je navržen model partnerství veřejného a soukromého sektoru při tvorbě požadované infrastruktury pro elektromobilovou dopravu v Kazachstánu s využitím strategických nástrojů, jako jsou analýzy SWOT a PESTEL. Dále zahrnuje statistickou metodu hodnocení vývoje dynamiky této oblasti, včetně průzkumných metod a finanční analýzy pro realizaci projektu sdílení automobilů.

Práce dochází k závěru, že země musí učinit výrazný pokrok v rozvoji infrastruktury pro rozvoj PPP a poskytuje doporučení ohledně dalších kroků nezbytných pro rozvoj elektromobilové dopravy v Kazachstánu.

**Klíčová slova:** Partnerství veřejného a soukromého sektoru, Kazachstán, rozvoj, elektrická vozidla, pokrok, infrastruktura, doporučení, světové statistiky

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# 1 Introduction

Overwhelming majority of developing countries and countries with economies in transition need to expand and deepen their knowledge of the development of the potential of PPPs, improve their skills, and form effective procedures for implementing such projects, which will allow them to properly develop and implement promising strategies for economic growth.

These tasks find their solution in the process of determining the role and place of public-private partnership in the development of entrepreneurship in the Republic of Kazakhstan. Successful development of Kazakhstan, which has rich natural resources, highly qualified human capital, can be achieved by using the organizational and economic potential of PPP, especially in the system of production and social infrastructure. To fulfill the goals, set by Kazakhstan's strategy of joining the thirty most developed countries of the world "Kazakhstan-2050", the country needs a significant development of infrastructure industries.

Thus, the effectiveness of the socio-economic development of the Republic of Kazakhstan now will largely depend on a new tool for economic development and modern models of interaction between the state and business structures.

Some experience of PPP of the Republic of Kazakhstan is in the field of formation and management of energy, transport and production infrastructure. Most of the PPP projects are considered in terms of social projects for the livelihood of the population in the territorial entities.

The government of Kazakhstan creates several legal, institutional and economic preconditions that facilitate the entry of the potential of private entrepreneurship into infrastructure sectors to solve state and socially significant tasks. Because of the development of public-private partnership projects, the tasks of assessing the degree of socio-economic significance of projects, their level of effectiveness to make decisions on their implementation based on public-private partnership arise, which underlines the relevance of this study.

## **2 Goals and Methodology**

### **2.1 Goals**

The main goal of this work is to characterize economic relations in the field of interaction between the state and business in the Republic of Kazakhstan, to identify promising and applicable in Kazakhstan methods and forms of PPP in the development of electro mobile transport, as well as provide recommendations on further steps necessary for the development of electro mobile transport in Kazakhstan.

The set goal involves the number of objectives:

1. To give classification to Public-Private Partnership, it's forms and its main types;
2. To evaluate world current situation regarding development and use of electric vehicles;
3. To evaluate the development of public-private partnership in Kazakhstan;
4. To describe the possibilities of public-private partnerships in the field of development of electro mobile transport;
5. To investigate necessity and essence of green economy
6. To evaluate the global experience in the development of electric vehicles;
7. To propose a model of public-private partnership in solving the problems of the formation and development of electro mobile transport in Kazakhstan.
8. To evaluates acceptable financial performance indicators for implementation of the project of electric vehicles car-sharing
9. To investigate a survey conducted among topic-aware people to evaluate today's situation regarding electric vehicle development in Kazakhstan

### **2.2 Methodology**

The information base of the research in the theoretical part consists of official statistic, informational and analytical materials, special reviews, prepared by regulating bodies, as well as scientific literature, mass media and internet publications.

In practical part following methods were analyzed:

I. Financial analysis is the process of evaluating businesses, projects, budgets and other finance-related entities to determine their performance and suitability. <sup>1</sup> In the practical part, author evaluates acceptable financial performance indicators for implementation of the project of electric vehicles car-sharing. There is calculated following indicators:

1) Net present Value (NPV) is a method used to determine the current value of all future cash flows generated by a project, including the initial capital investment.<sup>2</sup>

$$NPV = \sum_{t=0}^n \frac{R_t}{(1+i)^t}$$

2) The internal rate of return (IRR) is a metric used in capital budgeting to estimate the profitability of potential investments. The internal rate of return is a discount rate that makes the net present value (NPV) of all cash flows from a particular project equal to zero. IRR calculations rely on the same formula as NPV does.

3) Profitability index (PI) is an index that attempts to identify the relationship between the costs and benefits of a proposed project using a ratio.<sup>3</sup>

$$PI = \frac{PV}{CI}$$

4) Operating leverage is a cost-accounting formula that measures the degree to which a firm or project can increase operating income by increasing revenue.

$$DOL = \frac{MP}{EBIT}$$

II. Survey Method is defined as a research method used for collecting data from a pre-defined group of respondents to gain information and insights for a specific topic.<sup>4</sup> In the practical part there is a survey that was conducted among 100 respondents. The respondents consist of owners of vehicles, students of faculty of automobile transport, students of faculty of ecology, car

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<sup>1</sup> Financial analysis, <https://www.investopedia.com/terms/f/financial-analysis.asp>, 2018

<sup>2</sup> Net Present Value, <https://www.investopedia.com/ask/answers/032615/what-formula-calculating-net-present-value-npv.asp>, 2018

<sup>3</sup> Profitability index, <https://www.investopedia.com/terms/p/profitability.asp>, 2019

<sup>4</sup> What is a survey? <https://www.questionpro.com/blog/surveys/>, 2017

parking employees. The survey helps to figure out a clear picture of people's opinion of electric vehicles and its implementation in the Republic of Kazakhstan.

The following strategic management tools are most applicable for solving research questions:

III. PESTEL – analysis is a framework or tool used by marketers to analyze and monitor the macro-environmental (external marketing environment) factors that have an impact on an organization. The result of which is used to identify threats and weaknesses which is used in a SWOT analysis.<sup>5</sup>

PESTEL stands for:

- P – Political
- E – Economic
- S – Social
- T – Technological
- E – Environmental
- L – Legal

In practical part it helps to identify the factors of the macroenvironment, which carries certain risks and opportunities for the development of electric vehicles in Kazakhstan.

IV. SWOT analysis is a process that identifies an organization's strengths, weaknesses, opportunities and threats. Specifically, SWOT is a basic, analytical framework that assesses what an entity (usually a business, though it can be used for a place, industry or product) can and cannot do, for factors both internal (the strengths and weaknesses) as well as external (the potential opportunities and threats).<sup>6</sup>

The SWOT analysis is represented graphically as a square, which is divided into 4 sections, which represent external and internal positive and negative factors. SWOT analysis is short, simple and realistic, what is very important.

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<sup>5</sup>Marketing Theories, <https://www.professionalacademy.com/blogs-and-advice/marketing-theories---pestel-analysis>, 2018

<sup>6</sup> SWOT Analysis, <https://www.investopedia.com/terms/s/swot.asp>, 2019

Table 1: Swot analysis

	POSITIVE	NEGATIVE
Internal	<b>S</b>	<b>W</b>
External	<b>O</b>	<b>T</b>

Source: Own table

In this case it evaluates potential threats of development electric vehicles, as well as opportunities for the development of local strategies in the city of Astana.

V. Statistical method involved in carrying out a study includes planning, designing, collecting data, analyzing, drawing meaningful interpretation and reporting of the research findings.<sup>7</sup> This analysis conducted by author to evaluate the statistics of electro mobiles during long-time period, analyzing data from different countries where electric vehicles develop.

VI. Comparative analysis is a method that can be used to compare the outcomes of alternative solutions or processes applied in similar circumstances.<sup>8</sup> In practical part comparative analysis conducted by the author in the study of the websites of automotive companies in terms of the development of strategies to produce electric vehicles.

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<sup>7</sup> Basic statistical tools in research and data analysis, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5037948/>, 2016 Sep; 60 (9): 662–669.

<sup>8</sup> What is comparative analysis? [http://www.investorwords.com/19263/comparative\\_analysis.html](http://www.investorwords.com/19263/comparative_analysis.html), 2019

### 3 Theoretical part

A public-private partnership, also called a PPP, is a long-term cooperative agreement between a private company and the national or local government.

One of the main sectors where PPP projects are currently being implemented is the sphere of environmental protection and ensuring environmental safety. One of the most perspective and currently popular areas for the development of the use of the public-private partnership mechanism can be attributed:

- investment projects aimed at reducing the negative impact of economic activity, restoring the disturbed state of the environment (water bodies, land), because in most cases, the solution of the problems of modernization and (or) reconstruction should take place in a comprehensive manner, which will help to achieve certain goals: increasing the economic efficiency of production by reducing its energy and resource intensity, as well as reducing the level of negative environmental impact. At the same time with the listed problems, there is a problem of reclamation of polluted lands, the development of environmental monitoring, greening of common areas, sanitary protection zones;
- implementation of measures to eliminate environmental damage accumulated in the past (rehabilitation of contaminated areas, land reclamation, disposal of accumulated industrial waste and others).

Each of the parties of the partnership contributes to the implementation of a common project. Thus, a contribution from the private sector are financial resources, entrepreneurial and professional experience of businessmen, flexibility and efficiency in making management decisions that ensure the efficiency of the project being implemented, the ability to innovate using new technologies, new technology.<sup>9</sup>

The state contribution to PPP projects is related to its status as the main socio-economic institution of society, which defines the regulatory framework and ensures the possibility of providing various guarantees and benefits to business partners, as well as the redistribution of budgetary financial

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<sup>9</sup> Yescombe E.R. (2015). Public-private partnership. Fundamental Funding Principles. ISBN-13: 978-0750680547, ISBN-10: 0750680547



owes between various socio-economic goals, based on their social significance, including for ongoing PPP projects.<sup>10</sup>

As practice shows, many problems are related to the renewal of engineering and social infrastructures, modernization of housing and communal services (housing and communal services), development of the transport strategy cannot be solved without attracting investments from business structures using state funds, including regional budgets.

In a foreign business environment, namely, in the economy of a significant number of developed and developing countries to attract a private investor, a well-known form of government-business interaction is often used public-private partnership (PPP). This is done to develop various infrastructures, as well as successfully manage them.

The concept of public-private partnership (PPP) is defined as a type of institutional and organizational alliance of government and private business, in all sectors of the economy for the implementation of socially significant projects - from creating strategic sub-sectors of the economy to providing services to the public.<sup>11</sup>

The main goal of this partnership is determined by the development of infrastructure in the public interest through a combination of various resources and entrepreneurial experience, as well as the implementation of socially significant projects with minimal costs and risk levels, while providing high quality services for economic actors.

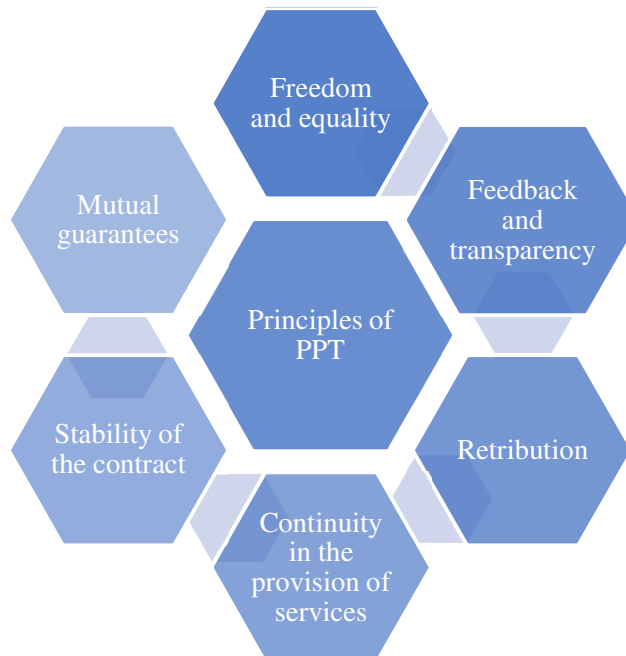
So public-private partnership is a system of medium-term and long-term relations between the government and the private sector, to provide socially important design services, financing, construction, reconstruction, rehabilitation and operation or maintenance of facilities by private business on behalf of the government.

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<sup>10</sup> Petrova I.V. The concept of public-private partnership: an assessment of foreign and domestic definitions // Bulletin of economic science of Ukraine. - 2014. - № 3.

<sup>11</sup> Marat, G. Public-private partnership in Kazakhstan: a new form of interaction between the state and business. Regulatory mechanisms of PPP in the Republic of Kazakhstan. Korkyt Ata KSU, 2014, <http://group-global.org/ru/publication/16664-gosudarstvenno-chastnoe-partnerstvo-v-rk-novaya-forma-vzaimodeystviya-gosudarstva> (application date 05.03.2017)

Figure 1: The main principles of PPT



*Own figure based on the source<sup>12</sup>*

In the Figure 1 there is shown a concept of principles of PPT. Unlike conventional administrative relations, PPP relationships create, as a rule, completely new relationship models: the search for new sources of financing, the distribution of property rights and project management, etc. Here, an important role is played by a few issues, that are directly related to the redistribution of property rights and arise because of such relations. However, it is worth noting that, within the framework of a partnership between the state and the private sector, the separation of property rights in relations between the state and business structures does not directly relate to the whole complex of powers, but only some of them (for example, management and income rights, control over the

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<sup>12</sup> Petrova I.V. The concept of public-private partnership: an assessment of foreign and domestic definitions // Bulletin of economic science of Ukraine. - 2014. - № 3.

use of assets, the right to change the value of the capital of objects of agreements, the right to transfer powers to individuals, etc.).<sup>13</sup>

As for world practice, the most effective examples are the distribution of the right of state and private business to develop infrastructure (or in the provision of public services). These include the construction of highways and roads, the airport, the reconstruction of heat and water supply enterprises, the restructuring and modernization of energy facilities, the construction of health facilities, the provision of pre-school education, the training and development of specialists in various industries.

Table 2: The main tasks of public private partnership

The main tasks of the state as a public party in partnership with private business	
1	Determining the need for such partnership agreements and projects with entrepreneurial business structures in certain areas of the economy
2	Development of a set of recommendations for partnership projects between the state and business;
3	Development of PPP projects with a detailed description of the main characteristics, taking into account public interests, as well as the organization of the procedure for the selection of private partners
4	Preparation of a full package of documents for partnership projects between the state and business, negotiating, concluding agreements with private entities
5	Monitoring the implementation of agreements, including issues of monitoring and ensuring the implementation of state interests in the field of this partnership.

*Own table based on the source<sup>14</sup>*

<sup>13</sup> Kazbekov, G. Features of the development of public-private partnership in the Republic of Kazakhstan, Business and Entrepreneurship Magazine, 2014. URL: <http://group-global.org/kk/node/17855> (appeal date 15.04.2017)

<sup>14</sup> Kazbekov, G. Features of the development of public-private partnership in the Republic of Kazakhstan, Business and Entrepreneurship Magazine, 2014, <https://cyberleninka.ru/article/n/institutsionalnoe-razvitie-sistemy-gosudarstvenno-chastnogo-partnerstva>

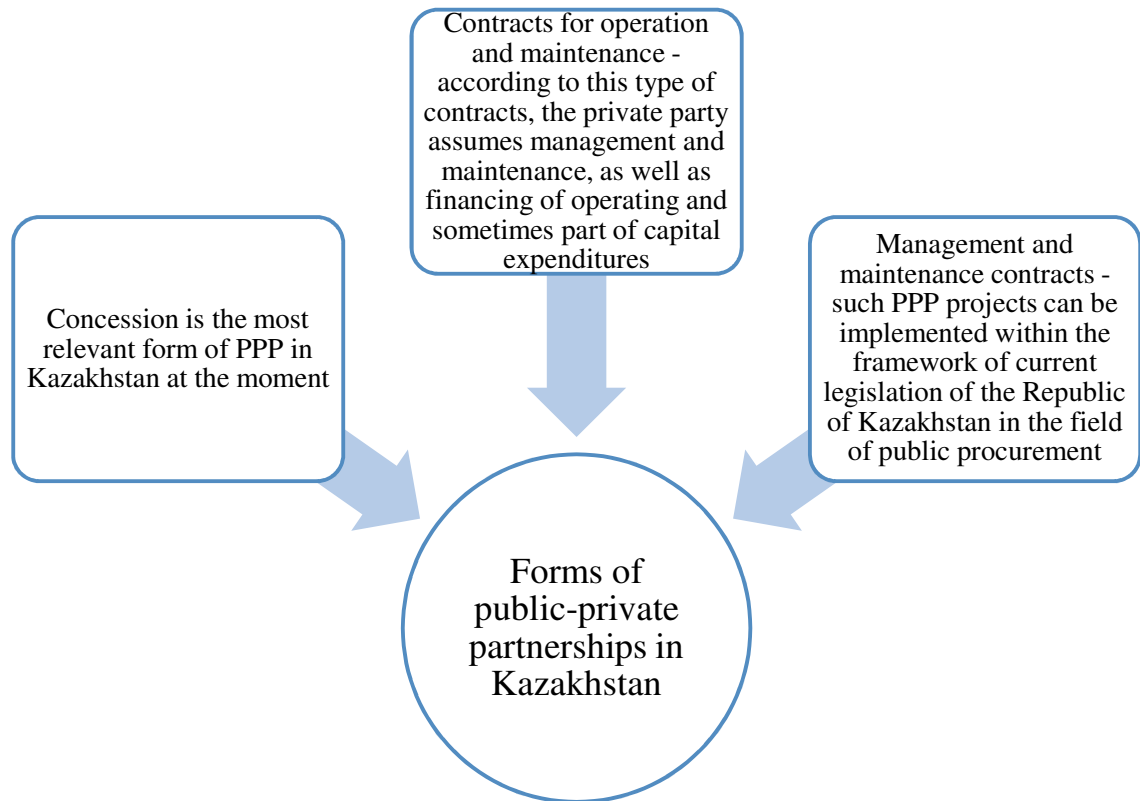
The state is the party that has the measure of all responsibility before society for the provision of necessary social benefits. In turn, private structures have significant advantages, such as maintaining the high quality of the services provided, mobility, efficient use of existing resources, the use of know-how, efficiency, searching and attracting new customers.

