VEHICLE EMISSIONS, FUEL QUALITY STANDARDS AND FUEL ECONOMY POLICIES IN KAZAKHSTAN

Stocktaking analytical report

The report assesses the current transport sector in Kazakhstan including information and trends in relevant policy framework, key problems and other issues, with an overview of vehicle-fuel economy and emission policies, fuel quality legislation as well as other relevant related policies in Kazakhstan

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Introduction

Kazakhstan, located in the heart of Central Asia is the ninth largest country in the world in terms of territory (2724.9 thousand km2) and posses enormous natural resources. Population of the country is around 17 million people, and the largest cities are: Almaty (1.48 million), Astana (786 thousand), Shymkent (668 thousand) and Karagandy (480 thousand).

Endowed with large fossil fuel reserves, Kazakhstan has achieved considerable GDP growth at average annual rate of 8% since 2000, mainly due to the export of oil and other mineral resources. Transport is among key sectors of the domestic economy providing 6% of the country`s GDP (The Agency of Statistics of the Republic of Kazakhstan).

Table 1. Main economic and transport sector development indicators of Kazakhstan

Indicator	2000	2005	2010	2012
GDP (current billion USD)	18.3	57.1	148.1	203.5
GNI per capita, PPP (current USD)	4,480	7,850	10,440	11,780
Population (million)	14.9	15.1	16.3	16.8
Goods transported by all transport (billion ton-km)	207.1	296.3	385.3	478.0
Passengers carried by all transport (million passenger-km)	73,105	107,600	149,065	213,036

Source: Agency of Statistics of the Republic of Kazakhstan, World Bank

The road network of Kazakhstan has increased by 13% since the collapse of the Soviet Union and expected to expand further. In order to reduce reliance of the economy on oil and gas mining sector, the government is focused on development of manufacturing industries and increase of value-added output production in the country. Further development of the transport sector and respective infrastructure thus is seen as a facilitation tool for economic diversification in the country.

Steady income growth in the country over the past two decades has significantly increased vehicle ownership among the population. It is claimed that growing number of cars, coupled with problems related to quality of the vehicle fuels in the country, has eventually led to excessive air pollution and raised health issues particularly in urban areas. The continuously deteriorating air quality in large cities has been a longstanding concern of the civil community and NGOs that increasingly demands for tougher intervention from the state and other stakeholders into the situation.

The main aim of this report is to assess the current transport sector in Kazakhstan, vehicle emissions as well as main policy and regulatory framework related to fuel quality and air pollution by transport. The report provides an overview of the current state and trends in the country`s vehicle fleet structure, production and consumption of transport fuels, fuel quality standards and fuel economy policies adopted in the country.

Overview of motor vehicle fleet in Kazakhstan

As of 2012, motor vehicle fleet in Kazakhstan constituted around 4.1 million units, 87% of which are passenger cars. Figure 1 indicates the dynamics of the total motor vehicle fleet since 1990 till 2012. From 1991 till 1999 motor vehicle fleet had been declining by 1% annually following economic downturn after the collapse of the Soviet Union. Since 2000, motor vehicle fleet has been showing rapid grow rate, following tremendous economic growth of the country over the last decade and tripling the number of vehicles by 2012
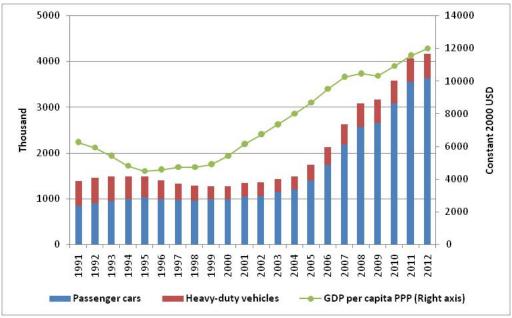
Figure 1. Motor vehicle fleet in Kazakhstan

Source: Agency of Statistics of the Republic of Kazakhstan, the World Bank

Passenger cars

Passenger cars dominate the motor transport fleet of Kazakhstan, with total number of cars passing 3,700,000 units in 2012. Due to the combination of income growth and availability of bank loans, the number of private cars has been rapidly growing since 2000. The fastest growth was observed in 2006 and 2007, when the average annual growth was at around 25%.
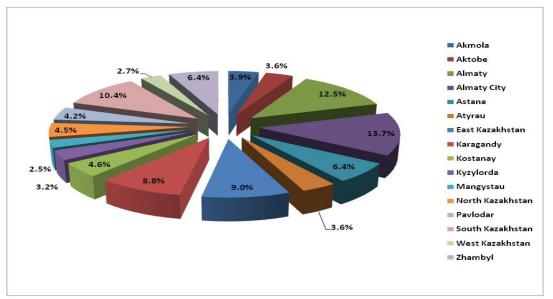
Figure 2. Car distribution by region as of 1-Jan-2013

