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# ENERGY EFFICIENCY IN TRANSPORT SECTOR OF THE REPUBLIC OF KAZAKHSTAN: CURRENT STATUS AND MEASURES FOR IMPROVEMENT

Analytical Report, 2015



UDC 656

LBC 39.1

E65

E65 Energy Efficiency in Transport Sector of the Republic of Kazakhstan:  
Current Status and Measures for Improvement. Almaty, 2015 – XX pages

ISBN 978-601-80520-1-9

This report was prepared under the UNDP/GEF Project 'City of Almaty Sustainable Transport'. The report analyzes the current state of energy efficiency in transport sector of the Republic of Kazakhstan and provides recommendations for central and local governments of the country on how to improve it based on the synthesis of international best practices.

The report was composed by the Group of Experts of the Green Academy Scientific Research and Education Center, Tynyshbayev KazATC JSC, Zhasyl Damu JSC, edited by prof., D.Sc. Yessekina B. K.

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This publication is intended for state officials, management of businesses, scientists, experts and all those interested in energy efficiency and reducing greenhouse gas emissions in course of modernizing the national economy.

UDC 656

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ISBN 978-601-80520-1-9

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REPUBLIC OF KAZAKHSTAN:  
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# Glossary

AGDS	Automatic Gas Distribution Stations
CNGC	CNG Vehicle Refueling Compressor
VRS	Vehicle Refueling Station
LDV	Light-Duty Vehicle
MT	Motor Transport
GDP	Gross Domestic Product
GEF	Global Environment Facility
ICE	Internal Combustion Engine
RTA	Road Traffic Accident
EU	European Union
H&U	Housing and Utilities
EF	Efficiency Factor
CNG	Compressed Natural Gas
CIT	Corporate Income Tax
LRT	Light Rail Transit
IEA	International Energy Agency
VAT	Value Added Tax
OR	Oil Refinery
OECD	Organization for Economic Cooperation and Development
GHG	Greenhouse Gases
UNDP/GEF Project	Project of the United Nations Development Program and the Global Environmental Facility 'City of Almaty Sustainable Transport'
UNFCCC	United Nations Framework Convention on Climate Change
LPG	Liquefied Petroleum Gas
LHCG	Liquefied Hydrocarbon Gas
EE	Energy Efficiency
GIZ	German Society for International Cooperation
ЭЭ	энергоэффективность
GIZ	Немецкое общество международного сотрудничества

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# INTRODUCTION

The United Nations Framework Convention on Climate Change (hereinafter referred to as the UNFCCC) sets out goals on climate change mitigation and reduction of greenhouse gas emissions for all countries. Thus, according to the International Energy Agency, urgent action is recommended in transport sector, where by 2050 CO<sub>2</sub> emissions must be reduced: by 80 % for developed countries and by 70 % for developing countries. Achieving this will require strong political action at all government levels<sup>1</sup>.

The Republic of Kazakhstan, as a country with booming economy, also needs to define its goals to address the challenge at the national level. First, strategic measures need to be developed to improve energy efficiency of the overall national economy, including the transport sector, which bears great importance for the international efforts pursuing stabilization of the global warming.

It is well known that the Concept for Transition of the Republic of Kazakhstan to Green Economy<sup>2</sup> (hereinafter referred to as the Concept), approved by the President of the Republic of Kazakhstan in his Decree issued in May 2013, defined the strategic approaches and directions of focus for the country in its transition to low-carbon development and energy efficiency. Thus, section 3.3 of the Concept outlines a number of key reasons of high energy

consumption for transport, which include, in the first place, aging of the vehicle fleet (80%), inadequate fuel quality as to European standards, limited gas fuel utilization due to the lack of gas infrastructure, and substandard road infrastructure for public transport, electric-powered mobility, cycling and walking, etc. Action Plan for implementation of the Concept until 2020<sup>3</sup> defines a set of measures to reduce transport emissions. Paragraphs 86–88 of the Action Plan include performance of a review and alignment of the national standards on transport emissions with the European standards; annual inspections of exhaust quality and conversion of large cities' public transport to gas fuel; as well as implementation of 4 pilot projects on energy efficiency in transport.

To date, the Energy Efficiency 2020 Program<sup>4</sup> developed over 3,000 standards of energy consumption, including approval of Energy Efficiency Requirements for buildings, transport and electric motors, and over 200 Technical Standards on energy efficiency. Despite the adoption of the Program and the Almaty Sustainable Transport Strategy for 2013–2023<sup>5</sup>, developed with the assistance of the UNDP/GEF Project 'City of Almaty Sustainable Transport' (hereinafter referred to as the UNDP/GEF Project), the challenges in improving energy efficiency and reducing transport-related emissions remain urgent at both the national and local levels, and require effective action at this stage of innovational development of the country.

With this in view, the UNDP/GEF Project initiated preparation of this analytical report to develop recommendations for central and local governments to improve energy efficiency and reduce emissions from the transport sector of the Republic of Kazakhstan, based on research and synthesis of the international best practices.

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1. IEA, 2014

2. Concept for transition of the Republic of Kazakhstan to Green Economy

3. Action Plan for implementation of the Concept for Transition of the Republic of Kazakhstan to Green Economy for 2013-2020

4. Energy Efficiency 2020 Program of the Republic of Kazakhstan, 2012

5. Almaty Sustainable Transport Strategy for 2013-2023

# 1 ENERGY EFFICIENT TRANSPORT: INTERNATIONAL EXPERIENCE AND THE REPUBLIC OF KAZAKHSTAN

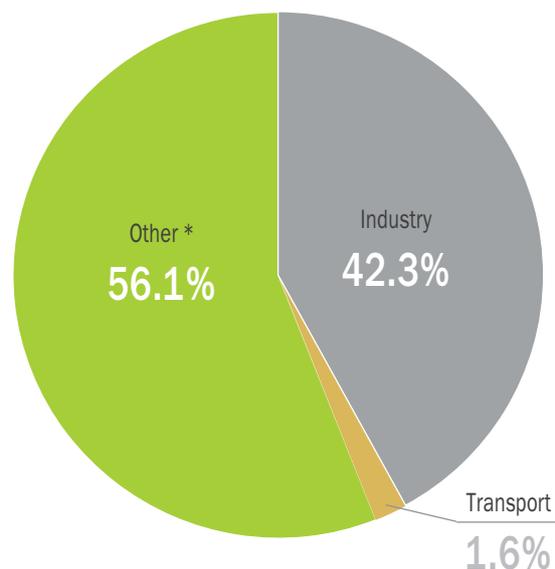
## 1.1. Current trends and methodologies used to assess energy efficiency in transport

The global energy crisis makes energy efficiency a top priority for economic policies in both developed and developing countries. World practice demonstrates that improving energy efficiency is the most effective way of ensuring energy security, mitigating the socio-economic impact of the growing energy prices and climate change. In addition, the increased energy efficiency promotes higher competitiveness.

Energy efficiency measures not only reduce fuel consumption, but also contribute to overcoming other challenges associated with various transport modes. Thus, the effective organization and operation of public transport contribute to a significant reduction in fuel costs, traffic congestion, noise, local air pollution, decrease the risk of accidents and greenhouse gas emissions, and ensure economic growth.

Currently, energy efficiency is recognized as a key indicator in energy strategies of many countries. Growing energy demand depends on the areas where the ultimate consumption occurs (transport, industry, households, services, agriculture, and other). According to experts, road transport consumes approximately 70% of energy used in the global transport system, while road passenger transport alone accounts for 50% of this energy consumption<sup>6</sup>.

Figure 1: Energy consumption by sector, 2012



\*Including agriculture, commercial and public services, housing and other

Source: IEA (2014).

6. Urban Transport and Energy Efficiency. Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities. – GIZ. 2013. – 106 pp. - <http://www.giz.de>

According to the International Energy Agency (IEA), between 1990 and 2011, transport energy consumption increased by almost 55% to 102 exajoules (EJ) (excluding international bunkers), and was the fastest-growing end-use sector.] In 2001, 27% of global total final energy consumption was transport energy consumption. The associated CO<sub>2</sub> emissions rose broadly in line with this increased energy consumption to reach 6.8 gigatonnes of carbon dioxide (hereinafter referred to as CO<sub>2</sub>). On average, the growth in non-member countries of the Organisation for Economic Co-operation and Development (OECD) (100%) was faster than in OECD countries (26%). The large increase in non-OECD countries is in part attributable to the rapid economic growth of several major countries, leading to increased personal disposable incomes, higher vehicle ownership and increased need for freight transportation.

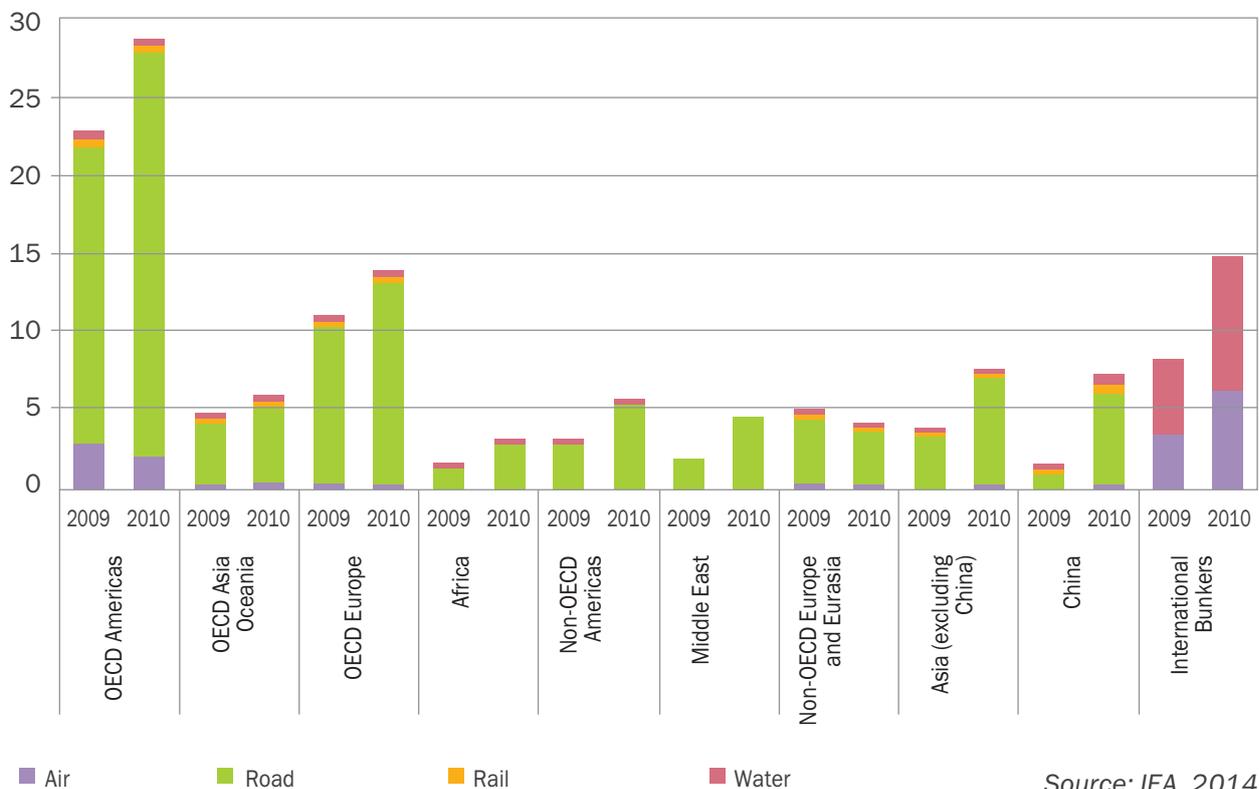
Today, there are huge regional differences in energy consumption for transport. The United States, Canada, Australia and Saudi Arabia are among the countries with high levels of energy use per capita. At the same time, India and neighboring countries, as well as some African countries expend about 20 times less energy to transport.

The use of different types of fuel varies by region. In Europe, Latin America and India, diesel is the main fuel used in transport, while in North America, the Middle East and the OECD countries of the Pacific region, gasoline predominates. In the former Soviet Union, compressed natural gas (CNG) and liquefied petroleum gas (LPG) make up a relatively large share of transport fuels. Only a small proportion of the energy used derives from natural gas, electricity or biomass<sup>7</sup>.

According to forecasts, along with an increase in renewable fuels, petroleum-based types will maintain their dominant position, while possessing a specific gravity greater than 90%. IEA expects oil demand growth in the transport sector by 2030 by 25%. However, the future development of this demand varies greatly between regions.

7. Urban Transport and Energy Efficiency. Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities. – GIZ. 2013. – 106 pp. - <http://www.giz.de>

Figure 2. Transport energy consumption by mode



Source: IEA, 2014

Note: All international navigation and aviation are included in the last bars, and are considered as a separate region. As a consequence, only domestic navigation and shipping are considered in each region or country. For the rest of the analysis, international bunkers have been excluded.



According to the IEA, the transport energy consumption analysis suggests that road transport is by far the largest energy consumer and accounted for 90% of total transport energy consumption in 2010. It is also the main contributor to increased transport energy consumption. While non-road modes increased only 5%, road transport energy consumption jumped 55%.

The share of the different modes of passenger transport in final energy consumption has remained relatively stable since 1990. Energy consumption trends in the residential sector and the different end uses are driven by a wide range of factors, including changes in population, land use pattern, transport infrastructure, types of trips, income level, personal car availability, car occupancy, consumer preferences and overall energy efficiency improvements.

**Energy Consumption of Light-Duty Vehicles (LDVs)** – four-wheeler vehicles for personal use which contain eight seats or less, (including cars, minivans, sport utility vehicles (SUVs) and personal-use pick-up trucks), are by far the largest energy consumers in all the countries analysed, accounting for 88% of total passenger transport energy consumption on average. Approximately 8% of passenger transport energy consumption was for domestic air travel, with the remaining shares being accounted for by buses, passenger rail and passenger ships.

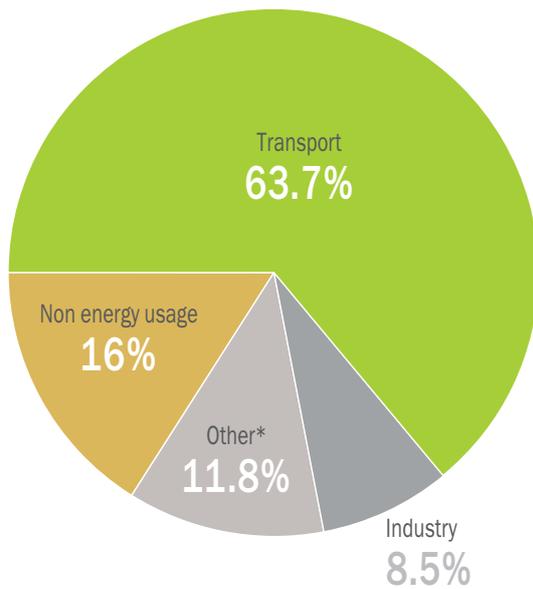
Passenger transport remains extremely dependent on oil products, which constitute 93% of final energy consumption. The fuel mix in passenger transport has undergone some important changes in recent years. Most significant has been the increased use of diesel in cars in Europe. As a result, the share of diesel in passenger transport energy consumption in IEA15 has increased from 8% in 1990 to 15% in 2010. In some passenger modes there has been a notable shift from oil products.<sup>8</sup>

Energy-efficient transport offers great potential to reduce demand for both oil and energy in general. According to experts, deployment of advanced technologies and alternative fuels (hybrids, electric vehicles, and fuel cell vehicles) can reduce energy use in transport by 20% to 40% by 2050, as compared to the baseline. However, the overall energy demand is likely to increase and exceed the current levels in view of the overall growth in demand for transportation services and motor vehicles<sup>9</sup>.