According to the official document, public-private partnership in the Republic of Kazakhstan is a set of medium-term and long-term relations between the government and the private sector to provide socially important works and design services, financing, construction, reconstruction, rehabilitation and operation or maintenance of facilities from private sector in accordance with the basic principles of PPP.

In addition, the purpose of this document is to create a legal and institutional framework for the implementation of investment projects using public-private partnership mechanisms in the country. To achieve this goal, the program defines several tasks:

- 1) improvement of the legal framework in the field of PPP;
- 2) providing a set of measures for the effective planning and management of processes to prepare and implement PPP projects;
- 3) the establishment of certain criteria for assessing the effectiveness of the project at the expense of the quality of the provision of public services;
- 4) ensuring the phased provision of training and measures to improve the skills of personnel specialists in the field of PPP.

Figure 2: Forms of public-private partnership



*Own figure based on the source<sup>15</sup>*

All over the world there are seven main types of PPP, however, in Kazakhstan, only three forms of public-private partnerships are established by the legislation of the Republic of Kazakhstan that are mentioned in the Figure 2 above.

In general, the main forms of PPP in the field of economics and public administration include:

- any form of mutually beneficial relations between the state and business;
- government contracts;

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<sup>15</sup> Public - private partnership in Kazakhstan, 2014. URL: <http://edariger.kz/ru/article/stati/145/> (appeal date: 04/05/2017)

- public-private enterprises; - lease agreements;
- financial lease;
- production sharing agreements (PSAs);
- concession agreements.

Consider these forms of PPP in more detail. The contractual form of PPP refers to the type of partnership that is based on the contractual relationship between the parties. Management and maintenance contracts assume that state authorities can put up for a competitive lot the right to manage and maintain a state-owned property that is necessary for the normal functioning and fulfillment of state functions. This kind of relationship is called trust management. As a rule, private entrepreneurs find contracts with state or municipal bodies very attractive, since such a business, in addition to prestige, also guarantees them a stable market and a steady income.

The purpose of using contracts for operation and maintenance (leasing and renting) is to improve the quality of services provided, to increase operational efficiency and to raise funds from private business to resolve issues related to financing state facilities. For example, a private entrepreneur leases state property for a long period, at the same time bears full responsibility to consumers as a service operator, being a legal entity, receives entrepreneurial income from operating the facility and pays rent to the government, which is used to create operating or capital investment.

The most convenient form of PPP in Kazakhstan is a concession, since it involves a balanced distribution of risks in this type of agreements.

Within the framework of such partnership agreements, being the full owner of the property, the state authorizes the private investor to perform the functions described in the agreement and gives it all the rights necessary for the development of the object of the concession. The concession model implies that most of the investment and operational risk is borne by the private party. In addition, it involves the implementation of large-scale projects that can generate high income.

However, there is another form of public-private partnership in Kazakhstan - institutional, which is implemented as an activity of legal entities with state participation and private business entities.<sup>16</sup>

As practice shows, regardless of the form of PPP, both parties are interested in the effective implementation of PPP projects. Such projects facilitate the entry of private companies into the world capital market, thereby stimulating the attraction of foreign direct investment in various sectors of the economy. Such PPP projects are significant for the economy of the regions of Kazakhstan, since it is due to them that the local market for goods, services and capital is developing.

PPP is a mutually beneficial cooperation of the state and the private sector in industries traditionally related to the state responsibility under the conditions of a balanced distribution of risks, benefits and costs, rights and obligations defined in the relevant agreements.

The main goal of a public-private partnership is to develop infrastructure in the public interest by combining the resources and experience of the state and business, implementing socially significant projects with the lowest cost and risk, subject to the provision of high-quality services to economic entities.<sup>17</sup>

Each side of the partnership contributes to the common cause. Private business provides financial investments, effective management, professional experience, efficiency and flexibility in decision making. At the same time, new enterprises are opened, thereby creating new jobs, improving production technology, introducing more efficient working methods, etc. The state, in turn, is responsible for ensuring business powers, the provision of guarantees, tax and other benefits, project financing.

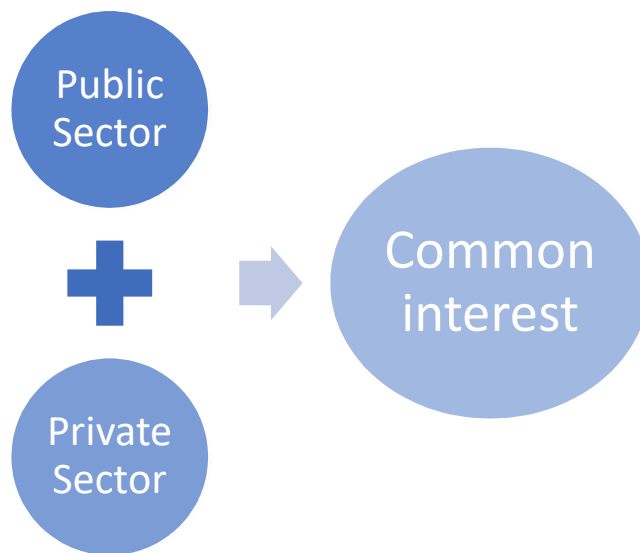
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<sup>16</sup> Public-private partnership in Kazakhstan, 2014, <http://be5.biz/ekonomika1/r2015/1393.htm> (appeal date: 04/05/2017)

<sup>17</sup>Public-private partnership.

[http://economy.gov.kz/ru/kategorii/gosudarstvenno-chastnoe-partnerstvo?theme\\_version=mobile](http://economy.gov.kz/ru/kategorii/gosudarstvenno-chastnoe-partnerstvo?theme_version=mobile), 02/10/2018

Figure 3: PPP Model



*Own figure based on source<sup>18</sup>*

In research and practice, public-private partnerships are explored as a method of attracting direct investment and specialists with relevant professional competencies to optimally solve the tasks facing the public sector. In this case, the interest of entrepreneurial structures in participating in the competition for the right to conclude PPP contracts depends on the distribution of all types of risks between the business and the public sector. The minimization of the risks of a contract is favored by the concentration of regulatory powers on the public side of the PPP contract.

Thus, if we consider all the models that have been repeatedly studied and analyzed in scientific studies, then of all the models, the contractual basis of the PPP is the most suitable for the project.

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<sup>18</sup> John D. M. Davie, (2015). Public-Private Partnerships Unbundled. ISBN 10: 0993163106 ISBN 13: 9780993163104, Inspire Publishing, 2015



### 3.1 Development of public-private partnership in Kazakhstan

The development of the national economy of the Republic of Kazakhstan requires further study and development of new forms of PPP, the definition of basic principles for the implementation of public-private partnership as one of the most effective mechanisms of relations in innovative industries.

Table 3: Advantages and disadvantages of PPT

Advantages	Disadvantages
Ensure the necessary investments into public sector and more effective public resources management	Development, bidding and ongoing costs in PPP projects are likely to be greater than for traditional government procurement processes
Incentivizing the private sector to deliver projects on time and within budget	PPP project public sector payments obligations postponed for the later periods can negatively reflect future public sector fiscal indicators
Using PPPs as a way of exposing state-owned enterprises and government to increasing levels of private sector participation	Government responsibility continues, long-term government control and involvement into projects
Supplementing limited public sector capacities to meet the growing demand for infrastructure development	PPP service procurement procedure is longer and costlier in comparison with traditional public procurement

*Own table based on the source<sup>19</sup>*

An effective tool for solving problems of improving partnership between the government and the private sector is active public participation in the process. This kind of participation that provides a qualitative breakthrough in the development of a general PPP mechanism in Kazakhstan, an

<sup>19</sup> PPP Advantages and Disadvantages, <https://finmin.lrv.lt/en/competence-areas/public-and-private-partnership-ppp/ppp-advantages-and-disadvantages>, 31/07/2015

increase in the level of openness and transparency of relations between private business and the authorities and is of great importance for the fight against corruption.

The main purpose of the center is to promote the methodological and methodological support for the implementation of concession projects. In addition, this center has experience in the field of implementation and has the necessary powers as an institutional system that conducts economic expertise of concession projects. The role of the center includes:

- 1) study of PPP projects at all stages of their preparation;
- 2) preparation of recommendations for government agencies on the development of legislation and methodological framework for PPP projects.
- 3) monitoring of PPP projects in the process of development and construction.
- 4) organization of seminars, trainings, conferences and other events related to PPP.

Specialists of the Kazakhstan PPP Center predict that in 2023 the volume of PPP projects can reach 10-15% of the total republican need for financing infrastructure facilities. In this case, according to international financial institutions, "Kazakhstan will need about 38 trillion KZT for these purposes by 2040. That is, we can assume that 4-6 trillion KZT of this amount, or 130 billion KZT will be needed annually for the implementation of PPP projects ".<sup>20</sup>

It can be argued that with the policy of fully financing the infrastructure from the state budget, there will be a huge overload. To solve this problem, Zhomart Abiesov, the chairman of the Board of Kazakhstan Center for Public-Private Partnerships, proposes to attract investors through the implementation of the PPP mechanism. It is also important to note that, considering the qualitative selection of PPP projects and their efficient structuring, the state's obligations may amount to only 50% of projects worth about 2-3 trillion KZT. This is less than 5% of Kazakhstan's projected GDP. This level of commitment made by the state is safe enough for the country's economy and will not lead to a rapid increase in public debt.<sup>21</sup>

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<sup>20</sup> Astana: An Advancing City in the Modern Age, 2014, <http://www.uitp.org/astana-advancing-city-modern-age> (appeal date: 03/16/2017)

<sup>21</sup> Astana's Mayor spoke about the state and prospects of development of public transport, 2015. URL: <http://www.inform.kz/rus/article/2790941> (address: 21.04.2017)

According to Zhomart Abiesov, at present, there are 24 potential PPP projects in Kazakhstan, which form a portfolio of more than 227 billion KZT. In their structure, the transport sector is 25%, health care - 25%, education - 13%, development of urban infrastructure (construction of public parking) - 33%, the penitentiary system - 4%. According to experts of the Center, today the most promising sectors for applying PPPs at the regional level are health care, housing and utilities (water resources and solid household waste), urban infrastructure, the penitentiary system, as well as transport and energy.<sup>22</sup>

In addition, Kazakhstan has not yet implemented the practice of planning PPP projects, considering that they are limited to concession limits at the local level.<sup>23</sup>

That is why the Kazakhstan Center for Public-Private Partnership identified existing barriers to the development of the PPP mechanism and formulated appropriate solutions to overcome them.

The first thing that really slows down the development and implementation of PPP projects is the low level of education. In accordance with the legislation of the Republic of Kazakhstan, only regional governance, ministries and departments can initiate PPP projects. Thus, the development of such projects, even at the level of an idea, directly depends on the activities of these state bodies.

Another negative factor is the low interest in PPP projects at the level of local executive bodies, since such projects, on the one hand, associate them with long-term liabilities with defined payments and, on the other hand, do not bring short-term “political dividends”.

In addition, today in Kazakhstan there is no specialized organization, which’s area of direct responsibility will include the practical development of PPPs and an increase in the portfolio of current projects. For example, the Kazakhstan PPP Center, within its competence, provides only experience, acting as a so-called “filter” for PPP projects, but not as a “locomotive” for their promotion.

As a solution to this problem, in May 2013, at the International Investment Forum VI “Astana Invest 2013”, it was decided to create a single center for the preparation and support of all PPP

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<sup>22</sup> Mouraviev, N. and Kakabadse, N. K. (2012). Conceptualizing public-private partnerships: A critical appraisal of approaches to meanings and forms. *Society and Business Review*. 7 (3), pp. 260-276.

<sup>23</sup> Dalrymple, R. (2013). Public-Private Partnerships in Kazakhstan: An Evaluation of the Framework and Risks of Public-Private Partnerships, REECAS NW Conference 2013, Vol. 3, 5, pp. 4-16.

projects, which should work on the principle of common contact. Now, work is underway to create such a structure. According to Zhomart Abiesov, the main tasks of this structure will be the development of PPP projects, cooperation with financial institutions, search for financing, attracting investors, marketing Kazakhstan's real needs in PPP projects, etc.

According to experts, another important problem is the low quality of these projects, which are still generated by government bodies. As evidence of this fact, Zhomart Abiyesov noted that of all the concession proposals that the Kazakhstani PPP Center received under consideration from 2008 to 2012, 40% was sent for revision or a negative opinion was received. The reason for this is simple - lack of qualifications of developers who specialize in PPP projects. In addition, given the potential of a single industry, the share of skilled workers from the total number of government employees involved in the implementation of infrastructure projects should be at least 15%.<sup>24</sup> For example, in 2013, regional PPP centers were opened in Mangystau (Region in Kazakhstan) and South Kazakhstan regions, which were fully staffed, technically prepared and have a high potential to assist urban governance in the development of PPP.

In general, regional PPP centers operate in seven regions of Kazakhstan. It should be noted that the institutional establishment of regional centers is a very important step in the development of the entire system; therefore, the Kazakhstan PPP Center provides them with full support in the creation, construction and further development of the enterprise.

In order to realize the potential of PPP in the regions, it is also necessary to put into practice the principle of "one contact". The Kazakhstan's PPP Center and regional centers form a network structure that can not only provide expert advice on the development of PPP projects, but also become a "think tank" for analyzing real needs and possibilities in solving infrastructure problems at the regional and national levels.

Obviously, that it is necessary to fix the direct responsibility of state bodies for the implementation of PPP projects. An indicator such as the "number of PPP projects" should be significant for KPI regional leaders (Aryn Ernazarov, 2010). In turn, this will make it possible to determine the area

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<sup>24</sup>Center for support of public-private partnership projects in Kazakhstan, 2016, available at <http://kzppp.kz/%D0%BE-%D1%86%D0%B5%D0%BD%D1%82%D1%80%D0%B5-%D0%B3%D1%87%D0%BF>

of responsibility of mayor for fulfilling the instructions of the head of state regarding the introduction of new mechanisms for financing infrastructure projects.

Another open question for PPP projects remains long-term and simplified financing. In general, the problem of a limited financial resources market remains acute in any sector of the economy of Kazakhstan. To solve this complex problem, the successful experience of foreign partners from Europe and Asia was studied, and the concept of a loan and providing a system of PPP projects is currently being developed. If the concessionaire does not fulfill its obligations or in the event of a termination or project, such a concept will serve as a guarantee for investors / creditors, and this greatly increases the likelihood of a successful financial issue.

Nevertheless, according to Nikolai Muravyov, legislative initiatives that are being taken may lead to a significant increase in the PPP project portfolio, and, therefore, there will be a need for harmonization of legislation in the field of infrastructure projects. Therefore, it is necessary to develop a general framework of the law on state support measures and cost recovery mechanisms. For example, there is a real need to develop a single mechanism for the allocation of land and the provision of infrastructure for all projects, regardless of the current legislation. Therefore, it is necessary to think about the standardization of approaches in the implementation of infrastructure projects.<sup>25</sup>

In addition, much work has been done in the field of tariff regulation. Due to the unpredictability of the tariff policy, investors abandon projects in the field of natural monopolies. To reduce this risk, in accordance with the new law, the Agency for the Regulation of Natural Monopolies is involved in the process of harmonizing tariffs already at the stage of consideration and approval of concession proposals, and the procedure for changing tariffs in the long term is established directly in the contract.

Security for investment is another solved problem in the field of PPP. No investor will contribute in a country where there are uncontrollable and unpredictable risks to investment. PPP projects are essentially contracting with a prospect of implementation for 20-30 years. Thus, it is necessary to substantiate and prove to potential investors that such projects have real protection.

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<sup>25</sup> Mouraviev, N. (2012). What Drives the Employment of Public-Private Partnerships in Kazakhstan and Russia: Value for Money? Organizations and Markets in Emerging Economies. Vol. 3, No. 1 (5): 32–57.

The government is ready to provide investors with several additional guarantees. For example, a new tool has been developed - “affordability fee”, which will be applied to “commercially weak” projects where the power consumption is not enough to ensure economic attractiveness.

In general, the PPP mechanism is an important element of the general state policy in the field of infrastructure development. International practice has proven its viability: today it is used in 120 countries around the world. According to the UN Economic Commission for Europe, 80% of all PPP projects in the world are successful, thereby making a significant contribution to economic development.<sup>26</sup>

Today, Kazakhstan has created all the necessary conditions for the development of PPP. The President and the Government of the Republic considered the issue of state-business partnerships as an excellent alternative to government procurement and direct budget investments. Issues of development of PPP were repeatedly raised in the messages of the President to the people of Kazakhstan, were discussed at the specially created Coordination Council on PPP under the Government, headed by the Prime Minister.

Today, it can be said with confidence that the Republic of Kazakhstan has created a business climate for the fundamental development of the PPP mechanism and it is time to begin the implementation phase. This will allow PPP to become one of the important points of economic growth in Kazakhstan.

The most significant risk for businesses in the PPP system is the lack of actual responsibility of the public sector for the project implementation.