Source: Ministry of Internal Affairs of the Republic of Kazakhstan

Heavy-duty vehicles

It is estimated that total number of heavy trucks in Kazakhstan in 2012 has reached more than 420,000 units, whereas total number of registered buses in Kazakhstan reached 97,000 units. [1] Although the absolute number of heavy-duty vehicles has been growing since 2000 and almost maintained at 1991 level by 2012, their share in the total vehicle fleet has been declining for the same period due to more intensive growth of passenger cars.

Vehicle fleet regional distribution and density

About third of all passengers cars are registered in the most densely populated regions: Almaty city, Almaty region and South Kazakhstan. Similar to distribution of the passenger cars, about 30-35% of all heavy duty vehicles and buses are registered in the South Kazakhstan, Almaty and Kostanay regions. Vehicle density has tripled from 2003 and consisted 21.3 per 1000 people in 2012. Almaty and Astana are the cities with the highest vehicle density in the country as shown in Figure 3

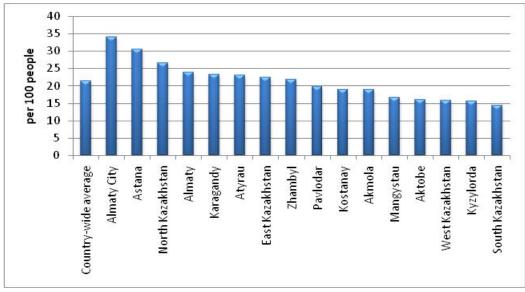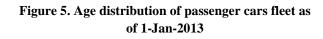---

[1] Agency of Statistics of the Republic of Kazakhstan

Figure 3. Vehicle density by region in 2012

Source: Agency of Statistics of the Republic of Kazakhstan

According to the Ministry of Internal Affairs of the Republic of Kazakhstan, almost 40% of all registered cars have engine size in the range of 1.5-2.0 liters as seen in Figure 4. Planned increase of vehicle tax for cars with engine size bigger than 3.0 liters may reduce the share of such vehicles in the fleet from 2014.

Figure 4. Passenger cars distribution by engine size as of 1-Jan-2013

Figure 5. Age distribution of passenger cars fleet as of 1-Jan-2013

Engine size, liter	Number of cars	Age, years	Number of cars
<1.1	1,688	<3	15,329
1.1-1.5	22,457	3-7	21,741
1.5-2.0	82,826	7-10	17,128
2.0-2.5	35,100	10>	117,433
2.5-3.0	25,731	Not defined	9,422
3.0-4.0	7,760		

>4.0	4,664		
Total	181,053		181.053

Source: Ministry of Internal Affairs of the Republic of
Kazakhstan

Almost 2.9 million passenger cars (80%) are 10 years and older as displayed in Figure 5. The biggest number of passenger cars under three years is in Almaty city, Astana and Atyrau region. While, about 90% of all passenger cars in Almaty and Zhambyl regions are over 10 years old.

Production and consumption of transport fuels

Over 98% of all cars in the country use gasoline, while the share of vehicles run on diesel, gas (CNG and LPG) and hybrids (including fully electric vehicles) consist of 0.9%, 0.1% and 0.8% respectively. There is however a skewed regional distribution of these vehicles, with:

- about 35% of all diesel-powered cars are registered in Almaty city;
- around 70% of cars that use gas are in North Kazakhstan, Aktobe, Almaty city and Atyrau regions, primarily because of comparatively developed infrastructure for CNG/LPG supply ;
- over 80% of all hybrid cars are registered in North Kazakhstan.

Paradoxically, despite large reserves of fossil fuel Kazakhstan is a net importer of petroleum products, due to insufficient production capacities of local refineries. Built during USSR time, the refineries were set to produce mainly low octane fuels and have limited capacities to alter structure of production output. Increasing vehicle ownership and changes in the vehicle fleet (i.e. dominance of passenger cars) the following collapse of the Soviet Union determined market demand skewing towards using higher octane gasoline. Besides 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. Average rate of subsidy was 29.1% in 2012 accounting for 3% of GDP and 358 USD per person [IEA]. Subsidies targeting towards oil and oil products, main fuel for transport sector, consisted 1.4 billion USD in 2012 [IEA].

