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## CIVIL & ENVIRONMENTAL ENGINEERING | RESEARCH ARTICLE

# Review of transportation modes in Kazakhstan region, Central Asia

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**Abstract:** After the dissolution of the Soviet Union, the former Soviet countries emerged and became independent and began the transition from centrally—planned economy to a market economy. This paper presents a case study of Kazakhstan. This paper aims to review of the transport sector in the Kazakhstan aims to assess the current condition and performance of transport systems and to identify key issues and underlying causes. The paper principally covers development of transportation, condition of current situation, including institutional arrangements, legal and regulatory issues, operation of public transport systems, traffic management, and parking, and less extensively hardware aspects, such as construction of road network. Kazakhstan is located in the heart of Eurasia and plays key role in the logistics between Asia and Europe, in so called “Modern Silk Road”. Statistics, analytical materials and legislative frameworks were translated from the references that are in Kazakh and Russian language into English and it brings value to this manuscript. This paper creates different perspectives for future research of transportation modes and infrastructure in Kazakhstan region and central Asia.



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### ABOUT THE AUTHORS

Madina Bazarbekova, 3rd year doctorate student at Kazakh Academy of Transport and Communications named after M. Tynyshpayev. Her area of interest is connected with transportation system and transportation geography of Central Asia, especially in Kazakhstan. She has several publications in Kazakh and Russian languages about urban transportation in Almaty city, Kazakhstan, policy in transportation industry of Kazakhstan and others.

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### PUBLIC INTEREST STATEMENT

Transportation sector is a main sector of economy in the world. Different modes of transportation as railway, road, air, water and pipelines organize movement of people, goods, animals and other things from one place to another. In such big continent as Eurasian continent the Central Asian space’s transportation plays a huge role. Historically by this space there were passed Great Silk Road which connected Europe and Asia. Central Asian region includes post-soviet countries as Kazakhstan, Uzbekistan, Kyrgyzstan, Azerbaijan and others. And all of them have post-soviet historical background which influenced on development of transport systems. This article reviews case of Kazakhstan country, which takes the 9th place in the world by the territory and located in the heart of Eurasia. Kazakhstan is modern, new independently post-soviet country and its significant location also influences on transportation all over Eurasian continent. This paper explains current condition of transportation in the country, policy in transportation industry, modern roads and condition.

The research was undertaken to assist researchers and transportation planners to define and comprehend the basic views of transportation.

**Subjects: Environmental Studies & Management; Engineering & Technology; Tourism, Hospitality and Events; Geography**

**Keywords: transportation modes; Kazakhstan; logistics; Central Asia region**

## 1. Introduction

Central Asia is a land—locked region, which has no access to the world’s high seas, but in terms of natural resources, especially petroleum, natural gas and rare metals is very rich and has an important status in the world (Amirahmadian, 2008).

Central Asia has a fairly well extended infrastructure network inherited from pre-Soviet and Soviet times. It is also situated at the intersection of several international road and railway routes. The routes are identified both by states and under the framework of international organizations. Thus, road routes are identified in regional agreements by the UNESCAP and UNECE in the Intergovernmental Agreement on the Asian Highway Network, European Agreement on Main International Traffic Arteries (1975) as well as under the framework of the CIS, Transport Corridor Europe-Caucasus-Asia (TRACECA), ECO and Central Asia Regional Economic Cooperation (CAREC) program. International rail networks are determined by the European Agreement on Main International Railway Lines (1985), Intergovernmental Agreement on the Trans-Asian Railway Network, and under the framework of Organization for Cooperation of Railways, TRACECA and ECO and Western Europe - Western China International Transit Corridor (Emerson & Vinokurov, 2009; Norojono, Roland, & Sugiyarto, 2010; Peterson, 2007; Vinokurov, Dzhadraliyev, & Shcherbanin, 2010). The US New Silk Road Strategy aims to advance liberalization of trade, foster economic cooperation, increase trade volume, and establish people-to-people connections between and within South and Central Asia (Fedorenko, 2013; Hanks, 2009). Countries that are incorporated into the Silk Road Project are Azerbaijan, Georgia, India, Iraq, Iran, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Syria, Tajikistan, Uzbekistan, Afghanistan, China and South Korea (Bhattacharyay & De, 2009).