At the preliminary stage of the implementation of the PPP project (development of a feasibility study, investment plan, formation of project documentation, etc.) the risks between the state and the private investor are distributed in adequate detail. In case of refusals and discrepancies in the characteristics and sections of the project arising in public documents, only the public sector is responsible. In case of errors and inaccuracies in the documents and proposals of the participant in the PPP project, this is his area of responsibility. It is worth noting that technical risks are mainly related to the stage of project preparation, construction phase, operation and management

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<sup>26</sup> Hon, E., Public-Private Partnership to develop the infrastructure of Kazakhstan, Kazakhstan Institute for Strategic Studies under the President of the Republic of Kazakhstan, 2012, available at [http://www.gratanet.com/uploads/user\\_14/files/kazakhstan\(1\).pdf](http://www.gratanet.com/uploads/user_14/files/kazakhstan(1).pdf)

(production process, completion dates, quality, cost of deferral and changes in initially agreed requirements and standards). In this case, the risks are borne by a private business or a contracting company.

It should be noted that, even before the adoption of the Law of the Republic of Kazakhstan “On Concessions”, concession relations began to form and were developed in Kazakhstan.

Thus, the first concession projects in Kazakhstan, before the adoption of the Law of the Republic of Kazakhstan on concessions, were:

- a) the construction and operation of the new railway line “Station Shar - Ust-Kamenogorsk” (the contract was concluded in 2005, the construction of the line was completed in October 2008, the line was commissioned at the end of 2008);
- b) construction of the interregional power line Northern Kazakhstan - Aktobe region (the contract was concluded in December 2005, construction was completed in 2008, and commissioned in December 2008).

Exclusively, to implement the project for the construction and operation of the interregional power transmission line “Northern Kazakhstan - Aktobe Region”, provided for by the Strategic Development Plan of the Republic of Kazakhstan until 2010, approved by the Decree of the President of the Republic of Kazakhstan No. 735 of December 4, 2001, Batys Transit JSC was established.

Joint Stock Company Batys Transit was established in November 2005 in accordance with the Government of the Republic of Kazakhstan dated October 7, 2005 No. 1008. The founders of Batys Transit JSC are Kazakhstan Electricity Grid Management Company JSC (KEG-C JSC) and Mekhenergostroy LLP.

Batys Transit JSC implements the project because of a concession agreement and is one of the pioneers of participation in the framework of public-private partnership. The project “Construction and operation of the interregional power line 500 kW “Northern Kazakhstan - Aktobe region” was a breakthrough project in the framework of the state program “30 corporate leaders of Kazakhstan”.

Currently, six PPP concession projects are being implemented in Kazakhstan for a total amount of 80.1 billion KZT. One of the projects is an energy project - power transmission line Northern Kazakhstan - Aktobe region. The task of building this object is to reduce the dependence of the population and business of the Aktobe region on the supply of electricity from Russia.

Currently, the country has approached the stage when the PPP mechanism that was created earlier needs to be brought into line with international standards.

Despite all the advantages of a public-private partnership, its development in Kazakhstan is hampered by a big number of circumstances.

The main reason is a significant lack of trust between business and the state, which is due to the lack of a clear state responsibility mechanisms for the implementation of the project.

According to international practice, in the event of suspension or termination of a contract, government agencies should provide compensation to private partners for the occurrence of such risks.

The mechanism for the development of PPPs is hampered by the lack of a unified program of action, the presence of many centers for regulating PPPs. As a result, the lack of coordination in this area leads to a delay in the consideration of projects, inconsistencies in the regulatory framework. There are unclear points in the aspects of transferring a part of property rights from the state to business, there are no conflict points in the legislation (contradictions with the law on state property). This does not reduce the risks of private business investment in PPP projects.

The important fact is that the implementation of PPP projects in Kazakhstan involves only cooperation with big business, and the cost of the projects is at least \$ 100 million.



## **4 World experience in the development of electric vehicles**

### **4.1 Features of the production of electric vehicles**

Throughout the history of humanity, travel has been essential. From walking to riding horses to carriages pulled by horses to the first automobile, we humans have consistently tried to improve the process of travel. Getting from point A to point B more efficient, comfortable, and safe has been a staple in our history on this planet. As of the most recent decade or two, electrically-powered cars have become more prevalent in our society.

Now, EVs have several positive impacts on our lives, environment, and wallet. First off, EVs have an overwhelming amount of benefits on our daily lives and travel. With “less interior noise, and vibration from the powertrain,” we can enjoy a quieter and more comfortable ride (Board on Energy and Environmental Systems, 2015). Electric cars such as Tesla’s Model S, X, and 3 cars utilize an electric powertrain.<sup>27</sup>

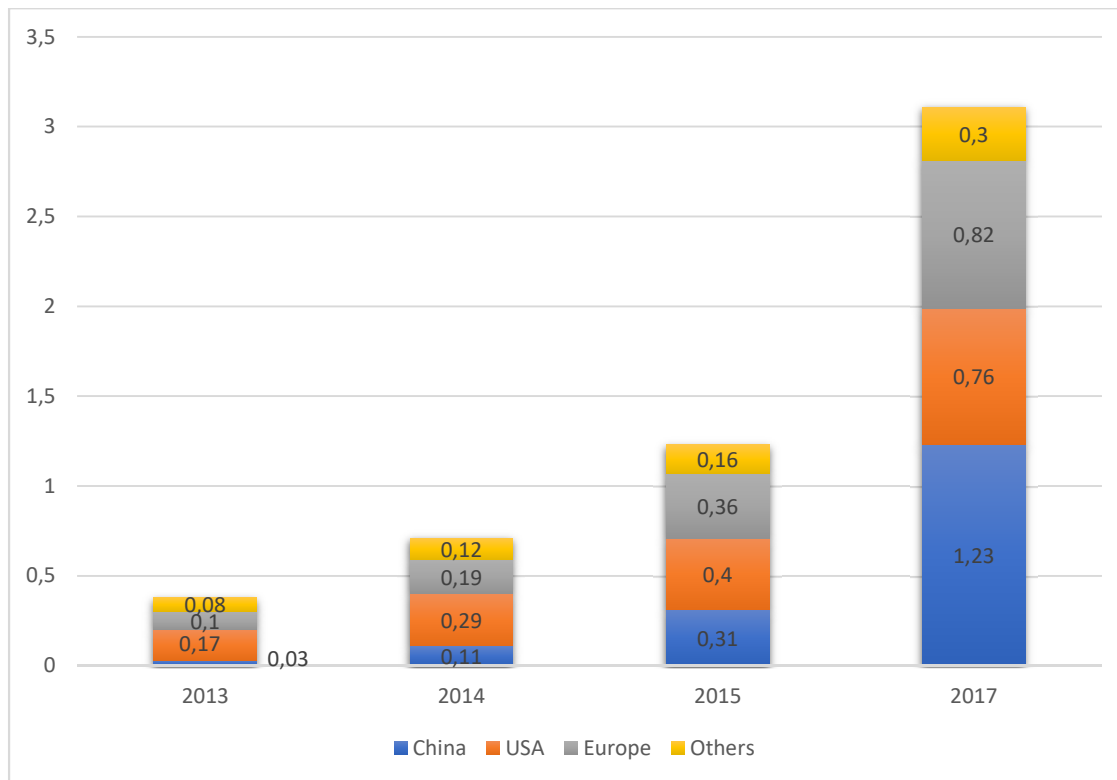
Automakers are preparing to phase out cars powered solely by internal combustion engines (ICEs) as governments look to tackle fuel emissions. The growth in electric vehicles (EVs) and hybrid electric vehicles (HEVs) is climbing and by 2025, EVs and HEVs will account for an estimated 30% of all vehicle sales. Comparatively, in 2016 just under 1 million vehicles or 1% of global auto sales came from plug-in electric vehicles (PEVs).<sup>28</sup>

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<sup>27</sup>The Significance of Electric Vehicles in the 21st Century, <https://medium.com/datadriveninvestor/the-significance-of-electric-vehicles-in-the-21st-century-591d17ff671e>, 2018

<sup>28</sup> J.P. Morgan, (2018). Driving in 2025: The Future of Electric Vehicles, <https://www.jpmorgan.com/global/research/electric-vehicles>

Figure 4: Number of electric cars in circulation



Own chart based on the source <sup>29</sup>

Over 1 million electric cars were sold in 2017 – a new record – with more than half of global sales in China. The total number of electric cars on the road surpassed 3 million worldwide, an expansion of over 50% from 2016.

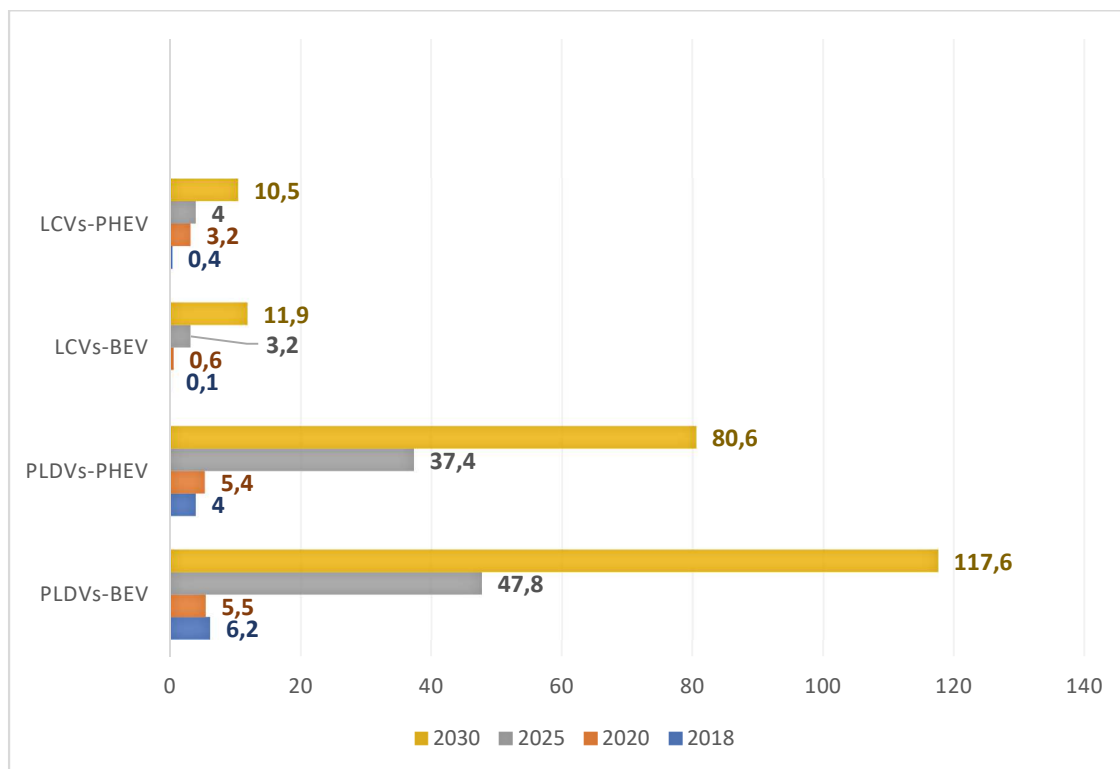
A key element in determining the direction of development of electric vehicles is the presence of batteries. The potential distance of movement of electric vehicles on a single charge mostly depends on the batteries. On the other hand, a weighty argument is the difference in price with conventional cars with internal combustion engines. The most common type of battery for cars PHEV and BEV are now lithium-ion batteries.

<sup>29</sup> Global EV deployment to 2030 by scenario, <https://www.iea.org/gevo2018/>

At the present stage of development of the production of electric vehicles the maximum distance of movement of electric vehicles on a single charge can reach about 500 km. Also, an increase in the range of electric vehicles can be achieved by increasing the number and capacity of batteries that are installed on electric vehicles. For example, Tesla cars, which have the most power reserve (334-508 km.), Are currently equipped with batteries with an aggregate power consumption of 60-100 kWh.

At the same time, electric vehicles of other companies, which are focused on a single-charge power reserve of 100–200 km, are equipped with batteries with an aggregate power consumption of 20–40 kWh.

Figure 5: Global Electric vehicles development to 2030 scenario (number of vehicles in millions)



The chart is based on the source<sup>30</sup>

<sup>30</sup> Number of electric cars in circulation, available at <https://www.iea.org/gevo2018/>

The number of electric cars on the will be over 100 million by 2030 under the IEA's New Policies Scenario.

The range of movement on a single charge in innovative models of electric vehicles is fully capable of satisfying consumers. The reverse side of a greater range of movement is the increase in the total price of installed batteries, which affects the price of an electric vehicle as a whole.

The cost of batteries for electric vehicles has recently been reduced almost fivefold (from \$ 1.000 per kWh in 2008 to about \$ 200 per kWh in 2015)

But due to the large capacity of the batteries, which are installed on the newest electric vehicles, the price is approximately 13.000 dollars more than ordinary cars. This factor continues to slow down the development of the electric vehicle market in the world.

Prospects for technological renewal in the production of batteries for electric vehicles in the medium-term context (from 2016 to 2020) are associated with the modernization and further developments in the production of lithium-ion batteries. An increase in the energy density up to 800-1200 W / l is expected (in 2015, one will be 600 W / l), which will make it possible to reach the cost level of \$ 125 per kWh. by 2022.

In the long-term program, the technological update of batteries for electric vehicles will be associated with new types of batteries:

1. Lithium metal batteries;
2. Lithium-sulfur batteries;
3. Lithium air batteries.

According to the forecasts of the US Department of Energy, the achievable energy density of innovative types of batteries will be above 3000 W / l. This will make it possible to produce batteries of considerably smaller size and produce them at significantly lower prices.

The US Department of Energy is promoting a program to develop charging stations for electric cars in employer parking lots.<sup>31</sup>

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<sup>31</sup> Workplace Charging at Federal Facilities, <https://energy.gov/eere/vehicles/workplace-charging>, 201

Since most of the time on average, an electric car spends close to home and with the work of car owners.

The next potential business model is not charging the batteries at the station, but the possibility of replacing them with fully charged batteries. So, within the framework of such a business model, a startup Better Place tried to work. The same variant of the development of electric stations was developed by Tesla. But as a result, Tesla abandoned such a business model in favor of the Supercharger project.

Experts who analyzed the business of Better Place, noted the shortcomings of this model. The main disadvantage is associated with the need for additional investments (the high cost and large mass of batteries require special equipment for replacement).

In the medium term, lithium-ion batteries are considered the most promising types of batteries for electric vehicles. Tesla, together with Panasonic, has currently invested five billion dollars in the creation of a Gigafactory production line to produce lithium-ion batteries, counting on a reduction in the price of batteries to \$ 150 per kWh. because of scale effect.

Despite the need to form a special charging infrastructure and service, the production of electric vehicles is influenced by a group of factors:

- climate change and depletion of natural resources determined the need to reduce the total carbon intensity of the global economy - by about 60% by 2050;

- production technology of electric vehicles is already available. In addition, it is expected an additional increase in production from major manufacturers: according to forecasts, the production of electric cars by nine largest automakers will increase to 872 thousand by 2019, which will increase by more than 6 times compared with 2013.

- regulatory factors - the tightening of environmental requirements and public policy aimed at the growth of the park of ecological transport. There is constant pressure on participants in the car market to reduce exhaust emissions from passenger cars;

- change in consumer preferences - a significant number of consumers who started using electric vehicles at an early stage, ensure the adoption of technology by the masses. In addition, the existing owners of electric vehicles are distinguished by high loyalty.

The global map of the electric vehicle market includes about a dozen countries that are interested in the production of electric vehicles. They are united by one thing: activation of state subsidies, which are guaranteed to future buyers.

For example, in the PRC is subsidized up to 50 percent of the cost of an electric vehicle. China's investment of about 3 billion euros aimed at supporting and increasing the production of electric cars.<sup>32</sup>

The EACU (Eurasian Customs Union) member countries have also agreed on programs for the development of the “electric vehicle industry” industry - development plans have been adopted in the Russian Federation, Armenia, Belarus and Kazakhstan.

The EACU countries have abolished duties on imported electric motors, batteries, gearboxes, including some parts to produce electric vehicles. Companies and organizations of medium and small businesses that have established refueling for electric cars will be able to get certain benefits.

Duty-free importation of electric vehicles will spread only to electric vehicles and does not apply to vehicles with hybrid power plants.<sup>33</sup>

The German federal budget allocated approximately 500 million euros for the development and marketing of electric vehicles.

Currently, there are eight municipal aerobatic projects in Germany that test prototypes of electric vehicles and help shape the conditions for their movement. One of the largest projects is concentrated in two cities - in Berlin and Potsdam. For example, in Berlin now there are 550 stations for charging electric vehicles.