Although the production of gasoline and diesel fuel has been growing from beginning of 00s, it has not reached the Soviet era production level as displayed on Figure 6.
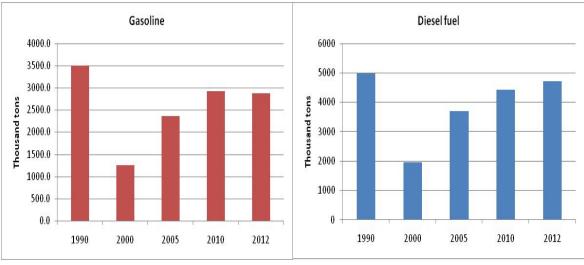
Figure 6. Production of gasoline and diesel in Kazakhstan between 1990 - 2012

Source: Agency of Statistics of the Republic of Kazakhstan

Only 20-30% of all diesel fuel produced in the country is consumed by transport sector, while the government has to import the fuel, primarily from Russia, in order to satisfy its domestic demand. Around 20-45% of all gasoline consumed domestically, mainly of higher octane brands, is imported as displayed in Figure 7.

Figure 7. Production/consumption balance of gasoline in Kazakhstan between 1990 to 2012

Source: Agency of Statistics of the Republic of Kazakhstan

Retail prices of gasoline (RON[2] 80 and RON 92) and diesel are subject to state regulation. The Agency for the Regulation of Natural Monopolies (ARNM) sets the maximum retail prices.

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[2] Research Octane Number

Motor vehicle emissions and air pollution

Air pollution monitoring

Kazakhstan Hydrometeorological Service ("Kazhydromet") is responsible for air pollution monitoring in the country. Established in 1972, systematic air pollution observation system in Kazakhstan 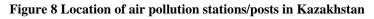saw a period of irregular operation and weak maintenance during economic disruptions of 90s, but its functioning has been restored again by 1999. At present the monitoring system covers 34 major cities and locations with intensive industrial activities in the country. Air pollution observation surveillance is supported by 104 monitoring stations; including 56 manual and 48 automated monitoring posts.

It should be noted that most of the monitoring posts were installed in 80s, and given urban structural changes and expansion occurred over the past 30 years, number and locations of existing posts might be inadequate for a representative analysis of air pollution in cities (Novitskaya, 2013).

The monitoring utilizes both discrete method (four times a day) and continuous mode, and depending on location and needs, determines presence and concentrations of more than 17 contaminating substances, including: particulate matter (dust), sulfur dioxide, carbon monoxide, nitrogen dioxide, hydrogen sulfide, phenol, formaldehyde, ammonia, etc.

Figure 8 Location of air pollution stations/posts in Kazakhstan

Source: Kazakhstan Agency for Hydrometeorological Service

Findings of the monitoring over air quality in 2012 (MEP, 2013) suggest that integrated air pollution index exceeds maximum allowable concentration in 11 cities in the country, and in 8 of these cities the pollution is characterized as very high. It is reported (Ecotech.kz, 2013) that in large cities, such as Almaty and Shymkent, up to 80% of the air pollution is attributed to vehicle

emissions. For example, total amount of air pollutants in 2008 in Almaty consisted 190,100 tons and breakdown of pollutants are given below:

Table 2. Annual air pollution in city of Almaty

Pollutant	Annual emissions, ton	Share, %
Carbon Monoxide (CO)	145,829.9	76.7
Hydrocarbons, Benzo(a)pyrene, Benzole and other	23,977.0	12.6
NOx	17,990.2	9.5
Sox	1,860.2	1.0
Formaldehyde	133.9	0.1
Total	190,100.0	

Source: Comprehensive program on air pollution reduction in Almaty for 2009-2018

Road Transport and GHG Emissions

In 2008, the contribution of road transport sector to the total GHG emissions in Kazakhstan was 8%. 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 (UNFCCC).

Similar to other sector of economy, GHG emissions from road transport had been decreasing until year 1999, when emissions started increasing following economical growth of the country. 80% of all GHG emissions from transport are caused by road transport as displayed in Figure 9.

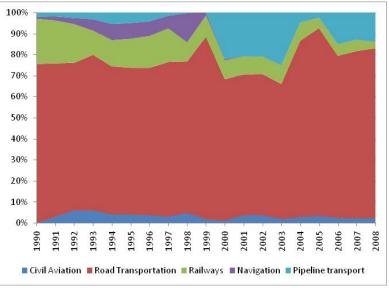**Figure 9. Breakdown of GHG emissions from transport sector**