8. Energy Efficiency Indicators: Essentials for Policy making. – IEA: 2014 – 181 pp.

9. Transport, Energy and CO<sub>2</sub>: Moving Toward Sustainability. – OECD/IEA, 2009 – 418 pp.

Figure 3. Oil use by sectors, 2012



\*Including agriculture, commercial and public services, housing and other

Source: IEA (2014).

There is a close relationship between energy consumption and CO<sub>2</sub> emissions due to the nearly hundred-percent dependence of light-duty vehicles, buses and airplanes on oil-based fuels. Therefore, measures to improve energy efficiency in transport contribute not only to a decrease in fuel consumption, but also to the reduction in CO<sub>2</sub> emissions, overall trip time, noise and pollution, etc.<sup>10</sup>

Global policy measures for energy-efficient and environmentally friendly transport include introduction of CO<sub>2</sub> emission standards for certain types of motor transport, fuel standards, tire standards, instruments to promote eco-driving, etc. It was the introduction of fuel consumption standards for motor transport that enabled the United States and Japan to reduce their fuel consumption by 20–30% in 2006–2015.

For over 30 years, the US is adherent to its vehicle fuel consumption control program – CAFE (Corporate Average Fuel Economy) – and provides vehicles labelling for fuel consumption as an effective means to inform consumers when choosing a car. The label provides vehicle fuel consumption information, and projected annual fuel costs based on 15000 mileage.

In the European Union, Directive 1999/94/EC stipulates that all new car models must be labelled with fuel economy and CO<sub>2</sub> emissions information. Reduced fuel consumption and CO<sub>2</sub> emissions are also regulated by the standards set out in the 2009 Community Strategy to Reduce CO<sub>2</sub> Emissions from Passenger Cars<sup>11</sup>, by means of improved engine technologies, efficient tires, reduced fuel consumption for air conditioning, and wider use of biofuels. Furthermore, legislation provides for fiscal incentives to manufacturers for each vehicle sold in the European Union (hereinafter referred to as the EU) with lower CO<sub>2</sub> emissions compared to the standards, and extra-clean vehicles with extremely low emissions below 50 g/km, depending on the year of sale, are given additional incentives – each such vehicle is counted as 3.5 vehicles in 2012, 2.5 in 2013, 1.5 in 2014, and 1 from 2015 onwards.



10. <http://solex-un.ru/energo/review/avtomobilnyy-transport/obzor-2/obzor-22> (на английском источник не нашла, хотя, судя по тексту, я бы предположила, что он существует)

11. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52007DC0019>

Japan adopted the Top Runner program, setting fuel consumption standards for passenger cars depending on their weight, and certification program (since 2004), which assigns vehicles to one of four categories:

- meets the fuel consumption standards;
- improves fuel consumption by 5 %;
- improves fuel consumption by 10 %;
- improves fuel consumption by 20 %.

Since 2001, the country had also implemented a tax system for transport use, with:

- tax incentives for fuel efficient cars and for cars with lower CO<sub>2</sub> emissions;
- taxes on vehicles over 11 years old reviewed every two years<sup>12</sup>.

**The car tire standards adopted in the US, EU and Canada<sup>13</sup>** aim at reducing fuel consumption by another 4–5%. In 2007, the US had introduced Tire Pressure Monitoring System (TPMS) for all types of vehicles. Practice shows that maintaining proper tire pressure increases fuel efficiency. The Tire Fuel Efficiency Consumer Information Program, which stipulates labelling of tires, had also been contributing to fuel efficiency since 2009.

In EU, the new tire labels, in addition to the tire's fuel efficiency, provide rolling resistance information, as well as wet asphalt grip and noise classification. To EU standards, car manufacturers must only install tires tested for CO<sub>2</sub> emissions. Moreover, all tires installed on new cars after November 2012 must meet certain requirements laid down in the EU Strategy.

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In January 2010, a voluntary tire labelling system was introduced in Japan. The label provides vehicle owners with information on fuel consumption and wet grip reliability.

**Competent information policy aimed at increasing consumer awareness** can improve the attitude towards fuel efficiency. A widely recognized low-cost solution to reduce vehicle fuel consumption without any improvement of existing technologies is eco-driving.

The experience of eco-driving demonstrated that it helps achieving fuel economy and the resulting reduction in CO<sub>2</sub> emissions by 10–20%, but needs a continuous support by regular information campaigns and training programs for car drivers to gain and maintain positive long-term effect. Importantly, this experience is applicable to driving of both old and new cars.



12. <http://solex-un.ru/energo/review/avtomobilnyy-transport/obzor-2/obzor-22>

13. [http://www.vazdriver.ru/sovremennaya\\_markirovka\\_shin/sovremennaya\\_markirovka\\_shin\\_novye\\_evropeyskie\\_standarty\\_markirovki](http://www.vazdriver.ru/sovremennaya_markirovka_shin/sovremennaya_markirovka_shin_novye_evropeyskie_standarty_markirovki)

Energy-efficient transport offers great potential to reduce demand for both oil and energy in general. According to experts, deployment of advanced technologies and alternative fuels (hybrids, electric vehicles, and fuel cell vehicles) can reduce energy use in transport by 20% to 40% by 2050, as compared to the baseline

To that effect, many countries have launched their **eco-driving programs at national and regional levels**. For example, eco-driving programs implemented in Australia, Canada, EU, Japan, Korea, New Zealand, and the United States aim to reduce fuel consumption by 5–20% in the short-term perspective, and by 5–10% in the long run.

Austria's experience in promoting eco-driving is remarkable. The initiative includes certification of trainer-driver, the training of drivers, as well as awareness raising among the public. The initiative offers subsidies for commercial fleets and arranges eco-driving trainings. Approximately 90,000 novice drivers per year are educated in eco-driving skills<sup>14</sup>.

**Since 2007, Sweden enforces the rules, by which obtaining a driver's license requires knowledge of eco-driving basics<sup>15</sup>.**

Widely known is the **Bogota mayor's office effort to improve energy efficiency of public transport** by introducing the TransMilenio BRT system. The system operates articulated buses that travel dedicated bus lanes in two directions. According to 2009 data, the BRT allows to save over 10 hours per passenger monthly on average, and reduce carbon dioxide emissions by 0.25 tons a year. In addition, the program resulted in a 90% reduction of accidents on the bus routes<sup>16</sup>.



According to Russian experts, the real solution to energy consumption, greenhouse gases and pollutants emissions is the so-called **'modal shift'**. With regard to urban transport, this means priority, rapid development of public transport. Indeed, energy consumption per passenger traveling by bus is 5 times less than if traveling by car. Tram or subway train's energy consumption per passenger is over 10 times more efficient than that of a car.

The concept of 'modal shift' includes giving people more opportunities to travel by bicycle and by foot. **Development of public transport, cycling and pedestrian infrastructure** can help to simultaneously address two other problems – traffic congestions and air pollution. Emissions per passenger are 5–10 times less from public transport than that from a car. Moreover, each passenger in a public transport occupies 10–20 times less of the roadway<sup>17</sup>.

In view of the trends above, transport energy efficiency plays a crucial role for the economy, since the savings serve as an energy resource with a unique potential to promote long-term energy security, economic growth, and even improve health and prosperity; in particular, it is the main tool for reducing greenhouse gas emissions. Energy

14. [http://www.measures-odyssey-mure.eu/public/mure\\_pdf/transport/AU14.PDF](http://www.measures-odyssey-mure.eu/public/mure_pdf/transport/AU14.PDF); [www.ecodrive.org](http://www.ecodrive.org)

15. [http://www.journal.esco.co.ua/2012\\_12/art144.htm](http://www.journal.esco.co.ua/2012_12/art144.htm)

16. <http://datosabiertos.bogota.gov.co/ru/dataset?tags=transmilenio>

17. <http://solex-un.ru/energo/review/avtomobilnyy-transport/obzor-2/obzor-22>



efficiency measures, such as reducing or limiting energy consumption, can ensure resistance to a variety of risks, including growth or volatility of energy prices, energy infrastructure loads and disruptions in energy supply systems.

Therefore, defining the transport energy efficiency assessment methods is of the essence. For a better understanding of the energy efficiency drivers and capacity, methodologically justified energy efficiency indicators must be developed and maintained, to better inform policy-making and assist decision makers in designing practical measures most consistent with the domestic and/or international policy agenda, etc.<sup>18</sup>

International organizations involved in energy efficiency research develop their own methodologies to assess energy efficiency in various sectors of economy (Annex A). The International Energy Agency (IEA) uses decomposition or factorization analysis, which quantifies the impact of different driving forces or factors on energy consumption. Understanding how each of the elements impact energy consumption is essential to determine which have the largest potential to reduce energy consumption and the areas that should be prioritized for the development of energy efficiency policies.

Emissions per passenger are 5-10 times less from public transport than that from a car. Moreover, each passenger in a public transport occupies 10-20 times less of the roadway

Passenger transport energy efficiency is assessed by using three level indicators pyramid:

**Level 1** – Aggregate indicators;

**Level 2** – Indicators by transport mode;

**Level 3** – Indicators by vehicle type.

Besides, IEA attempts to make sure transport data are coherent by cross-checking top-down (through energy consumption questionnaires) with bottom-up (from vehicle stock, mileage and fuel economy) approaches [2, pp.20–25].

Another widely used practice is to assess energy efficiency indexes for the whole economy and for its individual sectors. The ODYSSEE-MURE (Online Database for Yearly Assessment of Energy Efficiency, Mesures d'Utilisation Rationnelle de l'Energie) project monitors energy efficiency in the EU and uses the ODEX index. ODEX is used to measure the energy efficiency progress by main sectors (industry, transport, households) and for the whole economy (all ultimate consumers).

ODEX is calculated from energy consumption trends over the previous year. Sectoral ODEX is measured by aggregating the specific energy consumption indices in the sub-sectors based on their current weight in the sector (koe/m<sup>2</sup>, kWh/appliance, l/100 km). The lower the index, the better is energy efficiency<sup>19</sup>.

18. <http://solex-un.ru/energo/review/avtomobilnyy-transport/obzor-2/obzor-22>

19. Definition of ODEX indicators in ODYSSEE data base. 2010 – p. 12.

Emissions per passenger are 5-10 times less from public transport than that from a car. Moreover, each passenger in a public transport occupies 10-20 times less of the roadway

Transport energy efficiency is also measured using the methodology of GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH – German Society for International Cooperation), developed under their Sustainable Urban Transport Project (SUTP).

This method of transport energy efficiency assessment is based on determining energy efficiency of three components each having their own indexes: system efficiency, travel efficiency and vehicle efficiency.

$E^*$ . urban transport =

$E$ . urban transport  $\times E$ . travel efficiency  
 $\times E$ . system efficiency where

\*  $E$ . – is energy efficiency



## System efficiency

The traffic volume generated and the system efficiency of a city are closely connected, as travel activity is influenced not only by the urban structure, but also by economic, cultural or behavioral factors. Because energy consumption is directly related to traffic volume, a key indicator for evaluating system efficiency is the per capita annual passenger-kilometers (hereinafter referred to as passenger-km). This is calculated by dividing the amount of total distances travelled in a given period by the number of people who travelled.

Another indicator for system efficiency is urban density (person/km<sup>2</sup>), which can reveal structural reasons for different traffic volumes.

A possible third indicator is passenger transport energy use per capita (MJ/person).

## Travel efficiency

Travel efficiency depends mainly on the share of energy-efficient modes of transport used. Besides that, the energy intensity of each mode of transport used is also important, which depends on both the vehicle efficiency and the occupancy rate. The indicators applied are the share of each mode of transport in the total number of trips made, as well as the respective passenger-km or ton-km moved; the energy use per passenger-km (MJ/pkm) or ton-km (MJ/tkm) of each mode; the occupancy rate of vehicles is a crucial aspect of travel efficiency (this is already considered under energy use per pkm/tkm, but a separate analysis is often useful).

## Vehicle efficiency

Vehicle efficiency is assessed using vehicle-kilometers per energy unit. Vehicle efficiency is important both for private motorized vehicles and for public transport vehicles. Energy efficiency indicators are fuel consumption and energy consumption per vehicle-kilometer (MJ/km); average age of the fleet.

It should also be noted, that another way to assess vehicle efficiency is by measuring CO<sub>2</sub> emissions per vehicle-kilometer (g CO<sub>2</sub>/km). However, it is important to consider that not all fuels provide the same energy output. [5, pp. 18–21]<sup>20</sup>.

Evaluation of various assessment methods shows that the GIZ methodology is the most appropriate to study the transport energy efficiency in Kazakhstan, helping to find the best ways to save energy, and to model and forecast the future energy consumption.

20. Key World Energy. STATISTICS. IEA: 2014

## 1.2 Regulatory and legal framework to improve energy efficiency and reduce emissions in the Republic of Kazakhstan

To date, the international community has taken a number of measures to stabilize global warming, including reducing transport-related greenhouse gas emissions. Kazakhstan, as a developing economy, has not yet created a dedicated development policy for low-emission transport. However, there certain policy measures exist at the national level to address this and other issues.

In order to build an appropriate legislative framework for energy saving and energy efficiency in transport, in January 13, 2012, Kazakhstan adopted the Laws “On Energy Saving and Energy Efficiency” and “On amendments and additions to some legislative acts of Kazakhstan on energy saving and energy efficiency”.

In 2013, the Concept for Transition of the Republic of Kazakhstan to Green Economy (hereinafter referred as the Concept) was approved by the Decree of the President of the Republic of Kazakhstan. The Concept defined strategic goals and objectives of the country’s transition to low-carbon development, improvement of energy efficiency and reduction of greenhouse gas emissions by 2030 and by 2050. The document emphasizes that in Kazakhstan, transport is one of the key energy consumers and polluters.

### Key objectives for improving energy efficiency in transport sector of the Republic of Kazakhstan

1. Ensure the optimum mix of the vehicle fleet by means of monitoring and enforcing fuel efficiency requirements for new vehicles in the market;
2. Develop alternative modes of transportation and associated infrastructure, particularly for electric and gas-fueled vehicles;
3. Ensure the use of high quality fuel;
4. Develop a Program of incentives for car disposal aimed at faster renewal of the fleet (for example, trade-in schemes for more eco-friendly cars);
5. Improve traffic management systems (“smart traffic control system”);
6. Manage mobility (transport infrastructure enabling efficient use of all transport modes, increasing public transport accessibility and quality).