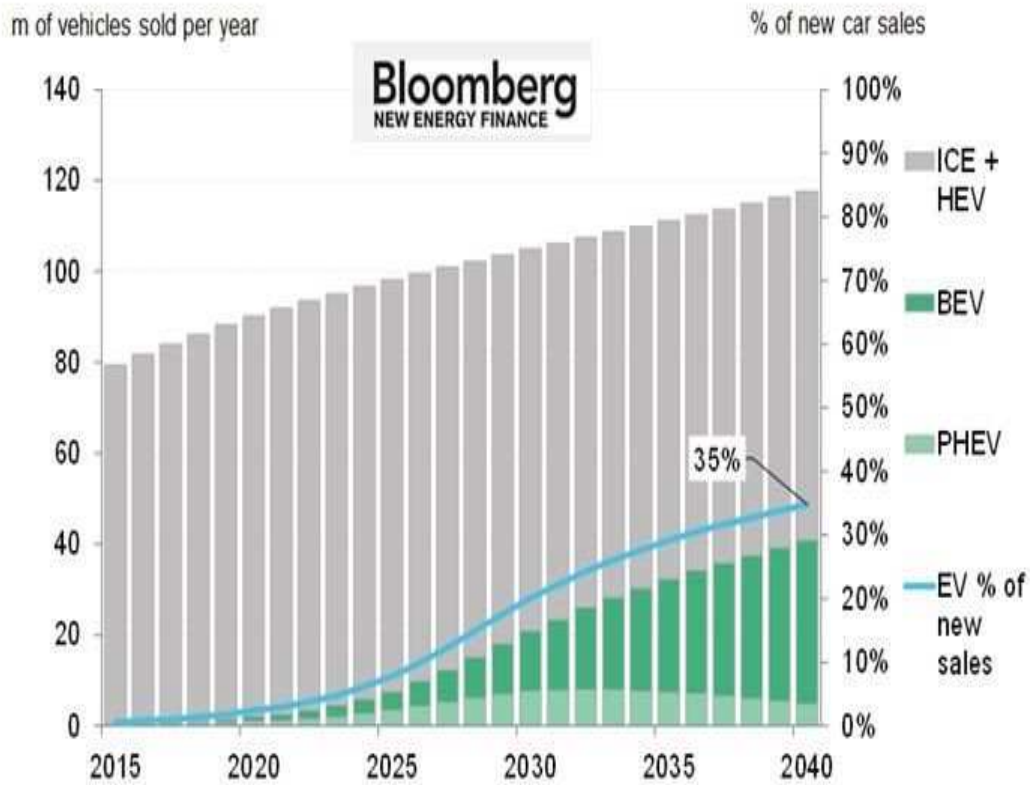
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<sup>32</sup>Strategy of development of industry of Russian Federation to 2025,

<http://static.government.ru/media/files/EVXNIplqvhAfF2Ik5t6l6kWrEIH8fc9v.pdf>, 2018

<sup>33</sup> McKinsey & Company, 2017, Electrifying insights: How automakers can drive electrified vehicle sales and profitability

Picture 1: Bloomberg New Energy Finance: Electric vehicles to be 35% of global new car sales by 2040



Source: Data from Bloomberg website<sup>34</sup>

According to the Picture 1 above Bloomberg New Energy Finance released a bold forecast of a bright electric vehicle future. They suppose that electric vehicles will occupy approximately 35 % market share of new cars.

Now formally stand out the following main types of electric vehicles:

Type 1 PHEV is a hybrid electric vehicle with charging batteries from an external network;

<sup>34</sup> Bloomberg New Energy Finance: Electric Vehicles To Be 35% Of Global New Car Sales By 2040, <https://insideevs.com/bloomberg-new-energy-finance-electric-vehicles-to-be-35-of-global-new-car-sales-by-2040/>

Type 2 HEV - a hybrid electric vehicle with charging batteries from internal combustion engines (ICE);

Type 3 BEV - electric cars that run fully on rechargeable batteries;

Type 4 FCEV - electric cars that run on fuel cells.

The most promising types of electric vehicles are now considered as experts PHEV and BEV. Now the global market for sales of the above types of electric vehicles show a rapid growth rate (on average, about 50 percent per year from 2012 to 2016).

The key markets for sales and production of these types of electric vehicles are the USA and China. In China, due to government incentives, the market is very actively growing - in 2015 and in 2016 it showed growth rates: +21 percent for PHEV and +68 percent for BEV (compared to +14 percent for PHEV and +15 percent for BEV in the rest countries in the world).

The second type of electric vehicles - HEV, is currently considered as the most popular type of electric vehicles in the world (over 1.8 million purchased cars or approximately 70 percent of the total sales of electric vehicles in 2016).

This type is an upgrade of a car with an internal combustion engine (ICE), that is, not quite a full-fledged electric car.

The most popular all-electric cars (BEV) around the world. However, in different countries, the infrastructure of the car park varies. In some countries (in the Netherlands, Sweden, Great Britain) PHEV dominate.

The question of choosing between BEV and PHEV involves studying a set of technical characteristics - such properties as the range of a single charge, the level of emissions into the atmosphere, the degree of noise. The second factor of choice is the cost of transport. It is also important to introduce state subsidy programs and actively develop the infrastructure of refueling stations in all countries.

In 2017, only three FCEV models - Toyota, Hyundai, Honda - were presented on the US market. While the BEV was represented by 25 models.



Also, PHEVs were shown by 20 models, and HEV - by approximately 40 models.<sup>35</sup>

The sales volumes of BEV and PHEV in 2015 amounted to over 200 thousand units and 300 thousand units, respectively. The world sales of FCEV amounted to only about 1 thousand units with a forecast of sales development to the level of over 70 thousand units by 2027.<sup>36</sup>

Also, there is a significant lag of FCEV in the growth of the network of filling stations. Thus, in the United States since 2011, there has been a growth in the number of electric charging stations (about 40 thousand for 2016) (Figure 5).

At that time, the number of hydrogens refueling stations is represented by dozens of units. The situation with electric filling stations in the European Union and Japan is like the American situation.<sup>37</sup>

Due to the reduction in cost of ownership and the growth of charging infrastructure, according to industry experts, the proportion of electric vehicles in total production will be about 17 percent by 2020, 75 percent will be hybrid models.

At the same time, the total number of electric vehicles in the park will reach the level of 20 million units, which will be about 1.7% of the global fleet in 2020.<sup>38</sup>

At the same time, the share of electric vehicles in the car park of Europe may be on average about 5% by 2020.

According to estimates of such advanced electric vehicle companies as Tesla and GM, the cost of batteries for electric vehicles should decrease to ~ 100-150 US dollars per kWh between 2020 and 2022. At the same time, Tesla calls the commissioning of its production site, Gigafactory in 2017, the main factor that will reduce the cost of the battery pack for their electric vehicles by 30 percent. The expected power of the Gigafactory to produce batteries by 2020 should be 35 GW \* h per year and for battery packs - 50 GW \* h per year. At the same time, GM announced that for their new

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<sup>35</sup> Global EV outlook 2017, <https://www.iea.org/publications/freepublications/pub..>

<sup>36</sup> International Energy Agency forecasts, <https://www.cnbc.com/2018/05/30/electric-vehicles-will-grow-from-3-million-to-125-million-by-2030-ia.html>

<sup>37</sup> Samuelsen, Why the Automotive Future Will Be Dominated by Fuel Cells, 2015, <https://spectrum.ieee.org/green-tech/fuel-cells/why-the-automotive-future-will-be-dominated-by-fuel-cells>

<sup>38</sup> Global EV Outlook 2018, <https://www.iea.org/publications/freepublications/publication/GlobalEVOutlook2017.pdf>

model of Chevrolet Bolt electric car, the contracted battery price for 2016-2019 is set at ~ \$ 145 per kWh.

As for the minimum required scale to produce batteries, according to Tesla, the optimum level is not less than 10 GWh per year.

At the end of 2016, global sales of electric vehicles exceeded 750 thousand units (although as early as 2010 accounted for less than 7 thousand), and their number exceeded 2 million units. However, even in countries where sales of electric cars are mainly concentrated, their share in the structure of the car market is only 1.1%, and in the fleet - 0.2%. At the same time, the growth rate of sales of electric vehicles is gradually reduced.

In 2016, they slowed to 38% compared to 2015, although since 2010 they significantly exceeded 50%.

While the bulk of sales of electric vehicles is concentrated in a limited number of countries.

In 2010, the main markets for sales of electric vehicles were the United States, Japan and Norway, but in 2016, China ranked first in this respect, having the most dynamically developing car market in the world. Moreover, in 2016, this country began to possess the largest fleet of electric vehicles in the world, ahead of the United States. In 2016, electric cars exceeded the level of 1% of the total sales of passenger cars only in Norway (28.8%), the Netherlands (6.4%), Sweden (3.4%), France (1.5%), the UK (1.4%) and China (1.4%).

Political decisions on the limitation and targets for stopping sales of traditional cars are accompanied by the uncertainty of the mechanisms for their achievement and consequences.

Bloomberg believes that the spread of electric vehicles by 2040 will reduce the demand for oil by 8 million barrels per day and they will provide 5% of the global demand for electricity.<sup>39</sup>

In the IEA (International Energy Agency) 2DS scenario, it is assumed that the fleet of electric vehicles will form up to 1.5% of total electricity demand by 2030, which will be only 6% of the total increase in electricity demand. At the same time, in many power systems, especially in large

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<sup>39</sup> New Energy Outlook 2018, <https://about.bnef.com/new-energy-outlook/>

cities, major transformations in the operation of distribution networks, the introduction of energy storage systems and the optimization of peak loads will be required.

In Germany, there are no direct subsidies for the purchase of electric vehicles. However, all buyers of electric vehicles are exempt from paying transport tax (Kfz-Steuer) for five years. Here, the serial production of electric cars improved in 2011.

In 2012, 500 million euros was allocated from the federal budget for such purposes. At the same time, sales of electric vehicles increased from 13 thousand units in 2014 to 23,500 units in 2015. The leadership of Germany plans by 2020 to launch one million electric vehicles on the country's roads, including hybrid cars.<sup>40</sup>

The UK government has provided tax breaks for electric vehicle buyers at up to 25 percent of the cost of a new electric car, however, not exceeding 5,000 British pounds (7.8 thousand US dollars).

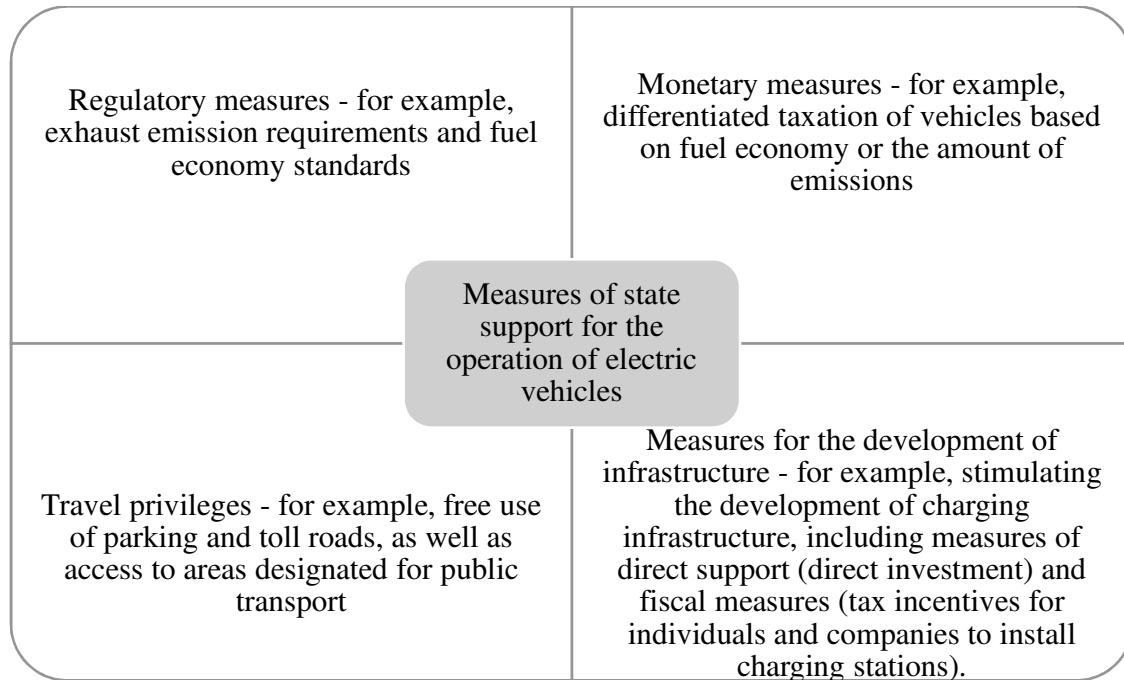
In the case of buying a commercial electric car, the benefits can be up to 20 percent of the cost, but not more than 8 thousand pounds sterling (12,5 thousand US dollars). Certain toll roads and parking have become free for such cars or discounts are provided. Sales of electric vehicles increased from 16.5 thousand units in 2014 to 28 thousand units in 2015. In London, by 2018, it is planned to introduce a park of zero-emission taxis.

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<sup>40</sup> Model Year 2017: Alternative Fuel and Advanced Technology Vehicles, <http://www.afdc.energy.gov/vehicles/search>

Based on international practice, measures of state support for the operation of electric vehicles are shown in the Table 4 below:

Table 4: Measures of state support for the operation of electric vehicles



*Own table based on the source <sup>41</sup>*

Developed countries use a combination of measures that not only reduces the cost of ownership of electric vehicles, but also enhances their advantage when moving in traffic. At the same time, regulatory measures for exhaust gases, as well as benefits for the purchase of electric vehicles are applied mainly at the national level, while measures relating to road traffic are implemented at the regional level.

<sup>41</sup> Model Year 2017: Alternative Fuel and Advanced Technology Vehicles, <http://www.afdc.energy.gov/vehicles/search>

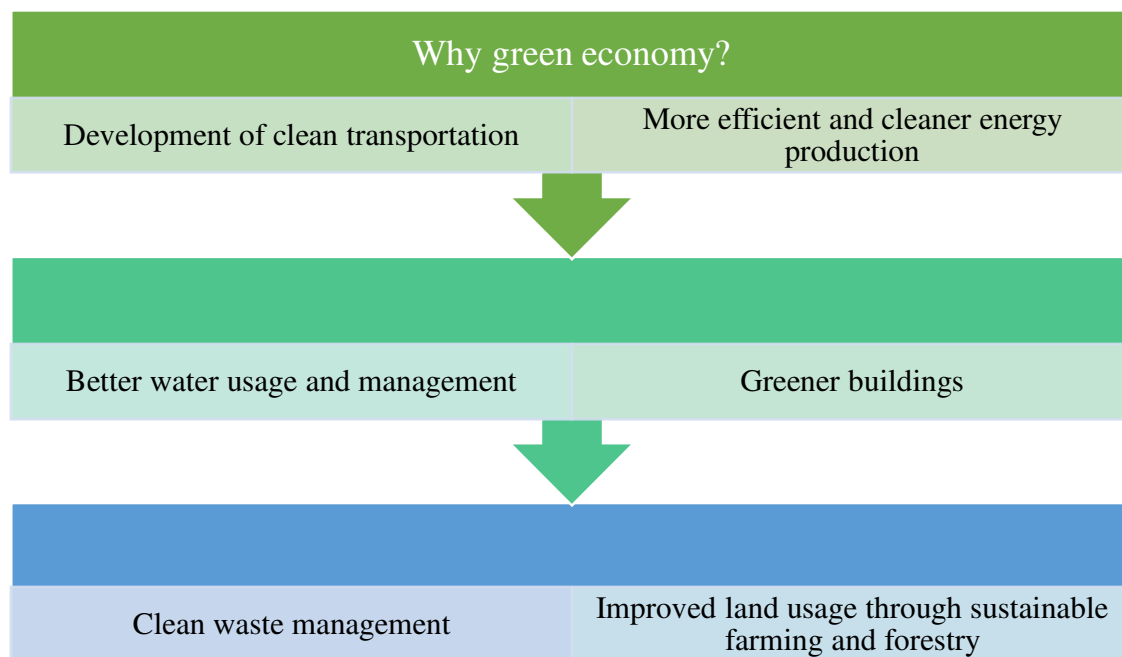
## 4.2 Green technologies as a trend in the Republic of Kazakhstan

Electric cars are one solution to the negative environmental impact of conventional cars. However, they have also proven to have many more benefits to society.

The advent of electric cars has called for an improvement in overall energy usage and generation. They have shown how important it is to find alternate sources of fuel and they can positively affect the environment and society.

One of the main issues on the agenda of the global community is to reduce the negative impact on the environment.

Figure 6: Green economy reasons



*Own figure based on the source<sup>42</sup>*

On August 2, 2016, Kazakhstan signed and ratified the Paris Climate Agreement on November 4. The expected contribution of Kazakhstan to reduce greenhouse gas emissions in the form of an

<sup>42</sup> Leal Filho, Walter, Pociovalisteanu, Diana-Mihaela, Al-Amin, Abul Quasem, (2017), Sustainable Economic Development, ISBN: 978-3-319-45081-0

unconditional goal will be 15% and in the form of a conditional goal - 20% by 2030 from the 1990 baseline.<sup>43</sup>

Also, as a member of the UN Framework Convention on Climate Change, Kazakhstan ratified the Kyoto Protocol, according to which official commitments were made to reduce greenhouse gas emissions by 2020 by 5% based on 1990 figures.

On May 30, 2013, the Head of State signed a decree approving the Concept on the country's transition to a “green economy”.

Most of the total emissions of pollutants in Kazakhstan come from the electricity sector. About 40% of the total emissions of dust, sulfur dioxide and nitric oxide come from thermal power plants and other sources of burning natural fuels.

The main reason for this indicator is the use of low-quality coal, as well as the lack of necessary equipment at power plants for proper control of emissions.<sup>44</sup>

The urgent task is the timeliness of the transition to low-carbon energy, acceleration of decarbonization, which in practice means a decrease in coal generation. In the last 3 years alone, 442.6 GW of renewable energy sources have been commissioned in the world.

According to international expert calculations, Kazakhstan has enough potential for the introduction of innovative technologies in terms of reducing emissions, namely the development of scientific and technological potential and the intensive use of renewable energy sources.