Source: National GHG inventory report, 2010

Prior to hydrocarbons export boom, emissions caused by road transport constituted almost 90% of all GHG emissions of the sector. Comparing to other sectors of Kazakhstan's economy, particularly power production, contribution of road transport to global warming is not large. However, air

pollution from motor vehicles causes serious threat to health and well-being of population, especially in urban areas.
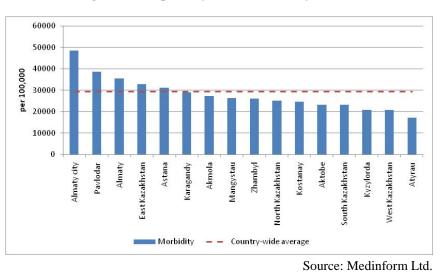
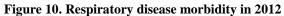**Health Effects of Road Transport-Related Air Pollution**

It is proven, that air pollution has serious implications for public health and safety. Poor air quality causes cardiovascular health deterioration and respiratory diseases like asthma and bronchitis. Furthermore, air pollution heightens the risk of lung cancer.

Cardiovascular disease is the main cause of mortality in Kazakhstan. While respiratory diseases, like asthma and other chronic obstructive pulmonary disease, claim over 50 thousand lives annually in Kazakhstan according to the national statistics.

Cardiovascular and respiratory diseases burden the health care system with substantial medical cost. Average length of stay at hospital due to cardiovascular and respiratory diseases in Kazakhstan is 10.3 and 8.7 days respectively.

Almaty region and city of Almaty, where over 25.6% of total road transport fleet is registered, have significantly higher respiratory disease morbidity rate. In 2012, the highest number of respiratory diseases was registered in Almaty city - 14.4%. Furthermore, respiratory disease morbidity in Almaty city is 1.7 times higher than country-wide average as shown below:

Figure 10. Respiratory disease morbidity in 2012

Source: Medinform Ltd.

The combination and combined effect of air pollutants from transport causes health concerns and resulting external costs in urban areas due to increasing number of motor vehicles.

State regulation and policy framework on fuel quality and air pollution from vehicle emissions

Fuel and vehicle standards

In 2007, the government has endorsed Technical Regulations "Technical requirements to transport vehicle emissions", which adopted new environmental standards for fuels and vehicles, and provided a roadmap for a gradual introduction of these standards in Kazakhstan from 2010 to 2016. The new standards were based on respective classification of the UNECE Regulation 24-03, adopting Euro 1 to 5 technical classes for both fuels and vehicles.

As the country became a member of the Customs Union during the following years, vehicle and fuel standards became subjected to Technical Regulation of the Customs Union "On requirements for automobile and aviation gasoline, diesel and marine fuel, jet fuel and heating oil" (TR TC 013/2011), that came into force in January 2013 (thus, substituting the national technical regulation issued 2007).

The initial schedule for adoption of new vehicle and fuel standards, outlined for the first time in 2007, has been reconsidered and rescheduled several times, postponing introduction of subsequent standards. Table 3. below, presents the most recent amended schedule of shifting to new standards. Due to different state of readiness of local vehicle produces and refineries to undertake necessary upgrades and arrangements in order to meet new standards, commencement of a same standard has a different timeline for fuels and vehicles.

Table 3. Schedule of introduction of EURO standards for vehicles and fuels (as of Dec, 2013)

Standard	Vehicles	Fuels
Euro-2	July 2009	January 2010
Euro-3	January 2013	January 2014
Euro-4	July 2013, for imported vehicles; January 2014, for vehicles produced in the country	January 2016

Source: Technical Regulation of the Customs Union "On requirements for automobile and aviation gasoline, diesel and marine fuel, jet fuel and heating oil"

Soon after introduction of the UNECE environmental standards, the national oil and gas company, KazMunaiGaz has started developing a program for modernization of refineries in the country. After a series of alterations based on outcomes of public and inter-departmental discussions, KazMunaiGaz has presented a final version of the program in 2010. Among the most important features of the program is that the refineries will pass interim upgrade from current Euro-2 to Euro-3, but transit to production of fuels meeting Euro-4,5 standards by completion of the modernization in 2015. According to state officials, a deep modernization would avoid additional capital expenses linked to continuous gradual upgrading of the refineries from one standard to upper one. It is reported (KMG, 2013), that the modernization program will require approximately 4.5 billion USD

and it will expand refineries` capacities up to 18 million tons of oil a year, whereas depth of refining will reach 90%. Consequently, it is envisaged that introduction of the Euro-3 standard for fuels will be skipped from the schedule and the Euro-2 standard will be in force untill 2016. Respective amendments to legislation are currently under preparation and expected to be issued by January 2014 (CTRM 2014, Kalmuratova, 2013)

Fuel quality monitoring

Quality of vehicle fuels in Kazakhstan has been a long-standing issue and a point of criticism from both business and civil society. According to annual survey of the Fuel Quality Center, Kazakhstan ranked 92 out of 100 countries in 2012 in terms of fuel quality. The government however had limited options to change the situation up to now, as it requires a deep modernization of the refineries that were built up during the soviet time.

