The evaluation of potentiality of the Belt and Road Initiative. Kazakhstan part

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Introduction

The Belt and Road Initiative (BRI) or the One Belt One Road (OBOR) project was first announced in Astana, Kazakhstan, in September 2013 in the course of an official state visit of President Xi Jinping. The initiative involves an area potentially covering 55% of the world’s Gross National Product (GNP), 65% of its global population, and 75% of its known energy reserves. In 2014, the Silk Road Fund was launched with a starting capital of US$40 billion. The management of the China Development Bank announced that by 2020 it would channel up to US$1 trillion into Silk Road projects. The project, as the name suggests, consists of two distinct but mutually reinforcing trajectories, the Silk Road Economic Belt, and the twenty first-Century Maritime Silk Road. These two vectors, alongside the secondary and parallel infrastructure, will serve as the two main commercial routes through which China will foster its economic development by finding new export routes, but also promote, encourage, and sustain the economic development of the states and territories affected by the project. The project has been framed and conceived on the basis of the principles of equality and non-interference.

The purpose of this work is an attempt to assess the potential of Kazakhstan’s transport and infrastructure facilities within the framework of the BRI project with a description of their technical characteristics. Understanding the technical characteristics of objects gives an opportunity to estimate the volume of cargo which is transported through the Kazakhstan part of the project, and we also try to understand which modes of transport are mainly used for cargo transportation.

The first chapter begins with a general description of the BRI project and tells about the history and goals of this project. The following is a description of the three principal directions of the BRI project as a land corridor, a sea corridor and a northern sea corridor.

For understanding the integrity of the BRI project, the description of the Kazakhstan part of the project is conventionally divided into periods before and after the announcement of the BRI project.
The second chapter describes the projects, infrastructure and transport facilities that already existed at the time of the announcement of the BRI and which were later integrated as part of the BRI. In particular, there is a description about the automobile corridor “Western Europe - Western China”, which, as the name implies, connects the western part of China with Europe. There is also a description of the only, at that time, Dostyk railway frontier crossing on the border of China and Kazakhstan, as well as the seaport of Aktau, which is located on the shores of the Caspian Sea. There is another description of the new railway lines that made it possible to shorten the route from Central Kazakhstan to the west of Kazakhstan by hundreds of kilometres.

The third chapter describes the projects that were mainly implemented within the framework of the BRI and with the funds of Chinese banks specially created for this aim with the purpose of financing. This chapter describes the largest dry port in the world, Khorgos, the new seaport of Kazakhstan, Kuryk, as well as the construction of new railway lines to increase the capacity of the transport corridor. There is also a description of the management system "NOMAD", which helps to reduce operational time at the borders and increases the processing speed of documentation, which in turn increases the speed of cargo delivery by rail and road.

After receiving all the information on the technical characteristics of the objects, in the fourth chapter we present a data of the Statistics Committee of the Republic of Kazakhstan, and on their basis, we will try to estimate the traffic volumes in numbers and the potential of transport and infrastructure networks for each mode of transport.

In the fifth chapter, we describe the technical and economic challenges faced by the project. The Kazakhstan part is the main component of the China-Europe direction, and that's why we will review this direction entirely. Also consider the difficulties on the border of China and Kazakhstan, Poland and Belarus, and describe the difficulties that exist within Europe itself. There will additionally be an analysis of current prices for the transportation of goods in containers and their possibility of competing with the rates for sea transportation.

In the sixth chapter, we summarise this work.
1. General overview of the Belt and Road Initiative or the One Belt, One Road

Introduction

The Belt and Road Initiative (BRI), also known as the One Belt, One Road (OBOR) or the Silk Road Economic Belt and the 21st-century Maritime Silk Road, is a development strategy adopted by the Chinese government involving infrastructure development and investments in countries in Europe, Asia and Africa. "Belt" refers to the overland routes or the Silk Road Economic Belt; whereas "Road" refers to the sea routes, or the 21st Century Maritime Silk Road. Until 2016, the initiative was officially known in English as the One Belt and One Road Initiative, but the official name was changed as the Chinese government considered the emphasis on the word "one" prone to misinterpretation.

The BRI initially manifests itself primarily as a massive infrastructure development programme. It is based on the logic of using China’s enormous economic leverage abroad and exporting its strong infrastructure development capabilities to other regions. Ongoing and planned projects will focus on the development of a wide array of assets, including ports, roads, railways, airports, power plants, oil and gas pipelines and refineries, and Free Trade Zones, etc., as well as a supporting information technology (IT), telecommunication and financial infrastructures. To date, PricewaterhouseCoopers (PwC) has tracked the equivalent of US$250 billion in projects that have either been built already, recently started construction or have been agreed on and signed concerning BRI. Already, some estimates list the Belt and Road Initiative as one of the most significant infrastructures and investment projects in history, covering more than 68 countries, including 65% of the world’s population and 40% of the global Gross Domestic Product (GDP) as of 2017. The Belt and Road Initiative addresses an "infrastructure gap" and thus has potential to accelerate economic growth across the Asia Pacific area and Central and Eastern Europe: a report from the World Pensions...
Council (WPC) estimates that Asia, excluding China, requires up to US$ 900 billion of infrastructure investments per year over the next decade, mostly in debt instruments, 50% above current infrastructure spending rates. If carried out at full scale, the implementation of BRI will cover a long period of at least 30 to 40 years. The gaping need for long term capital explains why many Asian and Eastern European heads of state gladly expressed their interest join on this new international financial institution focusing solely on ‘real assets’ and infrastructure-driven economic growth.

1.1 The Silk Road Economic Belt

The Silk Road Economic Belt (SREB) is the overland interconnecting infrastructure corridors. When Chinese leader Xi Jinping visited Astana, Kazakhstan, and Southeast Asia in September and October 2013, he raised the initiative of jointly building the Silk Road Economic Belt and the 21st-Century Maritime Silk Road. Essentially, the "belt" includes countries situated on the original Silk Road through Central Asia, West Asia, the Middle East, and Europe. The initiative calls for the integration of the region into a cohesive economic area through building infrastructure, increasing cultural exchanges, and broadening trade. Apart from this zone, which is largely analogous to the historical Silk Road, another area that is said to be included in the extension of this "belt" is South Asia and Southeast Asia. Many of the countries that are part of this belt are also members of the China-led Asian Infrastructure Investment Bank (AIIB). North, central and south belts are proposed. The North belt would go through Central Asia and Russia to Europe. The Central belt goes through Central Asia and West Asia to the Persian Gulf and the Mediterranean. The South belt starts from China to Southeast Asia, South Asia, to the Indian Ocean through Pakistan. The Chinese One Belt strategy will integrate with Central Asia through Kazakhstan’s “Nurly Zhol” infrastructure program.

The land corridors include:
- The New Eurasian Land Bridge runs from Western China to Western Russia through Kazakhstan and includes the Silk Road Railway through China’s Xinjiang Autonomous Region, Kazakhstan, Russia, Belarus, Poland and Germany.
- The China–Mongolia–Russia Corridor will run from Northern China to the Russian Far East.
- The China–Central Asia–West Asia Corridor will run from Western China to Turkey.
- The China–Indochina Peninsula Corridor will run from Southern China to Singapore.
- The Bangladesh-China-India-Myanmar (BCIM) Economic Corridor, runs from southern China to Myanmar and is officially classified as "closely related to the Belt and Road Initiative".
- The China–Pakistan Economic Corridor (CPEC), also classified as "closely related to the Belt and Road Initiative," which is a US$62 billion collection of infrastructure projects throughout Pakistan that aims to rapidly modernise Pakistan's transportation networks, energy infrastructure, and economy. On November 13, 2016, CPEC became partly operational when Chinese cargo was transported overland to Gwadar Port for onward maritime shipment to Africa and West Asia.
The Belt is a Chinese proposal to interlink the countries and economies of the Eurasian continent through a range of projects focused first and foremost on infrastructural development and connectivity and coordination of national and regional development plans. In essence, the Belt intends to (a) expand and connect transport networks and markets; (b) disperse and improve Eurasian production capacity; and (c) facilitate the transit of goods, capital, energy, raw materials and—to some extent—information, people and culture. It plans to do this through substantial investments in road, rail, port and aerial infrastructure, along with ancillary facilities such as power grids, energy pipelines and high-speed fibre optic cables.

The March 2015 white paper, ‘Vision and Actions on Jointly Building Silk Road Economic Belt and 21st Century Maritime Silk Road’, the most comprehensive official policy on the BRI issued to date, has clarified general integration goals. The Belt’s five major goals are to promote: (a) policy coordination, (b) facilities connectivity, (c) unimpeded trade, (d) financial integration, and (e) people-to-people bonds (the ‘five connectivities’). In China’s view, connectivity and co-development are common interests and keys to peace and prosperity.
More concretely, the Belt is related to six planned economic corridors stretching outwards from China throughout Eurasia, some of which merge with the Road. In the European Union (EU), these corridors end up in Rotterdam, Hamburg, Prague and Madrid. Some of these economic corridors, as well as related components or projects, had already been proposed, planned or completed before the Belt announcements, but have been subsequently subsumed into the Belt. However, the Belt is also progressing through a range of investment projects unconnected to infrastructural and transport corridors, ranging across a variety of economic sectors. It aims to coordinate policies and economic development strategies among states, it does not set a priori parameters on methods, actors or mechanisms—nor is it treaty-based. Nonetheless, it should be noted that the Belt is not an entirely new endeavour. China and many states in the Caucasus, Central Asia and Eastern Europe have been promoting closer integration since at least the late 1990s. To some degree, the Belt is also a continuation of China’s regional connectivity policies from the 1990s and builds on some existing and uncompleted physical linkages throughout Eurasia. As such, the Belt serves to harmonise and synchronise existing fragmented policies with new policy aims, and current and future projects—including some existing oil and gas pipelines. The Belt is a long-term Chinese connectivity vision with no a priori parameters on methods, actors or mechanisms, nor much granularity to date. It, therefore, allows a great deal of flexibility and could—possibly—become a leading new model of cooperation and global governance.

The Belt initiative has been proposed in response to China’s domestic economic problems and its foreign policy goals. The Belt also fits well into China’s evolving security concepts, which stress common security through economic cooperation. Indeed, if the Belt is developed and sustained successfully, it could become one of the cornerstones of further Asian economic growth and integration, and closer political and security cooperation in the region.

It is beyond question that there is an immense infrastructure vacuum in large parts of Eurasia, which many relevant states have not been able to fill independently, nor with
the aid of existing multilateral development mechanisms. There is also much-untapped development and integration potential in Eurasia. The Belt could, therefore, be a win-win deal for some states. The Belt has the potential to address some of the socioeconomic challenges in the Eurasian continent, there is also the prospect of a mismatch in governance expectations. Arguably, the Belt works best if other governments are comparatively as efficient at mobilising themselves as China. Improved infrastructure can certainly catalyse employment and economic activity, but tapping the developmental potential of infrastructure requires investment in human and institutional capital and the right economic policies from local states. This is an inherently political process, one that is not necessarily in the hands of China.