In the case of the implementation of the planned alternative energy projects, the construction of new generating capacity using coal is expected to decrease to 200 MW, which will correspondingly reduce CO<sub>2</sub> emissions by about 1 million tons per year.<sup>45</sup>

The growth rate of investment in low-carbon generation should be consistent with this decarbonization process. The volume of global investment in alternative energy has reached record

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<sup>43</sup>Satybaldin A., (2017) Kazakhstan's low-carbon development strategy in the context of globalization, <http://nblib.library.kz/elib/library.kz/jurnal/Vestnik%2004-2017/Otziv1.pdf>

<sup>44</sup> Concept for the transition of the Republic of Kazakhstan to a "green economy", available at [https://greenkaz.org/images/for\\_news/pdf/npa/koncepci...](https://greenkaz.org/images/for_news/pdf/npa/koncepci...), Astana 2013

<sup>45</sup> The concept of sustainable development of the Republic of Kazakhstan, <https://monographies.ru/en/book/section?id=104416> 2018

levels, despite the decline in prices for traditional energy resources, the strengthening of the US dollar, and the current instability in the economies of European countries.

So, if in 2004 investments in renewable energy sources amounted to only \$ 45 billion, for 2013-2015, investments increased more than 17 times and amounted to about \$ 791 billion. Advances in technology and a growing market for renewable energy continue to reduce the cost of electricity generated in alternative ways.

The relevance of this work lies in the timely assessment of the prospects for the development of electro mobile transport in Kazakhstan.

The results of the work can be applied when updating the state programs for the transition to a low-carbon economy and the formation of a new strategy for the development of the transport complex of the Republic of Kazakhstan, as well as other legislative and regulatory documentation.

The author considers that exhaust emission is absent. As a result, the deposition of harmful substances into the atmosphere decreases in the process of movement.

Megacities are almost 90 percent, so the popularization of demand for electric cars makes it possible to improve the situation in the capitals of Astana.

Over the past decade, the number of people living in Astana has increased by about 10%. In addition, private cars, which are in use by residents of Astana, are very outdated.

Astana is declining, as they suffer from the problems of strong air. In the next 10 years, the emission of greenhouse gases will significantly increase by about two times - from \$ 2.6 million. USA. tons (2014) to 5 million tons (2023). The same negative growth rate is expected for other indicators.

Implementing demand management, including the collective use of cars (or car sharing) and bicycles, motives for public transport and limits on the movement of private cars, the development of parking rules, and changes in behavior, such as environmental driving (reducing fuel consumption), reduce harmful substances that reduce greenhouse gases and noise.

The implementation of a sustainable transport policy, which will contribute to the development of road transport, ensure safety and reduce the number of traffic jams, improves the urban population,

reduces the level of weathering and reduces the number of traffic jams. Such a policy is a global trend in the development of megacities.

The second direction is the electrification of road transport. Currently, electric cars are one of the main directions of the global automotive industry.

The main incentives in the production of electric vehicles are associated with the need to improve the environmental and energy efficiency of road transport, as well as the lack of noise, dynamic performance, etc.

The main barriers to the production and sales of electric vehicles are:

Figure 7: Main barriers to the production and sales of electric vehicles



*Own figure based on the source<sup>46</sup>*

For all sectors of the development of electric vehicles of great importance is the policy of the state to support markets and production. Reducing the initial cost of production of electric vehicles and increasing the number of charging stations does not allow to achieve perfection in this area.<sup>47</sup>

<sup>46</sup> Khamzina S. Sh., Zhumabekova B. K., The concept of sustainable development of the Republic of Kazakhstan, <https://monographies.ru/en/book/section?id=104416> 2018

<sup>47</sup> Dynamics and structure of the global electric vehicle market, [https://www.skoltech.ru/app/data/uploads/2014/02/Monitoring\\_yanvar-aprel\\_2017.pdf](https://www.skoltech.ru/app/data/uploads/2014/02/Monitoring_yanvar-aprel_2017.pdf)

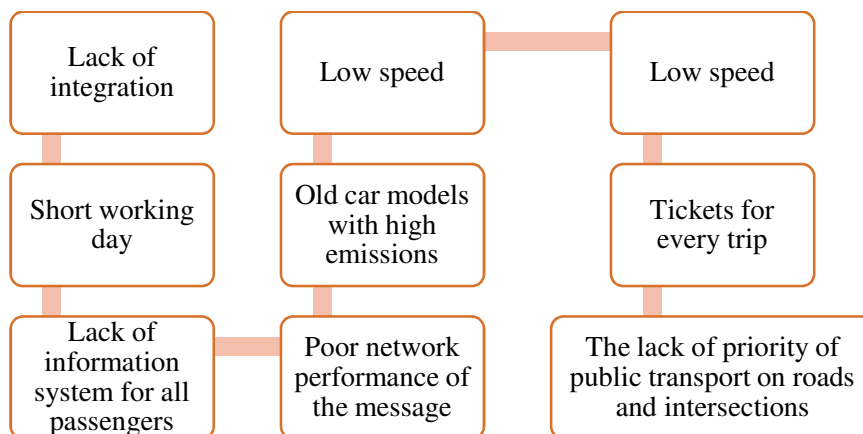


### 4.3 Trends in the development of road transport in Kazakhstan

As the results of recent studies show, today less than 30 percent of all trips to Astana are carried out using public transport. In recent years, the share of public transport use by Astana residents has significantly decreased, and this trend is likely to only increase, given the factor of increasing private automobilization, as well as poor service and poor quality of service. It is worth noting that in recent years, significant financial resources have been invested in public transport, however, they were mainly used to upgrade rolling stock.

In the strategy of sustainable transport in Astana, it is noted that the main shortcomings in the field of public transport in Astana are:

Figure 8: The main shortcomings in the field of public transport in Astana



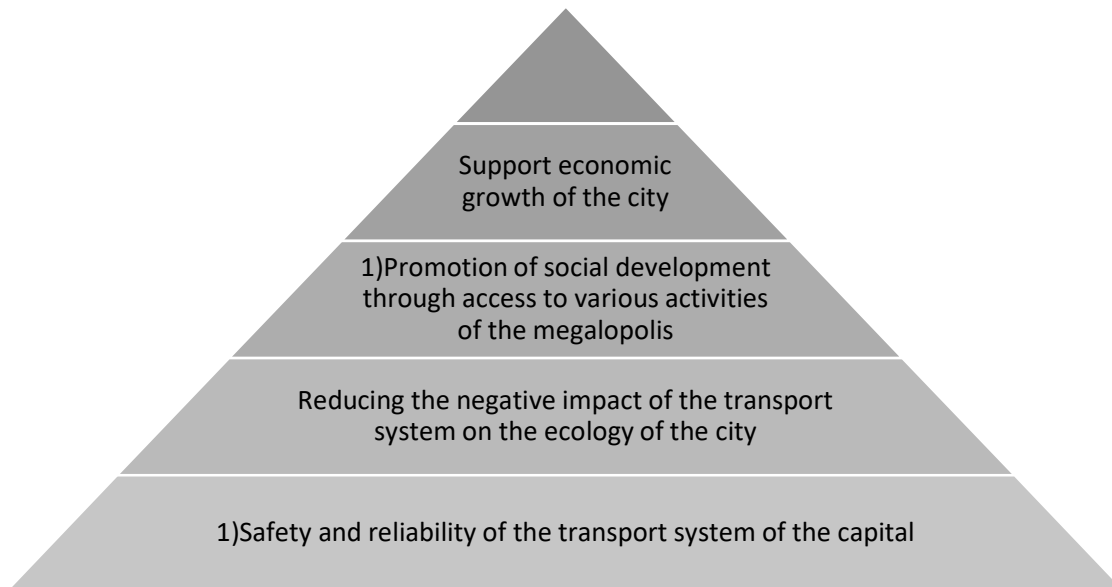
Own figure based on the source<sup>48</sup>

In addition to the problems listed above, there are several issues that need to be addressed - social exclusion, lack of integration between transport planning and urban planning, the constant expansion of the city, lack of parking management and active management of traffic flows in the city, the problem of road safety, lack of personnel and integration processes, as well as an unsatisfactory regulatory framework in this area.

<sup>48</sup> Astana's development program until 2020 will ensure further transformation of the city, <http://astana.gov.kz/ru/news/news/11161>

To solve these problems, the strategy provides clear goals and vision for the transport system in Astana. The main objectives are:

Figure 9: Main objectives of Kazakhstan transport system development



*Source: Own figure based on the source<sup>49</sup>*

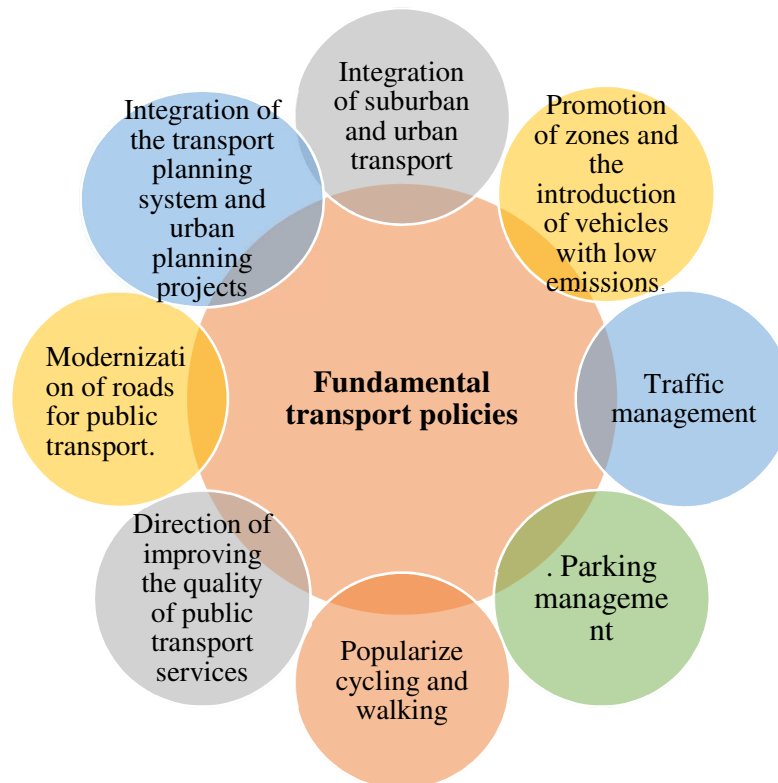
To solve the current problems occurring with transportation in Kazakhstan certain objectives should be taken into consideration that are mentioned in the Figure 9.

To implement the objectives outlined above, the city's management adopted eight fundamental transport policies:

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<sup>49</sup> Support for environmentally friendly urban public transport in Kazakhstan, [https://www.oecd.org/environment/outreach/Kazakh%20Transport%20brochure%20\[Russian\]%20\[2b%20WEB\].pdf](https://www.oecd.org/environment/outreach/Kazakh%20Transport%20brochure%20[Russian]%20[2b%20WEB].pdf), October 2017

Figure 10: Fundamental transport policies



*Own figure based on the source<sup>50</sup>*

These policies in the Figure 10 are for ten years ahead and should regulate the decision-making process in the field of public transport in the city of Astana.

Obstacles that Kazakhstan is facing in electro mobile development:

1. The factor holding back widespread electric cars in Kazakhstan is their price, which is significantly higher than the price of traditional cars with internal combustion engines.

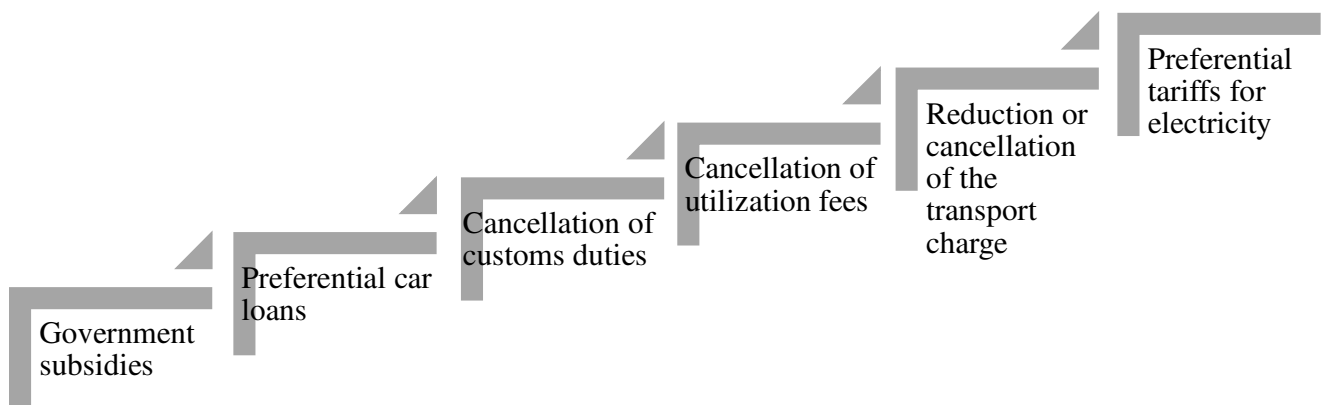
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<sup>50</sup> Support for environmentally friendly urban public transport in Kazakhstan, [https://www.oecd.org/environment/outreach/Kazakh%20Transport%20brochure%20\[Russian\]%20\[2b%20WEB\].pdf](https://www.oecd.org/environment/outreach/Kazakh%20Transport%20brochure%20[Russian]%20[2b%20WEB].pdf), October 2017

## 2. Lack of charging stations infrastructure for electric vehicles in Kazakhstan.

However, with the current ratio of the price of electricity for individuals and traditional motor fuel, the cost of charging electric vehicles is much lower than that of cars with internal combustion engines.

Figure 11: The key mechanisms for stimulating the development of sales of electric vehicles in the Republic of Kazakhstan



*Own figure is based on the source<sup>51</sup>*

An active state economic policy is needed, which will be aimed at supporting the owners and owners of electric vehicles, otherwise the development of electro mobile transport will proceed at a slow pace.

The main factor in the development of electro mobile transport is the installation of appropriate infrastructure - a network of charging stations in various places of the capital: near residential and administrative areas, streets, shopping centers, highways.

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<sup>51</sup> Support for environmentally friendly urban public transport in Kazakhstan, [https://www.oecd.org/environment/outreach/Kazakh%20Transport%20brochure%20\[Russian\]%20\[2b%20WEB\].pdf](https://www.oecd.org/environment/outreach/Kazakh%20Transport%20brochure%20[Russian]%20[2b%20WEB].pdf), October 2017

Charging mode determines the types of stations: stations “fast” and “slow” charging. By 2020, the countries of the world EVI Group plan to install 2.4 million "slow" charging stations and 6 thousand "fast".

The largest installation volume of charging stations in Japan. The Japanese state program includes the deployment of 2 million “slow” charging stations and 5 000 “fast” charging stations. In Japan, the creation of charging stations is engaged in the Technical University of Nagaoka.

A nationwide US demonstration project aims to deploy 22 000 charging stations. And by 2015, 350 “fast” charging stations were established. In the US, Delta Electronics is building a network of charging stations.

By 2016, the target installations in the Netherlands are 20.000 “slow” charging stations and one hundred “fast” stations.<sup>52</sup>

As noted earlier, the disadvantages of lithium rechargeable batteries are considered high price. Such batteries do not have a “memory effect”. That is, they are not restored when fully discharged, which complicates their use.

Also, this “memory effect” is absent in Ni-MH batteries. They found widespread use on hybrid cars. Sales of Ni-Cd batteries are determined by their low price.<sup>53</sup>

In order to provide charging infrastructure for electric vehicles in the city of Astana, it is not necessary to use expensive and complex installations for fast charging (30-40 min) of an electric vehicle.

The experience of European countries has shown that most of the time during the day, the electric car is parked at the place of work or home

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<sup>52</sup> Global EV Outlook, Understanding the Electric Vehicle Landscape to 2020, Report 2013, [https://www.ourenergypolicy.org/wpcontent/uploads/2013/09/GlobalEVOutlook\\_2013.pdf](https://www.ourenergypolicy.org/wpcontent/uploads/2013/09/GlobalEVOutlook_2013.pdf)

<sup>53</sup> Monitoring analytical, strategic and forecasting documents in the field of scientific and technological development, [https://www.skoltech.ru/app/data/uploads/2014/02/Monitoring\\_yanvar-aprel\\_2017.pdf](https://www.skoltech.ru/app/data/uploads/2014/02/Monitoring_yanvar-aprel_2017.pdf)

If we look at the percentage, it turns out that the daily cycle of operation of an electric vehicle averages only two hours - the car is in motion currently. In the remaining hours of transport is in the parking lot.

It should be noted that out of a hundred percent, only ten percent of the time a car consumes fuel. In the case of an electric vehicle - the battery charge. If we consider that the battery charge is not all spent for the movement of an electric vehicle from one parking point to another parking, then the need arises only for charging an electric vehicle.

Many experts and experts have offered the installation of low-cost charging stations in places of mass idle transport and near the homes of owners of electric vehicles.

This will give the opportunity to abandon the laying of expensive cables and lines, which are designed for high current and reduce impulse loads on the mains. Smooth and slow charging of the electric vehicle will allow to integrate into the existing power transmission network without significant problems.

It is necessary to determine the rules for charging an electric vehicle for each client before the introduction of electric vehicles with charging stations. And it is necessary to develop technologies for controlling the distribution of electrical loads when charging an electric vehicle. In this case, it is only possible to say about the effectiveness of the introduction of an electric vehicle in Kazakhstan.

It is believed that at some point in time, with a certain number of electric vehicles, the existing generating capacity and capacity of electric networks will not be enough to charge electric vehicles. However, it does not make sense to focus on the capacity of batteries of electric vehicles, it will certainly grow, but this does not matter from the point of view of the power system.

You can also exclude the value of the power that the charging stations are able to transfer to the battery of an electric vehicle, since this value is either limited by the capacity of the electric vehicle to receive this energy, or it can be limited by the technological management of the network of charging stations by the grid company.