The main Euro-Asian routes in Central Asia are well marked in the UNECE/UNESCAP Joint Project on Developing Euro-Asian Transport Linkages which proposes four major Euro-Asian transport corridors for priority cooperation.

Central Asia countries have a problem of cooperation between themselves (Kulipanova, 2012), structural factors such as economic asymmetries, diverging state-building dynamics and interests, the constraining effects of forces external to the region all affect on cooperation process. However, the legal and regulatory framework in the area of international transport is relatively well developed, limited interest in policy-related issues has resulted in the lack of implementation and any real coordination of the transport policies.

## 2. Geographic, demographic and economic profile

The Republic of Kazakhstan is situated in the heart of Eurasian continent. Kazakhstan is bordered on the north and west with Russia in the east—with China, in the south—Kyrgyzstan, Uzbekistan and Turkmenistan and is washed by intracontinental Caspian and Aral seas. Kazakhstan is the 9th world’s largest country with an area of 2,727,300 km<sup>2</sup>. And within a population in 2013 of 17 million 125 thousand people. Ethnically Kazakhstan is very diverse country containing more than 150 nationalities and ethnic groups. According to population census in 2009, majority are Kazakh group (63%), Russian (23%), Uzbek, Ukrainian, Uyghur, Tatar and others (14%). The capital of Kazakhstan is Astana, but financial, cultural center is ex-capital Almaty.

Kazakhstan in the modern borders is a twentieth century Soviet invention, which had been created as a republic in Soviet Union in 1920. After the collapse of Soviet Union Kazakhstan was proclaimed as independent state. Kazakhstan is a unitary republic of presidential-parliamentary type.

Kazakhstan is a country with a rich historical and cultural past. Located in the center of Eurasia, Kazakhstan was at the crossroads of ancient civilizations of the world, at the intersection of major transport arteries such the Great Silk Way and the economic, cultural and ideological ties between East and West, North and South, between Europe and Asia, between the largest state formations of the Eurasian continent (Lee, 2012).

Kazakhstan is very rich of mineral resources and oil. More than 99 elements of periodic table of Mendeleev can be found in the country, 70 elements are explored, and more than 60 elements are involved in the production (Pomfret, 1995).

### 3. Policy issues

Policy and regulation issues are managed by Committee of transport in Ministry of investment and development of Republic of Kazakhstan. Main areas of activities are formation of state policy in the field of transport, creation of conditions for ensuring the needs of the economy of the republic and the population for transportation, works and services, as well as further development of transport and transport infrastructure.

As a transport sector is very connected with other economy industries, majority of legal law documents are strongly intersect with other laws of different sectors. Main documents in transportation are: Law about transportation in Republic of Kazakhstan, Strategy “Kazakhstan-2050”, “On approval of the Rules for the transport of passengers, baggage and cargo in transport”, “On the Transport Strategy of the Republic of Kazakhstan to 2020” and other regulatory documents, standards, rules which are used in different types of transportation.

### 4. Analysis of transportation modes in Kazakhstan

The transport complex of Kazakhstan is provided by all transport modes: railway, automobile, pipeline (petro—and gas pipelines, conduits), and also water (river and sea) and air. Respectively transport infrastructure of the republic contains network automobile and the railroads, river navigable waters, numerous objects of transport infrastructure, somehow: the stations and stations, the airports, the service entities and services providing repair of vehicles, services for transport workers and passengers (Panasyuk, Gafurov, & Novenkova, 2013)

Each type of transport modes in Kazakhstan has its own sphere of beneficial use (Appendix 1), which depends on the nature of the transported goods and the range of transportation. In the structure of the transport complex, rail transport is the most common. Kazakhstani railways provide the bulk of cargo turnover (more than 70%) and 10% of the country’s passenger flow. However, motor transport is gradually increasing its potential and has a share of the total cargo turnover of more than 20%.