1.2 The 21st Century Maritime Silk Road

The Maritime Silk Road (MSR), also known as the "21st Century Maritime Silk Road" is the sea route corridors and first proposed by The President of China Xi Jinping during a speech to the Indonesian Parliament in October 2013. It is a complementary initiative aimed at investing and fostering collaboration in Southeast Asia, Oceania, and North Africa, through several contiguous bodies of water: the South China Sea, the South Pacific Ocean, and the wider Indian Ocean area. The Road currently has three envisaged major arteries. The first and main artery goes from China’s coast to Europe through the South China Sea, the Indian Ocean Region and the Mediterranean Sea, and into the Atlantic. Its second artery extends from China’s coast through the South China Sea to the South Pacific and then onto greater Australia. The third artery extends through the Arctic Ocean, passing north-west alongside Russia’s northern coast to connect with the Nordic region and other parts of Europe, and north-east past Canada. The third maritime branch we will review separately in subchapter “The Polar Silk Road”.

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The 21st Century Maritime Silk Road cover more than 20 countries and regions, and its real aim – similarly to continental projects – is to promote regional collaboration, financial integration, free trade and scientific cooperation. The Road runs through a region that is sensitive to international strategy and has complex geopolitics. The countries in the region differ in size, development, history, religion, language and culture. The Road accommodates various countries’ demands and applies suitable policies to each country.

China has actively promoted maritime cooperation between Southeast Asia, South Asia and African countries and established high-level mechanisms between various national maritime departments. At that time, the Maritime Silk Road extends southward from China’s ports, through the South China Sea, the Straits of Malacca, Lombok and Sunda and then along the north Indian Ocean to the Persian Gulf, Red Sea and the Gulf of Aden. In other words, the Road extends from Asia to the Middle East, East Africa and Europe, and connects the Pacific and Indian Oceans. In the Indian Ocean Region, the Road seeks to create, alongside the Belt, a production and trade network linking this maritime domain with the Eurasian hinterland and Western China. This would be a
historic first that could contribute to the opening up of landlocked Central Asia, improved connectivity in South Asia, and greater Eurasian economic integration and security cooperation. As a result, the Road in association with the Belt could reshape the nature of the Indian Ocean Region into a more interconnected global commons that could provide a host of new economic opportunities. In so doing, the Road has begun to stimulate greater competition over development–support and connectivity in the region.

China has been building friendships and partnerships with neighbouring countries and developing maritime partnerships with its ocean neighbours, providing a solid foundation for cooperation with the Association of Southeast Asian Nations (ASEAN) and countries in the region. The Road makes good use of the China-ASEAN Maritime Cooperation Fund and enhances practical maritime cooperation. By prioritising cooperation in inter-connectivity, the maritime economy, marine environmental protection and disaster prevention and mitigation, China aims to improve the welfare of countries along the route and share the benefits of the Maritime Silk Road.

The Road is also aiming to use of existing bilateral and multilateral marine cooperation mechanisms and frameworks. By making use of the existing and effective marine cooperation platforms, China will improve the area’s marine partnership network, forge closer ties between countries along the route and finally create a cooperation landscape in which marine resources, industries and culture are all reasonably distributed and mutually reinforcing.

The Maritime Silk Road of the 21st century will further unite and expand common interests between China and other countries situated along the route, activate potential growth and achieve mutual benefits in more extensive areas. It is in line with the development of national economies and the improvement of welfare. China follows the new perspectives on value, cooperation and development featuring equality, cooperation, mutual benefits, win-win results, inclusiveness and harmony.
1.3 The Polar Silk Road

In addition to the Maritime Silk Road, the President of China Xi Jinping also urged the close cooperation between Russia and China to carry out the Northern Sea Route cooperation to realise the "Polar Silk Road" to foster development in the Arctic region. China COSCO Shipping Corp. has completed several trial trips on Arctic shipping routes, the Transport departments from both countries are continually improving policies and laws related to development in the Arctic, and Chinese and Russian companies are seeking cooperation on oil and gas exploration in the area and to advance comprehensive collaboration on infrastructure construction, tourism and scientific expeditions.

![Figure 3: The Polar Silk Road](image)

This direction in shipping routes across the Arctic is very interesting for China, as it provides an alternative to the traditional southern maritime route through the Suez Canal. Equally important is that alternative Arctic shipping routes such as the Northern Sea Route (NSR), the Northwest Passage and the Transpolar Route are much shorter
(up to 35%) than the traditional maritime route, requiring less fuel and producing less CO₂ emissions. On the other hand, additional fees arise from passing through Russian waters with ice-breaker escorts and so far the Northern Sea Route, for example, is only passable for 4 months per year. Other challenges include the unpredictability of Arctic weather conditions, ice floes, and tonnage limitations. These constraints make Arctic shipping routes less suited for transit container shipping that relies on on-time delivery within a tight schedule. The routes are better suited for destination shipping, i.e. the transport of bulk goods such as minerals, LNG, gas and oil from points of extraction to markets outside the Arctic. Other disadvantages are the lack of purpose-built shipping fleets, variable seasonal conditions, limited satellite coverage, poor shore-side infrastructure and search-and-rescue capabilities, and high insurance premiums.

2. Projects implemented before the announcement of BRI

The vast territory of Kazakhstan, 2.7 million km² (9th territory in the world), low population density (6 people per km²), dissociation centres of industry and agriculture, and the remoteness from world markets, makes the possession of advanced transportation system vital for Kazakhstan.

At the official level, Kazakhstan has been an enthusiastic supporter of the BRI project. The importance of Kazakhstan for the BRI project is indicated by the fact that the President of China Xi Jinping decided to launch the project in Astana. Kazakhstan has warmly welcomed the launch of the BRI initiative as a means to increase its connectivity and achieve alternative routes of transport and trade.

Astana has already received over US$27 billion of China’s BRI investment to realize these transport infrastructures and to develop some transport hubs along the Sino–Kazakh border; among them, Khorgos—opened in 2015—is the most relevant land bridge, which currently represents the main commercial and logistics hub in Eurasia under the BRI label. The Khorgos dry port also is the main gateway of the BRI
infrastructural and energy projects. In May 2017, the Chinese COSCO Shipping Corporation and Jiangsu Lianyungang Port Co purchased a 49% stake in the Khorgos transport hub from the national railway company, further showing the relevance of this transport hub to the BRI project. According to Kazakh officials, the integration of these projects will create a multiplying effect for the development of industries and unimpeded trade in the region, turning Kazakhstan into a significant Eurasian transport and logistics hub.

2.1 Central Asian and Kazakhstan existing transport projects integrated with BRI

The following selected list of ongoing projects illustrates that, although they all can be combined under one mega-brand, “Silk Road,” in fact some of them were started before the BRI was initiated. In 1996, the construction of the Tedjen – Serakhs - Mashhad railroad was completed. It connected the network of Iranian railroads to those of Turkmenistan and other Central Asian countries and opened the shortest way from the Central Asian region towards the Middle East and Europe. It was done more than a decade before the BRI, but today it can become one of the links in the chains of the BRI.
In 2011, at the initiative of Uzbekistan President Islam Karimov, an agreement was signed on the construction of the new international transport-communication corridor Uzbekistan – Turkmenistan – Iran – Oman (Central Asia – Persian Gulf). It is another example that the overall future outlines of the BRI space are shaped not only from the east (China) to west but also independently as some clusters of roads and infrastructure that are to be combined gradually within BRI.
On 22 June 2016, in Tashkent, an official ceremony took place devoted to the completion of the most strategically crucial grand project symbolising Uzbekistan - China cooperation—the construction of the railroad segment Angren - Pop (in the southeast of Uzbekistan) and the Kamchik tunnel (19.2 km).

It has to be said that the Kamchik tunnel represents in itself the most significant construction of this type in the post-Soviet space and the world ranking by its complexity; it is the eighth longest tunnel in the world. The tunnel was accomplished within 32 months and began its operation in August 2016.
Currently, intra-regional highways and railroads are being constructed between Central Asian countries; thereby, the regional clusters of the New Silk Road are being shaped. Especially, this is peculiar to two key countries of Central Asia—Kazakhstan and Uzbekistan. The reconstruction of the old 99 km-long highway connecting Uzbek city Tashkent with Kazakh city Shymkent is underway. Soon it will be the first category international road and an important segment of the “West China–West Europe” transit corridor. Its length in the territory of Kazakhstan is 2787 km. Besides, the railroad is about to be constructed soon, connecting the Uzbek town Uckuduk with the Kazakh
town Kyzylorda, which further has the connection to the Russian Ural and Siberia regions.

In the energy field, two major projects already link Central Asia with China. The first is the 2,228 km Kazakhstan–China oil pipeline that was completed between 2001 and 2009, with a current capacity of 20 million tons of oil per year. The second is the China–Central Asia Pipeline, which pumps natural gas from Turkmenistan, as well as Kazakhstan and Uzbekistan. The fourth section was ready in 2016/17 and delivers gas from another field in Turkmenistan. The four lines of the China–Central Asia Pipeline are destined to supply more than 40 per cent of Beijing’s gas requirements by 2020 – the equivalent of 80 billion cubic meters per year.
2.1.1 Transcontinental road corridor “Western Europe – Western China”

Kazakhstan, which is located in the centre of the Eurasian continent, continuously implements the formation and development of modern transport infrastructure, mainly, motoring highways of international importance. An active integration process into European and Asian regional system of motor roads with access to the majority of states on the Eurasian continent, the most significant transport hubs and terminals are underway. In this regard, a transcontinental road corridor “Western Europe – Western China” is the main sectorial project of the beginning of this century. Main commercial partners of Kazakhstan are interested in its development. At present, intergovernmental memorandums are signed with Russia, China and the European Union.

The total length of the corridor along the route St. Petersburg – Moscow – Nizhny Novgorod – Kazan – Orenburg – Aktobe – Kyzylorda – Shymkent – Taraz –
Korday — Almaty — Khorgos — Urumqi — Lanzhou — Zhengzhou — Lianyungang is 8445 km. 2233 km are on the territory of the Russian Federation, 2787 km belong to the Republic of Kazakhstan, 3425 km belong to the People’s Republic of China.

Figure 9: “Western Europe – Western China” transcontinental road corridor

2452 km of road in Kazakhstan is to be reconstructed. 1390 km of road are I technical category with 4 traffic lanes (Kyzylorda — Turkestan — Shymkent — Taraz — Almaty — Khorgos), other 1,062 km are transferred to II technical category (cities of Russia — Martuk — Aktobe — Karabutak — Kyzylorda).
The leading positive indicators of the project in comparison with existing alternative corridors (road Transsiberian, sea through the Suez Canal) are its length and hours underway. If it takes up to 45 days travelling along a marine corridor, and 14 days along “Transsiberian” railway road, then along the corridor “Western Europe — Western China” from the port Lianyungang to the borders of the European states the travel time will take up only about 10 days. The project will provide transportation on three main directions China- Kazakhstan, China — Central Asia, China — Kazakhstan — Russia — Western Europe.
The project has high importance for the economy of Kazakhstan. Significant regional development will be given to five major regions of the country (Aktobe, Kyzylorda, South Kazakhstan, Zhambyl and Almaty, including the city of Almaty) where the total population of 7.5 million people or nearly half of the country’s population.

All roads of international and republican values are reconstructed according to intensified parameters with the expectation of a higher weight load (13.26 t/axle) and traffic density.

Construction of the 8500 km-long motor road corridor started in 2007, and it is scheduled to be completed by 2018.

**Classification of the roads in Kazakhstan**

- **International roads (M)** – provide the essential interstate transport links; (5382 km);
- **National roads (A)** - provide transport links between the major administrative, cultural and economic centres of Kazakhstan, as well as neighbouring states, including roads of military importance; (12695 km);
- **Regional roads (P)** – for others (5 401 km).