The only figures that can be considered are the energy costs per 1 km. run Today, this figure for passenger electric cars is 150-300 W / hour per 1 km. mileage (depending on driving style, ambient temperature and included heater or air conditioner). If we assume that the average car travels 20 000 km per year, we will get that in a year it will consume from 3 000 to 6 000 kW / hour.

If we assume that in general, for a year, the need for this energy will be generally uniform, then about 17 kW / hour will be required per day. And if we say that most of the battery energy of the machine will be received during the night charging, this means that in six-night hours, you need to bring only about 3 kW to charge the electric vehicle.

Currently, according to the data of the energy company of Kazakhstan, about 8.8 GW of power, which could be used to charge electric vehicles, is idle in the networks.<sup>54</sup>

This power is enough to charge 2.88 million electric vehicles.

Based on the above information, in the Table 5 below were analyzed the factors of the macroenvironment, which carries certain risks and opportunities for the development of electric vehicles in Kazakhstan.

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<sup>54</sup> Electricity Market of Kazakhstan, 2017,  
[http://www.encharter.org/fileadmin/DocumentsMedia/Events/12RECA\\_Almaty\\_2016\\_S4\\_ZKuanysbayev.pdf](http://www.encharter.org/fileadmin/DocumentsMedia/Events/12RECA_Almaty_2016_S4_ZKuanysbayev.pdf)

Table 5: PESTEL - analysis of the development of electro mobile transport in Kazakhstan

	Factors	Evaluation of risk
<b>1</b>	Political	It is necessary to change the priorities of the state policy in the regulation of transport in the framework of the development of the electro mobile sector.
	Total risk level	High
<b>2</b>	Social	The lack of personnel in the service system of electric vehicles, domestic software products supporting car sharing services.
	Total risk level	Average
<b>3</b>	Ecological	The development of electro mobile transport will give positive environmental effects within the framework of decarbonization and megalopolis emissions.
		High
<b>4</b>	Economic	Tax options
		Inflation, devaluation processes
		Reduced battery costs
	Total risk level	Average
<b>5</b>	Technological	The introduction of modern technology by competitors to reduce costs, increase productivity Development of basic technological solutions (R & D), implementation of pilot projects on the use of electric vehicles and the creation of charging infrastructure
	Total risk level	High
<b>6</b>	Legal	Planned changes in legislation that could affect sales of electric cars. Necessary to update the legislative framework in the Republic of Kazakhstan in the implementation of charging infrastructure for electric vehicles
	Total risk level	High
<b>7</b>	Total project risk level	High

Note: The table is based on the source<sup>55</sup>

<sup>55</sup> Factors affecting the development of electric vehicles, available at <http://365-tv.ru/index.php/stati/mashinostroenie/176-factory-vliyayushchie-na-razvitie-elektromobilej>, 2017



Due to the study of secondary sources, there was concluded:

There are many factors affecting the pace of electric vehicle deployment in the global automotive market, including: reducing the cost of batteries, developing infrastructure, ensuring safe operation, and maintaining a favorable regulatory policy.

At the same time, in Kazakhstan, several factors become more significant, both due to the underdevelopment of this trend in the country, and due to the peculiarities of the national automotive industry.

For more effective development, it is necessary to propose the improvement the legislative base in terms of providing benefits to users and manufacturers of electric vehicles. This practice is widely used in other countries.

Table 6: Proposal for the improvement of benefits for manufacturers and consumers of electric vehicles

User Benefits	Benefits for manufacturers
Government subsidies for the purchase of a car	Tax breaks
Free parking	VAT exemption
Electricity discounts	Government subsidies
Insurance concessions	
Maintenance Benefits	
Exemption from transportation tax	

Source: Own table

The table above shows proposal for the improvement of benefits of electric vehicles users and consumers. To implement the idea of development of electric vehicles there should be provided advantages for both users of vehicles and manufacturers, to have a motivation for a future progress.

## **5 Organization of interaction of the state and business in the formation of car-sharing of electric vehicles**

### **5.1 Description and evaluation of models of interaction between government and business in the process of implementing the formation of charging infrastructure of electric vehicles**

Bolloré Group is a French company specializing in rental services for electric vehicles. Also, Autolib's rental centers are already in operation in France. This network is spread over the largest cities (Paris, Lyon, Bordeaux). For rental consumers offered electro hatch Pininfarina.

In France and the United States, such models are named differently - Blue car or Blue Indy.

To rent an electric car, you must have a driver's license and a subscription cost of \$ 19.9 per month. The service has a flexible pricing. So, the first twenty minutes of using an electric vehicle is \$ 6.

In the following minutes, the price is 35 cents every minute. Social discounts were introduced for some segments of the population. For example, for students. For students, the discount price of the subscription is only \$ 30 annually and 15 cents per minute. For customers, city government of Indianapolis in the United States also introduced free parking for rented electric vehicles.

The rental service turned out to be very popular among the population. During 2017, the service was already used 21.5 thousand times. And the owners of season tickets became 2.1 thousand clients. Often, customers use the rental service to get to or from the airport, including to get to their place of work.

Car2go representatives in Canada have published their achievements for the year in the field of "public car". Over the year, the army of permanent members of the club, united around such an approach to transport, has grown from 2 to 15 thousand; 12 thousand people in Vancouver weekly drive behind public electric vehicles. The number of available cars has grown to 320 units, the territory with parking lots, where you can leave the car, has also expanded.

It should be noted that not all the cars provided are Smart Fortwo or other electric vehicles, but Car2go ensures that this fleet is environmentally friendly. Vancouver is the first Canadian city in which the program was launched, which at that time was already represented in some cities of Europe and the United States. During the year, the number of participating cities has increased significantly. For example, in Canada, a “public car” drove also to Toronto, Ontario, Calgary and Alberta.

As for the principle of “public car” as such, many experts in the field of ecology, as well as designers, see it as a real salvation, both for urban air and for the roads of this city itself.

Operators provide members with access to a fleet of common vehicles located in districts and popular locations for short-term rentals, making it easier for families to live without a car or a second vehicle.

Users pay for time, in a vehicle that is debited with a smart card, and the customer can leave the vehicle at one of several locations throughout the city.

The project plans to organize an innovative project in the provision of electric vehicle rental services in Astana.

Carsharing is a convenient and affordable alternative to private car ownership in developed countries.

This is an environmentally friendly service that contributes to cost reduction and sustainable development of urban agglomeration.

Employees who could get to work by public transport, bicycle or on foot, can use the new type of service during the working day.

The service gives its customers independence; allows them to book an electric car at any time for them online or by phone. In the vehicle, they use their personal smart card to unlock the electric car, enter a PIN code, and can drive.

After their trip is completed, customers return the electric car to the next parking lot.

A classic ABC user is a resident of the center and other densely populated areas of the city of Astana. Using the Carsharing service for a client will be a way to get to work or go on business.

In the evening, the client can return home or go to a meeting with friends. It is more convenient to do on Carsharing because there is no binding to the car. Many spend most of their time in the center of the capital, come to the mall, park there, and go to meetings in the afternoon, and go home in the evening, while they can leave the car for a free overnight stay.

Table 7: SWOT -analysis of the project

<b>Strength</b>	<b>Weakness</b>
<ol style="list-style-type: none"> <li>1. Unique technology platform</li> <li>2. Industry Experience</li> <li>3. Save-Earth Strategy</li> <li>4. Green / sustainable city image (tourism and urban marketing)</li> <li>5. Politicians / stakeholders / multipliers promoting e-mobility</li> <li>6. Noise reduction measures (motorcycle / moped, night traffic, etc.)</li> <li>7. Potential to improve air quality significantly / reduction potential</li> <li>8. High-quality parking for bicycles at central suburban stations</li> <li>9. Residential areas with private parking</li> <li>10. Zero import duty, the utilization rate and the primary registration fee in the amount of 50 percent, exemption from the transport tax.</li> </ol>	<ol style="list-style-type: none"> <li>1. Lack of experience in emerging markets</li> <li>2. Lack of academic knowledge and research in technical faculties</li> <li>3. Lack of frames</li> <li>4. There are no local utilities for renewable energy.</li> <li>5. The number of public parking spaces (underground garages) in the new residential areas of Astana is limited</li> </ol>

<b>Opportunities</b>	<b>Threats</b>
<ol style="list-style-type: none"> <li>1. Increasing environmental problems</li> <li>2. State support of eco-mobiles and infrastructure development</li> <li>3. Automotive partnerships</li> <li>4. Culture of world cooperation - creation of clusters of enterprises</li> <li>5. Proposals for advertising organizations in electric vehicles</li> <li>6. Experience of local industry in a globalized economy</li> <li>7. Impact of the results and infrastructure of the exhibition EXPO -2017</li> <li>8. Green Economy Transition Program</li> </ol>	<ol style="list-style-type: none"> <li>1. Lack of charging infrastructure</li> <li>2. Expanding opportunities for competitors and replacement (car rental, taxi, public transport)</li> <li>3. Lack of world carsharing experience</li> <li>4. High level of corruption and bureaucracy</li> <li>5. Alternative development paths supporting internal combustion engines</li> <li>6. Lack of qualified personnel and mechanics for the repair of electric vehicles</li> <li>7. Insufficient demand for electric cars in the Kazakhstan market</li> </ol>

*Source: Own table*

Table below describes the strengths, weaknesses, opportunities and threats (SWOT) of electric vehicles for developing local strategies in Astana city.

Astana city already has a good level in terms of sustainable transport development strategies. The established goals will further improve the idea of zero emissions and help overcome the future problems of intra-city traffic and make the city center worth living and visiting. Competence of the population of the capital regarding the reduction of emissions and the development of the city's green economy is adequate. Astana has set clear and achievable goals in terms of zero emissions transfer and has previously demonstrated that municipality of city districts place emphasis on achieving such goals.

Many uncertainties and limited effects are already becoming visible upon closer examination of the planned implementation of the development model of Carsharing electric vehicles in the city of Astana.

All interested parties should ensure that the new systems approach considers such elements, for example, how new offers can be built into the existing traffic information and management system, how they are sold and understood by users, and an aspect of the introduction of electric vehicles with zero emission, as far as these measures are able to achieve the decarbonization goals in the microclimate of the capital.

## **5.2 Conducting a survey, the field of transport development in Kazakhstan**

One of the most acute problems of our time is the problem of the ecological state of the environment of large cities. In large cities, the main objects of environmental pollution include air pollution by motor transport. Every year around 95 million cars are produced in the world.<sup>56</sup> Among the sources of air pollution cars rank first. One passenger car can absorb more than four tons of oxygen per year from the atmosphere. The car emits about 800 kg of carbon monoxide, about 40 kg of nitrogen oxides and about 200 kg of various hydrocarbons with exhaust gases.<sup>57</sup>

The annual emission of harmful substances from cars in the world is 50 million tons. hydrocarbons, including 200 million tons carbon monoxide and 20 million tons nitrogen oxides.<sup>58</sup>

Areas of air pollution with harmful substances, such as carbon monoxide and nitrogen dioxide, which are formed by emissions from traffic flows, can be characterized as emissions with high concentrations. Often, emissions exceed the values of maximum permissible concentrations and cover very large areas.

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<sup>56</sup> Electric vehicles, <http://www.oica.net/category/auto-and-fuels/alternative-fuels/electric-battery-powered/>

<sup>57</sup> Methods and results of the assessment of the impact of road transport on the environmental pollution of a large city region: (Using the example of Moscow) / [Zotov V. B., et al.]. - M.: Prima-press, 1997. - 104 p.

<sup>58</sup> N.G. Kirillov, The problem of ecologization of road transport in St. Petersburg // Industry Today. No. 11. 2001. - C.13, <https://www.doccity.com/ru/problemy-ekologii-avtomobilnogo-transporta-rossii/1147900/>

The highest values of the maximum concentrations of harmful (or polluting) substances in the atmospheric air are created near highways and their interchanges, through which motor traffic flows with different intensity, density and speed.<sup>59</sup>

The increase in emissions of suspended solids, hydrogen fluoride, and the presence of sulfur and nitrogen dioxide in the atmosphere in Astana are due to an increase in the number of vehicles. The share of transport in atmospheric pollution in the city of Astana on average is about 47.8 percent.<sup>60</sup>

Every year the situation worsens due to the rapid growth in the number of cars and, consequently, traffic jams. To the problem of environmental pollution is added the problem of depletion of oil reserves and, therefore, the increase in fuel prices.

In fact, in all developed countries of the world, strict standards have been introduced to reduce harmful emissions from automobiles. Different types of transport on environmentally friendly fuel were proposed and developed.

However, in practice, electric cars were the most efficient. Many countries have approved state programs for the transition of urban vehicles to electric traction.<sup>61</sup>

The largest car manufacturers started production of their own lines of electric cars. City services of large cities establish test stations for charging electric vehicles to stimulate society to move to electric vehicles.

However, the transition process is still delayed due to the lack of research of the entire complex of infrastructure necessary for the full use of the electric vehicle.

In Kazakhstan, to this day, no research has been carried out on the practical use of electric vehicles in urban environments.

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<sup>59</sup> Sidorenko L.P., Guturova V.V. Prospects for the development of environmentally friendly vehicles in Russia, [https://www.nntu.ru/frontend/web/ngtu/files/org\\_structura/instit\\_fakul\\_kaf\\_shkoly/fsvk/dissertacii/2017/kozlova\\_t\\_a.pdf?07.04](https://www.nntu.ru/frontend/web/ngtu/files/org_structura/instit_fakul_kaf_shkoly/fsvk/dissertacii/2017/kozlova_t_a.pdf?07.04)

<sup>60</sup> Strategic plan of the State Institution “Department of Natural Resources and Environmental Management of the City of Astana” for 2011-2015, Astana Municipality, <http://upr.astana.kz/?p=283>

<sup>61</sup> Tuleshov A. Integration capabilities of electric vehicles in Kazakhstan: Monograph. Almaty, Nur-Print, 2014. Almaty, 2014. – 93, ISBN 978-601-7390-41-9, p., [http://portal.kazntu.kz/files/publicate/2015-10-12-11845\\_1.pdf](http://portal.kazntu.kz/files/publicate/2015-10-12-11845_1.pdf)

In this regard, a gap appeared in this area, which must be filled with additional research and practical results. There is a need to study the technology of refueling an electric vehicle with energy carrier, to consider the energy potential to reduce risks when introducing a new type of transport.

Work on the formation of the park and the study of electro mobile transport are relevant, as they lie in the mainstream of strategic developments to improve the economic and environmental safety of Kazakhstan.

A significant element of the state strategy for the development of electro mobile transport is the support of the most problematic aspects of the new sub-sector of motor transport. Such problematic aspects are: staffing, regulatory support, as well as informational support, including the relevance of the formation of the financial mechanism for managing this industry.

Ust-Kamenogorsk plant AZIA AVTO in June 2017 during the EXPO-2017 exhibition in the capital presented the electric sedan LADA Vesta EV, which was produced at the company's production facilities.

Thus, within the framework of the development of the green economy in Kazakhstan, certain measures are being taken in shaping interest in electro mobile transport.

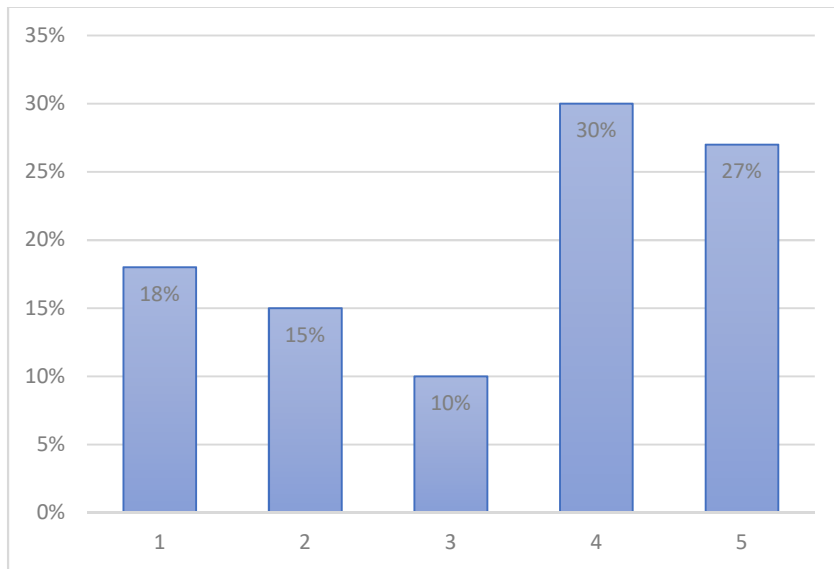
The survey was conducted among 100 respondents. The respondents consist of owners of vehicles, students of faculty of automobile transport, student of faculty of ecology, workers of car parking.

Respondents were asked to answer 10 questions of the questionnaire, based on the Likert scale, the degree of agreement was evaluated from 1 (no) to 5 (Yes).



Question 1: The main economic factors affecting the state of the automotive industry market are the volume of investments in fixed assets, the rate of lending to the economy and the income of the population.