There is used horse-drawn vehicles (horses, donkeys and camels as vehicles) in rural areas of the republic. Such transport is important in the economy of specific households practicing this type of transportation of goods, or in the sectors of economic entities engaged in agriculture and forestry, tourism, rescue operations in hard-to-reach areas, mountainous, desert and forest areas.

Transport of Kazakhstan is unevenly developed across the territory of the republic and therefore the analysis of the situation in specific regions in comparison with other has high importance. The main regional features of transport development are the poor provision of transport infrastructure in rural areas and territories with low population density (Western and Central Kazakhstan).

Through the territory of Kazakhstan there are 6 railway, 6 automobile and 72 air corridors. A special place in the system of the transport and communication complex of the country is occupied by two nodes located on international transport corridors. This is the railway junction “Dostyk” in the East and the sea trading port of Aktau in the west of the country. The purpose of the transport complex development is to effectively deliver domestic export goods to the foreign market and provide a wide range of transport services to their users.

The developed Concept of the state transport policy of the Republic of Kazakhstan for the period till 2015 sets as the main goal development of a transport complex for increase in efficiency of transit transportations on the territory of the Republic of Kazakhstan.

The share of transport enterprises in GDP constitutes more than 9% (1,160 billion tenges). The transport complex provided with workplaces 198 thousand people, including 53.7 thousand women. The average monthly salary in an industry constituted more than 70 thousand tenges, for 35% having exceeded the level of the average monthly salary on the republic.

#### **4.1. Railway**

Railway transport is the main mode of transport in Kazakhstan. The strategic foundations for the development of railway transport are laid down in the Sectoral Program for the Development of the Transport Infrastructure of the Republic of Kazakhstan for 2010–2014 and the Development Strategy of the Joint Stock Company “National Company” Kazakhstan Temir Zholy (“JSC” NC KTZ”) until 2020. The documents are aimed at the formation of an optimal system of railway transport, improving the efficiency and quality of services, updating and modernizing the fixed assets of the industry. The first opening of railways trunk in Kazakhstan took place 25th October 1894—after the construction of narrow-gauge line “Pokrovskaya svoboda” (nowadays city Engels, Saratov region, Russian Federation)—Uralsk. 130 km of this railway have passed on territory of present Kazakhstan. 4 years later another narrow-gauge line was opened Urbah-Astrahan, 77 km which also was constructed over the Kazakhstan steppes. After dissolution of Soviet Union, the development of railway transportation may be divided into 3 stages: The first period (1992–1996)—adaptation of branch to consequences of disintegration of the USSR and essentially new economic conditions. Essence of the second stage (1997–2001) became becoming and development of first Kazakhstan railway enterprise “Kazakhstan Temir Zholy”, united in itself three Kazakhstan highways, managed to overcome the crisis phenomena and to put in pawn a basis for the further reforming branch. The third period (since 2001 to the present moment)—marks the beginning of reforming of branch. As a matter of fact, creation of Joint-Stock Company “National company” “Kazakhstan Temir Zholy” was the beginning of realization of new reforms in branch. All changes are directed on transformation of a railway transportation of the country into the modern, highly effective organism, which is organically integrated into continental system of transportations and capable as much as possible to correspond to requirements of clients in conditions of the developed market competition (Kazakhstan Railroad, 2012).

As the Kazakhstan’s rail system was designed during the Soviet era, rail routes were designed ignoring inter-soviet borders and to the needs of Soviet planning. This has caused anomalies such as the route from Uralsk to Aktobe now passes briefly through Russian territory. It also means that routes might not suit modern-day Kazakhstani needs.