During the soviet period, quality of transport fuels had been under a control of the state laboratories that carried out regular inspection of petroleum products alongside the production-distribution chain, from refineries to refueling stations. The system of regular inspection of fuel quality had unfortunately disrupted after dissolution of the USSR, and nowadays only Committee on Technical Regulation and Metrology under the Ministry of Industry and New Technologies of Kazakhstan has the right to conduct inspection along the whole chain of petroleum products– production, transportation, storage and distribution.

The legislation however puts some limitations on fuel quality verification and articulates (CTRM 2014) that the Committee can conduct inspection of petroleum products quality under the following conditions: any subjected object can be inspected no more than 1 time per year; any inspection can be pursued only upon preliminary permission from the prosecutor`s office; object to be inspected should be informed about forthcoming inspection in advance. Furthermore it is noted (Kalmuratova, 2013; Ibranova, 2013) that existing legislative framework does not provide necessary conditions for establishing permanent monitoring system, and procedures for sampling, attribution and appellation.

There are a few cases when fuel quality is being examined by some municipal authorities under local initiatives. Due to deteriorating fuel and air quality, Municipality of Almaty has initiated regular checks of fuel quality on refueling stations in the city in 2010. The sampling and examination on a quarterly basis is carried out by authorized private laboratory, which verifies compliance of the fuels to established technical standards. As findings of the laboratory tests suggest (ORGANIC 2013), around a third of total fuel samples in 2012 were not compliant to existing technical standards. It is assumed (Kalmuratova, 2013) that share of fuels which do not meet technical requirements, might be much higher in all other regions due to absence of fuel quality monitoring on a permanent basis.

Low quality of fuels in the country is blamed for frequent technical failures of vehicles. According to some estimates (Romanovskaya, 2013), more than 100,000 of vehicle technical failures in the

country are linked with consumption of low quality fuels. Reportedly, one of the most frequent breakdowns in this respect is malfunction of the catalytic convertors in cars. Though no precise estimates are available in this regard, there is an assumption (Edokov, 2013) that more than half of owners of cars with catalytic convertors subsequently dismantle the convertors from cars due to the abovementioned problem. As exhaust gases of vehicles without catalytic convertors contain higher content of pollutants, the mentioned tendency of dismantling the convertors from car engines eventually contributes to increasing air pollution from road transport.

Vehicle emissions checks

The Ecological Code of Kazakhstan articulates that amounts of carbon -oxides and hydrocarbons in vehicle emissions should not exceed levels, set up in 2004 with adoption of new Technical Standard 51709-2004. Accordingly, emissions of the two substances should be in line with values indicated by vehicle manufacturer, but not exceed maximum allowable concentrations established by the Standard:

Table 4. Maximum allowable concentrations of pollutants in vehicle exhaust gases

Vehicle category	Carbon -oxide, (volumetric share, %)		Hydrocarbons, (ppm)	
	idling mode	running mode	idling mode	running mode
Vehicles produced before 1986	4.5	-	-	-
Light duty vehicles (up to 3.5 t), without catalytic converter	3.5	2	1200	600
Light duty vehicles (up to 3.5 t), with catalytic converter	1	0.6	400	200
Light duty vehicles (up to 3.5 t), with multiple-way catalytic converters	0.5	0.3	100	100

Source: Technical Standard 51709-2004 "Motor vehicles. Technical requirements for road safety."

According to the legislation, all vehicles registered in Kazakhstan should undergo regular obligatory technical inspection, which among others includes compliance validation of engine exhaust gases emissions to maximum allowable concentrations noted above. Since 2011, vehicle technical inspection is carried out by private parties, accredited by the Ministry for Transport and Communications. The private technical inspection centers are equipped with both stationary and mobile inspection lines, and reportedly use advanced electronic equipment for performance tests.

Obligatory technical inspection is conducted annually – for vehicles of more than seven years old; every two years – for vehicles between 3 to 7 years old; and once in three years – for vehicles less than 3 years old. Besides obligatory regular technical inspection, there are also unscheduled examinations of vehicle exhaust gases emissions pursued at various locations on roads by Environmental Prosecutor office representatives along with road police officers.

Existing procedures on vehicle exhaust gases emissions examination are however criticized by civil society due to certain drawbacks. Vehicle owners in particular point out that beside technical state of vehicles themselves, concentration of the noted pollutants in the exhaust gases depends on quality of fuels as well. It is claimed therefore that exceed concentration of noted pollutants in the exhaust gases might be attributed to certain extent to low quality of fuels.