Figure 12: Survey question # 1



*Source: Own processing*

Answer 1. Absolutely disagree: 18 respondents (18%)

Answer 2. I do not agree: 15 respondents (15%)

Answer 3. I am neutral: 10 respondents (10%)

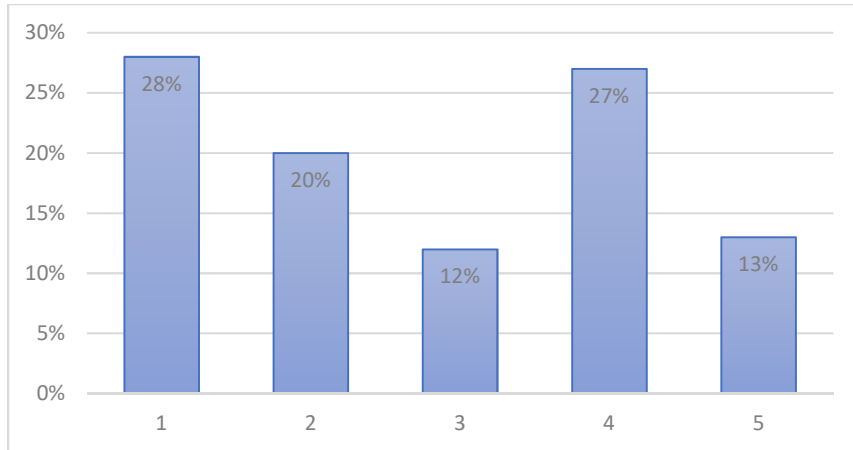
Answer 4. I agree: 30 respondents (30%)

Answer 5. I absolutely agree: 27 respondents (27%)

As we according to the results most respondents agree with the fact that volumes of investments, economy lending rates and income of population are the main economic factor that affect on vehicle market situation. The majority truly believe that only rich population of the country can afford buying vehicles.

Question 2: The demand for electric cars will grow in the automotive market in Kazakhstan.

Figure 13: Survey question # 2



*Source: Own processing*

Answer 1. Absolutely disagree: 28 respondents (28%)

Answer 2. I do not agree: 20 respondents (20%)

Answer 3. I am neutral: 12 respondents (12%)

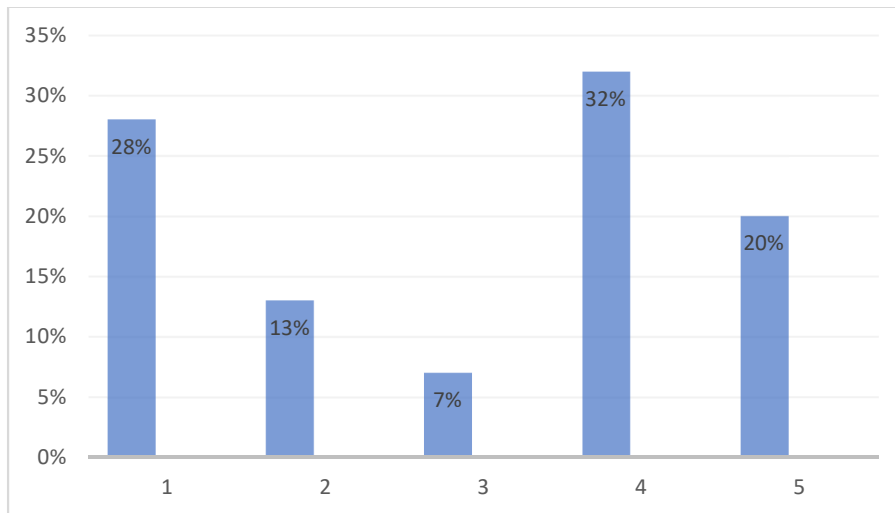
Answer 4. I agree: 27 respondents (27%)

Answer 5. I absolutely agree: 13 respondents (13%)

Most of the respondents don't agree that demand of automobile industry will increase. Only 27% agree and 13 % absolutely agree with this statement which is only a minority. As mentioned of the respondents: "Kazakhstan is only a developing country and advance of such technologies would not be that rapid as we want."

Question 3: The basic criterion for the development of electro mobile transport in Kazakhstan is the presence of charging stations.

Figure 14: Survey question # 3



*Source: Own processing*

Answer 1. Absolutely disagree: 28 respondents (28%)

Answer 2. I do not agree: 13 respondents (13%)

Answer 3. I am neutral: 7 respondents (7%)

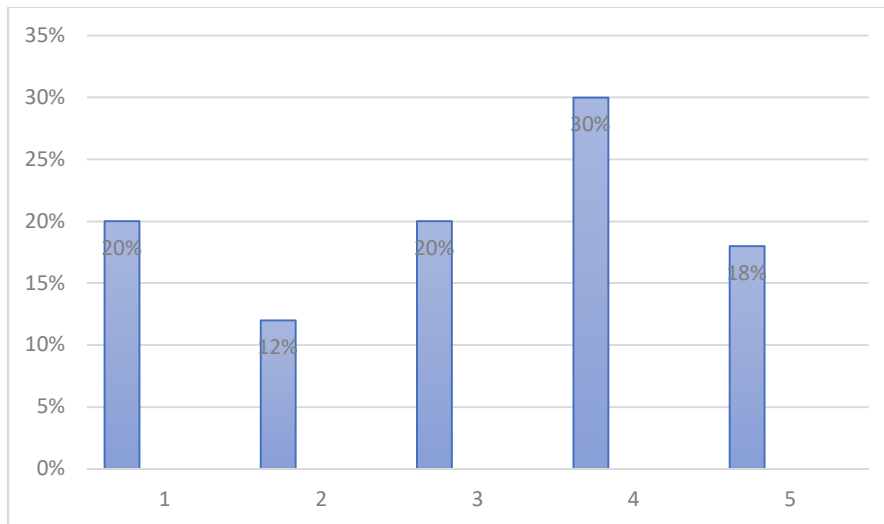
Answer 4. Agree: 32 respondents (32%)

Answer 5. I absolutely agree: 20 respondents (20%)

According to the results there is an assumption that the main criteria for development of electric vehicles in Kazakhstan is the availability of charging stations that currently are not developed there. As it was mentioned in the thesis work, the government should support EV implementation starting with financial support to create required infrastructure.

Question 4: An effective solution to the problem of increasing the number of charging stations in Astana is the presence of many underground parking lots.

Figure 15: Survey question # 4



*Source: Own processing*

Answer 1. Absolutely disagree: 20 respondents (20%)

Answer 2. I do not agree: 12 respondents (12%)

Answer 3. I am neutral: 20 respondents (20%)

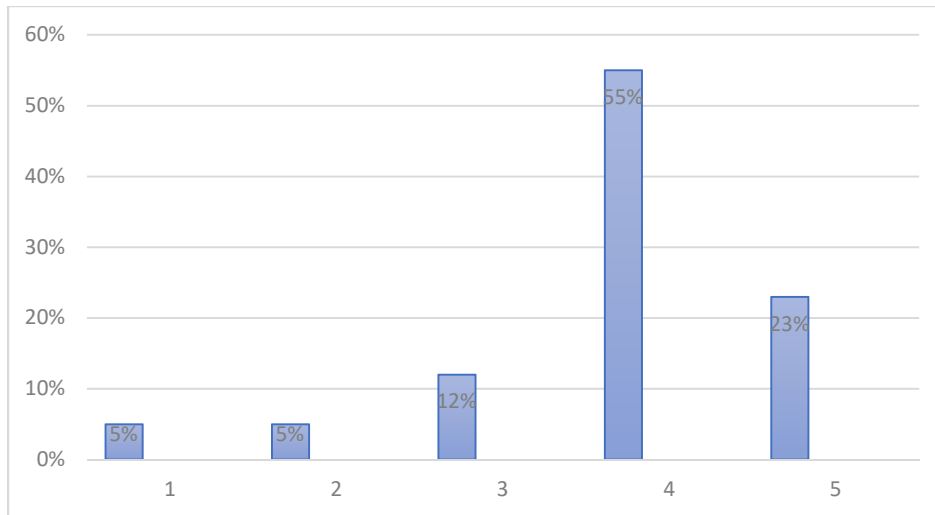
Answer 4. I agree: 30 respondents (30%)

Answer 5. I absolutely agree: 18 respondents (18%)

To increase the number of charging stations it is necessary to establish more underground parking lots. The minority of respondents of 20 % disagree with this question.

Question 5: Holding EXPO-2017 has intensified interest in electric vehicles in Kazakhstan.

Figure 16: Survey question # 5



*Source: Own processing*

Answer 1. Absolutely disagree: 5 respondents (5%)

Answer 2. I do not agree: 5 respondents (5%)

Answer 3. I am neutral: 12 respondents (12%)

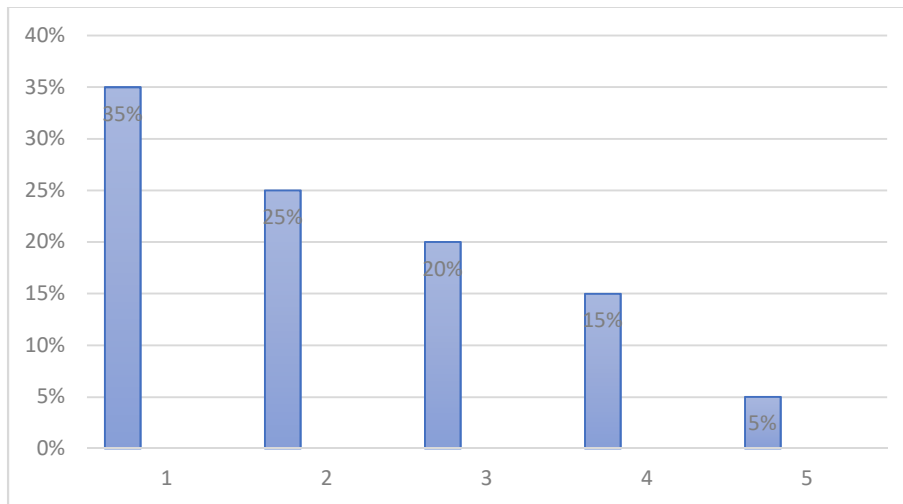
Answer 4. I agree: 55 respondents (55%)

Answer 5. I absolutely agree: 23 respondents (23%)

The poll showed that the greater number of the interviewees agree with that EXPO 2017 activated the demand for electro mobiles in Kazakhstan for 55 %, as a lot of investors and producers of vehicles arrived at Kazakhstan from different countries.

Question 6: Charging conditions and the price of an electric vehicle do not play a key role in choosing the brand and type of electric vehicle.

Figure 17: Survey question # 6



*Source: Own processing*

Answer 1. Absolutely disagree: 35 respondents (35%)

Answer 2. I do not agree: 25 respondents (25%)

Answer 3. I am neutral: 20 respondents (20%)

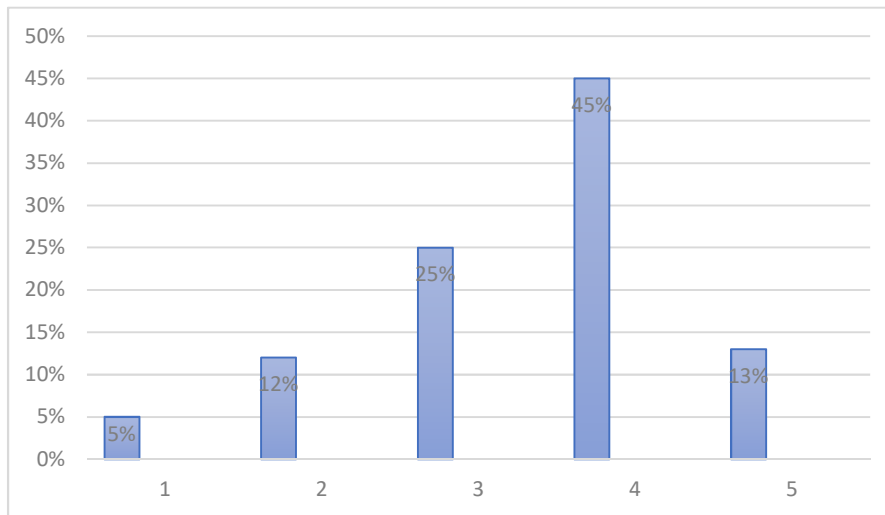
Answer 4. I agree: 15 respondents (15%)

Answer 5. I absolutely agree: 5 respondents (5%)

The key element for a buyer of electric vehicles is a price and charging conditions. The conditions of the country for electric vehicles implementation are unfavourable.

Question 7: In the development of the car-sharing project of electric vehicles, it is necessary to use the model of public-private partnership.

Figure 18: Survey question #7



*Source: Own processing*

Answer 1. Absolutely disagree: 5 respondents (5%)

Answer 2. I do not agree: 12 respondents (12%)

Answer 3. I have a neutral attitude: 25 respondents (25%)

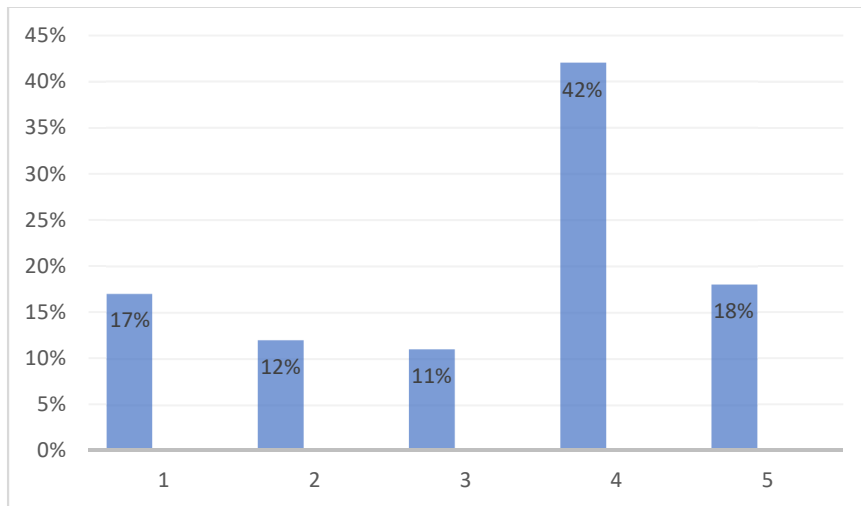
Answer 4. I agree: 45 respondents (45%)

Answer 5. I absolutely agree: 13 respondents (13%)

The survey shows that the relative quantity supports the fact that the main factor for establishment of electric vehicles car-sharing is a public-private partnership. 45 % agree and 13 % absolutely agree which creates a confidence in the necessity of PPT project implementation.

Question 8: Large automakers entering the market of Kazakhstan impose strict requirements on the availability of charging infrastructure.

Figure 19: Survey question # 8



*Source: Own processing*

Answer 1. Absolutely disagree: 17 respondents (17%)

Answer 2. I do not agree: 12 respondents (12%)

Answer 3. I am neutral: 11 respondents (11%)

Answer 4. Agree: 42 respondents (42%)

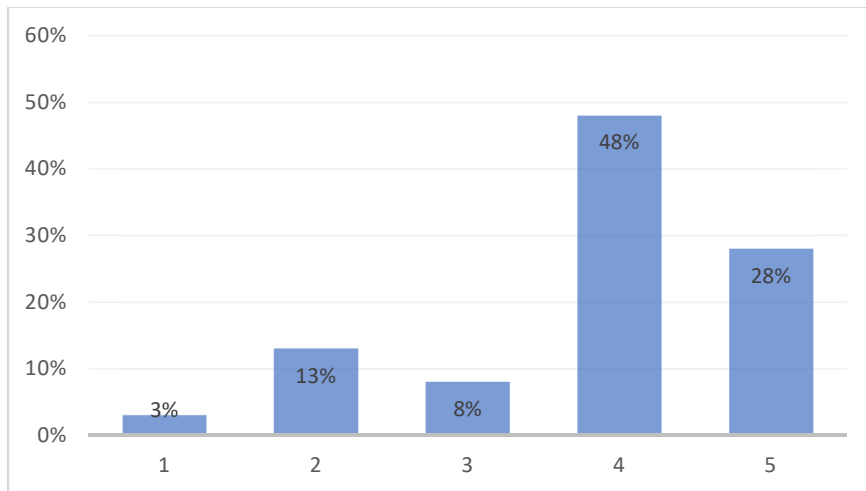
Answer 5. I absolutely agree: 18 respondents (18%)

The result is that high requirements are needed for infrastructure of electric vehicles, especially charging stations and parking lots according to 42 % agreed and 18 % absolutely agreed answers of the respondents.



Question 9: The complex of services for the operation of electro mobile transport is not formed in Kazakhstan.

Figure 20: Survey question # 9



*Source: Own processing*

Answer 1. Absolutely disagree: 3 respondents (3%)

Answer 2. I do not agree: 13 respondents (13%)

Answer 3. I am neutral: 8 respondents (8%)

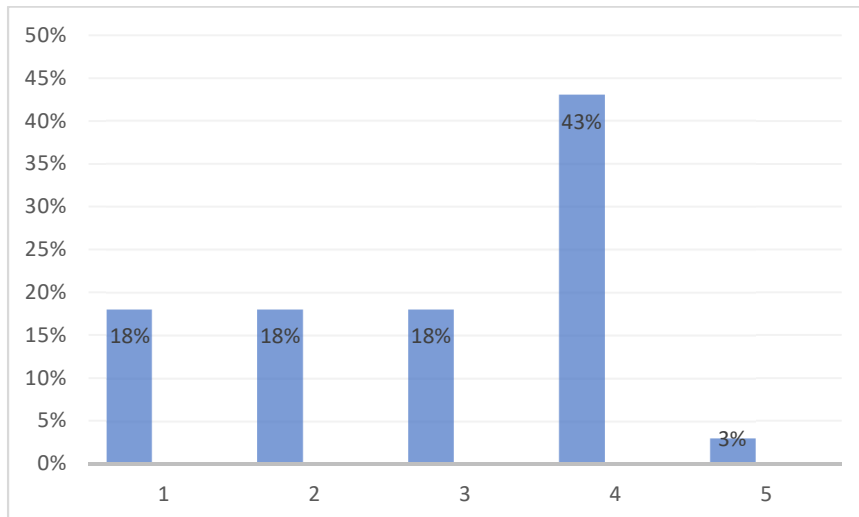
Answer 4. Agree: 48 respondents (48%)

Answer 5. I absolutely agree: 28 respondents (28%)

In Kazakhstan service level is low for establishment of electric vehicles. The big majority of respondents 48 % agree and 20 % are absolutely agree with this statement.