The sum of three types of roads – 23 478 km.
The total length of all types of roads – 96 000 km.

**Category of roads**

For classifying the roads by categories are used building regulations of Kazakhstan BR RK 3.03-09-2006 (СНиП РК 3.03-09-2006)

<table>
<thead>
<tr>
<th>Category of roads</th>
<th>Estimated traffic flow</th>
<th>Economic and administrative significance of the road</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>vehicles/day</td>
<td>transport units/day</td>
</tr>
<tr>
<td>I-a</td>
<td>more than 14000</td>
<td>more than 9000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Highways of international and republican importance</td>
</tr>
<tr>
<td>I-b</td>
<td>more than 14000</td>
<td>more than 7000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-speed highways of international or republican importance (not classified in I-a category)</td>
</tr>
<tr>
<td>II</td>
<td>from 6000 to 14000</td>
<td>from 3000 to 7000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-speed highways of international or republican importance (not classified in I-a and I-b categories)</td>
</tr>
<tr>
<td>III</td>
<td>from 2000 to 6000</td>
<td>from 1000 to 3000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Car roads of republican or local significance (not classified in I-b and II categories)</td>
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<tr>
<td>IV</td>
<td>from 200 to 2000</td>
<td>from 100 to 1000</td>
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<tr>
<td></td>
<td></td>
<td>Car roads of republican or local significance (not classified in I-b, II and III categories)</td>
</tr>
<tr>
<td>V</td>
<td>to 200</td>
<td>to 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Car roads of local importance (except for those classified in III and IV categories)</td>
</tr>
</tbody>
</table>

Table 1: Category of roads

**Design speeds for each category**

<table>
<thead>
<tr>
<th>Category of roads</th>
<th>Design speeds, km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main</td>
</tr>
<tr>
<td></td>
<td>Crossed</td>
</tr>
</tbody>
</table>


### Table 2: Design speeds for each category

<table>
<thead>
<tr>
<th>Category of roads</th>
<th>I-a</th>
<th>I-b</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed, km/h</td>
<td>150</td>
<td>120</td>
<td>80</td>
<td>150</td>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>Speed, km/h</td>
<td>120</td>
<td>100</td>
<td>60</td>
<td>120</td>
<td>100</td>
<td>60</td>
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<tr>
<td>Speed, km/h</td>
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<td>80</td>
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<td>80</td>
<td>30</td>
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<tr>
<td>Speed, km/h</td>
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<td>40</td>
<td>80</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Speed, km/h</td>
<td>60</td>
<td>40</td>
<td>30</td>
<td>60</td>
<td>40</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 2: Design speeds for each category

### Basic parameters of highways cross section (m)

<table>
<thead>
<tr>
<th>Parameters of road elements</th>
<th>Category of roads</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I-a</td>
</tr>
<tr>
<td>Number of lanes</td>
<td>2 and more in each direction</td>
</tr>
<tr>
<td>Lane width, m</td>
<td>3,75</td>
</tr>
<tr>
<td>Shoulders width</td>
<td>3,75</td>
</tr>
<tr>
<td>Median width without safety barriers</td>
<td>min. 6</td>
</tr>
<tr>
<td>Median width with safety barriers</td>
<td>minimum 2 m + width of fences</td>
</tr>
<tr>
<td>Security strip width at the median</td>
<td>1,0</td>
</tr>
</tbody>
</table>

Table 3: Basic parameters of highways cross section (m)

### 2.1.2 Dostyk railway station

Dostyk is a frontier transfer railway station which services a full complex of operations and provides passenger and cargo transportation with railway transport in the communication Eastern Europe – Asian-Pacific region through the territory of Kazakhstan. It was put into operation in 1991, and until 2013, the stage was the only junction of the railways of Kazakhstan and China.
The station’s terminal consists of:

- 3 receiving-departure yards;
- 1 yard for the customs control of passenger and freight wagons;
- maintenance yard for wagons;
- 7 transshipment areas (total capacity - 5.3 million tons/year or 144 wagons/day or 760 TEU/day);
- Replacing Point of Wagons (RPW) from a wide gauge (1520 mm) to a standard gauge (1435 mm) and back.
The Replacing Point of Wagons has 10 positions for replacing wheelsets of passenger wagons and 42 positions for replacing wheelsets of freight wagons.

2.1.3 Aktau seaport

Aktau port is located on the east coast of the Caspian Sea and is determined for the international transportation of various dry cargoes, crude oil and oil products. It was built in 1963 for the transportation of products of the uranium industry and oil fields. Creation of the port began with the construction of the main and secondary breakwaters and four dry cargo terminals at once. In 1969 – 1986 four oil-loading terminals and ferry complex were created. Oil accounted for the most significant part of the traffic through the port of Aktau – up to 7 million tons per year in the early 80s, the transportation of dry cargo did not exceed 300 thousand tons per year. In 1999 there was a modernisation of the Aktau seaport.

In 2014, on the territory of the port was built a separate infrastructure “Aktau Marine North Terminal” for increasing export-import and transit capabilities.

In 2015, with the creation of the Trans-Caspian International Transport Route, the Aktau port became as one of the important transport nodes along the Middle Corridor for the smooth transit of cargo from Asia to Europe and the Middle East countries.

Capacities of the Aktau port:
- Number of quays – 11;
- Number of simultaneously processed ships – 15;
- Area of open space – 179 700 m²;
- Area of the roofed transit warehouse - 2000 m²;
- Cargo classification - oil, metal, grains and cargoes, transported by railway ferries;
- Cargo transshipment capacity – 20.7 million tons.

The Aktau port consists of:
- Ferry terminal;
- Oil loading terminal;
- Grain terminal;
- Dry bulk terminal;
- Container terminal;
- Loading and unloading equipment;
- Port auxiliary service fleet;
- Cargo district “Bautino”.

Figure 13: Aktau seaport location
1. Ferry terminal

A permanent ferry service is established between the ports of Aktau and Baku (Azerbaijan). Railway ferries and Ro-Ro ships transport oil products, consumer goods, grain and fertilisers, covering 253 nautical miles for 18-20 hours. The ferries can accommodate up to 54 wagons and 35 heavy trucks.

The terminal capacity:

- Direction – Baku – Aktau – Baku;
- Distance – 253 nautical miles;
- Traffic capacity – 2 million tons;
- Time of ferry travelling – 18-20 hours;
Time of ships’ processing – 8-10 hours;
Ferry’s storage capacity – 54 wagons;
Restrictions on ship draft – 5.1 meters;
Main cargo classification – oil products, consumer goods, grains, mineral fertilizers.

2. Oil loading terminal
The terminal capacity:

   Number of oil loading piers – 6;
   Storage capacity of oil loading piers – 12 million tons;
   Restrictions on ship draft – 5.1 and 7 meters.

3. Grain terminal
The terminal was built as part of the “Agricultural food program of the Republic of Kazakhstan”. The terminal operated 24 hours and equipped with active ventilation, high-precision electronic scales. Automated management of the entire process cycle is allowing to provide high-quality services.

   The terminal capacity:
   
   Number of silos for temporary storage of grain – 40;
   Total volume of silos – 82 500 tons;
   Productive capacity of transport communications for handling - 850 tons of grain per hour;
   Productive capacity of uploading wagons – 8000 tons per day;
   Productive capacity of downloading ships – 9000 tons per day.

4. Dry bulk terminal
The terminal capacity:

   Number of quays – 3;
   Storage capacity – 2.5 million tons;
Restrictions on ship draft – 4.8 meters;
Warehouse capacities (open spaces) – 80 000 m²;
Roofed transit warehouse – 2000 m²;
One-time spotting/picking of wagons – up to 145 wagons;
Processing of oversize cargoes – up to 84 tons (operation of a pair of cranes – up to 104 tons).

5. Container terminal

The terminal capacity:

Productive capacity – 240 000 TEUs/year;
Warehouse capacities (open spaces) – 100 000 m²;
Numbers of TEUs are able to store simultaneously – 5000 TEUs;

6. Cargo district “Bautino”

Cargo district “Bautino” is a division Aktau port and is located in the village of Bautino (150 km from the city of Aktau), in the waters of the Bautino Bay of Tyubkaragansky Gulf.

Figure 15: Cargo district “Bautino” location
The seaport Bautino can process up to 200 000 tons of cargo. The main advantage is the absence of ship’s downtime in the port thanks to the natural protection from outside waves, which allows performing cargo operations even in stormy weather.

The terminal capacity:

- Navigation – year-round;
- Working timetable – 24 hours a day;
- Number of terminals – 1;
- Length of the quay – 150 m;
- Depth – 5.5 meters;
- Loading and unloading machinery – 2 frame cranes with load-carrying ability of 5 and 32 tons;

Cargo classification - industrial equipment, construction materials, stone shell bricks, building and fuelwood forest, foodstuff, foodstuff for livestock, container cargoes, scrap metal and others.
2.1.4 Railway line “Jezkazgan – Beineu”

The construction of the Jezkazgan-Beineu and Arkalyk-Shubarkol railway lines began on July 3, 2012, and the builders were given the task to implement this project as soon as possible. By that time, the company “Kazakhstan Railways”, which had only completed the construction of two cross-border lines Jetygen - Altynkol and Uzen - Bolashak, had mobilised the entire production and technical potential of contractors for the implementation of a new project.

Jezkazgan - Beineu is the longest railway section built after the collapse of the Soviet Union during the years of independence of Kazakhstan (more than 1000 km long) and reduced the distance of trains from the east to the west of the country by 1000 km.

For example, earlier a passenger train that followed the route Almaty-Aktau needed to overcome 3269 km, then with the introduction of new lines, it was possible to reduce the distance along the train’s route by 469 km, i.e. up to 2800 km.
The new Jezkazgan-Beineu and Arkalyk-Shubarkol lines link the Eastern and Western gates of the country by the shortest route: the Dostyk station and the port of Aktau, thereby becoming part of the Trans-Caspian transport corridor, and also optimise the delivery routes for industrial goods in the north-south direction.
The main path is laid in record time. 48 stations and sidings were erected along the new railway lines, power lines, industrial buildings and facilities, housing and social facilities were built.
On August 22, 2014, the Jezkazgan-Beineu and Arkalyk-Shubarkol railway lines with a total length of 1,250 km were commissioned: Jezkazgan-Beineu - 1,036 km, Arkalyk-Shubarkol - 214 km.
The Jezkazgan-Beineu railway line was put into permanent operation in 2016, and Arkalyk-Shubarkol - in 2015.
Jezkazgan-Beineu line allows transporting up to 21 million tons of cargo per year. For the first 22 months of operation, more than 15 million tons of cargo were missed, with a plan of 12 million tons, thereby showing the relevance of this line.
The commissioning of the Jezkazgan-Beineu and Arkalyk-Shubarkol railway lines allowed us to offer trade and business partners the shortest possible route for the transport of transit cargo from Europe to Asia and back with all the attendant economic benefits.

3. Projects implemented after the announcement of BRI

In this chapter, we overview at infrastructure facilities and projects that were implemented after the announcement of BRI. Some projects were planned before, but the timing so coincided that their implementation was accelerated after the announcement of the BRI project and was included in this project.
3.1 Khorgos dry port

KTZE – Khorgos Gateway Dry Port is strategically located on the Kazakhstan-Chinese border, within the Kazakh territory, which lies in the centre of Special Economic Zone “Khorgos – Eastern Gates”.