Source: *Concept for Transition of the Republic of Kazakhstan to Green Economy, 2013*

Figure 4. Pilot projects for transport energy efficiency and reduction of emissions



Source: *Action Plan for Implementation of the Concept for Transition of the Republic of Kazakhstan to Green Economy for 2013-2020*

There is a number of key reasons for intensive energy consumption in transport, including aging of the vehicle fleet (80%), inadequate fuel quality as to European standards, limited gas fuel utilization due to the lack of gas infrastructure, and substandard road infrastructure for public transport, electric-powered mobility, cycling and walking, etc.

In terms of reducing pollution, we must note that the national emission standards are significantly more stringent than those in Europe. Main polluters in Kazakhstan are urban areas. And in the urban areas, emissions from transport are much greater than emissions from other sectors.

Action Plan for implementation of the Concept for Transition of the Republic of Kazakhstan to Green Economy for 2013–2020 adopted in 2013 includes specific actions and pilot projects, which will help achieve main objectives set for the transport sector.

Since 2013, the country began practical implementation of the energy saving policy within the framework of Energy Efficiency 2020 Program, aimed at reducing the energy intensity of Gross domestic product (hereinafter referred to as GDP) by at least 40% from the 2008 baseline<sup>21</sup>. According to the data, nearly 20% of the country's energy is used by vehicles consuming gasoline. To reduce the energy intensity of the economy, the Program developed over 3,000 standards of energy consumption, including approval of Energy Efficiency Requirements for buildings, transport and electric motors, and over 200 Technical Standards on energy efficiency.

21. The Energy Efficiency 2020 Program of the Republic of Kazakhstan

## The Energy Efficient Transport Objective

### Targets to 2020

- 30% reduction in fuel consumption by road, rail and air transport
- 50% renewal of the vehicle fleet in the country.

Source: *The Energy Efficiency 2020 Program, 2013*

Energy efficiency in transport is also governed by Resolutions of the Government of the Republic of Kazakhstan on establishing mandatory energy efficiency requirements for transport and electric motors, and on reduction of fuel consumption in transport sector (Table 1).

Resolution of the Government of the Republic of Kazakhstan No 97<sup>22</sup> as of 06.02.2013 provides that in order to comply with the EURO-4 environmental standards, high-quality fuels must be used, which will respectively lead to lower emissions. Another measure involves the use of compressed natural gas (CNG) as a fuel for motor vehicles (Table 2).

**Table 1.** Indicators of Transport Energy Efficiency

##	Mode of Transport	EE, %	
1	Motor Transport:	natural gas engine	66
		diesel engine	55
		gasoline engine	60
		hybrid vehicle (gasoline/electric)	75.7
		electric motor	52.5
2	Aircraft engine	40	
3	Railway	Diesel locomotive	41
		Electric locomotive	82
4	Maritime transport	60	
5	Inland waterborne transport	60	
6	Urban electric transport, including subway	75	

Source: *Resolution of the Government of the Republic of Kazakhstan "On establishing the energy efficiency requirements for transport" No 1048 as of August 15, 2012*

**Table 2. Table of conformity of vehicles and internal combustion engines to the requirements of technical regulations on emission classes 2, 3, 4 and 5, by year of production**

Vehicle/Engine country of manufacture	Vehicle's year of production corresponding to the emission class			
	Class 2	Class 3	Class 4	Class 5
An EU country*, gasoline engines	1997-2000	2001-2004	2005 – August 2009	Category M1-3, N1 – September 2009 and later
				Category N2 – September 2010 and later
				Category N3 – October 2008 and later
An EU country*, diesel engines	1997-2001	2002-2004	2005 – August 2009	Category M1-3, N1 – September 2009 and later
				Category N2 – September 2010 and later
				Category N3 – October 2008 and later
USA	1996-2000	2001-2005	2006 and later	-**
Japan	1998-2004	2005-2010	2010 and later	-
India	2005-2009	2010	-	-
Malaysia	2003	-	-	-
China	2004-2007	-	-	-
			Category M3 – January 2012 and later	
Korea	2001-2002	2003-2005	2006 and later	-
Russia	2006-2007	-	2010 and later	-
Uzbekistan	2007-2009	2012 and later	-	-
Belarus	2007	-	-	-
Ukraine	Cat. M – 2006	-	-	-
	Cat. N – 2007			

Source: Resolution of the Government of the Republic of Kazakhstan No 97 as of February 6, 2013

Resolution of the Government of the Republic of Kazakhstan No 57 as of February 4, 2014 “On amendments to the Resolution of the Government of the Republic of Kazakhstan “On approval of the Technical Regulations setting the requirements on harmful emissions from motor vehicles entering the market of the Republic of Kazakhstan” No 1372 as of December 29, 2007” amended the existing Technical Regulations. Article 16 of the Regulations sets out the requirement to verify conformity of vehicles entering the market of the Republic of Kazakhstan to the declared emission classes.

Another instrument governing transport emissions is the Order of the Ministry of Investment and Development of the Republic of Kazakhstan “On approval of permissible parameters of motor vehicles intended for road use in the Republic of Kazakhstan” No 342 as of March 26, 2015. The Order includes the requirement that motor vehicles must comply with emission class 4, limitations as to certain years of production, etc. (Table 3).

These requirements are stipulated by the Technical Regulations of the Customs Union “On safety of wheeled vehicles”. However, so far these only applied to vehicles imported from countries outside of the Union. With enactment of the Order, these requirements also apply to vehicles imported into Kazakhstan from the Customs Union member countries.

22. Resolution of the Government of the Republic of Kazakhstan “On approval of the Technical Regulations setting the requirements on harmful emissions from motor vehicles entering the market of the Republic of Kazakhstan” No 1372 as of December 29, 2007

**Table 3.** Permissible levels of emissions from vehicles entering the market of the Republic of Kazakhstan

Vehicle/Engine country of manufacture	Vehicle's year of production corresponding to the emission class	
	Class 4	Class 5
An EU country*, gasoline engines	2007 – August 2009	Category M1-3, N1 – September 2009 and later
		Category N2 – September 2010 and later
		Category N3 – October 2008 and later
An EU country*, diesel engines	2007 – August 2009	Category M1-3, N1 – September 2009 and later
		Category N2 – September 2010 and later
		Category N3 – October 2008 and later
USA	2007 and later	..**
Japan	2010 and later	-
India	-	-
Malaysia	-	-
China	-	-
	Category M3 – January 2012 and later	
Korea	2007 and later	-
Russia	2010 and later	-
Uzbekistan	-	-
Belarus	-	-
Ukraine	-	-

*Source: Order of the Ministry of Investment and Development of the Republic of Kazakhstan “On approval of permissible parameters of motor vehicles intended for road use in the Republic of Kazakhstan” No 342 as of March 26, 2015*

## Notes:

1) A dash (-) in columns Class 4 and Class 5 means that the vehicle's compliance with the emission class should be verified by a document (the formal type approval based on the UNECE Regulations), issued under the Agreement concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions (Geneva 1958 Agreement);

2) In case the country of manufacture of the vehicle and (or) engine is China, emission class 4 category M3 shall be ascribed to it from January 2012 and later, and in relation to other categories of vehicles – in accordance with procedures set out for the dash (-).

The energy saving and consumption efficiency is supported by energy audits. According to article 16 of the Law of the Republic of Kazakhstan “On Energy Saving and Energy Efficiency”, all organizations listed in the State Energy Registry are obliged to undergo energy audits every five years. Resolution of the Government of the Republic of Kazakhstan No 1115 as of August 31, 2012 approved the “Rules for energy audit” that govern the energy audit procedures, including those in transport.

According to the Rules, individual entrepreneurs and legal entities that consume energy in amount of five hundred or more tons of fuel equivalent per year, as well as governmental agencies and quasi-public sector entities listed in the State Energy Registry must undergo energy audits. However, it should be noted that these rules are general in nature and apply depending on fuel types.

To improve energy efficiency and reduce emissions, measures are taken at regional and local levels. One of the priorities in reducing greenhouse gas emissions is the development of transport using alternative fuels or natural gas, which is the most appropriate fuel.

The Program for Integrated Gasification of Almaty Province in 2007–2015 with an outlook to extend to 2020 is aimed at supplying natural gas throughout the Almaty province, which will help to significantly reduce greenhouse gas emissions.

The Almaty-Taldykorgan gas pipeline has now been built and commissioned. This is the first national gas distribution pipeline with design pressure of 100 atmospheres, which allows for another 230 kilometers extension in the nearest future, once the automated gas distribution stations (hereinafter



referred to as AGDS) are built. Unfortunately, the program does not provide for the construction of gas vehicle refueling stations (hereinafter referred to as VRS), and therefore will not result in reduction of greenhouse gas emissions from transport sector. However, in future, the gas pipeline and the AGDS infrastructure will greatly facilitate the construction of gas VRS, which will have a positive impact on reduction of greenhouse gas emissions from transport.

A number of joint projects with international organizations helped develop regional transport strategies and programs.

Thus, the Almaty City Administration developed the Almaty Sustainable Transport Strategy for 2013–2023 under the auspices of the UNDP/GEF Project ‘City of Almaty Sustainable Transport’, launched in 2011 with the financial support of the Global Environment Facility (hereinafter referred to as GEF).

Since June 15, 2015, a dedicated lane for public transport (buses and trolleybuses) is functioning in Almaty under a new project. Works have started to arrange parking pockets for cars.

The city of Astana is also taking practical steps to address transport issues. In May 2015, the China Railway Corporation and Astana LRT signed a framework agreement on the first phase of the project for construction of the capital’s light rail.

### The Almaty Sustainable Transport Development Goals for 2013-2023

- Reduce air pollution and greenhouse gas emissions (hereinafter referred to as GHG) by 32% against the current trends of growth;
- Increase the market share of sustainable transport modes (public transport, walking and cycling) from the current 42% to 55%;
- Decrease the number of fatalities in road accidents, especially involving pedestrians, by 35%;
- Reduce congestion in the city center by 30%;
- Achieve full integration of urban and transport planning.

Source: Almaty Sustainable Transport Strategy for 2013-2023

# 2 ANALYSIS OF CURRENT ENERGY EFFICIENCY IN TRANSPORT SECTOR OF KAZAKHSTAN

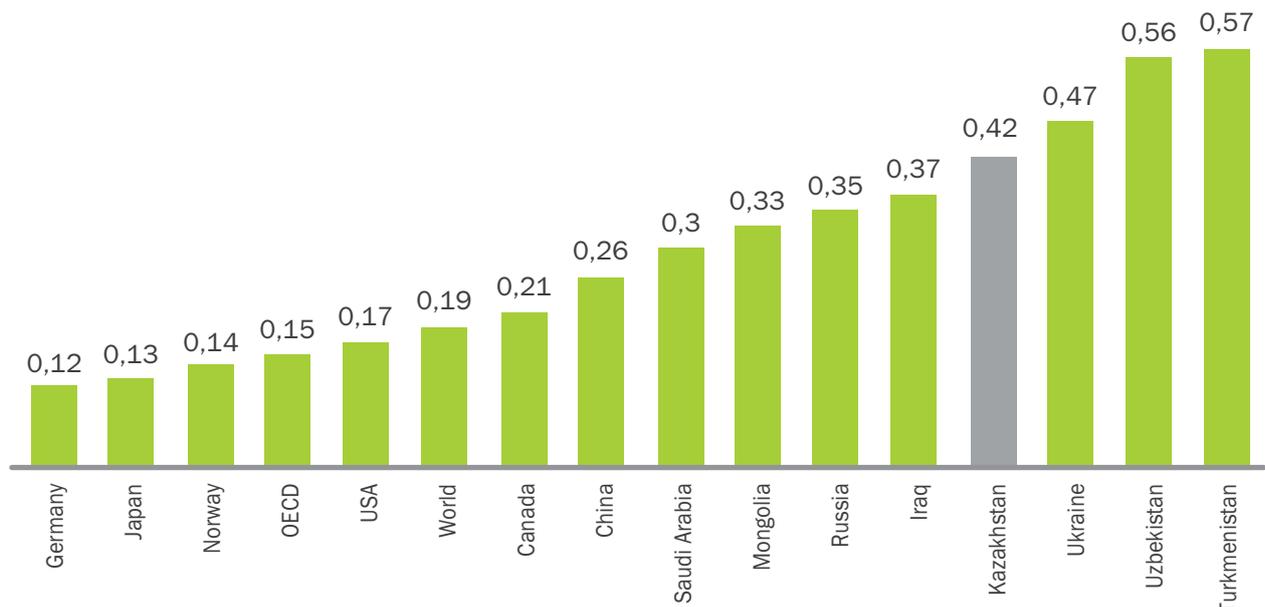
## 2.1 Current energy efficiency in transport sector of Kazakhstan

Today, the transport sector of Kazakhstan is addressing a number of challenges in organizing passenger transportation, implementing modern technologies, raising the level of transportation and logistics services. Successful completion of the tasks requires a modern transport infrastructure to enable transit of goods between East and West, and passenger transportation, both international and domestic, with quality of service attaining the level of developed countries engaged in the transport integration<sup>23</sup>.

The Republic of Kazakhstan falls behind the most developed countries in terms of energy efficiency. According to experts, high level of emissions, urban pollution, environmental imbalances and power shortages are all consequences of inefficient use of energy. High level of emissions per unit of GDP was detected in Karaganda, Pavlodar and Almaty provinces, where the emissions per unit of GDP are 4–5 times higher than the national average.

23. State Program 'Information Kazakhstan – 2020', 2012.

Figure 5. GDP energy intensity by country, tons of oil equivalent/USD 1,000



Source: KAZENERGY National Energy Report, 2013

**Currently, energy intensity of Kazakhstan's GDP as compared to other countries is extremely high.**

This is primarily due to the resource-based structure of the economy:

- energy and industry sectors consume over 50% of energy resources, which can potentially be reduced to 40%;
- transport sector consumes up to 20% of energy, which can potentially be reduced to 35%;
- housing and utilities (hereinafter referred to as H&U) consume up to 30% of energy, which can potentially be reduced to 25%.

Since year 2000, the share of transport in total energy consumption in Kazakhstan ranges from 10% to 20%. Transport sector ranks fourth in the consumption of primary resources; therefore, the need to implement measures to improve energy efficiency in transport is urgent<sup>24</sup>.