Fuel efficiency and other policies related to air pollution reduction

Besides direct measures and regulations focusing on fuel quality and vehicle emissions issues in Kazakhstan, there are some initiatives that implicitly address air quality issues as well. These regulations touch upon such themes as fuel use efficiency, improvement of public transportation, road fees and taxes.

Following a general policy framework of the government on improving energy efficiency in the key economy branches, the government set up minimal energy efficiency standards for transport vehicles in 2012 (Table 5.). Some parties raise a question on feasibility of these standards, since they are based on calorific value of fuels and specific fuel consumption values, whereas there are some other factors beside these parameters that may affect fuel use performance of a vehicle. Expediency of these standards is also under a question because they are difficult to utilize and comprehend compared to more common tool, such as average consumption of fuel per km for example.

Table 5. Established minimal energy efficiency requirements for road vehicles

Road transport vehicle type	EE requirement (%)[3]
Natural gas vehicles	66
Diesel vehicles	55
Gasoline vehicles	60
hybrid (gasoline/electric) vehicles	75,7
Electric vehicles	52,5

Source: Government decree #1048 dated 15/08/2012 On energy efficiency requirements for transport vehicles

The government has been also gradually increasing custom taxes on imported vehicles, discouraging import of old vehicles and establishing higher road taxes for vehicles with large engines. The custom fees saw the most significant increase in 2011, when respective tariffs had increased for more than five times after introduction of the Custom Union`s regulations. Starting from January 2014 the custom taxes will see further amendment, introducing much higher custom tariff for vehicles with engine of more than 3000 cm3.

The government also plans to introduce incentives and respective infrastructure for expansion of nontraditional fuels such as compressed natural gas (CNG) and liquefied petroleum gas (LPG). It is projected that number of CNG powered vehicles will increase from current 32,000 to 54,000 by

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[3] Expressed as 100/specific fuel consumption in kg/kWh * calorific value of fuel (calorific value) in kWh/kg.

2018, and increase afterwards by 7% annually till 2027. The municipality of Almaty has a program started in 2011 on gradual restructuring its public transportation fleet, switching to cleaner fuels and modes for transportation. It is reported that half of the city bus fleet will be CNG powered by beginning of 2014.

It is noted however (MTC 2014) that for successful expansion of CNG and LPG as transport fuels, the government needs to get in the place a long-term price policy for gas, facilitate investment into gas refueling network and establish necessary technical standards for gas equipment. In order to develop clean transport in the country, the government has recently set up a state inter-departmental working group which aims to elaborate respective roadmap within 2014.

Conclusions

Vehicles fleet in Kazakhstan has seen significant quantitative and qualitative changes since gaining independence in 1992. After a steady growth during 90s, number of vehicles in the country has almost tripled over the past decade, following tremendous economic growth during this period. This increase in number of vehicles however was largely dominated by import of old passenger cars, so that at present almost 80% of light duty vehicles in the country are more than 10 years old.

The rapid growth of vehicles over the past decade in Kazakhstan has consequently led to increased consumption of fuels, which has also tripled during the past 10 years. Gasoline makes almost 85% of fuels consumed in the country, followed by diesel (~13%), where as CNG and LPG constitute only 1% of the total fuel demands. Despite being a large oil producer, the country at present does not have enough capacities to meet internal demand for transport fuels, and import up to 30% of gasoline and diesel from CIS countries and China.

Due to expansion of the vehicle fleet and increasing consumption of fuels, emissions of exhaust gases by road transport is one of major source of air pollution in Kazakhstan, especially in the large cities. Concentration of major pollutants in the air exceeds maximum allowable levels in most province-capital cities of the country, whereas in half of these cities deterioration of air quality became an acute problem. Though occupying comparatively small share in the country`s total GHG emissions, road transport has been also exhibiting the most rapidly increasing carbon footprint since 1992.

Challenged with socio-economic imperatives during the transition period, the government largely neglected the issue of air pollution from transport sector in 90s and the first half of 00s. Technical requirements and standards for fuels saw limited alterations over that period, whilst air pollution monitoring and fuel quality control systems have been partially disrupted and experienced weak maintenance. But aided with the following economic recovery, the state has started putting closer attention to the mentioned issues by the end of 00s introducing several amendments into respective regulative and policy framework.