Question 10: The profitability and payback of the project on the introduction of car-sharing services for electric vehicles in the city of Astana can be compensated for by advertising large corporate players (banks, national companies) on electric vehicles.

Figure 21: Survey question # 10



*Source: Own processing*

Answer 1. Absolutely disagree: 18 respondents (18%)

Answer 2. I do not agree: 18 respondents (18%)

Answer 3. I am neutral: 18 respondents (18%)

Answer 4. Agree: 43 respondents (43%)

Answer 5. I absolutely agree: 3 respondents (3%)

The project of car-sharing requires a huge amount of capital, 43% of respondents agree with that and 3 % absolutely agree according to the result of the survey.

The analysis figured out that most respondents believe that for the successful implementation of electric vehicles car-sharing in the city of Astana, it is important to have parking spaces, the level of quality management of the company to provide services, support from government agencies and municipality.

A qualitative leap in the development of electric vehicles in Kazakhstan, according to the respondents, will be to popularize the use of electric vehicles in the urban environment through the introduction of electric vehicles car-sharing.

The financial efficiency of the project is estimated ambiguously by topic-aware people, and many respondents consider consideration of the possibilities of using operational leasing, subject to preferential loans from second-tier banks and state support within the priorities of greening the urban environment of megacities.

According to the whole work provided there are can be concluded some advantages and disadvantages of having electro mobiles. Electric cars attract more and more attention for consumers unmatched benefits. Compared to conventional vehicles with a combustion engine they are lower consumption, less noise and lower emissions. The big disadvantage of EM is the high purchase price, which is significantly higher than the price of combustion vehicles of the same classes.

Analyzing electric vehicles current situation there is a table 8 that describes its positive and negative points.

Table 8: Advantages and Disadvantages of electric vehicles

<b>ADVANTAGES</b>	<b>DISADVANTAGES</b>
High efficiency of the electric motor: reaches 90%	High purchase price: at least twice as high (high battery prices)
Low operating cost, maintenance and service costs: compared to classic cars	Small supply of available models on the market
Possibility of using renewable energy sources	Great weight: due to the high weight of the batteries,
Emission elimination	Limited battery life
Minimum noise and vibration	Short distance availability: Designed primarily for urban traffic (no heating, air conditioning)
Better drive technical features: power increases steadily, instant gas response, smooth start of the car, easy operation	Long charging time
Drive location and size: optimizing internal and external space dimensions	Not developed recharging infrastructure
Traffic safety: elimination of fire due to accident or damage fuel system thanks to an electric drive	Insufficient state support
	Danger of leakage of poisonous substances: Leakage may be leaked in case of an accident battery system
	Risk of fire: Li-Ion battery may suffer uncontrolled breakage of cells when overheating or overloading, in extreme cases it may lead to burning.

Own table based on the source<sup>62</sup>

<sup>62</sup> Are Electric Vehicles a Fire Hazard? [Online]. [cit. 2014-04-18]  
<https://www.technologyreview.com/s/521976/are-electric-vehicles-a-fire-hazard/>

Based on the analyzed all the data source about electro mobile industry there is a table made by author of advantages and disadvantages of it. The development of electromobility industry mainly depends on the development of relevant infrastructure. Another significant point is state support towards electric vehicle future. The development of it basically requires a continuous investment.

### **5.3 Project justification and financial assessment of the effectiveness of the car-sharing project of electric vehicles in Kazakhstan**

Carsharing service uses RFID (Radio Frequency Identification) technology to unblock cars of a rented car.

The most advanced solutions control the transport via wireless Internet, in this case the signal to the machine is fed through the operator's server.

In the first version, the client must have a Carsharing operator card with him.

In the second variant, restrictions on the possibility to rent a car in areas of weak cellular communication is necessary. Under the condition of underground parking or congestion of the base station, renting a reserved electric vehicle can be complicated.

The new technology MonGeo Connect gives an advantage - to perform actions to control the electric car does not need to connect to the mobile Internet.

Interaction between the client's smartphone and the onboard control unit may take place over a radio channel with a close range.

The basic principle is that the user downloads the MonGeo App for Android or iOS to the smartphone and registers in the system, receives a login and password.

After authorization, the user selects an available electric car and reserves it. Now, simultaneously in the application and in the electric vehicle with installed on-board equipment, a special key is transmitted in encrypted form.

As soon as the user enters the range of the electric vehicle's Bluetooth network, the application automatically connects to it, and it is possible to control the electric vehicle directly from the application. After the end of the lease, the keys in the smartphone and the car are erased.

Innovative technology allows you to make the process of managing the rental of an electric vehicle fast and reliable. In Western practice, users who used such services often encountered cases of network failures. This fact forces customers to constantly call up with the system operator for remote control of the car through the contact center. As a rule, the more reliable the system functions, the more positive feedback about its work will be received by the car sharing operator and will attract more users.

Carsharing system regulates incorrect signals and blocks commands during the movement of the electric vehicle. The use of technology U2F (Universal 2nd Factor) allows you to further protect when you lose your smartphone. So, this technology is not only reliable and stable, but also safe.

Access to the platform is based on a subscription.

The size of the monthly fee depends on the number of connected electric vehicles.

MonGeo Car platform outsourcing service includes:

The inclusion of electric vehicles carsharing - operator to the data processing server.

The inclusion of an automated workplace operator.

Configure client mobile applications to the system.

Connecting customers through the web interface of the system.

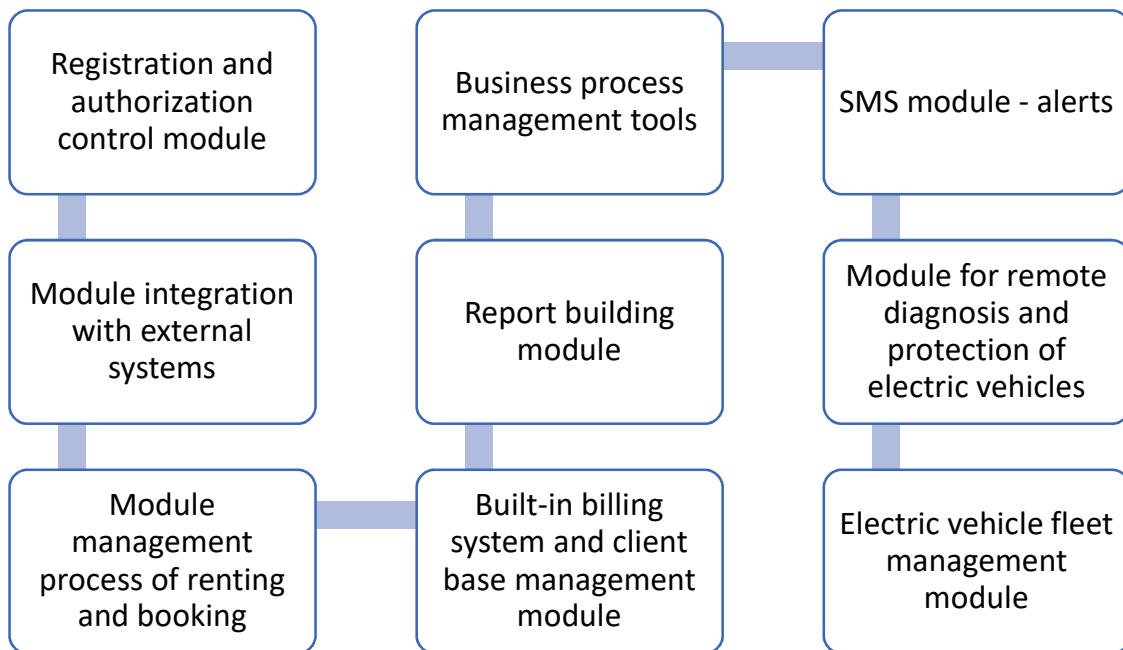
Rental of telematics kits with keyless entry.

Thus, car-sharing of electric vehicles includes technological advantages:

- A box solution that fits most commercial electric vehicles used in car sharing services.
- The modular configuration of the technology makes it possible to carry out a quick replacement or change of the modification to the current one.
- The equipment supports GLONASS, is certified, and has all the necessary management and control functions.

As a result, a complete automated control system for car-sharing service of electric vehicles includes the following modules:

Figure 22: Modules of car-sharing system



*Own table based on the source<sup>63</sup>*

The service has a simple registration procedure. The user should prepare an identity card, driver's license and a bank card. Registration is remote, via smartphone. The user enters the required data of these documents, then takes a picture with them. After a certain time, after checking the technical data, the user receives confirmation of his account. After that, the client can rent a car.

<sup>63</sup> The Carsharing Telematics Market, <http://www.berginsight.com/ReportPDF/ProductSheet/bi-carsharing2-ps.pdf>, 2017

Table 9: Initial project investment

Name	Quantity	Price	Total
			2019
<b>Equipment</b>			396 000 000 KZT = 930 600 EUR
<b>Electric vehicle</b>	40	9 000 000 KZT = 21 192 EUR	360 000 000 KZT = 847 680 EUR
<b>Software</b>		900 000 KZT = 2 119 EUR	36 000 000 KZT = 84 600 EUR
<b>Other fixed assets</b>			9 100 000 = 22 000 EUR
<b>Microvan</b>	1	9 000 000 KZT=21 192 EUR	9 000 000 KZT = 21 192 EUR
<b>Auxiliary equipment</b>	1	100 000 KZT = 235 EUR	100 000 KZT = 235 EUR
<b>Total</b>			405 100 000 = 951 985 EUR

*Own table with calculation*

Project cost in Table 10 is used to summarize the activities that will take place within a project providing a breakdown of the costs from the project level down to activity level. This helps to define the critical inputs required to ensure that the goals of the project can be achieved within the envisaged timeframe.



The financial model of the investment project reflects the following indicators, shown in the table below:

Table 10: Project Performance Indicators

Project Evaluation	KZT/EUR
<b>NPV (Net Present Value)</b>	939 539 KZT = 2 207 88 EUR
<b>IRR (Internal Rate of return) %</b>	38.0%
<b>PI (Profitability index)</b>	2.0
<b>ARR (Accounting Rate of Return), %</b>	58.5%
<b>SRR (Simple rate of return), %</b>	22.5%
<b>Project payback period (years)</b>	6.5 years
<b>Break-even (thousand KZT/EUR)</b>	57 593 KZT = 140 EUR
<b>Operating leverage, %</b>	1.8 %
<b>Profitability of the main activity, %</b>	355.2%
<b>Accumulated profit (thousand KZT)</b>	1 077 681 KZT = 2 532 51 EUR
<b>Cumulative cash flow (thousand KZT)</b>	1 005 973 KZT = 2 364 EUR

*Own table with calculation*

- 1) NPV = Net present Value with IRR (Internal rate of return) of 38% NPV is equal to 0 which means that money from project are enough to:
  - Return capital investment 405 100 000 KZT = 951 985 EUR
  - Make required revenue for its capital 1 005 973 KZT = 22 131 406 EUR
- 2) Operating leverage is a cost-accounting formula that measures the degree to which a firm or project can increase operating income by increasing revenue. A business that generates sales with a high gross margin and low variable costs has high operating leverage.<sup>64</sup>

<sup>64</sup> What is Operating Leverage? <https://www.investopedia.com/terms/o/operatingleverage.asp>, 2019

$$DOL = \frac{MP}{EBIT}$$

MP = Marginal profit = (p - v) \* Q; P = selling price per unit sold; V = Variable cost per unit;

Q = quantity sold

$$MP = (9\,000\,000 - 19\,000) * 355\,520 = 8\,981\,000 * 355\,520 = 3\,192\,925$$

$$P = 9000000; V = 19\,000 \quad Q = 355\,520$$

$$EBIT = (P - V) * (Q - FC) = (9\,000\,000 - 19\,000) * 355\,520 - 1\,773\,847$$

$$FC = 3\,192\,925 - 1\,419\,078 = 1\,773\,847$$

3) PI (Profitability index)

$$PI = \frac{PV}{CI} = \frac{939\,539}{469\,769\,85} = 2$$

Thus, the project shows acceptable financial performance indicators for implementation.

The company in the process of implementing the project creates the necessary technical base, infrastructure and premises.

The financial imbalance includes various currencies of income and credit, price increases for contracts, the unjustified optimistic prices in the calculations, the lack of marketing research, the lack of "strength" of price strength, calculations without including inflation processes.

In addition, irrational use of funds, lack of optimization of the tax burden, and weak sales activities have a significant effect on the increase in financial risks.

Analyzing the listed threats, the company pays close attention to financial planning and control issues. A strong analytical base will help the operational management decisions and reduce the above risks.

The main reasons for the emergence of marketing risks are: lack of marketing research; wrong choice of direction of development of the chosen activity; lack of experience in product sales; lack of a sales program; not considering features of the trade policy of competitors.

Therefore, of the carsharing project implementation there will be positive consequences for the transport complex of Kazakhstan.

For the normal functioning of electric vehicles will be introduced about 13 new standards for electric vehicles.

A charging infrastructure will be created in the capital for electric vehicles.

The demand for eco-friendly mode of transport will be intensified. Harmful emissions in the urban environment of the capital will be reduced.

## **6 Conclusion**

During the final thesis there were analyzed applicable and perspective methods and forms of PPP in the development of electro mobile transport, as well as provided recommendations on further steps necessary for its development in Kazakhstan.

Key characteristics of green PPP projects are:

- 1) a combination of standard principles for financing projects and the principles of environmental economics to develop a simple and reliable justification for government support for low-emission projects;
- 2) attracting new investments in environmentally friendly technologies instead of low-cost, high-pollution alternatives;
- 3) priority should be given to “green” PPP projects in assessing and monetizing environmental impacts at the global and local levels because of the project, as well as distortions resulting from subsidizing hydrocarbon fuels;
- 4) the existence of appropriate policies and conditions in the country that are designed to help the government perform a responsible function of creating a favorable investment climate and equal conditions for projects that imply low emissions;
- 5) the country's system of agreements on the effectiveness of PPPs, based on the regulatory framework, and sanctions for non-compliance with the requirements of the agreements should serve as the basis for a reliable and effective system of law, monitoring and regulation, reporting and subsequent evaluation necessary to reduce third-party liability risks.

Regulatory measures to support demand of electric vehicles may include the following initiatives implemented at the regional and national levels:

1) Measures to support demand should be aimed at reducing the cost of ownership and increasing the convenience of using electric vehicles, including:

- zero duties on the import of electric vehicles;
- free parking in the city / reduction of waiting time for receiving an individual parking space near the place of residence;
- access to lanes allocated for public transport and taxis;
- privileges on transport tax;
- free charging at public charging stations;
- discounts on the purchase of a motor third party liability insurance policy;
- discounts / free travel on paid sections of roads;
- excise tax exemption when purchasing electric vehicles
- The introduction of an environmental tax with reference to CO2 emissions;
- replacement of the unit of account for transport tax from HP to cubic meters. cm.

2) Activities to support the proposal should relate to the creation of conditions (tax breaks, export incentives, ease of doing business) for manufacturers of components of electric vehicles, including the manufacturers of batteries and battery packs.

The purpose of the component production support program should be to create incentives for the arrival of foreign manufacturers (such as Panasonic or LG Chem) with deep localization and focus on export sales markets. Otherwise, the domestic market will not have sufficient capacity (less than 5 GWh per year) to provide economies of scale and achieve a competitive battery cost of \$ 100-150 per kWh.

3) The following possible directions for regulating and supporting the development of charging infrastructure that can be implemented in Kazakhstan can also be highlighted:

- Regulator Levers. The Town Planning Code establishes the norms of urban planning, as well as requirements and specifications for real estate objects under construction. It is necessary to provide for amendments that establish the requirement for the mandatory equipping of new properties with

the necessary infrastructure to connect charging stations or the minimum number of charging stations per unit area of the territory being built.

- Technical regulations and standards for equipment charging stations determine the minimum technical requirements for the connection and safe operation of charging stations.

It is necessary to provide for amendments concerning the charging stations in the technical regulations of the Customs Union “On the safety of low-voltage equipment” (TP TC 0042011), namely the development of specialized regulations and regulations on the technical connection of charging infrastructure to electric networks, the formation of technical solutions for combining traditional distribution facilities networks with charging infrastructure.

- Regulation of electricity tariff through the investment component.

- The inclusion of investments in the development of infrastructure of charging stations in the calculation of tariffs for electric grid companies will increase the attractiveness of the industry for investors.

- Issuance of permits and directives - charging stations are already included in the list of objects that can be placed on land or land plots owned by the state or municipality without providing land plots or establishing servitudes.

Based on international practice, it is also necessary to provide for the possibility of establishing a simplified procedure for obtaining permits for the construction of such facilities.

- Ownership of land plots that can be used for charging infrastructure - municipality can transfer land plots in their ownership (street territories, public parking spaces) to private operators for the development of charging infrastructure in urban areas.

4) It is also necessary to provide monetary and non-monetary incentives:

- Subsidies for various types of charging equipment and types of owners, for example, for consumers of a home charging station and retail outlets.

- Tax breaks for owners and operators of charging infrastructure may include exemptions / discounts on property tax, value added tax, income tax.

- Discounts on the tariff for electricity, including zero selling retail tariff for objects of charging infrastructure.

## 7 Literature

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