24. KAZENERGY National Energy Report, 2013

**Table 4.** Energy consumption and technical potential for energy savings in various sectors of economy of the Republic of Kazakhstan

Indicator	Consumption of primary energy resources, Mtoe	Technical potential for energy savings, %	Technical potential for energy savings, Mtoe
Energy	29.85	24.5	7.31
Industry (excluding energy)	12.74	30	3.82
Housing and utilities (H&U) and households	10.17	42	4.27
Transport	9.81	20	1.96
Total	62.57	27.75	17.36

Source: KAZENERGY National Energy Report, 2013

**High energy intensity in transport sector is a result of the following:**

- **80%** of motor transport has been in service for over 10 years;
- **87%** of the total energy is consumed by road transport;
- **over 70%** of traffic in large cities is generated by cars;
- **8–11%** of the cost of goods constitute transportation costs (in industrially developed countries, this indicator usually does not exceed **4%**).



Since 90's, number of vehicles in Kazakhstan has almost tripled, following tremendous economic growth. The rapid growth of vehicles has consequently led to increased consumption of fuels: gasoline, for example, makes almost 85% of fuels consumed in the country, followed by diesel (13%), whereas compressed natural gas (CNG) and liquefied petroleum gas (LPG) constitute only 1% of the total fuel demands.

Expansion of the vehicle fleet and increasing consumption of fuels had jointly led to an increase in environmental pollution. Starting from year 2000, GHG emissions from road transport are growing rapidly at annual growth rate of 15% according to GHG inventory submitted by Kazakhstan to United Nations Framework Convention on Climate Change. In 2008, the contribution of road transport sector to the total GHG emissions in Kazakhstan was 8%.

Air pollution has serious implications for public health and safety, especially in urban areas. Almaty province and city of Almaty, where over 25.6% of total road transport fleet is registered, have significantly higher respiratory disease morbidity rate (1.7 times higher than country-wide average).

*Source: Stocktaking analytical report "Vehicle emissions, fuel quality standards and fuel and fuel economy policies in Kazakhstan", UNEP, 2013; <http://www.unep.org/>*

The road transport accounts for more than half of the total consumption of liquid hydrocarbons, and for about a quarter (23 %) of all carbon emissions. At the same time, road transport accounts for 73 % of all pollutant emissions.

Greenhouse gas emissions from transport sector of the Republic of Kazakhstan originate from all sub-categories of domestic transport: motor transport, off-road transport, railway transport, waterborne transport, civil aviation, pipelines (used to transport oil, oil products and natural gas).

As mentioned above, the main source of emissions in transport sector is the motorized transport. The CO<sub>2</sub> equivalent emissions as compared to 1990 increased from civil aviation by 95.5%, from motor transport – by 12%, and from pipeline transport – by 8%. CO<sub>2</sub> emissions from railway and waterborne transport have decreased by 56% and 55%, respectively.

- Kazakhstan's principal sources of pollution are industrial, municipal, agricultural, and transport emissions. The city populations of Kazakhstan affected by air pollution had risen to 1.4 million people in 2010.

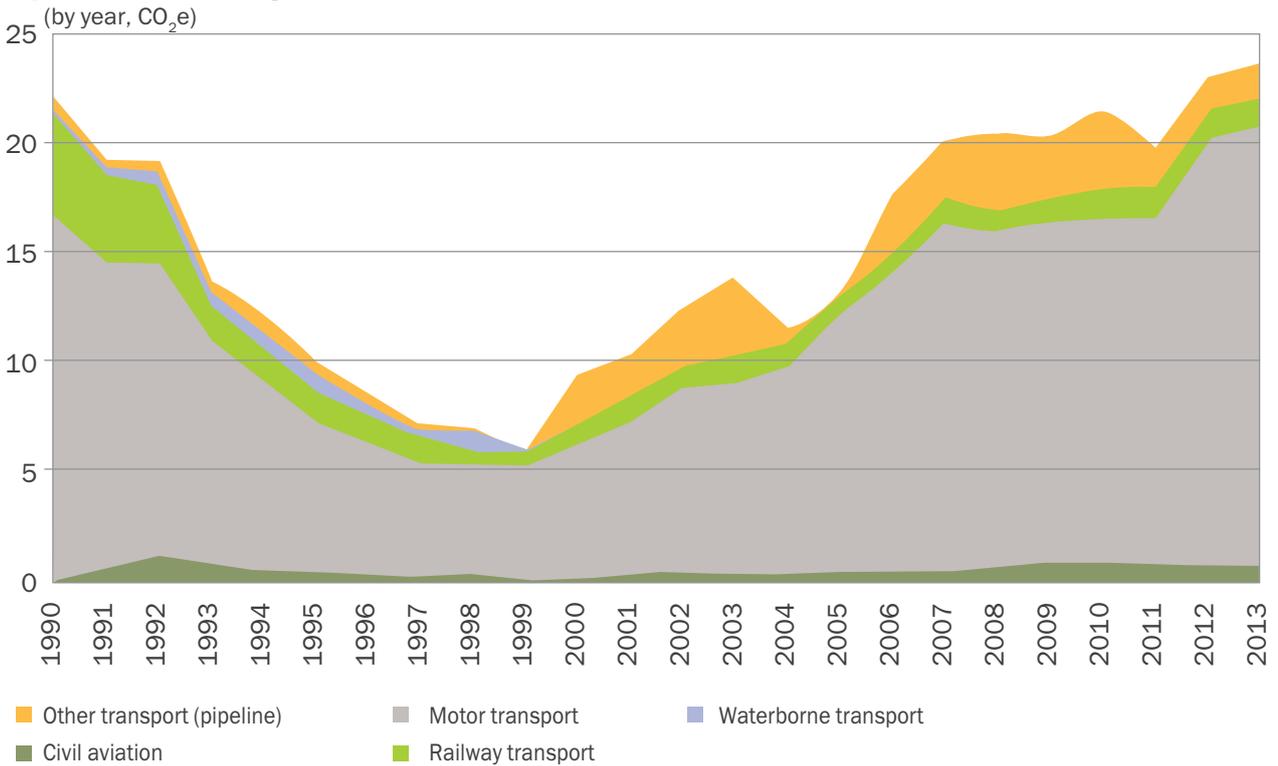
- Total greenhouse gas (GHG) emissions are about 250 million tons of carbon dioxide equivalent, representing the highest level per capita in Central Asia.

- In 2010, car ownership was estimated at 154 cars per 1,000 inhabitants in Kazakhstan and 290 cars per 1,000 inhabitants in Almaty. This is the highest in Central Asia.

*Source: Kazakhstan: Country Partnership Strategy (2012-2016); <http://www.adb.org>*

### Distribution of greenhouse gas emissions by modes of transport in 2013:

- motor transport – **85.1 %**;
- pipeline transport – **6.4 %**;
- railway transport – **5.1 %**;
- civil aviation – **3.1 %**;
- waterborne transport – **0.3 %**.

**Figure 6.** Greenhouse gas emissions from transport sector in 1990–2013

Source: National inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol, 1990-2012.



Total transport-related greenhouse gas emissions are on the rise since year 1999, having almost matched the 1990 level in 2007. The growth in emissions is chiefly attributed to motor transport and, after year 2000, pipeline transport.

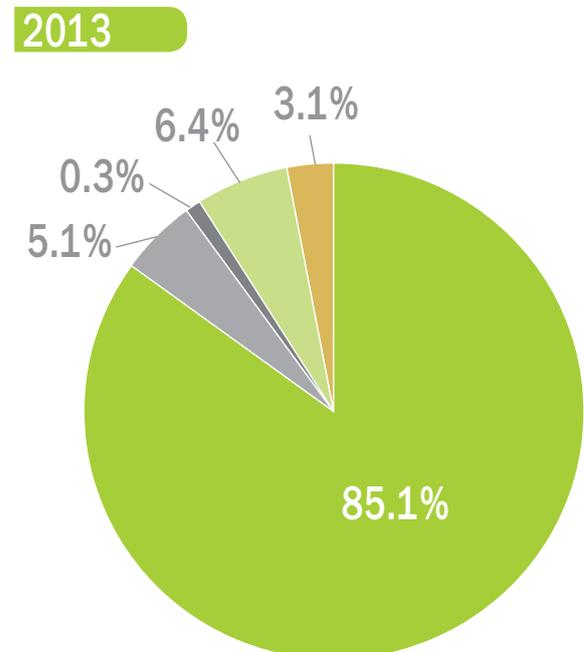
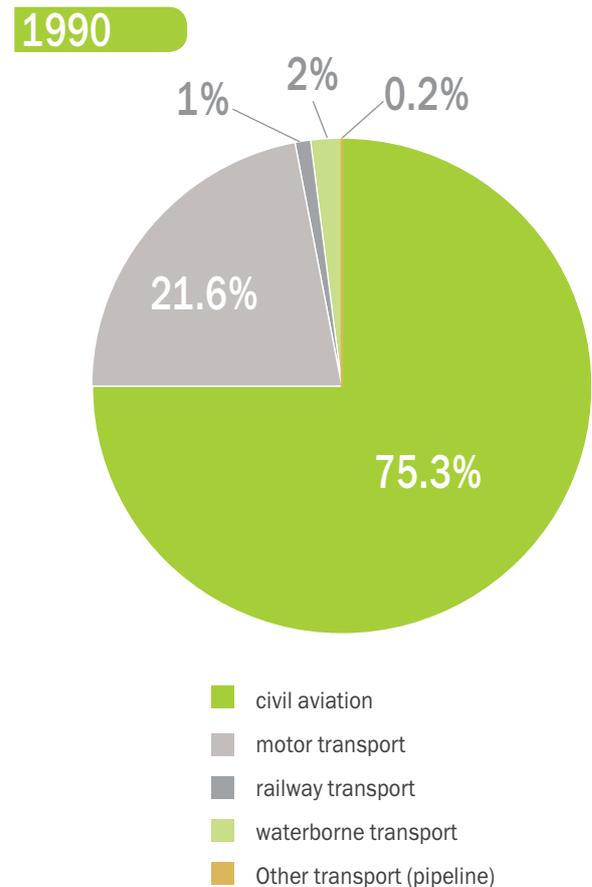
The share of CO<sub>2</sub> emissions from transport sector amounts to 99.35%, but it contributes very little to methane and nitrous oxide emissions, only 0.54% and 0.12%, respectively. The amount of CO<sub>2</sub> emissions slightly increased in 2013 over the 2012. The graph below illustrates the fact that the level of year 1990 (baseline) in CO<sub>2</sub> emissions was almost matched. However, the internal mix of proportions among the categories had changed a lot.

Currently, emissions in CO<sub>2</sub> equivalent are slightly higher due to the increase in fuel consumption in the country, which is natural in view of continued, albeit minimal, growth in the number of vehicles and the amount of fuel consumed.

According to the Center for Climate and Energy Solutions, US (Natural gas overview of markets and uses: Natural gas use in the transportation sector. – 2012) the use of CNG as fuel compared to gasoline results in lower greenhouse gas emissions by 29%. Experts assume that 5% of motor transport will shift to CNG by 2020, and 30% – by 2030. The switch from gasoline and diesel to CNG will be of particular significance in Almaty – 13.8%<sup>25</sup>.

Each year, motor transport consumes over 5.0 mln. tons of fuel. According to preliminary estimates, in 2015, fuel consumption by motor transport in the country will amount to 5432.0 thous. tons of gasoline, with energy consumption of 20405,0×10<sup>6</sup> kWh, 20813,0×10<sup>6</sup> kWh and 21437,0×10<sup>6</sup> kWh respectively, by year.

Figure 7. Share of GHG emissions from fuel combustion, by mode of transport, in 1990 and 2013



Source: National Inventory Report 1990-2012. National inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol

25. The III-VI National Communication of the Republic of Kazakhstan to the UN Framework Convention on Climate Change (UNFCCC). – Astana, 2013

**Table 5. Power and heat consumption by transport companies**

Type	2009	2010	2011	2012	2013
Electricity, thous. KWh	2,718,708	3,115,596	4,569,798	3,341,235	2,950,455
including by companies:					
railway transport	892,496	670,973	636,040	700,016	710,949
motor and urban electric transport	81,675	48,769	743,159	88,531	83,892
pipeline transport	198,640	588,447	485,639	383,706	192,161
waterborne transport	1,339	2,995	2,595	2,363	2,500
airborne transport	3,737	4,167	5,503	4,147	3,771
warehousing and auxiliary transportation activities	1,540,821	1,800,245	2,696,862	2,162,472	1,957,182
Heat, thous. Gcal	604.3	775.0	803.7	712.2	603.1
including by companies:					
railway transport	45.3	189.1	37.4	27.5	46.4
motor and urban electric transport	140.4	75.7	191.6	159.6	147.4
pipeline transport	76.7	136.8	152.1	121.9	77.3
waterborne transport		3.2	2.6	2.4	1.7
airborne transport	10.2	3.8	3.5	3.4	1.3
warehousing and auxiliary transportation activities	331.6	366.4	416.5	397.5	329.1

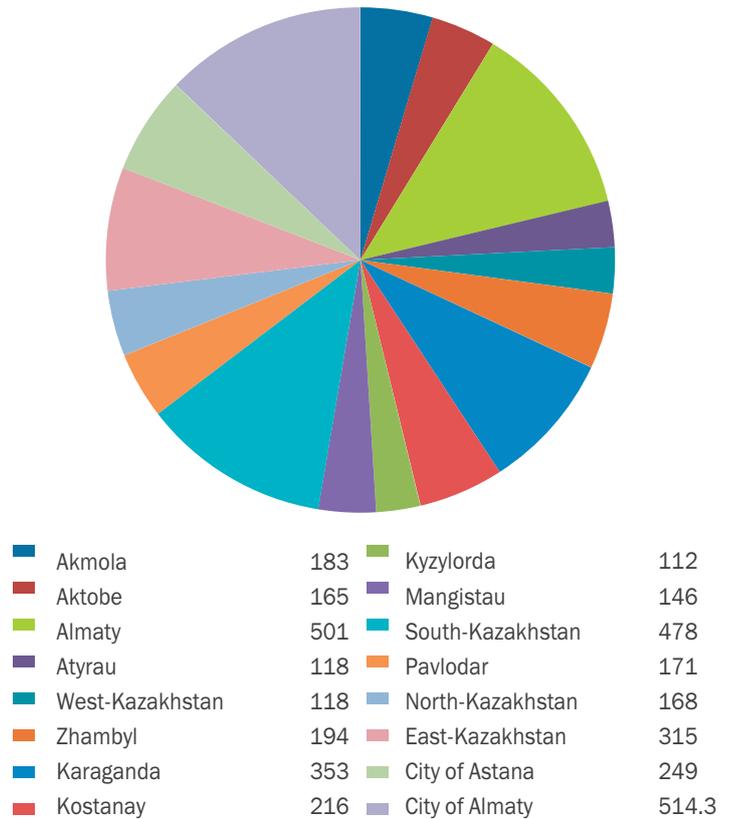
Source: KAZENERGY National Energy Report