The major state intervention into regulative framework in this regard is the introduction of the UNECE`s environmental standards for fuels and vehicles produced in or imported to Kazakhstan. It is expected that besides addressing air pollution issues, the new standards will also help to renovate the predominantly old-aged fleet of passenger cars in the country. The country has recently pursued other initiatives as well, such as increase of custom and road taxes for large engine vehicles, promotion of CNG and LPG as transport fuels and setting up energy efficiency requirements for vehicles.

The gradual introduction of "Euro" standards however came across several challenges, the biggest of which is different state of readiness of the refineries and local car producers to comply with new standards. As the result of these challenges, adoption of a subsequent standard has been several times postponed, and besides that the country now has different timelines for introduction of

vehicles and fuels standards. Thus, whilst the country expects commencement of Euro-4 standard for vehicles starting from January 2014, respective fuel standard is planned to come into force only by 2016, after completion of the modernization program in the local refinery plants.

The low quality of fuels is a longstanding problem, and there is evidence that considerable part of fuels at the refueling stations all across the country does not match nominal standards and requirements. 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 described in previous section imposes certain limitations for procedures of verification/monitoring over fuel quality, which exacerbates the situation.

Recommendations

Kazakhstan started undertaking more substantive policies to diminish the adverse impacts of the transport sector on the environment. The government has established a roadmap on gradual transition towards higher environmental standards in the transport sector. But as assessment has revealed there are major barriers in the country hampering smooth transition to clean transport. In order to discuss preliminary findings of the assessment as well as to define needed solutions to overcome defined barriers and gaps, a stakeholder meeting took place in Almaty on 21st of February 2014. The meeting gathered officials from key ministries, experts dealing with the issue and representatives of civil community.

During the roundtable discussion, the stakeholders have stressed that for securing sustainable development of the road transport it is needed to strengthen the framework for fuel quality monitoring, by involving public associations and independent expertise; to eliminate barriers towards the expansion of non-traditional fuels, such as compressed natural gas (CNG) and liquefied petroleum gas (LPG); and to undertake and promote fuel standards/economy policies, adjusting them to political, and socio-economic circumstances of the region.

- **Strengthen the framework for fuel quality monitoring**

As it is reported that there is a widespread violation of existing standards for fuels in the country, which to certain extent reasoned by lack of permanent fuel quality monitoring and procedural barriers to fuel quality examination described in the report. Adoption of higher environmental standards for fuels would have a lessen impact without reinforcement of fuel quality monitoring framework. The stakeholders stress on need

(i)   to amend the existing procedures for fuel quality examination by third parties and to eliminate limitations mentioned in the report (i.e. obligation to retrieve multiple permissions from other agencies, such as the prosecutor`s office, and to inform fuel sellers about coming inspection in advance);

(ii)   to establish prerequisites and favorable conditions for involvement of public associations and independent expertise into fuel quality monitoring.

- **Assure availability of fuels coherent to existing vehicle standard on the market**

Due to different state of preparedness to new standards among fuels and vehicles producers, the regulation currently sets up higher standard for vehicles (e.g. at present it is EURO-3 standard for imported and locally produced vehicles, and EURO-2 for fuels). The state plans to eliminate this gap after finalization of the refineries modernization program by 2016, which will also solve fuel security issues in the country. Since the country is forced to import some part of fuels until the modernization of the refineries is completed, it is proposed to the government to

(iii)   to investigate possibilities to impose higher quality requirements for fuels imported during transition periods (i.e. restrict import of fuels lower than EURO-3 during 2014-2016)

- **Reinforce technical inspection of vehicles and eliminate disincentives**

At present, low quality of fuels leads to frequent technical failures in vehicles and it is estimated that significant part of owners of cars with catalytic convertors eventually dismantle the convertors from cars since its repairmen/replacement is costly. In this respect it is proposed:

(iv)   to amend regulations and procedures governing technical inspection of vehicles   - to include/reinforce checking availability and proper functioning of catalytic convertors and other systems responsible for reduced concentration of pollutants in gas exhausts

Since besides technical state of vehicles, level of pollution is also linked to quality of used fuels, it is necessary to assure that reinforcement of technical inspection is introduced after elimination of fuel quality issues on market in general (i.e. after the modernization of the refineries in the country, and not before reinforcement of fuel quality monitoring proposed in i) and ii).)

- **Promote fuel economy policies**

The overall state policy focusing on enhancing energy efficiency in the country should cover the transport sector and road transport in particular. The government has previously introduced minimum efficiency requirements for vehicles, but it is strongly recommended to:

(v)   to define scope and frames where these requirements are applicable;
(vi)   to transform existing minimum energy efficiency requirements into a more universal form, such as km per liter of gasoline for example.