The indicators of Kazakhstan in comparison with the EU countries lag behind Sweden and Spain, but exceed the level of all other developed European states (Table 1). Accordingly, Kazakhstan’s indicators are several times higher than those of Asian countries. Comparatively low indicators of Asian countries are formed by two factors: weak development of railways in many countries, as well as high population density (Japan—340, India—360 people/km<sup>2</sup>) (Figure 1).

Thus, in terms of the density of the railway network per capita, Kazakhstan fits well into both the European and Asian zones.

**Table 1. Kazakhstan is among the twenty countries by freight turnover (18th place)**

Position	Country	Length of railway tracks, km <sup>2</sup>	Density of railways km/ thousand km <sup>2</sup>	Population density person/km <sup>2</sup>	Freight turnover million t/km
1	USA	227.058	23.1	32	2,212,711
2	Russian Federation	84.158	4.9	8	1,865,305
3	India	63.327	19.3	360	538,226
4	China	60.809	6.3	140	2,250,528
5	Canada	57.216	5.7	3	213,213
6	Argentina	35.753	12.9	15	12,600
7	Germany	33.862	94.8	229	48,696
8	France	29.901	46.5	120	18,023
9	Brazil	29.817	3.5	23	232,000
10	Mexico	26.677	13.6	55	69,185
11	South Africa	24.487	20.1	41	108,513
12	Ukraine	21.676	35.9	76	196,188
13	Japan	20.048	53.0	337	20,135*
14	Poland	19.627	62.8	122	43,394
15	Italy	16.862	56.0	200	8,122*
16	Great Britain	16.321	67.0	253	19,171
17	Spain	15.046	29.8	93	6,972
18	Kazakhstan	15.089	5.5	6	197,485
19	Romania	10.784	45.2	90	9,531
20	Sweden	9.830	21.8	21	9,763

**Figure 1. Passenger turnover of public railway transport, passenger-kilometers.**

Source: Statistical yearbooks.



However, the condition of railway networks in Kazakhstan is characterized by high physical depreciation of fixed assets of railway transport, which exceeds 60%. For comparison, in the Russian Federation, the corresponding figure is 58.6%. For Kazakhstan, there is a lack of repair of tracks and rolling stock, as well as unsatisfactory quality of repairs.

**4.2. Road transport**

Road transport in Kazakhstan over the last decade of economic importance came in third place after rail and pipeline transport. The advantage for road transport is almost 6 times higher density of roads (more than 30 km per 1,000 km<sup>2</sup> of territory) compared to railways. The lack of railcars on the railway works for road haulers, providing them with orders for transportation services.

Auto transport accounts for a significant share of freight traffic (20.8% in 2010 compared to 10% in the 90s) and more than 90% of passenger traffic. According to the forecast of analysts, by 2017 the share of cargo turnover of motor transport will increase to 32%. Roads and vehicles for many regions of Kazakhstan are the only transport connections.

The length of the roads is 128 thousand km, of which 97.1 thousand km—public roads, incl. 23.5 thousand km of the republican value, 73.6 thousand km belong to the local network. Roads with a hard surface make up only 32.8% of the total road network.

The development of Kazakhstan’s public passenger transport during the years of independence was accompanied by numerous reforms, as a result of which public transport underwent a significant reduction, and the population switched mainly to the use of personal cars. The number of buses in the republic for 2003–2010 increased 1.5 times (from 61 to 94 thousand units) compared to the growth of the fleet of passenger cars in the population by 2.5 times.

Throughout the period under review, the availability of cars of the population of all regions of the republic increased by 2–3 times. The highest rates of security have increased in the North-Kazakhstan region and the cities of Astana and Almaty.

For comparison, the current level of cars for 100 people. In the USA it is 50 cars, in European countries 30–60, in South Korea—60, in Almaty—33.6, in Moscow—31 (in 10 years it is planned to reach 60).

#### 4.3. Air transport

Kazakhstan has an in-continental location, and needs the active development of air transportation. Kazakhstani air carriers (Air Astana JSC, Skat JSC) operate flights on the territory of 18 foreign countries. There are 25 foreign airlines from 19 countries in Kazakhstan, which carry out regular passenger flights. In the field of domestic flights there are regular flights on 40 routes.