Figure 18: KTZE – Khorgos Gateway Dry Port location

Figure 19: KTZE – Khorgos Gateway Dry Port location
Khorgos Gateway is Kazakhstan main in-land dry port and Central Asia’s largest logistics park. This Special Economic Zone (SEZ) consists of a 1.4 km² dry port, combined with a logistics park (2.25 km²) and an industrial zone exceeding 2 km². The development, which is strategically located at the border-crossing between Kazakhstan and China, will be Central-Asia’s first purpose-built multi-user terminal of this size with both wide and narrow rail access for serving Kazakh and Chinese trains simultaneously. It will ultimately offer the largest new logistics park in the entire Central Asian region with planning consent for future expansion of total 45 km², offering a unique logistics platform. Compared with many existing supply chain models, the dry port’s highly efficient and state of the art handling facilities will offer a quicker, economic and more environmentally-friendly way to transport goods over the New Silk Road.

KTZE – Khorgos Gateway Dry Port was built to increase the export-transit potential of Kazakhstan in the Eurasian region, develop the competencies in the field of the global logistics, attract the foreign investments and was put into operation on July 29, 2015.
The primary task of the project is to provide a quick and reliable alternative route to the already existing model of the supply chain to clients. The efficient infrastructure of the project actively promotes the development of trade relations between East and West. This decreases supply chain costs significantly and will accelerate getting the goods into the world market. With the experience and management support of DP World, the quality services by implementing the highest international standards will be provided. The development of the Khorgos Gateway Dry port is planned as the multimodal logistics hub, where multiple cargo operations will take place. These operations include train operations, transhipment, yard operations, logistics operations, warehouse operations and various SEZ related activities.

Some of them are:

- Accepting and dispatching trains.
- Transshipment of containers/wagons of standard gauge (Chinese – 1435mm) to the wide gauge (KZ – 1520 mm) and vice versa.
- Transshipment of auto tracks (Chinese to KZ and vice versa).
- Transshipment of vehicles (wagon to wagon, auto to wagon).
- Formalization of block trains.
- Warehousing and terminal operations associated with loading, grinding, refining, sorting, stuffing/unstuffing, storage and shipping of cargo.
- Storage of dangerous goods and cargo demanding temperature conditions.
- Trucking of the goods.
- Scanning.
- Weighting.
- Sealing/unsealing.
- Custom clearance, insurance, guarantees on all types of risks.
- Consulting in the field of marketing research for goods and services market.

Khorgos Gateway Dry Port will function as a primary transport and logistics zone, and an industrial centre of the international level and operations are available for different
type of cargoes such as containers, general cargo, cars and heavy vehicles, bulk cargo and project cargo.

**Infrastructure of the dry port:**
- Container yard for 18,000 containers/per day.
- Container terminal for 6 loading and unloading areas.
- Terminal for unitized cargoes (of narrow and wide gauges).
- Terminal for over-sized cargo.
- Terminal for explosive and dangerous cargo.
- Terminal for cargo with temperature demands for 180 electricity power plugs.
- Line of sanitary and veterinary control.
- Access railways tracks of 25 km length (narrow and wide gauges).
- Warehouse on the wide gauge (1520 mm) with an area of 5,000 m² and with 4 climate control chambers (700 m²);
- Warehouse on the standard gauge (1435 mm) with an area of 5,000 m² and with 4 climate control chambers (700 m²);
- Access to ‘Western Europe – Western China’ highway.

**Advantages of KTZE-Khorgos Gateway**

The main advantages of the dry port:
- Quick time of train handling.
- Multimodality.
- Possibility to de/consolidate the cargo in different modes.
- Safety of cargo in accordance with DP World standards.
- Minimal probability of cargo loss.
- Information on cargo in online mode.
- Information in real time mode, including photos of cargo / containers, available on the corporate web site.
- Services for forming the container trains in different directions.
- Fixed online schedule of reception and dispatch of container trains.
- Provision of the new opportunities for development of business due to convenient location of logistic and industrial zones.

### 3.2 Kuryk seaport

Kuryk seaport is located on the coast of the Caspian Sea 50 km South of Aktau City, 17 km West of Kuryk Village in Mangystau Region. The port has direct access to the railway tracks.

![Figure 21: The Kuryk seaport location](image)
The port is well located at the intersection of the East-West trade corridors (Belt and Road Initiative) and the North-South corridors (Iran, India, Russia), creating one of the fastest multimodal routes for cargo delivery.

Figure 22: The Belt and Road Initiative

The way through Kazakhstan is the most efficient in terms of time and cost among the multimodal overland container transport routes connecting East Asia with Europe, Iran, and Turkey, and Kuryk seaport will be one of the key facilities in the system of the transport and logistics complex of the new Silk Way. Kuryk seaport is meant to perform two great missions – to increase Kazakhstan’s trade with the Caspian countries and to increase the transit potential of the Caspian Sea. Development of the port gave a powerful impetus to the transit and transport potential of cooperation between the Republic of Kazakhstan and the countries of the Caspian Region, contributing to the implementation of the New Silk Way project. Kuryk seaport includes several transshipment terminals:

- ferry complex
- universal reloading terminal
- liquid cargo terminal
- transport and logistics center
- production complex

Figure 23: The Kuryk seaport scheme

1. Ferry Complex
The ferry complex, implemented jointly with “Kazakhstan Railways” National Company, includes a railway and a car ferry quays with a total transhipment capacity of 6 million tons per year. The ferry complex has already been put into service in December 2016 and has been operating since March 2017. For an incomplete 2017, Kuryk seaport transshipped about 1.5 million tons of cargo. The total capacity of the ferry complex will be 10 million tons by 2030.

The terminal capacity:
- The railway berth - 4 000 000 tons per year
- The car berth - 2 000 000 tons per year

2. Universal Reloading Terminal
The universal reloading terminal is intended for transshipment of general, bulk, and container cargoes and will be able to transship about 3 million tons of cargoes. It is located on the territory of 32 hectares and is equipped with three quays with the depth of 7 meters.

The terminal capacity:
- General and bulk cargoes - 1,650,000 tons per year
- Containers - 150,000 TEU per year

3. Liquid Cargo Terminal
The terminal is designed for transshipment of oil, bulk oil cargo, and LPG, is located on the territory of 26 hectares, and will be equipped with two quays. The depth is 7 meters. Putting into service of these terminals is scheduled for 2022.

The terminal capacity:
- Oil and oil products - 2,600,000 tons per year
- Liquefied petroleum gas (LPG) - 300,000 tons per year

4. Transport and Logistics Center
The Transport and Logistics Center (TLC) is focused on servicing cargo flows at Kuryk port and providing logistics services to the port users.

“TLC Sarzha” LLP
- TLC Sarzha Company is the operator of Kuryk port that provides storage of various types of cargo at the warehouses of the transport and logistics center with a temporary storage warehouse, and carries out all customs procedures at the terminals of Kuryk port as well as export and import operations, including cargo insurance.

“Khazar Petroleum Logistics” LLP
- The company provides freight forwarding services for domestic, export-import, and transit cargo by its own and leased rolling stock.

“Khazar Petroleum Impex” LLP
- The company trades in sulfur, LPG, and other liquid products in the Black Sea Region, Iran, Tajikistan, Uzbekistan, and China directions.
5. Production Complex

The production complex of Kuryk seaport will be aimed at servicing oil and gas projects in the Kazakhstan sector of the Caspian Sea, carrying out ship repair, production of caissons and metal structures.

Ship repairing yard

- The first phase involves the creation of a ship repairing yard. At the moment, all the ship repairing yards existing in Kazakhstan are focused on vessels up to 600 tons. The ship repairing yard in Kuryk aims to fill the lack of production capacity for repair of medium and large vessels. The second phase involves the production of a shipbuilding yard that will be the first one in Kazakhstan.

Production of metal structures

- Production of metal structures is planned to be carried out in the workshops of Kuryk port production complex for oil and gas projects in the Caspian Sea.

Production of caissons

- The caisson is a special construction forming underwater or in water-saturated soil of the working chamber, free of water, to ensure construction of infrastructure facilities onto the top. Production of caissons for the needs of the Caspian Sea oil and gas projects is supposed to be created at Kuryk port production complex.

The total throughput capacity of Kuryk seaport terminals would be 13.9 million tons annually.

Kuryk seaport advantages:

- A possibility of carrying out year-round sea operations.
  Seaport’s year-round non-freezing water area is naturally protected from winds, which usually prevent navigation in the Eastern part of the Caspian Sea from September to January;

- The potential for expansion of capacities for transhipment and storage.
  The land plots adjacent to the port territory are free from any residential or industrial buildings;
- Saving time for goods delivery.
  The transit time from Kuryk port to the Black Sea (Georgian seaports) is 3 days.
- Near distance to trading countries;
  Closer proximity to the key trading countries reduces the cost of freight to the Iranian and Azerbaijani ports by ≈ 8-12 % compared to other Kazakhstan ports;
- Short distance for automobile transport.
  The distance to Kuryk port for heavy trucks is less than to Aktau port.

3.2.1 Trans-Caspian International Transport Route

The Middle Corridor of the Belt and Road Initiative or the Trans-Caspian International Transport Route (after this - TITR), a corridor of 6,500 km links Asia with Europe and passes through countries including Kazakhstan, Caspian Sea, Azerbaijan, Georgia and Turkey.

TITR is aimed to coordinate interaction of all the participants of transportation of goods and containers along the route from Asia to Europe and in the reversed direction, including needed informational support.

TITR is recognised as an authoritative partner, which contributes simplification an administrative procedures, helps to create a competitive environment and assist making best efficiency for the companions from business societies of different countries not only along the Trans-Caspian route.
In November 2013 as part of the II International Transport and Logistics Business Forum "New Silk Road" in Astana, the leaders of JSC "NC "Kazakhstan Railways", CJSC "Azerbaijan Railways", JSC "Georgian Railway" signed Agreement on the establishment of Coordination Committee for the development of the Trans-Caspian International Transport Route.

In February 2014, the Coordination Committee for the Development of the Trans-Caspian International Transport Route (TITR) was established with the initial membership of:

- CJSC «Azerbaijan Caspian Shipping»
- CJSC «Azerbaijan Railways»
- CJSC «Baku International Sea Trade Port»
- JSC «Georgian Railway»
- LLC «Batumi Sea Port»
- JSC «NC «Aktau International Sea Commercial Port»
- JSC «NC «Kazakhstan Railways»
The results of the coordinated work of the Coordination Committee members were:

- adoption of effective complex rates for container transportation, preferential tariffs for transportation of fuel oil, petrol, grain;
- the technology of interaction between transport companies for the passage of container trains by the China-Kazakhstan-Azerbaijan-Georgia-Turkey communication was approved with the participation of rail and sea transport in a direct international rail-ferry service;
- created «Nomad Express” container service;
- The International Trans-Caspian Transport Consortium was established.