- **Eliminate barriers towards the expansion of non-traditional fuels, such as compressed natural gas (CNG)**

(vii)   to explore possibilities to introduce incentives promoting wider use of CNG (e.g. tax preferences for CNG vehicles, tariff/price policy favoring to CNG suppliers);
(viii) to develop technical standards and requirements for CNG equipment

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Annex: Fuel and vehicle standards in other Central Asian countries

Central Asia is an important transit route between Asia and Europe, which determines the transport sector as an important factor of economic development of the countries. Road transport is particularly important due to the size of the countries and historically underdeveloped other types of transportation. Hence, GHG emissions as a consequence of growing energy consumption of the sector have been constantly increasing in the region. Main features of the road transport sector development in the region are indicated below:

Table 6. Road transport sector in Central Asia

Parameter	Kazakhstan	Kyrgyz Republic	Tajikistan	Turkmenistan	Uzbekistan
Total road network, km	96,018[1]	34,000[2]	27,767[3]	24,000[3]	81,600[3]
Road density (km/100 km^2)	4[1]	17[2]	19[3]	5[3]	18[3]
Motor vehicles per 1,000 people	219[1]	59[2]	38[2]	106[4]	37[5]
CO_2 emissions by transport sector (Mt) in 2011	12.5	2.8	0.3	7.2	7.9
Total fuel consumption by road transport, ktoe in 2010	4,088.3	870	102	833	1,645

[1]FY 2010, [2]FY 2007, [3]FY 2000, [4]FY 2008, [5]FY 2004   Source: World Bank Data, International Energy Agency (IEA)

Kyrgyz Republic. After the collapse of the Soviet Union, energy consumption by road transport in Kyrgyzstan dropped sharply from over 2,000 ktoe in 1990 till 167 ktoe in 1994. With economic recovery of the country afterwards, the consumption of fuels by the sector has been growing by 18% annually since 2004. According to IEA, in 2010 road transport fuel mix consisted of 65% of diesel fuel, 34% of gasoline and only 1% of natural gas.

All fuel in the country is imported primarily from Russia, and therefore existing fuel quality mainly follows the standards adopted in the Russia. Russian technical regulation "On requirements for automobile and aviation gasoline, diesel and marine fuel, jet fuel and heating oil" set the following schedule of introduction of fuel standards:

- Euro 3: Until 31st December 2014;
- Euro 4: Until 31st December 2015;
- Euro 5: not limited.

Tajikistan. Like Kyrgyz Republic, Tajikistan heavily relies on import of fuel for road transport, and existing petroleum refining capacities are insignificant. Until 2005 fuel mix consisted of almost 100% of gasoline, however, natural gas consumption by the sector has been constantly increasing at annual rate of 15% since then due to growing number of CNG vehicles. CNG has become a cheaper substitution of gasoline, and its share in fuel mix has reached 11% by 2010.

Majority of imported fuel at present meets Euro 2 standard. It is expected however that fuel quality will follow transition to higher standards in Russia, Kazakhstan and China (main exporters of fuel to Tajikistan).

Turkmenistan. Turkmenistan is the biggest gasoline exporter in the region, and currently exports almost 2,400 ktoe of gasoline and diesel fuel. The main importer of fuel from Turkmenistan is Iran. Starting from 2012, Turkmenistan has also started exporting Euro 4 and Euro 5 diesel fuel to Ukraine.

Domestic energy consumption is heavily subsidized, and car owners in the country are entitled to 120 liters of free gasoline a month for 6 months period (720 liters in total). Price of gasoline in Turkmenistan is around 0.128 Euro, the cheapest in the world. The government has promised to keep the subsidies on gasoline at least until 2030.

Despite the absence of stringent standards for fuel quality in the country, the government plans to upgrade existing petroleum refineries to produce Euro 4 and Euro 5 fuels by 2017-2018. Furthermore, the country plans to construct new refineries with state-of-art equipment in order triple its refining capacities by 2030

 Uzbekistan. According to IEA, road transport fuel mix in Uzbekistan in 2010 consisted of 84% of gasoline, 13% of diesel fuel and only 3% of natural gas. It is reported that pollution from road transport accounts for 65% of all emissions from transport in the country.

The government plans gradually adopt Euro 3 and Euro 4 standards fuels and vehicles, and has set the following schedule:

      Fuels: Euro 3 from 2015; Euro 4 from 2016;

      Vehicles: Euro 3 from 2018; Euro 4 from 2019.

In order to overcome the shortage and meet higher standards for fuels, the government of Uzbekistan is planning to upgrade the refineries plants by 2017. Furthermore, the government stimulates fuel diversification for wider use of CNG and LPG, and plans to construct gas-to-liquid and coal-to-liquid plants.

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