The growth of transit traffic of aircraft through the airspace of Kazakhstan for the period 2005–2010 was more than 10% per year. The revenue from transit air transportation for 2010 was 16.6 billion tenge (local currency) within 10 years (2005–2015), the transport strategy of Kazakhstan was planned to increase the volume of transit through the territory of Kazakhstan: from 9.4 to 32.2 million tons of cargo and cargo turnover from 84.7 million up to 190.0 million aircraft-kilometers (Figure 2).

The satisfaction of the available and anticipated demands in transport services, improvement of their quality is the launch pad for development of a transport complex. It should be noted that strategy covers all transport modes: railway, automobile, city, passenger, air and water which development and effective functioning substantially depend on policy of the state (Figure 3).

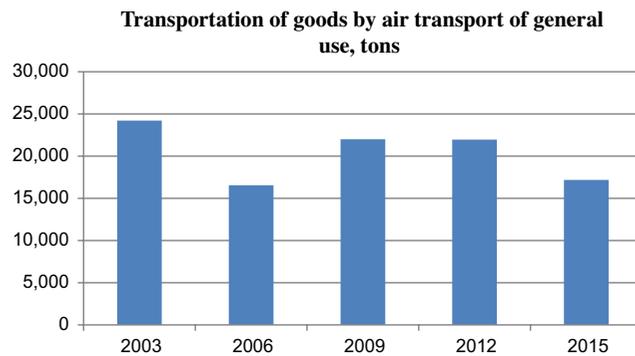
**Figure 2. Transportation of passengers by air transport of general purpose thsd. People.**

Source: Statistical yearbooks.



**Figure 3. Transportation of goods by air transport of general use, tons.**

Source: Statistical yearbooks.



The main objective formulated in strategy is an integration of transport system of Kazakhstan into a world transportation network by increase in the level of development of transport infrastructure based on the main meridional and width thoroughfares, binding routes and nodes in the East-West and North-South directions.

#### **4.4. Water transportation**

In Kazakhstan, due to geographical features, water transport until recently played an insignificant role in the economy. The main reason was the limited scope of its activities on a territorial basis and seasonality of work. For these and other economic reasons, domestic river water transport is not widely used, is not a priority in transport policy and takes a small share in the structure of transport services.

At present, about 1,200 sea and river vessels are registered in the republic, of which 74 are passenger (6.6%). Of these, 48 vessels are considered suitable for navigation. The average age of passenger ships is not more than 25 years. Transportation of passenger fats and cargoes is carried out by private shipowners on 530 vessels of various types. An important problem of the river transport industry is the wear of the technical fleet, which amounts to 85.0%. Work is underway on its stage-by-stage updating and modernization.

Cargo transportation by river transport in Kazakhstan is carried out in several regions of the republic. In the Pavlodar region in the field of river transport Pavlodar river port JSC acts, which renders services on extraction and transportation of river sand to the construction objects of the region, and also participates in the transportation of transit cargoes. Fleet consists of towboats, dry cargo ships and bulk barges. For 7 months of 2011, the volume of cargo transportation by river transport amounted to 315 thousand tons (119.3% against the same period of 2010).

#### **4.5. Metro in Almaty city**

The active construction of the underground began in Almaty in 1988. But the disintegration of the USSR in 1991 and the subsequent disruption of economic and economic ties did not allow the construction of the underground in Almaty to be fully implemented. Many issues remained unresolved due to the liquidation of a number of ministries and departments. And this caused a significant backlog in the construction of the metro (Jenkins, 1994).

The 1990s were a period of creating Kazakhstani material and technical and scientific base for metro construction. Despite the minimal financing, the penetration of the distillation and escalator stations, of the approach workings to the deep-seated stations continued, and, most importantly, the experienced cadres of engineers and workers were retained. During all this time, metro was built and on 1 December 2011 the first stage of the subway with a total length of 8.6 km was put into operation. It included seven stations. After four years, in 2015 were opened two stations and the length of the subway tunnel increased by 2.74 km (Official website).