As a part of TITR, three pilot container trains “Nomad Express” were organized and demonstration trains were launched:

- 28.07.2015 Shihezi (China) - Kishli (Azerbaijan);
- 29.11.2015 Lianyungang (China) - Istanbul (Turkey);
- 01.15.2016 Ilyichevsk (Ukraine) - Dostyk (Kazakhstan);

Later, container trains “Nomad Express” were also organized in the following directions and took:

- Shihezi (China) - Kishly (Azerbaijan) - 6 days
- 2 trains Lianyungang (China) - Istanbul (Turkey) - 18-19 days
- 3 trains Chandu (China) - Istanbul (Turkey) - 17 days
- Ilyichevsk (Ukraine) - Dostyk (Kazakhstan) - 16 days

Below is the graph where are shown the dynamics of growth and the expected volume of containers in the next 2 years

Figure 25: Container traffic in the direction China-Caucasus-Turkey (thousands TEU)
At the moment, the project is in the formative stage, and it takes some time for the shippers to believe in the reliability of this corridor and start transporting their cargo. In the future, with an increase in cargo traffic and expansion of the route is expected to cut down on international cargo shipping costs.

3.3 Unified Information System of Management “NOMAD”

The Unified Information System of Management “NOMAD” was created to integrate the information systems of all participants in the transportation process and exchanges electronic documents accompanying export, import and transit cargo. From the moment of dispatch from the point of departure, information about the cargo is replenished on the route and enters the “NOMAD” system. For example, the container train is still in China, and documents for it are already ready at the Altynkol railway station (Kazakhstan) in electronic form. It allows reducing the time for complete processing of one container train to 3 hours 55 minutes. For road transport capacity increased to 200 units per day.

The Unified Information System of Management “NOMAD” simplifies and speeds up the operation of transport checkpoints and the speed of obtaining necessary services when importing goods, thereby speeding up the work of all participants in the logistics process.

The logistic SEZ "Khorgos - Eastern Gate" is located in a special economic zone, which was established in the border zone between Kazakhstan and China.

- Goods imported into the territory of the logistics SEZ undergo the procedure of free customs zone without customs declaration.
- On the territory of the SEZ, you can unload and reload goods, replace the vehicle without additional costs associated with customs declaration.
- The SEZ simplifies placing goods under the customs procedure - it is enough to conclude an agreement with a resident of the logistics SEZ on the provision of services for the storage of goods and related cargo handling operations.

The primary vector of development of the SEZ “Khorgos-Eastern Gate” is an increase in international and domestic transit. The main problems in the SEZ processes are the influence of the human factor on the speed of work and the need for duplication of information in different sources and different people. To eliminate problems and increase transit, the SEZ management decided to create the Unified Information System of Management “NOMAD”, which accelerates the work of all participants in the logical process.

The main tasks of the system:

- Ensuring the possibility of obtaining all the necessary information in the "one window" mode - from permits from government agencies to booking a hotel and calling a taxi;
- Ensuring communication between all interested parties;
- Automation of processes of customs control and registration;
- Acceleration of the work of the main processes;
- Ensuring control of the movement of goods and goods;
- Automation of work processes with residents and investors of the SEZ;

Basic system requirements:

- The possibility of expanding the functionality;
- High speed;
- Ability to integrate with various information systems;
- Security and protection of transmitted data;
- Ability to cross - basic queries;
In life, it looks like this: “NOMAD” reads information upon entering vehicles, then collects information along the way and issues an electronic logbook for customs with data on dimensions, radiation monitoring and other relevant information.

When developing the system, world experience and a long-term system development strategy were taken into account and consultation was held with one of the world's largest operators - Dubai Port World (DP World). The company owns 77 terminals in 40 countries of the world and is managed by the world's largest investor and developer Dubai World, owned by the UAE government.

Additional benefits from system implementation:

- Owners of the transported goods reduce the cost of insurance for cargo and insurance payments. They see their goods at any point in the way - the process is transparent and the risks are minimal;
- Reduced risks of corruption. The participants of the SEZ receive all services online and on the "one window" mode. The participant contacts only with the management company, without interaction with government bodies.

Development results

1. Automated road and railway checkpoints

The system fully automatically works, collects and processes all necessary data. Automated all processes at the checkpoint.

For road:

Management of traffic lights and barriers;
- Recognition of vehicle numbers;
- Fixing arriving vehicles and determining the direction of movement;
- Uploading data in real time.
For railways:
- Identification of alarm events;
- Static and dynamic weighing;
- Comparison of weight at the entrance and exit;
- Support for manoeuvring the train by weights
- Formation of weighing certificates;
- Control overload and under load the vehicle.

2. Created a Single Window

The tasks of creating a single information space and simplifying the work of all participants in the process have been solved.

- Online support of the participants of the SEZ;
- Interaction with government agencies;
- Services for partners;

3. Developed a Monitoring Center

The Monitoring Center - closed tasks in the field of analysis, processing and visualisation of data, collecting information for decision-making and information security. The Monitoring Center provides guidance on the necessary management tools.

- Availability of relevant information for daily planning and decision making;
- Management of risks;
- Monitoring Key Performance Indicators (KPI);
- Analysis of the effectiveness of processes;
- Monitoring the dynamics of project implementation;
- Accounting for goods placed under preferential tax treatment;
- Collection and analysis of statistical information on transit goods.
4. Implemented a Department of Business Analysis

- Accounting and tax accounting;
- Electronic document management;
- Personnel Management;
- Budget Management;
- Treasury Department;
- Utility management.

5. Created an Internal Storage.

There was organised a library of internal documents and space for internal communications.

Planned results

The following planned quantitative and qualitative indicators for each direction were determined.

| 1. Monitoring Center | - Prevention of attempted theft and forgery of documents;  
|                       | - Reducing the risk of corruption offenses; |
| 2. Single window     | - Reducing the cost of participants at registration from 2000 to 200 euros; |
| 3. Checkpoint Management | - Reducing the time of passage of vehicles through the checkpoint from 10 minutes to 20 seconds; |
Currently, the “NOMAD” system is working in test mode at the Kuryk seaport. Soon, it will link Kazakhstan and Azerbaijani seaports - Aktau, Baku and Alat. In the future, it planned integration into the global port system, and the electronic document flow will cover the entire East-West transit corridor.

3.4 Railway line Almaty – Shu

To eliminate “bottlenecks” in organizing the movement of trains in the southern direction and to increase the capacity of the existing section “Almaty - Shu”, in 2015, started the construction of the second tracks. This section was quite busy because, in Kazakhstan, passenger and freight trains move along the same railway lines. The construction of the railway section with a total length of 112 km was completed in a short of a period of time and it started to work in full capacity on November 27, 2017. The implementation of the project allowed to increase the capacity of the section from 17 to 68 pairs of trains per day and to reduce the train transit time by 2.5 times.

Technical specifications:
The length of the line - 112 km;
The project cost – 97 million euros (38.1 billion tenge);
Figure 26: Railway line Almaty – Shu

Figure 27: Railway line Almaty – Shu
3.5 Future project – bypass railway of Almaty

Almaty is the largest city in Kazakhstan, with a population of 1,801,993 people (February 2018), about 10% of the country’s total population. It served as capital of the Kazakh state in its various forms from 1929 to 1997.

Kazakhstan has the most powerful economy in Central Asia and Almaty continues as the major financial, trading, manufacturing, business and cultural center of Kazakhstan, as well as its most populous and most cosmopolitan city. Almaty generates approximately 20 per cent of Kazakhstan’s GDP (or $36 billion in 2010).

If we look from the point of view of transport, then to provide the city with all demands you need to have a well-developed network of railways and roads. The entire transport flow on railways from the East to the South and vice versa passes through Almaty. Therefore there are large numbers of railway deadlocks (about 250) in Almaty, which increase the load on the carrying capacity of railways. Also around Almaty, there are many small railway stations, where are also many railway deadlocks. It is also worth considering that passenger trains travel along the same routes as freight wagons and passenger trains have more priorities in traffic organization. All these factors together create long delays for transit wagons. The opening of Khorgos dry port also increased the load and aggravated the situation on this stretch of the network. It seems logical to relieve the city and the railway section, building a bypass road around Almaty, thereby allowing transit trains from China and East Kazakhstan to pass unhindered. It is planned to connect Zhetygen and Kazybek Bek railway stations, which will shorten the route by at least 1/3. Currently, the length of railways from Zhetygen station to Kazybek Bek station is 107 km and there are 13 stations between them. At the moment, the administration of the railways calculating the estimated cost of the project and while there is no exact construction time.
Figure 28: Bypass railway of Almaty

Figure 29: Bypass railway of Almaty
4. Evaluation of potentiality of the network according to statistical data

In this chapter we will try to analyze the given static data on all types of transport and the data taken from public sources of the Statistics Committee of the Republic of Kazakhstan. We will try to consider the impact of the construction of infrastructure facilities on the transport corridor throughput in the Kazakhstan part of the project, as well as their development dynamics in general. We will also analyse data on domestic traffic because domestic shipments partially affect international or transit shipments. For example, the number of passengers carried by rail affects the reduction or increase in capacity of the network, because, in Kazakhstan, passenger and freight trains use the same routes.

The tables with statistical data are divided by types of transport for goods and passengers separately and begin with general tables. Next is road transport, sea transport, railway transport, pipeline transport, as well as tables for cargo classes like containers and transit cargo for all types of transport.

Below are the terms used in the tables and their explanations for a complete understanding of the statistical data.

**Methodological notes**

**Passengers transported** - the number of passengers transported over a specified period. The unit of observation in the statistics of passenger traffic is passenger-trip.

**Passenger traffic** - the amount of work for the transporting of passengers. The unit of measurement is a passenger-kilometre, i.e. movement of a passenger over a distance of 1 km.

**Cargo transported** - the amount of cargo in tons moved by transport.

**Freight turnover of transport** - the volume of work of transport for the transport of goods, expressed in ton-kilometres. It is defined as the sum of the products of the weight of each batch (dispatch) of the transported cargo for the distance of its transportation.
Types of connections:

International traffic - transportation between the Republic of Kazakhstan and foreign countries and (or) transit through the Republic of Kazakhstan, as well as transportation between different points carried out by vehicles of Kazakhstan, on the territory of other countries (without crossing the territory of the Republic).