## 2.2 Current energy consumption and dynamics of greenhouse gas emissions from transport in Almaty

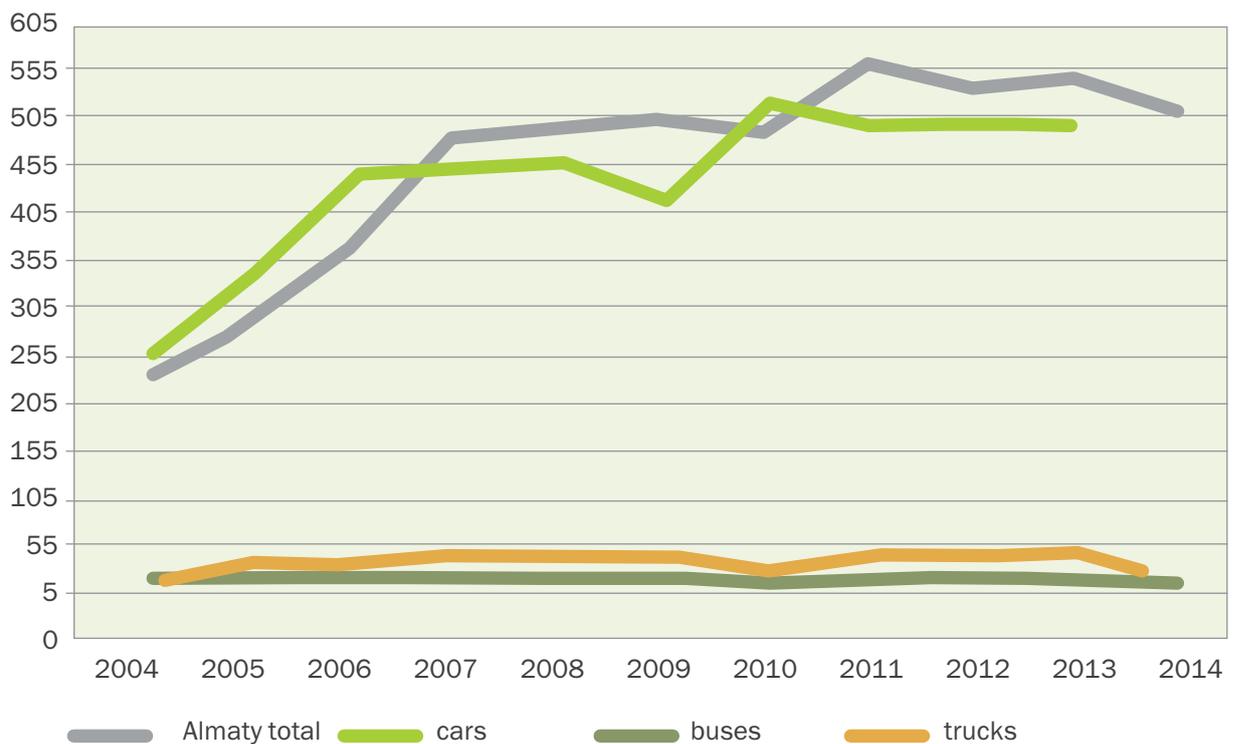
The issue of air pollution is pertinent for many cities around the world, despite the significant improvement in air quality over the last 30–40 years. The main source of air pollution in large cities is motor transport.

Figure 8. Number of motor vehicles in the Republic of Kazakhstan, by province, 2014, (thous. vehicles)



Source: Committee on Statistics of the Republic of Kazakhstan

Figure 9. Growth in the number of motor vehicles in Almaty, by vehicle type (thous. vehicles)



Source: Committee on Statistics of the Republic of Kazakhstan



Almaty is the largest metropolitan city in the Republic of Kazakhstan. According to the Department of Statistics of Almaty, the city population is 1,548,400 people as of January 2015. Thus, Almaty ranks first in the country (about 13%) by the number of vehicles. According to the Committee on Statistics of the Republic of Kazakhstan, in 2014 the number of motor vehicles in the city amounted to 514,300, which, if recalculated per capita, results in 30.7 cars per 100 people (Figure 8).

According to statistics, the number of motor vehicles has doubled over the last decade (Figure 9). Private cars account for the greatest proportion in the increase – over 90%. Number of trucks does not exceed 40 thousand throughout the years, with percent share ranging from 0.5% to 2%. The number of buses varies from 7 to 12 thousand, or from 0.2% to 0.6% throughout the years.

Review of the dynamics in motor transport growth reveals that the number of vehicles in Almaty was increasing rapidly till 2007, due to the favorable economic situation in the country. There was moderate growth observed from 2007 to 2009. Consumer ability decreased in 2009 due to the economic crisis, followed by some reduction in the number of cars. The growth in the number of vehicles has been stable in general since 2010.

Individual dynamics for each vehicle type reflects the overall growth in the number of vehicles in the city of Almaty.

**Cars:** sharp increase in the number of cars observed prior to 2006, with stable growth until 2009. After the 2009 crisis, there was another rise, with the number of cars peaking at 2010. There has been a modest increase in the number of cars after 2010. As of 2014, the number of cars in Almaty comprised 503,090.

**Bus fleet:** the average increase from 2004 to 2009 amounted to 10% per year, with about 1,000 vehicles/year. In 2010, the number of buses dropped by 50%. There was a moderate increase in the bus fleet in 2011–2014. As of 2014, the number of buses in Almaty comprised 7,675.

**Trucks:** the situation is similar to the growth in the number of buses: in 2004 through 2007, the number of trucks was increasing, with the annual average of 8%, which comprised about 3,000 vehicles per year. In 2010, the number of trucks dropped by 50%, or by about 18,000. Since 2010, there is a moderate growth. As of 2014, the number of trucks in Almaty is 26 thousand.

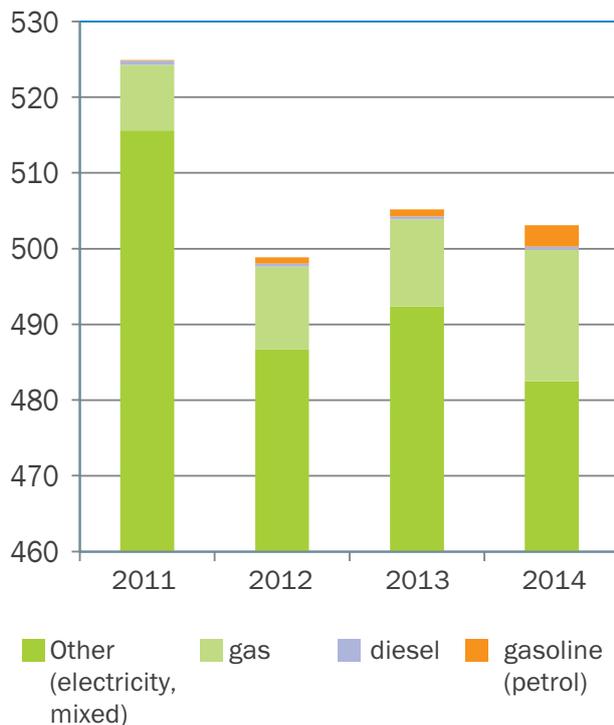
Fuel consumption in Almaty city is similar to that of the country in general. According to the Committee on Statistics of the Republic of Kazakhstan, the number of vehicles using gasoline has reduced from 98% to 96% in the period of 2011 to 2014, while the proportion of vehicles running on diesel fuel increased from 1.6% to 3%. The number of vehicles using gas (liquefied petroleum gas and liquefied natural gas) in Almaty has reduced from 0.1% to 0.08%, while the number of vehicles running on mixed fuel (electricity plus gas, electricity) increased from 0.016% to 0.5% (Figure 10).

Most cars running in Almaty and in Kazakhstan overall are manufactured abroad and imported. These cars use a higher octane gasoline. Unfortunately, despite large reserves of fossil fuel, around 20–45% of higher octane gasoline is imported.

This is primarily due to the fact that the available refineries built during the USSR time were set to produce mainly low octane fuels and have limited capacities to alter structure of production output.

Another important factor is that domestic prices for crude oil are significantly lower than the export prices, so that local oil producers have more incentives to export crude oil rather than selling it on domestic market<sup>26</sup>.

**Figure 10.** Dynamics of fuel use and distribution by fuel type in Almaty (thous. ton)



Source: Committee on Statistics of the Republic of Kazakhstan

Fuel consumption depends directly on the engine capacity. See Table 6 for distribution of motor transport registered in Almaty by engine volume and the dynamics of change over the years.

**Table 6.** Distribution of motor transport registered in Almaty by engine volume, 2010–2014

	2010	2011	2012	2013	2014
Number of registered vehicles	12,092	7,253	3,112	9,049	9,484
Of which, engine volume:					
under 1100 cc	82	109	82	153	108
1100 to 1500 cc	486	404	139	621	553
1500 to 2000 cc	3,216	2,052	1,273	3,196	3,348
2000 to 2500 cc	2,912	1,628	393	1,865	2,092
2500 to 3000 cc	2,872	1,677	397	1,673	1,636
3000 to 4000 cc	1,605	780	458	931	903
above 4000 cc**	919	603	370	610	844

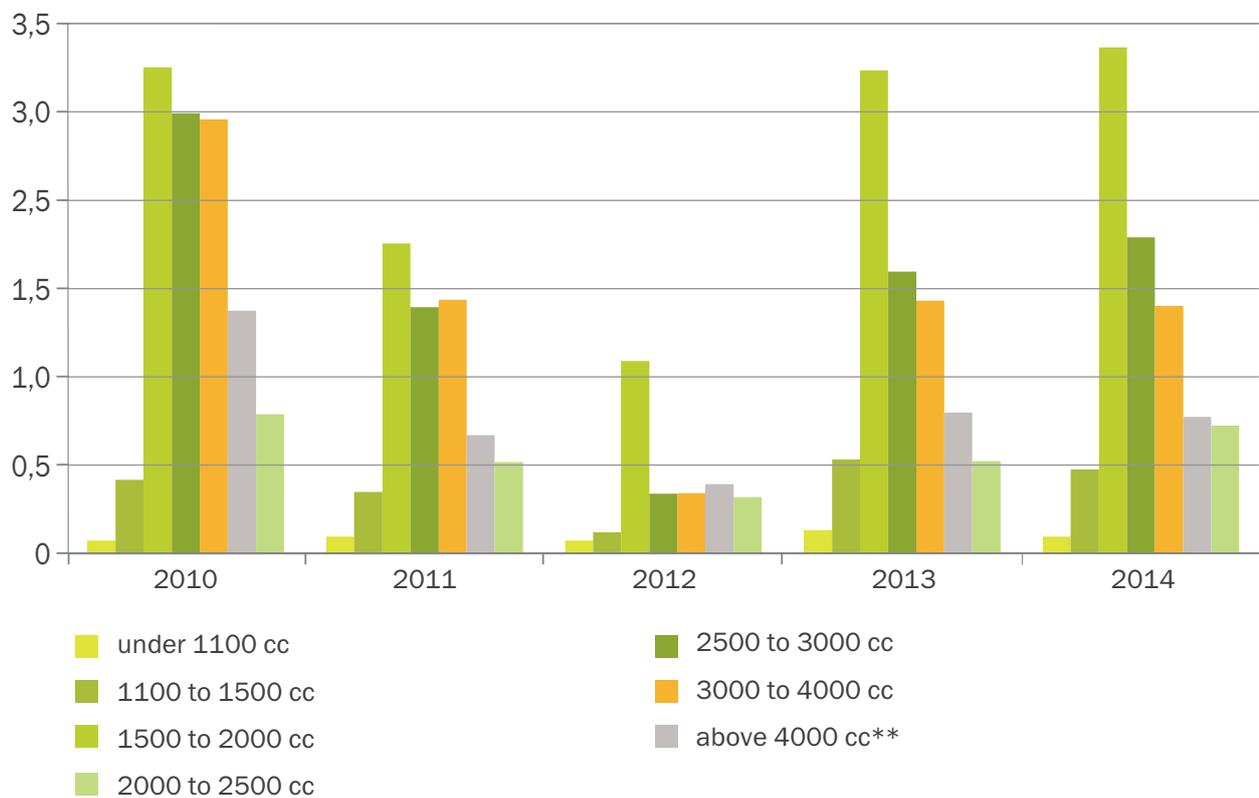
Source: Ministry of Internal Affairs of the Republic of Kazakhstan

According to the Ministry of Internal Affairs of the Republic of Kazakhstan, cars with engine displacement from 1.1 to 1.5 liters only account for a small share of the market, the number increasing by 4.5% to 5% per year (Figure 11). Most car owners prefer cars with engine displacement ranging between 1.5 to 2 liters. Every year, this type of cars grows in number. In percentage, the growth comprises 25% to 35% per year.

26. Stocktaking analytical report "Vehicle emissions, fuel quality standards and fuel economy policies in Kazakhstan", UNEP, 2013 [[http://www.unep.org/Transport/new/PCFV/pdf/cleanfue\\_transport\\_UNEP-CARECreport.pdf](http://www.unep.org/Transport/new/PCFV/pdf/cleanfue_transport_UNEP-CARECreport.pdf)]



**Figure 11.** Dynamics and distribution of motor transport in Almaty by engine volume



Source: Ministry of Internal Affairs of the Republic of Kazakhstan



In the period of 2010 to 2014, the number of cars with engine capacity of 2 to 2.5 liters also increased by about 20% per year. The number of cars with engine volume of 2.5 to 3 liters, in this period, on the contrary, has been decreasing from 23% to 17% per year. The number of registered cars with engine capacity of 3 to 4 liters dropped from 13% to 9%.

There has been an increase of about 1% per year in the number of imported cars with engine displacement of more than 4 liters. However, in 2014, compared to the year 2013, we saw a decline in the number of cars with large engine volume. Root cause for this decline was the increased vehicle tax, especially on cars with engine volume exceeding 3.0 liters.

Due to the growing vehicle fleet and increased fuel consumption, exhaust emissions from motor transport are among the main sources of air pollution in Almaty. Concentration of major pollutants in the air exceeds the maximum permissible limits. Motor transport accounts for 80% of air pollution emissions in Almaty<sup>27</sup>.

27. Comprehensive Program to Reduce Air Pollution in Almaty for 2009-2018.

In 2008, GEF produced “Manual for calculating greenhouse gas benefits of global environmental facility transportation projects”, which is the first methodology that focuses on transport sector specifics.

Differences of the GEF methodology compared to standard schemes for CO<sub>2</sub>e accounting:

- GEF financing – happens before project implementation and funding is not revoked if targets are not attained or certified
- GEF approach to investing in GHG reductions – focusing on strategic market development aimed at long-term impacts by reducing barriers to finance and markets, capacity-building, and improving the quality of proposed projects
- types of project activities supported by the GEF – many projects also include additional elements such as establishing financing mechanisms, capacity building and technical assistance, the development and implementation of government policies supporting climate-friendly investments

There are five physical elements of the transport sector, which GEF projects can influence to reduce GHG emissions: vehicle fuel efficiency, greenhouse gas intensity of the fuel used, amount of transport activity, mode of transport chosen, and amount of capacity/occupancy used.