## 5. Conclusion

Transportation of Kazakhstan is an important and rapidly developing branch of the economy of Kazakhstan. Some types of transport are characterized by the monopoly position of a limited number of companies in the services market (air transport, rail and pipeline transport), and the other part (automobile and water transport) is characterized by a competitive environment.

Summarizing the results of the analysis of the general situation of the development of the transport complex in Kazakhstan, the following main trends should be noted:

- (1) Transport of the Republic of Kazakhstan has developed over the last decade quite intensively to meet the needs of the domestic economy and within the framework of Kazakhstan's participation in international relations. The industry performs important economic and social functions in the economy of the republic and regions. Territorial location of transport is uneven.
- (2) Compared to developed countries, Kazakhstan's transport is still an uncompetitive industry, there is a tendency to a certain decrease in the share of transport in GDP and total investment, the industry is not characterized by sustainable development.

Summing up, this paper reviewed transportation industry in Kazakhstan Republic, gave and explained major characteristics of transportation modes. In future works it is planned to wider research in each transportation mode, give more quality data about services and state of infrastructure. Also analysis of implementation of different projects will be also meaningful, as in Central Asia countries implementation of strategies and policy is on very low level (Kulipanova, 2012).

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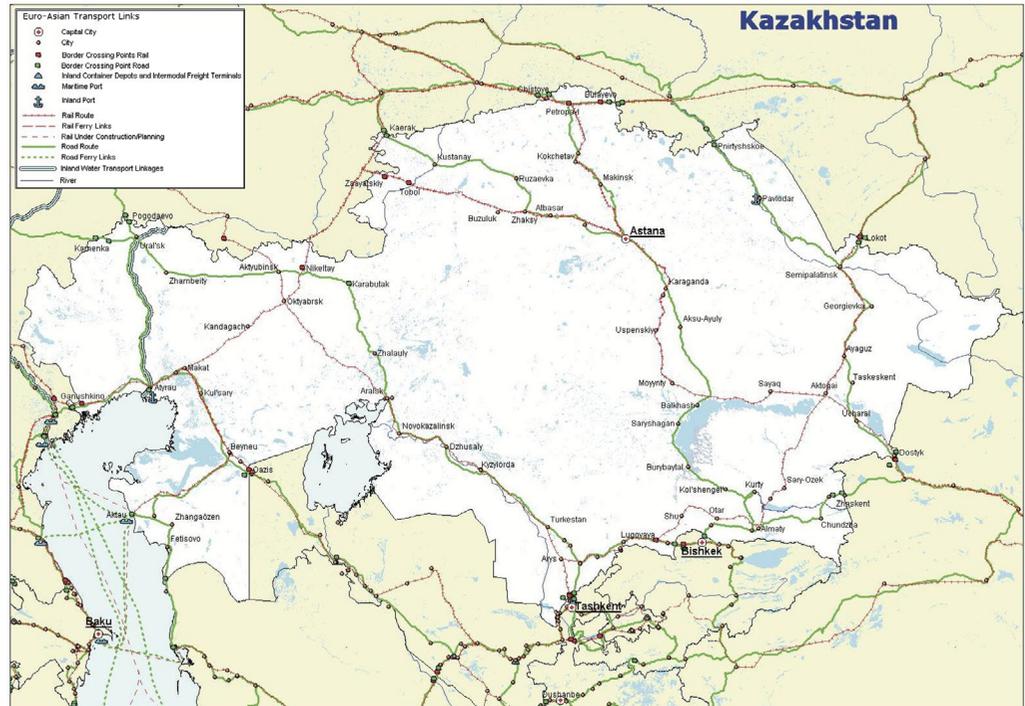
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## Appendix 1

### Map of Kazakhstan road and rail routes.



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