4.1. General data on the transport of goods and passengers by all modes of transport

4.1.1 Cargo transportation by all modes of transport

<table>
<thead>
<tr>
<th>Cargo transportation by all types of transport</th>
<th>million tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2,612,2</td>
</tr>
<tr>
<td>of them:</td>
<td></td>
</tr>
<tr>
<td>railways</td>
<td>345,0</td>
</tr>
<tr>
<td>automobile and urban electric *</td>
<td>2,235,8</td>
</tr>
<tr>
<td>inland water</td>
<td>10,7</td>
</tr>
<tr>
<td>pipelines</td>
<td>20,6</td>
</tr>
<tr>
<td>air, thousand tons</td>
<td>48,2</td>
</tr>
</tbody>
</table>

| Total                                        | 1,233,0| 1,077,7| 1,065,9| 1,293,1| 1,404,5| 1,531,1| 1,687,5|
| of them:                                     |       |       |       |       |       |       |       |
| railways                                     | 190,9 | 170,0 | 133,7 | 171,8 | 183,8 | 178,7 | 202,7 |
| automobile and urban electric *              | 961,2 | 830,5 | 825,8 | 982,0 | 1,076,9| 1,219,3| 1,318,2|
| inland water                                 | 1,0   | 0,5   | 0,2   | 0,5   | 0,5   | 0,5   | 0,5   |
| pipelines                                    | 79,9  | 76,8  | 106,2 | 138,8 | 143,3 | 132,6 | 166,1 |
| air, thousand tons                           | 24,6  | 14,5  | 17,2  | 14,4  | 9,4   | 15,9  | 24,2  |

|                                              | 2004  | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  |
| Total                                        | 1,840,5| 1,926,9| 2,023,4| 2,124,2| 2,188,7| 2,103,3| 2,439,4|
| of them:                                     |       |       |       |       |       |       |       |
| railways                                     | 215,6 | 222,7 | 246,9 | 260,6 | 269,0 | 248,4 | 267,9 |
| automobile and urban electric *              | 1,444,8| 1,511,1| 1,582,6| 1,667,4| 1,721,0| 1,687,5| 1,971,8|
| inland water                                 | 0,7   | 0,8   | 1,3   | 1,3   | 1,2   | 0,9   | 1,1   |
| pipelines                                    | 179,4 | 192,0 | 192,2 | 193,8 | 195,8 | 162,9 | 194,0 |
| air, thousand tons                           | 18,2  | 20,7  | 16,5  | 25,7  | 22,7  | 22,0  | 28,9  |
According to the table, the total volume of work performed on the carriage of goods by all modes of transport, starting in 1990, with indicators of 2 612.2 million tons, began to decline and continued to fall until 1999, when the minimum volume of traffic was fixed at 1,065.9 million tons of cargo. Fully the volume of traffic recovered only in 2010, 20 years later, and in the future, a gradual increase in the amount of cargo transported by all modes of transport began, reaching almost 4 billion tons in 2017.

Further detailed descriptions for each mode of transport will be proposed below in the respective sub-chapters.

### 4.1.2 Passenger transportation by all modes of transport

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3 899.2</td>
<td>3 591.7</td>
<td>2 992.7</td>
<td>2 627.4</td>
<td>1 986.1</td>
<td>4 953.8</td>
</tr>
<tr>
<td>of them:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>railways</td>
<td>42.6</td>
<td>40.0</td>
<td>39.7</td>
<td>44.0</td>
<td>41.1</td>
<td>37.4</td>
</tr>
<tr>
<td>automobile and urban electric *</td>
<td>3 844.4</td>
<td>3 540.7</td>
<td>2 946.2</td>
<td>2 578.6</td>
<td>1 942.1</td>
<td>4 914.0</td>
</tr>
<tr>
<td>inland water</td>
<td>3.6</td>
<td>3.1</td>
<td>1.6</td>
<td>1.2</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td>air</td>
<td>8.6</td>
<td>7.9</td>
<td>5.2</td>
<td>3.6</td>
<td>2.3</td>
<td>2.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>6 433.4</td>
<td>7 265.3</td>
<td>8 079.7</td>
<td>7 009.7</td>
<td>8 028.5</td>
<td>9 047.3</td>
</tr>
<tr>
<td>of them:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>railways</td>
<td>27.5</td>
<td>21.6</td>
<td>18.8</td>
<td>21.3</td>
<td>21.6</td>
<td>20.7</td>
</tr>
<tr>
<td>automobile and urban electric *</td>
<td>6 404.0</td>
<td>7 242.6</td>
<td>8 060.0</td>
<td>6 987.6</td>
<td>8 006.0</td>
<td>9 025.5</td>
</tr>
</tbody>
</table>

Table 4: Cargo transportation by all modes of transport
### Table 5: Passenger transportation by all modes of transport

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>9 390,3</td>
<td>9 924,0</td>
<td>10 592,8</td>
<td>11 160,1</td>
<td>11 325,4</td>
<td>11 806,5</td>
<td>13 186,5</td>
</tr>
<tr>
<td>of them:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>railways</td>
<td>16,4</td>
<td>16,5</td>
<td>17,8</td>
<td>18,1</td>
<td>17,7</td>
<td>18,6</td>
<td>19,6</td>
</tr>
<tr>
<td>automobile and urban electric *</td>
<td>9 372,6</td>
<td>9 905,8</td>
<td>10 573,1</td>
<td>11 139,1</td>
<td>11 304,8</td>
<td>11 785,1</td>
<td>13 163,4</td>
</tr>
<tr>
<td>inland water</td>
<td>0,05</td>
<td>0,04</td>
<td>0,04</td>
<td>0,05</td>
<td>0,10</td>
<td>0,09</td>
<td>0,1</td>
</tr>
<tr>
<td>air</td>
<td>1,3</td>
<td>1,7</td>
<td>1,9</td>
<td>2,7</td>
<td>2,8</td>
<td>2,7</td>
<td>3,4</td>
</tr>
</tbody>
</table>

Table 5: Passenger transportation by all modes of transport

### 4.2 Road transport

<table>
<thead>
<tr>
<th>Number of trucks</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2003</td>
</tr>
<tr>
<td>Republic of Kazakhstan</td>
<td>223 063</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2003</td>
</tr>
<tr>
<td>Republic of Kazakhstan</td>
<td>397 598</td>
</tr>
</tbody>
</table>

Table 6: Passenger transportation by all modes of transport

According to the table, we see that since 2003, the number of registered trucks gradually increased and in 2017 amounted to 440,612 trucks, i.e. an increase of 49% compared with data for 2003. Judging by table 4 “Cargo transportation by all types of transport”, the situation with road transport has developed almost the same as with the
general trend in the volume of goods transported by all modes of transport. The volume level of 1990 in the amount of 2,235.80 million tons of cargo was again reached only almost 20 years later in 2011 and amounted to 3,322.3 million tons in 2017. For 6 years, the growth in freight transportation grew by 25.5%. A record low numbers were recorded in 1999 at 825.8 million tons of cargo.

If we compare the data on the number of trucks and general data on cargo transportation, we see that the increase in the fleet of trucks by 49% from 2003 to 2017 had the effect of increasing the traffic volume by 60% in the same period.

### 4.3 Maritime transport

The table shows the volume of transportation by sea through the ports of Aktau, district cargo Bautino and Kuryk and the dynamics of changes in volumes shows negative growth. The most significant volume of traffic was reached in 2010, showing 4,655 thousand tons of cargo and starting from 2011, the numbers gradually fall reaching 1,759.4 thousand tons at the beginning of December 2018. The traffic fell by 62% in December 2018 compared with 2010.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>244,0</td>
<td>421,9</td>
<td>1,074,0</td>
<td>1,715,4</td>
<td>3,554,6</td>
<td>4,655,0</td>
<td>4,557,0</td>
<td>4,048,3</td>
<td>3,984,5</td>
<td>3,630,2</td>
<td>2,476,6</td>
<td>2,565,5</td>
<td>2,102,6</td>
<td>1,759,4</td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Main indicators of maritime transport

According to the following table, the Kazakh maritime fleet consisted of only 66 vessels in 2017, and almost half of them are tugs, that is to say, they more intended for port operations, rather than for the transport of goods.

<table>
<thead>
<tr>
<th>Number of vessels</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

61
Judging by the number of ship calls to the seaports of Kazakhstan, we see that in the period from 2015 to 2018 Aktau seaport is 75-80%, and the new seaport Kuryk is 95% served by foreign vessels. The cargo district Bautino is serviced on 17-18% by foreign ships only due to the small depth of the draft, which prevents large ships from entering and small volumes of the port’s carrying capacity. Generally, it shows the dependency of Kazakh seaports on the foreign maritime fleet, and if the trend continues, in the future this may affect the pricing for sea freight, and there is no guarantee that prices will not charge up when large volumes of cargo begin to be transported. It is a potential challenge which may lead to a decrease in the attractiveness of the Middle Corridor as a transport route.

<table>
<thead>
<tr>
<th>Total number of vessels</th>
<th>58</th>
<th>79</th>
<th>61</th>
<th>48</th>
<th>59</th>
<th>65</th>
<th>66</th>
</tr>
</thead>
<tbody>
<tr>
<td>of them:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>self-propelled cargo ships</td>
<td>27</td>
<td>29</td>
<td>30</td>
<td>15</td>
<td>16</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>non-self-propelled cargo ships</td>
<td>20</td>
<td>29</td>
<td>19</td>
<td>19</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>tugs</td>
<td>11</td>
<td>21</td>
<td>12</td>
<td>14</td>
<td>25</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

**Table 8: Number of vessels**

| Number of ship calls to the seaports of Kazakhstan |
|----------------------------------|-------------|
|                                  | units       |
|                                  | 2015      | 2016      | 2017      | 1 half year 2018 |
|                                  | Aktau | Bautino | Kuryk | Aktau | Bautino | Kuryk | Aktau | Bautino | Kuryk |
| Total                           | 1268 | 1570    | -     | 1606 | 1683    | -     | 1062 | 1051    | 320   |
| including ship types:           |        |         |       |        |         |       |        |         |       |
| barge                           | 2      | 486     | -     | 15    | 531     | -     | 16    | 330     | -     |
| tug                             | 7      | 1052    | -     | 32    | 1124    | -     | 51    | 709     | -     |
| ferry                           | 200    | -       | -     | 541   | -       | -     | 283   | -       | 302   |
| dry-cargo ship                  | 619    | 4       | -     | 672   | 2       | -     | 530   | -       | 381   |
| tanker                          | 434    | 16      | -     | 342   | 18      | -     | 174   | 8       | -     |
| others                          | 6      | 12      | -     | 4     | 8       | -     | 8     | 4       | 18    |
| including foreign vessels:      |        |         |       |        |         |       |        |         |       |
| Azerbaijan                      | 291    | 12      | -     | 577   | 14      | -     | 320   | 12      | 302   |
| Turkmenistan                    | 8      | -       | -     | 10    | -       | -     | 1     | -       | -     |
| Russia                          | 247    | 280     | -     | 256   | 273     | -     | 144   | 152     | -     |
| Iran                            | 411    | -       | -     | 448   | -       | -     | 389   | -       | -     |

**Table 9: Number of ship calls to the seaports of Kazakhstan**
The total capacity of the ports of Aktau, Bautino and Kuryk is slightly more than 30 million tons annually, and judging by statistics, peak figures of 4,655,000 tons of cargo in 2010 make up only 15.5% of the total performance of the ports at the moment. The trend of recent years is such that since 2010, the volume of traffic has fallen by 2 times and the data for 11 months of 2018 show that the volume of traffic at the end of 2018 will be approximately equal to the volume of traffic in 2017. There remains a huge potentiality of port productivity, which may be enough for the next 30-40 years.