Source: *Manual for Calculating Greenhouse Gas Benefits of Global Environmental Facility Transportation Projects*; [https://www.thegef.org/gef/sites/thegef.org/files/publication/GEF\\_CalculatingGHGbenefits\\_webCD.pdf](https://www.thegef.org/gef/sites/thegef.org/files/publication/GEF_CalculatingGHGbenefits_webCD.pdf)

Share of the CO<sub>2</sub> emissions from transport sector amounts to 99.35%. The share of methane and nitrous oxide emission is very small and amounts to 0.54% and 0.12%, respectively, which is quite natural, since the mass fraction of the gases generated by fuel combustion is very low. Therefore, assessment of greenhouse gas emissions from the transport sector of the city of Almaty used CO<sub>2</sub> emissions as the indicator.

To calculate CO<sub>2</sub> emissions from motor transport in Almaty, we used the approach recommended in the Methodology for calculating greenhouse gas emissions, approved by the Order of the Minister of Environment of the Republic of Kazakhstan No 280-P as of November 5, 2010 (Table 7).

This method suggests calculating level 1 greenhouse gas emissions from all types of gasoline and diesel vehicle engines, regardless of their technical condition, using the following formula:

$$M_{CO_2} = \sum m_m \times k_m \times \hat{\sigma}$$

Where:

$m_m$  is the amount of fuel combusted by vehicles in the class (fuel consumption, tons);

$k_m$  is the conversion factor, TJ (fuel unit);

$k_e$  is CO<sub>2</sub> emission factor for the type of fuel, obtained from Table 4 by default.

$n$  is the number of vehicles for which the CO<sub>2</sub> emissions are then summed up.

All factors needed for the calculation are provided in Table 7.

Table 7. Factors used to calculate the CO<sub>2</sub> emissions

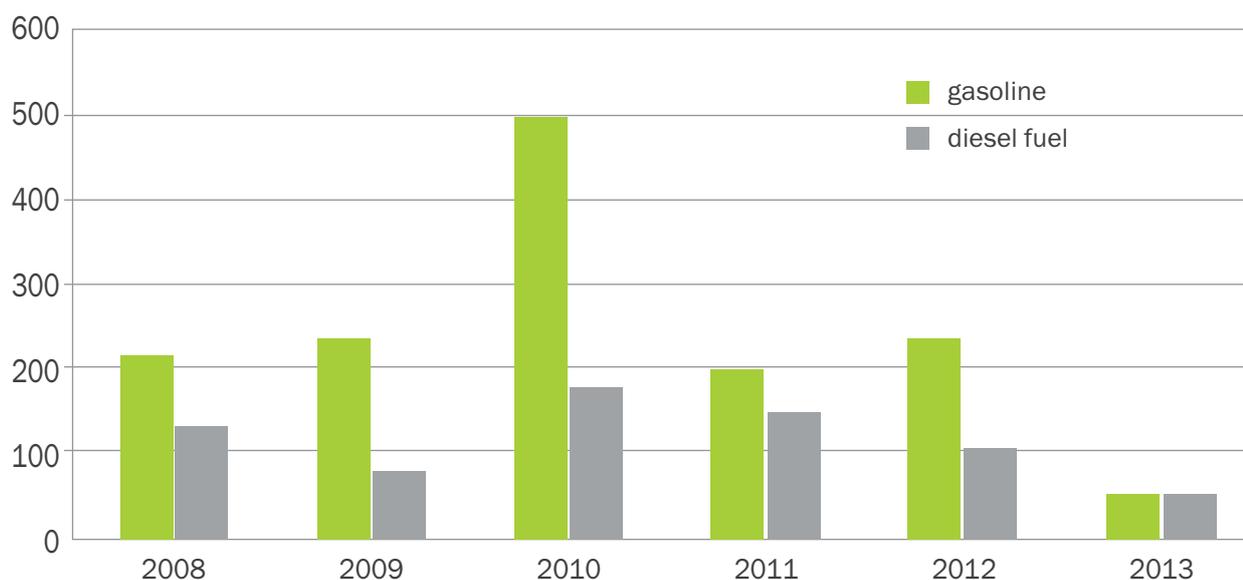
Fuel type	Conversion factor, thous. tons/TJ	CO <sub>2</sub> emission factor, t/TJ	Oxidation fraction, F
Gasoline	43.97	69.3	1
Diesel	42.50	74.1	1

Source: Methodology for calculating greenhouse gas emissions, approved by the Order of the Minister of Environment of the Republic of Kazakhstan No 280-P as of November 5, 2010

Actual fuel consumption data (gasoline, diesel) for 2004–2014 was obtained from the official Statistical Sourcebooks on Fuel and Energy Balances of the Republic of Kazakhstan for 2005–2014.

If we review the emissions from motor transport in Almaty over the period of 2004–2014, we will notice a gradual increase in CO<sub>2</sub> emissions due to saturation of the domestic market with relatively new cars in a good technical shape, and due to the purchasing abilities of population.

Figure 12. Motor transport emissions in Almaty, in 2004-2013



Source: Official Statistical Sourcebooks on Fuel and Energy Balances of the Republic of Kazakhstan for 2005-2014



When calculating emissions for the year 2007, we faced difficulties caused by the bias in data, therefore the level of emissions for that year is incorrect. Similar difficulties related to the 2007 data were faced while developing the National Inventory Report, 1990–2012, on anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol. This problem was reported in the abovementioned document, paragraph 3.4.1.4. Recalculations, Section 3.4. Transport. It can be found on the official website of the Ministry of Energy of the Republic of Kazakhstan (Figure 12).

A moderate growth in CO<sub>2</sub> emissions from transport sector of Almaty was observed in 2008 to 2009. In 2010, gasoline-related emissions increased sharply, while emissions from diesel fuel maintained a moderate growth. Greenhouse gas emissions from gasoline correlate with the increase in the number of cars in Almaty. According to the Committee on Statistics of the Republic of Kazakhstan, in 2010, following the economic crisis of 2009, the number of cars increased dramatically (Figure 9).

Since about 97% of the cars are fueled with gasoline, gasoline consumption had increased accordingly, thus raising the amount of CO<sub>2</sub> emissions in 2010. Emissions from diesel fuel showed a moderate growth, as diesel is mainly used for buses and trucks.

Figure 9 shows that in 2010, the buses and truck fleets had both shrunk. From 2011 to 2012, there was a moderate increase in CO<sub>2</sub> emissions, which corresponded to the dynamics of growth in the number of cars from 2011 to 2012. In 2013, the CO<sub>2</sub> emissions dropped both from gasoline and diesel fuel, although the number of cars had increased.

The sharp reduction in greenhouse gases emissions in 2013 was primarily due to the introduction of Euro-4 emissions standard in the Republic of Kazakhstan. The Euro-4 emissions standard applies to all cars manufactured at the year of its introduction in the exporting country. Euro-4 requires achieving better emission reduction performance, and particularly, for nitrogen oxides – 2 g/kWh, carbon oxides – 4 g/kWh and hydrocarbons – 0.55 g/kWh. Dynamics of greenhouse gas emissions suggests that introduction of this standard has had a significant impact on reducing the harmful emissions.

Introduction of Euro-4 emission standard in the Republic of Kazakhstan is one of the important steps towards reduction of greenhouse gas emissions. According to the standard, second-hand cars imported into the Republic of Kazakhstan are checked against the table of conformity, which helps to determine their emissions class depending on the year and country of manufacture.

Practice shows that introduction of restrictions on the import of cars non-compliant with the Euro emission standards correlate well with the reduction in greenhouse gas emissions from motor transport. Development and implementation of legal and regulatory instruments and regulations on the use of vehicles with smaller engine volumes, and restrictive requirements with respect to the year of car manufacture, had contributed significantly to the effective use of resources and reduction of greenhouse gas emissions from motor transport.

One of the priorities in reducing greenhouse gas emissions is the development of motor transport using alternative fuels or natural gas, which is the most appropriate fuel. The analysis showed that the share of this type of motor transport in the total mix is very small. This is due to the poor development of gas infrastructure.

Based on the historical grid of major gas pipelines and gas distribution networks, only 9 of 14 provinces in Kazakhstan are supplied with natural gas – Aktobe, Almaty, Atyrau, Zhambyl, West Kazakhstan, Kostanay, Kyzylorda, Mangystau and South Kazakhstan. The overall fuel market is mainly focused on cars using gasoline or diesel. To that end, development of the transport sector towards the use of alternative fuels is very promising.

## 2.3 Barriers to improving energy efficiency in transport (review of the social survey findings)

Kazakhstan strives to reduce its energy consumption and increase its energy efficiency, including in transport sector, in pursuit of the strategic objective to rank among the top thirty competitive countries of the world. According to the Energy Efficiency 2020 Program, improvement of energy efficiency of the road, rail and airborne transport and the transport system as a whole should contribute to the reduction of fuel consumption by 30%<sup>28</sup>.

According to experts, energy consumption in transport sector of the country showed a strong tendency to growth in the period of 2003 to 2008. Then, after a slight decline in the wake of the 2009 financial crisis, energy consumption continued to increase in 2010–2012 and reached 5,277 kilotons of oil equivalent (Figure 13).

Kazakhstan strives to reduce its energy consumption and increase its energy efficiency, including in transport sector, in pursuit of the strategic objective to rank among the top thirty competitive countries of the world.

Overall, since the year 2000, the share of transport sector in total energy consumption in Kazakhstan has been ranging between 10% to 18%. In 2012, the transport sector, which accounted for 18% of consumption of initial energy resources, ranked third after the industry and the housing sector<sup>29</sup>.

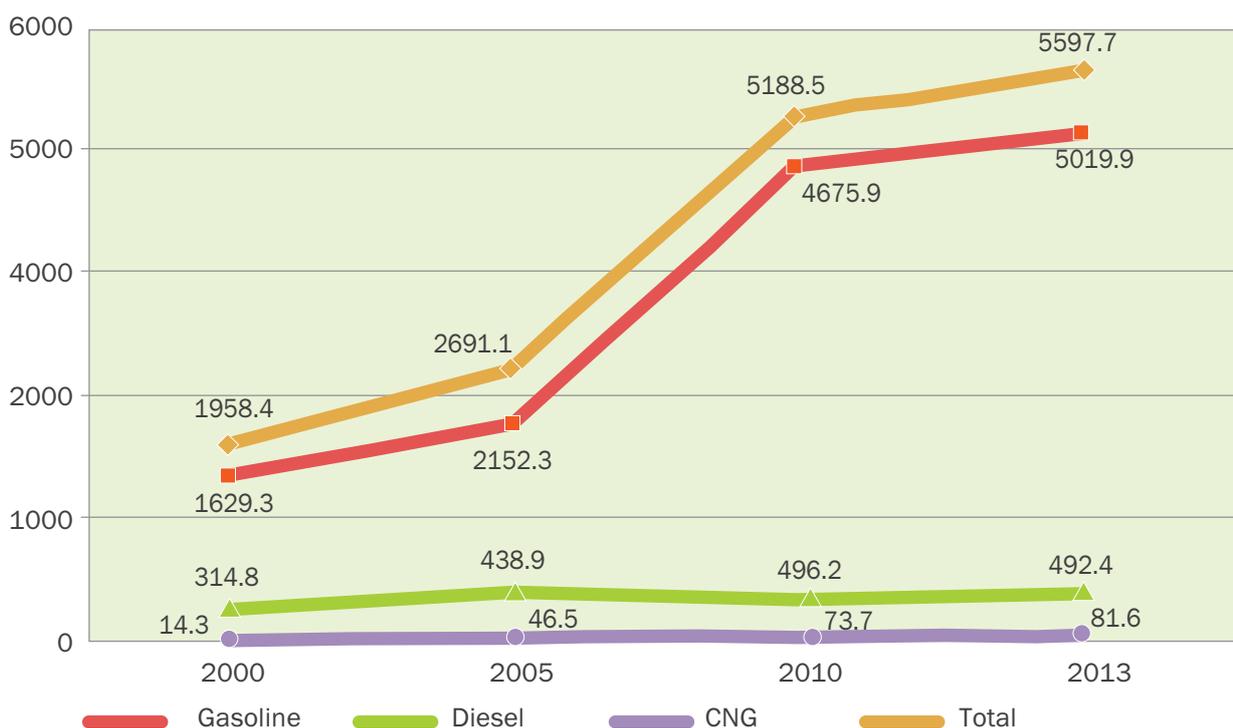
This situation resulted, primarily, from a number of barriers to reduction of energy consumption in transport sector. Above all, high energy intensity and low energy efficiency in transport are a result of the following:

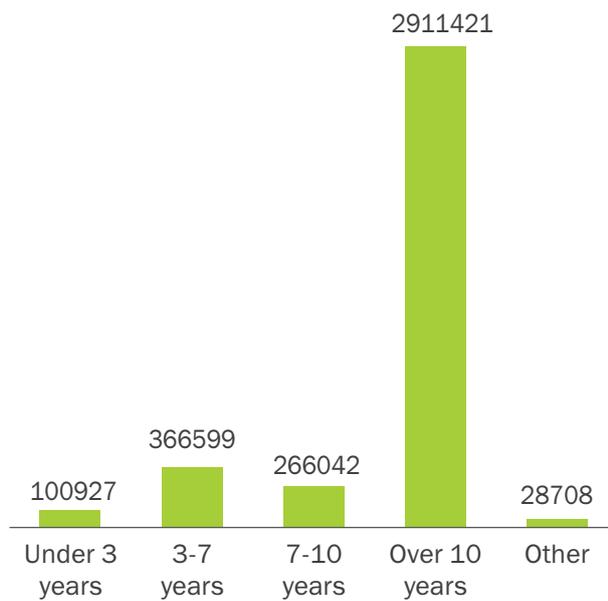
- **80 %** of motor transport has been in service for **over 10 years** (Figure 14);
- gasoline-engine vehicles account for **94 %**;
- **over 70 %** of traffic in large cities is generated by **cars**;

28. Bokenbayev Zh., "Implementation of energy saving and energy efficiency policy in the Republic of Kazakhstan". – [http://diw-econ.de/en/wp-content/uploads/sites/2/2015/03/4\\_Bokenbayev\\_Ministry\\_JSC-Institute-of-Electricity.pdf](http://diw-econ.de/en/wp-content/uploads/sites/2/2015/03/4_Bokenbayev_Ministry_JSC-Institute-of-Electricity.pdf)

29. Zhampiisov R.K., Arkhipkin O.O., Chobanova B., van Dalen, Caitlin Tromop. Review of the national policy of the Republic of Kazakhstan in the area of energy saving and energy efficiency. – Brussels, 2014

Figure 13: Fuel consumption by type



**Figure 14.** Mix of cars by year of production<sup>30</sup>

The large share of private cars is associated with the poor quality of public transport services, lack of ability to change the modes of transport in one trip (for example, switch between personal and public).

Today, less than 30% of all trips are done by public transport in Almaty, while in developed cities the share of public transport for all trips is more than 60%<sup>31</sup>.