4.4 Railway transport

The table shows data on the length of railway tracks from 1990 to 2017. During this time, the railway lines were extended from 14,463 km to 16,614 km, i.e. on 2 151 km.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>14 463</td>
<td>14 456</td>
<td>14 405</td>
<td>14 423</td>
<td>14 423</td>
<td>14 358</td>
<td>14 358</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>14 421</td>
<td>14 403</td>
<td>14 362</td>
<td>14 530</td>
<td>14 588</td>
<td>14 648</td>
<td>14 648</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>15 081</td>
<td>15 021</td>
<td>15 082</td>
<td>15 082</td>
<td>15 082</td>
<td>15 079</td>
<td>15 016</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>14 892</td>
<td>15 333</td>
<td>15 341</td>
<td>15 341</td>
<td>15 341</td>
<td>16 104</td>
<td>16 614</td>
</tr>
</tbody>
</table>

Table 10: The operational length of public railway tracks

The following table lists more detailed specifications for the various categories.
### Technical characteristics of the railways

<table>
<thead>
<tr>
<th></th>
<th>kilometers</th>
</tr>
</thead>
<tbody>
<tr>
<td>The operational length of the railways</td>
<td></td>
</tr>
<tr>
<td>electrified</td>
<td>4,217,0</td>
</tr>
<tr>
<td>non-electrified</td>
<td>12,397,0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of tracks:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single track</td>
<td>457,6</td>
</tr>
<tr>
<td></td>
<td>11,143,1</td>
</tr>
<tr>
<td>Double tracks and more</td>
<td>3,759,4</td>
</tr>
<tr>
<td></td>
<td>1,253,9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Width of gauge:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard (1435 mm)</td>
<td>4,217,0</td>
</tr>
<tr>
<td></td>
<td>12,397,0</td>
</tr>
<tr>
<td>Wide (1520 mm)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>18,6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of transportation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger and freight</td>
<td>4,217,0</td>
</tr>
<tr>
<td></td>
<td>12,397,0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of current:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Altering current (AC)</td>
<td>4,195,9</td>
</tr>
<tr>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Direct current 3000 V (DC)</td>
<td>21,1</td>
</tr>
<tr>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Table 11: Technical characteristics of the railways

Almost 75% or 12,397 km of railways are not electrified and use diesel locomotives as traction. Also, about 30% or 5013.3 km of railways of the total length has two or more electrified and non-electrified tracks.

The following table shows the number of rolling stock wielded by the administration of railways and private transport companies. The data in the table starts from 1995 and at the time of 2017, there are 54,925 wagons in the state park, and private companies have 75,496 wagons. The number of locomotives decreased from 3,045 units in 1995 to 1,732 units in 2017, and the difference was 1,313 units, that is, a decrease of 43%. However, the number of wagons increased from 111,908 units in 1995 to 133,082 units in 2017, or by 21,174 wagons. In 2017, there are on average 77 wagons per locomotive, and this is not taking into account “alien” and transit wagons. In 1995, one locomotive had an average of 36 wagons, that is, the load on locomotives has doubled in the last 22 years.
The following table gives more detailed data on the classes of wagons and the operational life of the rolling stock, and we see that the life of 25% or 14,103 wagons of the total number of state wagons exceeds 25 years. There is no information for private wagons, unfortunately. In this table, we are most interested in the category - flat wagons, since the BRI project is more focused on the transit of a large number of containers. The total number of flat wagons is 2,873 units, of which the state - 2,271 units, private - 602 units. The 80% of wagons (1812 units) are older than 25 years by operation time, and the private wagon's number is only 0.8% of the total number of private wagons in all categories. Such a quantity and quality of wagons will create a significant shortage of flat wagons soon, thereby increasing the waiting time at the border of China and Kazakhstan.
In Kazakhstan, freight and passenger trains use the same tracks, and during peak loads on the transport network, mutual influence is possible. Let's review the tables of transportation of cargoes and passengers and try to understand their impact on each other.
According to statistical data of transportation of cargoes, the most significant volumes of traffic were organised in 1990, 2014 and 2017. Accordingly, 345 million tons, 390.7 million tons and 387.2 million tons of cargo were transported. Now, look at the data on the transport of passengers. In this table, the most significant number of passengers was moved in 1993 - 44 million people. But we will exclude it from the list of analysis because this year only 220.5 million tons of cargo was transported.

The next volume of traffic is 42.6 million in 1990. These data are more similar to the data of cargo transportation for 1990, and we see that the networks cope quite well with such volumes of cargo and passenger traffic at the same time.

Next, we consider the data for 2014 and 2017 on passenger traffic and compare it with the freight traffic indicators for these respective years. In 2014 - 23.2 million people, and 2017 - 22.9 million people. From this, it follows that at the moment the volume of passenger traffic does not have a significant impact on the movement of freight trains and transit traffic. It should also be borne in mind that modern tools of communication are being used when organising the movement of trains, and all of this together increases the capacity of the railways.

### 4.5 Pipelines

The main pipelines in 2017 were longer by 27% or 6,372 km compared with 2003, reaching 23,268 km. If you look separately, then the gas pipeline showed a higher growth. The growth was 33% or 5 118 km over the same period. The total length of the pipe for 2017 is 15,256 km.

But the oil pipeline showed a more modest growth and amounted to about 15% or 1,255 km. The total length of the oil pipe for 2017 is 8,013 km.
Table 16: The total length of the main pipelines

The following table shows the dynamics of transportation by the amount of cargo transported and the gas transportation since 2003 has gradually decreased from 114.6 million tons and reaching 82.9 million tons in 2016. The volume of traffic for 13 years fell by 28% or 31.7 million tons of gas. Data for 2017 is classified.

The situation with oil showed positive growth, and since 2003 the volume of transportation has increased from 51.5 million tons to 122.9 million tons in 2016. Growth was 58% or 71.4 million tons of oil. Data for 2017 is also classified.
In November 2018, construction of the "Saryarka" gas pipeline began, which will provide the Central and Northern part of Kazakhstan with natural gas. The project consists of 4 stages of creation, and at the first stage, it will be laid along the Kyzylorda-Jezkazgan-Karaganda-Temirtau-Astana route. Its length on this site will be 1081 kilometres. The construction of the first phase is scheduled for completion at the end of 2019. At the second stage, the structure of the Astana – Kokshetau gas pipeline with a length of 276 km is envisaged. At the third stage, the construction of the Kokshetau - Petropavlovsk gas pipeline with a length of 177 km is expected. At the last, fourth stage, with a forecast of gas consumption growth, construction of "Jezkazgan” and “Temirtau” compressor stations is planned to increase the throughput capacity of the main gas pipeline to 3 billion cubic meters per year.

Table 17: The volume of cargoes transported by the pipelines

<table>
<thead>
<tr>
<th></th>
<th>100,0</th>
<th>99,7</th>
<th>103,3</th>
<th>99,6</th>
<th>90,6</th>
<th>82,9</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td>gas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>oil</td>
<td>114,1</td>
<td>113,5</td>
<td>122,6</td>
<td>125,4</td>
<td>124,0</td>
<td>122,9</td>
<td>x</td>
</tr>
</tbody>
</table>

Figure 30: “Saryarka” gas pipeline
Although this new section of pipe is intended for internal use, it will create an additional load on existing pipelines, and we see soon, active development of gas pipelines and an increase in gas transportation volumes are expected along with an increase in oil transportation.

4.6 Transit cargoes by all modes of transports

In this subchapter, we will look at transit cargo statistics from 2013 to 2017, and by which modes of transport they were mainly transported. As can be seen in the table, the dynamics of the general development of traffic is ambiguous. In 2013 and 2014, the volume increased, and in 2015 a sharp decrease went. From 2016, a gradual growth begins, and in 2017 the trend has remained, reaching about 7 million 600 thousand tons of cargo. The possible reason for the sharp collapse in 2015 is associated with international economic sanctions against Russia.

Further, having considered the table in more detail, we will see that 78-82% of the total volume of transit cargoes are transported by rail. It shows the importance of rail transport in Kazakhstan. The second place regarding transit cargo transportation is occupied by road transport, and it accounts for 16% -21% of the total volume in various years. The remaining 1-2% is divided by sea and air transport.

<table>
<thead>
<tr>
<th>The volume of transit traffic for all modes of transport</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, including by mode of transport:</td>
<td>8 177 481,5</td>
<td>8 698 610,8</td>
<td>6 475 509,5</td>
<td>6 732 037,4</td>
<td>7 643 312,8</td>
</tr>
<tr>
<td>road transport</td>
<td>854 867,6</td>
<td>501 256,5</td>
<td>229 122,0</td>
<td>230 973,5</td>
<td>119 273,3</td>
</tr>
<tr>
<td>air transport</td>
<td>193,9</td>
<td>211,3</td>
<td>72,4</td>
<td>56,4</td>
<td>484,9</td>
</tr>
<tr>
<td>railway transport</td>
<td>6 693 025,8</td>
<td>7 027 114,4</td>
<td>5 281 696,5</td>
<td>5 267 441,7</td>
<td>6 026 083,8</td>
</tr>
<tr>
<td>maritime transport</td>
<td>1 704,5</td>
<td>17 803,6</td>
<td>11 245,9</td>
<td>4 651,7</td>
<td>11 379,9</td>
</tr>
<tr>
<td>mailing</td>
<td>506,2</td>
<td>4 238,0</td>
<td>0,2</td>
<td>10,9</td>
<td>2 971,4</td>
</tr>
<tr>
<td>others</td>
<td>1 360,0</td>
<td>196,1</td>
<td>91,4</td>
<td>59,9</td>
<td>73,9</td>
</tr>
<tr>
<td>composition of vehicles (tractor with semi-</td>
<td>467 198,8</td>
<td>995 073,0</td>
<td>907 408,4</td>
<td>1 199 849,9</td>
<td>1 427 639,2</td>
</tr>
</tbody>
</table>
Statistics on the volume of transit traffic for all types of transport are further divided by the years from 2013 to 2017, and the data for each country were provided for each year. There are too many data, and therefore I sorted the data by main shipping countries, the number of destination states and the volume of freight for each year. Unfortunately, there are no quantitative data on individual mode of transport.

<table>
<thead>
<tr>
<th>Origin country</th>
<th>Number of destination countries</th>
<th>Total weight (brutto)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>8 177 481.5</td>
<td>100</td>
</tr>
<tr>
<td>China</td>
<td>30</td>
<td>4 566 530.6</td>
<td>56</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>67</td>
<td>1 588 781.6</td>
<td>20</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>49</td>
<td>480 418.0</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 19: The volume of transit traffic in the directions for 2013

<table>
<thead>
<tr>
<th>Origin country</th>
<th>Number of destination countries</th>
<th>Total weight (brutto)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>8 698 610.8</td>
<td>100</td>
</tr>
<tr>
<td>China</td>
<td>38</td>
<td>5 020 302.5</td>
<td>58</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>65</td>
<td>1 405 583.8</td>
<td>16</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>56</td>
<td>537 253.8</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 20: The volume of transit traffic in the directions for 2014
<table>
<thead>
<tr>
<th>Origin country</th>
<th>Number of destination countries</th>
<th>Total weight (brutto)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>6 475 509.5</td>
<td>100</td>
</tr>
<tr>
<td>China</td>
<td>39</td>
<td>3 763 337.1</td>
<td>58</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>66</td>
<td>1 126 421.9</td>
<td>18</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>25</td>
<td>301 989.4</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 21: The volume of transit traffic in the directions for 2015

<table>
<thead>
<tr>
<th>Origin country</th>
<th>Number of destination countries</th>
<th>Total weight (brutto)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>6 732 037.4</td>
<td>100</td>
</tr>
<tr>
<td>China</td>
<td>38</td>
<td>3 703 716.4</td>
<td>55</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>62</td>
<td>1 509 806.5</td>
<td>23</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>24</td>
<td>319 718.6</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 22: The volume of transit traffic in the directions for 2016

<table>
<thead>
<tr>
<th>Origin country</th>
<th>Number of destination countries</th>
<th>Total weight (brutto)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>7 643 312.8</td>
<td>100</td>
</tr>
<tr>
<td>China</td>
<td>36</td>
<td>4 188 730.9</td>
<td>55</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>61</td>
<td>1 818 687.2</td>
<td>24</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>26</td>
<td>365 268.4</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 23: The volume of transit traffic in the directions for 2017

For the period from 2013 to 2017, China was the leader in the shipment of transit cargo, and the percentage of the total volume varies between 55 and 58%. Uzbekistan is in second place with a share of 16-24% of the total amount of transit cargo. In third place are Kyrgyzstan and Tajikistan, with a percentage of 5-6% of the total, where each country takes turns replacing each other in different years.
If we judge only the amount of transit cargo and consider only China as the leading sending country, it is clear that the construction of the Khorgos dry port on the border of Kazakhstan and China did not have an instant and significant effect on the increase in transit cargo in quantitative terms. But the positive trend from 2015 on the rise in volumes remains.