In order to identify barriers to improving energy efficiency and reducing transport-related greenhouse gas emissions, the researchers conducted a questionnaire-based survey. They interviewed employees of transport companies, government officials, energy auditors and users of transport services in Astana, Almaty, Karaganda and Shymkent. In total, 37 people were interviewed.

**Among the respondents, vast majority had:**

- post-graduate or undergraduate degree – 33 respondents,
- post-secondary or technical education – 4 respondents.

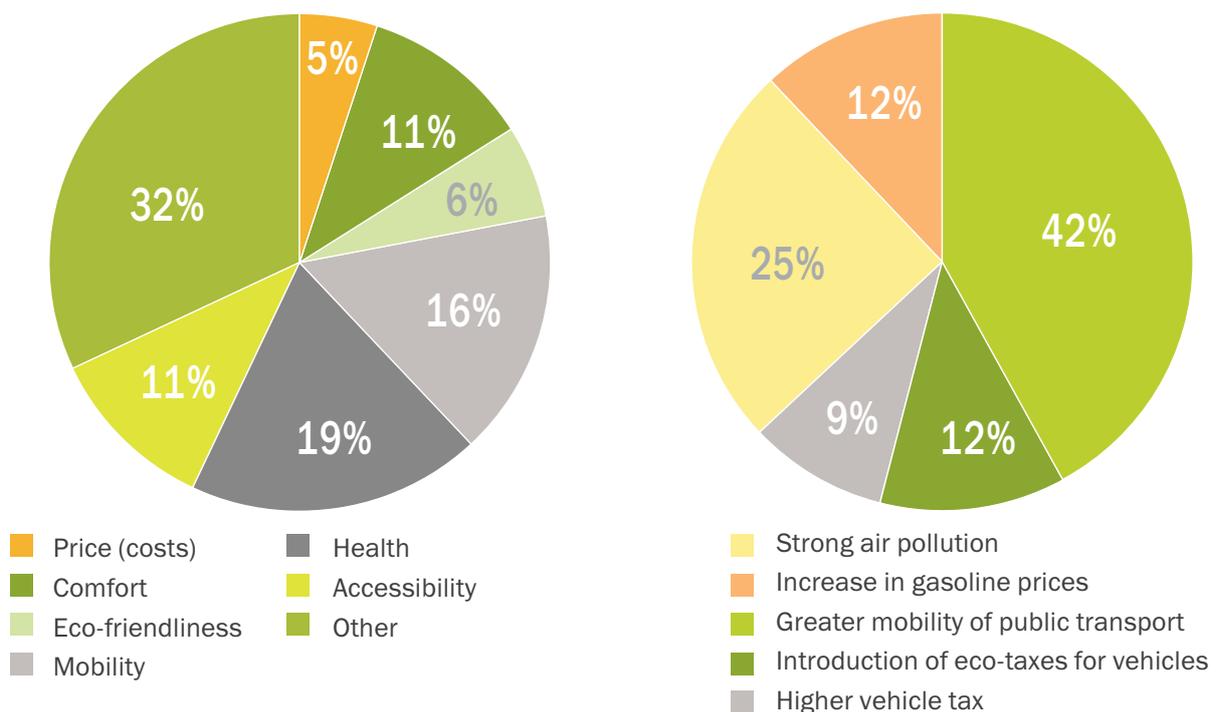
**Age composition of respondents:**

- under 30 – 10 people;
- 35 to 45 – 17 people;
- older than 45 – 10 people.

The questionnaire consisted of two blocks: the main questions, and the social and demographic questions. The main block consisted of 15 questions, the socio-demographic block – of 4 questions (see Annex B).

30. [[http://www.energycharter.org/fileadmin/DocumentsMedia/Thematic/EE-Kazakhstan\\_2014\\_en.pdf](http://www.energycharter.org/fileadmin/DocumentsMedia/Thematic/EE-Kazakhstan_2014_en.pdf)]

31. Zhampiisov R.K., Arkhipkin O.O., Chobanova B., van Dalen, Caitlin Tromop. Review of the national policy of the Republic of Kazakhstan in the area of energy saving and energy efficiency. – Brussels, 2014

**Figure 15:** Factors influencing the choice of transport mode, and reasons to give up the car



The survey found that majority of respondents (32%) named ‘mobility’ as the main criterion for choosing a transport mode, while 42% said that ‘more mobile’ public transport could cause them to give up their personal cars (Figure 15).

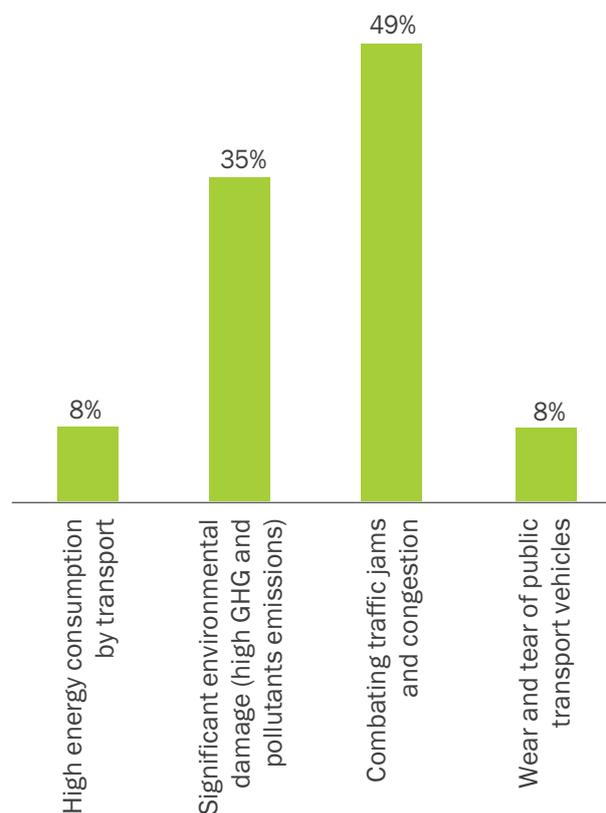
As seen in Figure 12, direct-impact economic instruments (taxes, increase in gasoline prices) have little influence on the choice of transport, since in the information-driven society, time is one of the most valuable and expensive assets, especially in large cities.

However, almost half of respondents (49%) sees “combating traffic jams and congestion” as the main challenges for public transport (Figure 16).

Almaty Sustainable Transport Strategy for 2013–2023 notes that today buses are the major public transport mode, the average bus speed is approximately 14 km/h, and in many cases closer to 10 km/h<sup>32</sup>.

Poor mobility of public transport is exacerbated by the lack of both dedicated bus lanes and priority at traffic signals, and the lack of integration between various modes of public transport. The international experience shows that the more roads there are, the more intensive is the traffic and, over time, road congestion only increases (and doesn’t decrease). Improved connectivity between major routes of public transport and the possibility to use different modes of transport in one trip can help reduce the congestions.

Figure 16. Key challenges for public transport



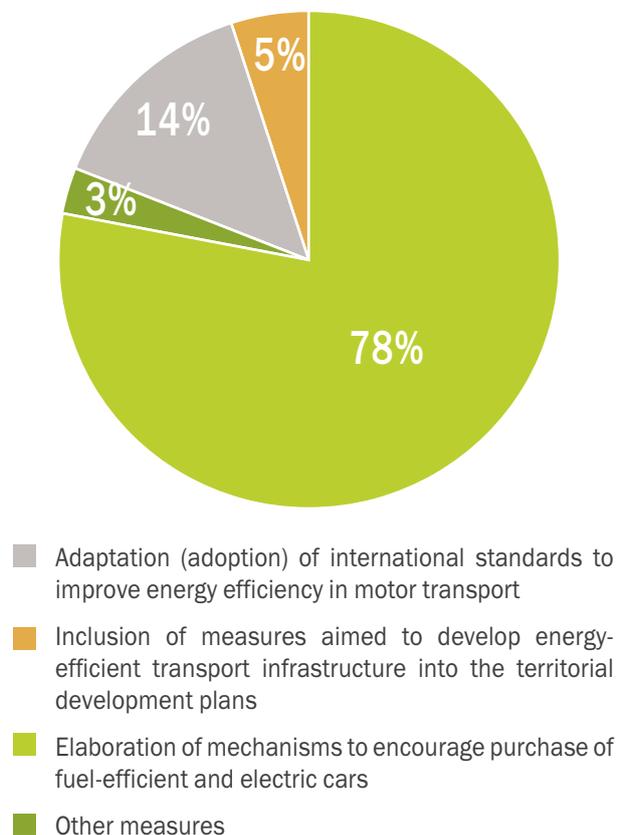
32. Almaty Sustainable Transport Strategy for 2013-2023

Another barrier to the development of energy-efficient public transport system is poor planning of transport services. A proper approach would be to integrate urban planning with optimum mix of residential, business, commercial and cultural areas, and adequate public transport development. Many European countries have managed to achieve that – more than 30% of all car trips are shorter than 3 km, and 50% of trips are shorter than 5 km.

Lack of navigation and timing systems to optimize the transport logistics is another barrier to improving energy-efficiency in public transport. To reduce fuel consumption and exhaust gas emissions, it seems appropriate to introduce a monitoring system for public travel, public transport and transport for dangerous goods, including the use of on-board navigation systems installed in compliance with the rules of the Customs Union.

The financial and economic barriers to reducing energy consumption in transport also include the lack of programs to incentivize transport energy-efficiency. As found by the social survey,  $\frac{3}{4}$  of respondents believe that development of mechanisms to encourage purchase of fuel-efficient and electric cars will help reduce energy consumption in transport (Figure 17).

**Figure 17:** Measures to encourage reduced energy consumption in transport



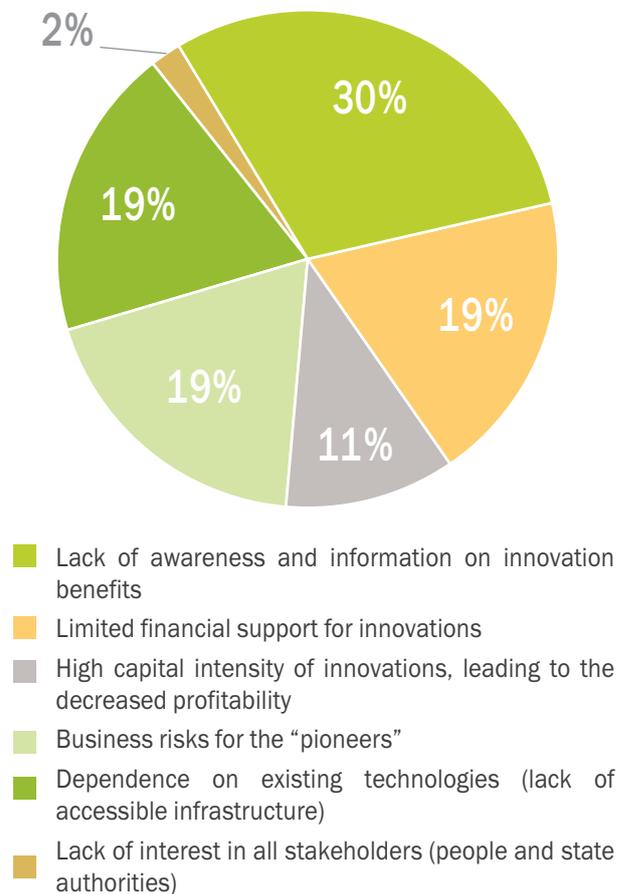
Thus, measures to reduce or lift the vehicle tax off the hybrid vehicles, subject to creation of the appropriate infrastructure, can increase public interest to this type of transport. Mechanisms of governmental subsidies to incentivize purchase of the new energy-efficient and cleaner vehicles, or introduction of a differentiated vehicle tax scale depending on emissions level, year of manufacture, or fuel consumption, could significantly speed up renewal of motor transport fleet of the Republic of Kazakhstan.

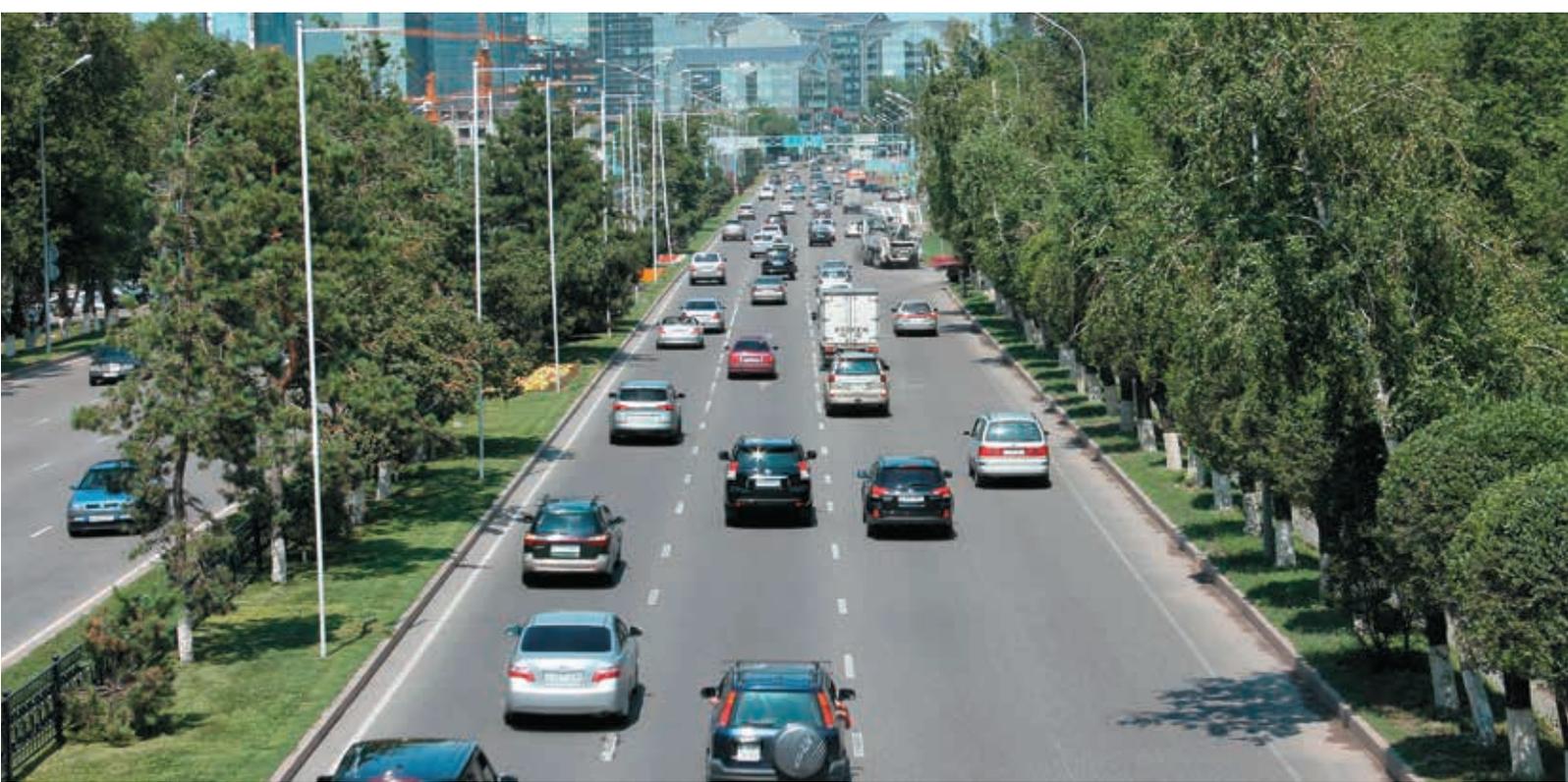
It should also be noted that more than half of the survey participants, when responding the question "What, in your opinion, slows the innovations that could reduce energy consumption?" checked answers relating to financial and economic aspects (Figure 18).

It is therefore appropriate to consider the experience of some foreign cities. For example, the Government of Moscow, in the framework of their state program of supporting reduction in energy consumption, offered to the buyers of midget and hybrid cars exemption from vehicle tax, and the benefit of free parking.

Similar incentives are offered in many US cities. For example, in San Jose (CA), plug-in hybrid and zero-emission vehicle owners are entitled to free parking in the city center. In California, hybrid cars can use

**Figure 18.** Reasons for the slow development of innovations to reduce energy consumption





lanes dedicated for passenger transport, regardless of the occupancy.

In general, the survey found that 86% of respondents are willing to switch to more environmentally-friendly transport modes, provided state support, and 70% of respondents are ready to support environmentally friendly transport even without state subsidies.

One other reason for poor efficiency of measures to reduce energy consumption in transport sector is the imperfect legal framework. In order to build an appropriate legislative framework for energy saving and energy efficiency in transport, in January 13, 2012, Kazakhstan adopted the Laws “On Energy Saving and Energy Efficiency” and “On amendments and additions to some legislative acts of Kazakhstan on energy saving and energy efficiency”, and the Resolution of the Government of the Republic of Kazakhstan on establishing mandatory energy efficiency requirements for transport and electric motors.

Government developed the Action Plan for implementation of Energy Efficiency 2020 Program, aimed at implementation of a set of measures on:

- introduction of **Euro (3, 4, 5, 6) standards** for motor transport;
- development of **energy efficient** transport infrastructure;
- promoting the use of **solar panels** in urban passenger buses;
- energy efficiency **labeling of tires**;
- encouraging the purchase of **fuel-efficient cars**;
- **exemption from customs duties** for hybrid, gas and electric cars;
- the use of energy-efficient tires in the state motor fleet.

It is important to note that almost all these activities were noted by respondents as measures that could improve energy efficiency in transport sector (Figure 19).

However, in order to implement the Plan successfully, it is important to justify all mechanisms of its implementation, with some of them requiring regulatory support and additional programming.

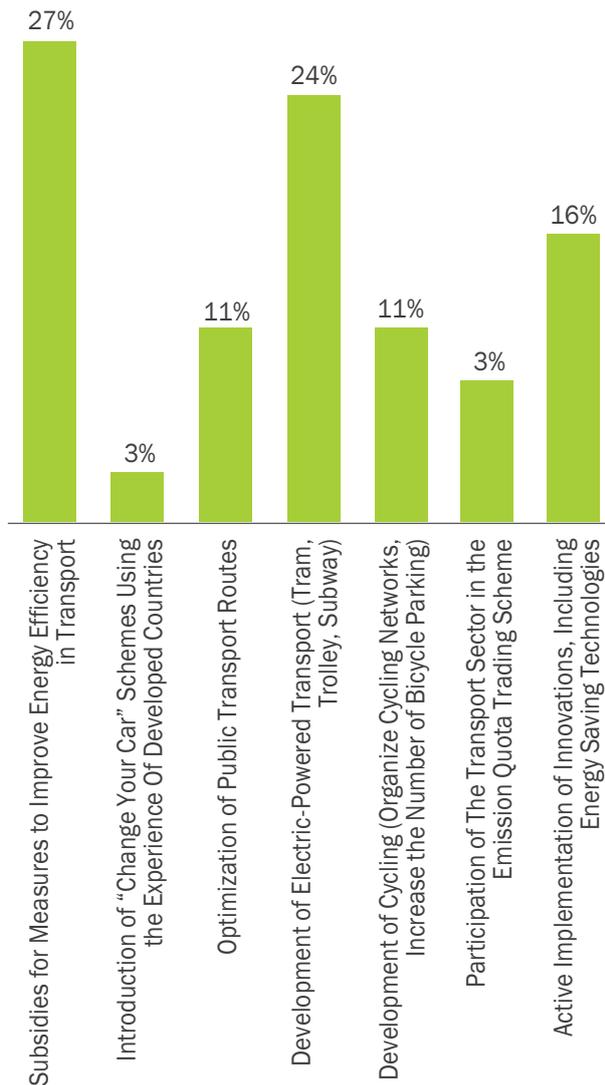
For example, to protect the interests of the poor, the ban on import and domestic manufacturing of vehicles failing to meet the requirements, which follows introduction of Euro standards, will not extend to the cars currently in use, allowing the use thereof until complete wear<sup>33</sup>. Given the fact that most of the vehicles have already been in service for more than 10 years, it would be appropriate to implement a vehicle disposal program, which would incentivize the car fleet renewal and improve energy efficiency in the transport sector.

Experience of other countries demonstrates that in most cases, the positive environmental impact from decommissioning of old vehicles exceeds the additional energy consumption for recycling of the old, and manufacture of the new vehicles. Car owners must be eligible for the car disposal incentives regardless of their decision to either subsequently get a new car, or get a trade-in bonus (depending on the type of trade-in).

At the same time, there are issues with supply of quality fuel. The existing large refineries in Kazakhstan were designed to produce old

33. Almaty Sustainable Transport Strategy for 2013-2023

**Figure 19:** Measures to improve energy efficiency in transport



fuel brands (low octane gasoline brands A-72, A-76). Retrofitting of refineries to meet modern requirements had commenced only recently. As a result, production output contains a considerable amount of additives, affecting the fuel quality and, consequently, the efficiency of combustion engines in motor transport. The use of fuel below the requirements of the engine reduces the engine efficiency and generates unburnt fuel exhaust.

The low quality of fuels is a longstanding problem. Surveys suggest that considerable part of fuels at the refueling stations all across the country does not match nominal standards and requirements<sup>34</sup>. Disrupted system of regular fuel quality monitoring by state or third independent parties might be considered as the main reason for widespread violations of respective technical standards. Furthermore, existing legislation imposes certain limitations for procedures of verification/monitoring over fuel quality, which exacerbates the situation.

Lack of fuel efficiency labeling for new cars is a serious gap in terms of fuel accounting. Thus, if in addition to the development of standards, a mandatory labeling of new cars could be introduced, it would greatly contribute to reduction in fuel consumption. The labelling must a priori include data on fuel consumption and CO<sub>2</sub> emissions. In some countries, the labeling also includes energy efficiency ratings and additional information such as noise rating, emissions standards, taxes, and other technical information.

Car labeling is widely used in the European Union and Australia. The EU Directive (1999/94/EC) requires manufacturers and distributors to provide information on fuel efficiency of new cars and their CO<sub>2</sub> emission levels. The experience of European countries shows that the labeling and consumer awareness can help reduce fuel consumption by 4–5%.

However, development of labeling systems required not only for cars, but also for fuels, tires, etc., is hampered by poor information base and quality of data collected. Success of any policy depends on reliability of data used to inform its development, i. e. fitness of the systems for transport sector data collection and analysis for their designed purpose. Therefore, a framework of indicators for transport sector sustainable development must be used to assess progress in urban planning, traffic management and transport operation at the national, regional and local levels.

To summarize the above, we can identify a number of factors responsible for the high energy consumption in transport sector of the Republic of Kazakhstan:

- large number of cheaper private cars that had been in service for many years;
- public transport uncompetitive in terms of mobility, contributing greatly to the increase in the number of private cars;
- lack of governmental mechanisms to incentivize purchase of more energy efficient vehicles by businesses and individuals;
- gaps in the regulatory framework for fleet renewal incentives, in particular, for the non-state-owned fleet;
- poor information base on benefits of energy saving innovations in transport sector, which results in poor communication on energy-efficient innovations between the competent authorities and the private sector.

34. Mozharova V. V., Transport in Kazakhstan: current situation, challenges and prospects for development. — Almaty: Kazakhstan Institute of Strategic Research under the President of RK, 2011, 216 pp.

# 3 RECOMMENDATIONS TO IMPROVE ENERGY EFFICIENCY IN THE TRANSPORT SECTOR OF THE REPUBLIC OF KAZAKHSTAN

**Motor transport (hereinafter referred to as MT)** is currently one of the key sources of harmful emissions, causing considerable negative impact on the environment and human health. For example, in Almaty transport emissions account for 80% of air pollution. Main causes of air pollution include the growing car fleet and the increase in fuel consumption. According to statistics, motor transport in Almaty combusts about 772 million liters of gasoline and diesel fuel per year, and more than

90% of this amount is consumed by private cars. Previous research of UNEP and GEF/UNDP projects suggests that if no urgent action is commenced, in the next 10 years the level of pollution in the city will increase by 75%.

With this in view, the UNDP/GEF Project initiated preparation of this analytical report to develop recommendations to improve energy efficiency and reduce emissions from the transport sector of the Republic of Kazakhstan.



Having synthesized the experience of the US, Japan, and the European Union countries in reducing greenhouse gas emissions and improving energy efficiency in transport, the authors of this report have concluded that:

1. Energy-efficient transport possesses great potential to reduce demand for both oil and energy in general. According to experts, deployment of advanced technologies and alternative fuels (hybrids, electric vehicles, and fuel cell vehicles) can reduce energy use for transport by 20% to 40% by 2050, compared to the baseline;
2. Effective measures to improve transport energy efficiency include implementation of standards on CO<sub>2</sub> emissions for certain types of motor transport, fuel standards, car tire standards, tax regulation tools, eco-driving incentives, and other;
3. Another effective measure is to create a vehicle fuel consumption control program – CAFE (Corporate Average Fuel Economy) and introduce fuel consumption labeling, based on the experience of some foreign countries.

To date, Kazakhstan had developed a fairly modern regulatory framework to reduce greenhouse gas emissions and improve energy efficiency, the cornerstones of which are the Environmental Code of the Republic of Kazakhstan, the Concept for Transition of the Republic of Kazakhstan to Green Economy, the Law “On energy saving and energy efficiency”, the Law “On Supporting the Use of Renewable Energy Sources”, and the Energy Efficiency 2020 Program.

Social survey conducted during the project delivered the following findings:

1. City of Almaty has a diverse transport system, which needs to be further developed, especially in view of the growing number of private cars;
2. Key issues of Almaty transport system, according to the survey, are poorly developed infrastructure contributing to traffic jams and road congestions (49%), and the environmental damage resulting from substantial pollution (35%);
3. Respondents see solutions to transport issues in implementing the innovations and energy saving technologies (27%); development of electric-powered transport – tram, trolley, subway, electric cars (24%); increasing the energy efficiency in transport (16%); optimization of public transport routes (11%); and development of cycling (11%).

Based on the research and in order to improve efficiency and sustainability of the transport sector in the Republic of Kazakhstan, we herein make the following recommendations:

### At the national level:

Have the **National Action Plan to Reduce Emissions by 2020**, which is currently being drafted, include provisions on:

- development and implementation of standards on CO<sub>2</sub> emissions for certain modes of transport, car tire standards, standards on alternative fuels, etc.;
- regular annual inspections of vehicles for exhaust quality, introduction of a vehicle fuel consumption labeling system;
- inclusion of the transport sector into the National Plan of the Republic of Kazakhstan to Reduce Emissions of Greenhouse Gases for 2016–2020.

To propose to the Committee for Technical Regulation and Metrology of the Ministry of Investment and Development of the Republic of Kazakhstan to develop a methodology for vehicle energy audits under the standard ST RK ISO 50001–2012 ‘Energy management systems – Requirements with guidance for use’

Within the Action Plan for implementation of the Concept for Transition of the Republic of Kazakhstan to Green Economy for 2013–2020 (Resolution of the Government of the Republic of Kazakhstan No 750 as of July 31, 2013):

- in accordance with paragraph 53, undertake a review of fuel consumption by motor transport with a view to optimize the motor transport fleet in each region with account of fuel availability (including LPG – liquefied petroleum gas, CNG – compressed natural gas, etc.) and access to alternative energy sources;
- in accordance with paragraph 54, introduce government subsidies for manufacture and procurement of efficient cars running on alternative fuels with lower CO<sub>2</sub> emissions;
- ensure fulfillment of requirements in paragraph 55 to develop a Program of incentives for car disposal aimed at faster renewal of the fleet and increased energy efficiency based on the “change your car” principle;
- include in the Action Plan for implementation of the Concept for Transition of the Republic of Kazakhstan to Green Economy include new paragraphs:
  - establish state control over the quality of petroleum products sold, and their conformity to the international standards;
  - undertake national advocacy campaigns to promote the use of more environmentally friendly transport modes (metro, light rail transit, cycling, etc.) and fuel (Euro 4 and 5);

- carry out activities to promote eco-driving, develop eco-driving programs and trainings at the national and regional levels.

Introduce the following changes and amendments to the **'Rules for energy audit'** (Resolution of the Government of the Republic of Kazakhstan No 1115 as of August 31, 2012):

- include requirements for motor transport energy audit.

### At the regional and local levels:

- In accordance with the State Program for Development and Integration of Transport Infrastructure in the Republic of Kazakhstan by 2020 (Resolution of the Government of the Republic of Kazakhstan No 725 as of January 13, 2014):
- have the territorial development programs include measures aiming to create energy-efficient transport infrastructures to support the use of natural gas and alternative fuels (construct gas Vehicle Refueling Stations (VRS) and Automatic Gas Distribution Stations (AGDS), etc.);
- convert local public transport to cleaner fuels (gas, electricity, biofuels, etc.);

- optimize public transport routes in cities, allocate lanes for public transport in major traffic corridors;
- promote the development of cycling (organize cycling networks in urban areas, deploy bicycle rental programs) and walking infrastructure;
- promote the widespread adoption of energy-saving technologies in public transport sector and the use of sustainable modes of transport for everyday travel and leisure.

In accordance with the Comprehensive action plan for state support to develop environmentally friendly transport modes in Almaty (Order of the Minister of Energy of the Republic of Kazakhstan No 218 as of 23 December 2014):

- establish mandate and mechanisms to issue subsidies for purchase or conversion of motor transport to the use of natural gas or electricity;
- exempt all types of vehicles running on natural gas (LPG and CNG) from customs duties and value added tax (hereinafter referred to as VAT) as well as from vehicle tax;
- exempt owners of CNGCs, CNG and LPG refueling stations from VAT and customs duties on newly purchased gas refueling equipment;
- exempt owners of vehicles running on electricity from vehicle tax.



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