4.7 Containers

This table shows the data on the volume of cargo transportation in containers for seven years, and we see that until 2014 the total amount did not exceed 83 thousand tons per year, and since 2015 there has been a sharp increase. In 2015, compared to 2014, the volume of transportation increased by more than 80%, reaching a mark of 445 000 tons. In 2017, the numbers reached a record 5 202 700 tons, and 97% of the total volume or 5 001 300 tons are transit containers.

<table>
<thead>
<tr>
<th>Cargo transportation in containers by all modes of transport</th>
<th>thousand tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total in all directions</td>
<td>82,4</td>
</tr>
<tr>
<td>of them:</td>
<td></td>
</tr>
<tr>
<td>international</td>
<td>14,2</td>
</tr>
<tr>
<td>domestic</td>
<td>16,6</td>
</tr>
<tr>
<td>suburban</td>
<td>12,6</td>
</tr>
<tr>
<td>city</td>
<td>38,9</td>
</tr>
</tbody>
</table>

Table 24: Cargo transportation in containers by all modes of transport

Next, come the tables with data on container shipments for certain types of transport and we see that until 2016, containers were mainly transported by road. Most likely this is due to the completion of the construction of most sections of high-speed highways Western Europe - Western China and their commissioning.
If we compare the indicators of the volume of transit cargo and the volume of cargo transportation in containers, then we note that the main focus has shifted from the carriage of cargoes in wagons to the carriage of cargoes in containers. For example, in 2017, 7 643 312.8 tons of transit cargo were transported, and of these, only 5 202 700 tons were transported in containers, that is, 68% of the total volume of transit cargo.

If we look at the table on rail transport, we see that the numbers for 2017 are 4 923 900 tons of cargo, that is, 95% of the total volume of freight in containers. From this, it follows that the opening of the dry port of Khorgos in a short period significantly changed the nature of transportation and the importance of transporting cargo in containers has increased dramatically.
4.8 Conclusions

In conclusion, we can say that the volume of cargo transportation by rail and road is growing from year to year and the construction of new infrastructure facilities has a positive effect on this. The opening of the Khorgos dry port made it possible to increase the volume of transit cargo, altered the nature of transit cargo transportation and to shift the focus on the carriage of goods in containers. Transportation in containers allows you to reduce the operating time at the borders, which in turn increases the speed of delivery of goods to the destination. Transportation of goods in pipelines also shows steady growth from year to year. The most unstable and showing negative growth regarding indicators is maritime transport, and so far no significant impact on the overall growth in the volume of cargo transportation is provided by the construction of the new seaport of Kuryk. However, for certain types of cargo as transit cargo in containers, there is positive growth, although the volumes are minimal at the moment. The opening of a new railway section of Baku-Tbilisi-Kars with a length of 846 km connecting Azerbaijan, Georgia and Turkey on October 30, 2017, may soon have an impact on the increase in traffic volumes and increasing the attractiveness of the TITR as one of the main corridors of BRI. Moreover, this, in turn, will affect the increase in traffic volumes through the seaports of Kazakhstan. At the moment, we can record only negative growth in maritime transportation. Perhaps shortly, the situation will change, since for such projects, 2-3 years is not enough.

5. Challenges and probable solutions

When it comes to the overall challenges that the BRI project can be faced with, one can group them into three categories: those caused by national interests, those related to security issues, and technical ones. We do not deal with topics those related to the economic policies of countries, geopolitics, but we stop on the technical and some of the economic challenges that the project has to face. The topic is pervasive, and there is no possibility to describe each major transport corridor and its technical difficulties
separately, so we discuss the technical difficulties in the direction China-Europe as a whole, and not the Kazakh part of BRI separately since it is an integral part of this direction.

Technical challenges can be divided:

- by their geographical location along the corridor (China – Kazakhstan border, Belarus – Poland border, technical challenges within Europe);
- by duration in time (short term, long term);
- economic challenges as a price policy.

5.1 China – Kazakhstan border

5.1.1 Border crossing delays

Border crossing delays have been, and continue to be, experienced at Dostyk/Alashenkou and Altynkol/Khorgos railway stations, due both to border control processes and to the need to transship cargo between the differing rail gauges of China (1,435 mm) and Kazakhstan (1,520 mm). From the point of the view of challenges, the differences of rail gauges will be the challenge in a long term period of time. For containers, the transshipment process is relatively fast, involving as it does the lifting of containers between wagons of differing gauge, but for non-container cargo, requiring either bogie exchange or bulk-trans-loading, transshipment can be very time consuming. Although many technical challenges of previous years were taken into account and solved at Khorgos dry port for increasing network capacity, these border crossings as Dostyk and Khorgos will remain one of the weak points in the BRI project. For instance, in conjunction with the CPMM (Corridor Performance Measurement and Monitoring) project, the Asian Development Bank regularly monitors container dwell times at stations on the border between Kazakhstan and China. An analysis of results for 2014 was published in a CAREC document. It gave the following average duration at each of the Kazakhstan/China rail border crossings:
<table>
<thead>
<tr>
<th>Border station</th>
<th>Average dwell time (hours)</th>
<th>Border station</th>
<th>Average dwell time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altynkol (Kazakhstan)</td>
<td>37.4</td>
<td>Dostyk (Kazakhstan)</td>
<td>59.7</td>
</tr>
<tr>
<td>Khorgos (China)</td>
<td>23.9</td>
<td>Alashenkou (China)</td>
<td>42.4</td>
</tr>
</tbody>
</table>

Table 27: CPMM results at Kazakhstan/China rail crossings

It was claimed that the time spent by containers at a border station should be minimal, sufficient only to examine customs and other border control documents and to transfer containers from one track gauge to the other. Since it was advised by the Kazakh Railway (KTZ) that the average time to lift and transfer a container from one wagon to another is about 5-6 minutes, it was argued that a wagon should not spend more than 24 hours at a station. Clearly, the station dwell times experienced at both border crossings are well in excess of this. The case study document recommends that station dwell times, defined as the time interval between arrival at the first border station and departure from the second, should not exceed 24 hours for containers and 36 hours for non-container cargo. For increasing the speed of operations at the stations and keeping improvements was created Unified Management Information System “NOMAD” which about we mentioned at previous chapters.

At the moment, the difficulties are of a different nature. For example, according to internal information of “System” Ltd (Kazakhstan) and “Shenzhen Camel Alliance International Logistics Limited” (China) transport companies from September 20, 2018, there was a large number of containers at Khorgos and Dostyk railway stations, and the waiting time was up to 10 days for individual containers. For the group of containers the waiting time was less. The reason was a shortage of flat wagons and diesel locomotives. At that time, about 1,300 loaded containers stood idle at Khorgos dry port, and their number increased every day. Also, several hundred containers were stopped inside China in the province of Xinjiang. For unloading the station, containers to the following destination in Kazakhstan were loaded into open wagons.
In 2014 by JSC “Russian Railways”, National Union “Belarusian Railways” and JSC “National Company “Kazakhstan Railways” was created Joint-stock company “United Transport and Logistics Company - Eurasian Rail Alliance” or JSC “UTLC – ERA”.

The primary purpose of the company is forming and providing the integrated transportation and logistics services for the regular container transportation with a clear timetable, in transit, at the railway infrastructure of Russia, Kazakhstan and Belarus on the route Dostyk/Altynkol - Brest from China and South-East Asia to Europe, and in the opposite direction.

But with this challenge, the JSC “UTLC – ERA” does not seem to cope and the current number of rolling stock of 4,100 units is insufficient. The company plans to bring the number of flat wagons to 5,000 in 2019, but even this number will not be enough, because expected to maintain growth and increase the volume of traffic in containers by 2 times.

This problem will be periodic in the long term and now it is necessary to increase the number of flat wagons and locomotives. But an excessive number of wagons and locomotives will also be harmful, because they will be downtime and decrease the operational turnover of wagons.

5.1.2 Problems with documentation and other issues affecting border performance

- Chinese Railways is still much closed and not market oriented – is cautious about providing information.

- In China, not all of the agents involved in international trade know what an SMGS consignment note is. Particularly those in inland China use domestic documentation, which must be transcribed to the SGMS document at the border. This often causes significant delays.

- Chinese documents often come with errors, resulting in a need for additional data, which can be time consuming.

- Arrivals of cargo in individual wagons rather than as part of a block train will often result in lengthy delays, owing to the need for train marshalling.
5.1.3 Probable solutions for solving problems with documentation will be the comments of KFFA (Kazakhstan Freight Forwarders Association) on development of a unified multimodal transport document:

- Consider that there could be benefits in developing and implementing a document which integrates and satisfies the needs of all modes
- This is not a new idea, but still separate documents are used for different modes of transport (e.g. CIM/SMGS for rail, sea B/L for sea transport, etc).
- While Kazakhstan regulations mandate the use of the FIATA document for multimodal transport, in practice the FIATA document does not replace the rail consignment note or the B/L, although it was designed to do this
- As a FIATA member, KFFA distributes the FIATA documents to its members, but it is clear that it cannot replace uni-modal documents (air transport has declined and railways consider CIM/SGMS is enough for their needs)
- There is a need to design something which is simple, clear, and capable of satisfying the needs of all transport modes
- Possible that this document should be designed as a composite document and from the outset be designed for electronic transmission

Transcript:

FIATA - "International Federation of Freight Forwarders Associations" in English;
CIM - Uniform Rules Concerning the Contract of International Carriage of Goods by Rail;
SMGS - Agreement on International Goods Transport by Rail (translation);
B/L - Bill of Lading or maritime consignment.

5.1.4 Differences in allowable truck weight

In the field of road transportation, most Chinese transport companies faced regulatory challenges. The truck weight regulations in China are more liberal than those in Kazakhstan. Maximum truck weight in China is 55 tones but in Kazakhstan only 40
tones. The mismatch of truck weight regulations causes operational difficulties. For example, Chinese trucks can enter the SEZ “Khorgos - Eastern Gateway” on the Kazakhstan side, only if they are lightly loaded. For handling this problem, it is planned to increase truck weights in the SEZ “Khorgos - Eastern Gateway” and the surrounding area.

5.2 Belarus – Poland border

5.2.1 Infrastructural challenges

According to the Polish railway operator PKP Cargo, there are currently five crossing points between the countries. The most known is Malaszewicze – Brest. It is the most popular crossing, with enough capacity to handle the volumes. Currently, the border point can handle more than twenty trains per day or 450 thousand TEUs per year. With the current volumes, it has more capacity than required, and this is to be increased by four in 2022. Most of the experts agree that the main bottleneck on the New Silk Road remains this main border point between Poland and Belarus. However, to say that the problems arise in Malaszewicze alone is too simple. It is the organisational infrastructure around this border that determines the movement of trains, or the lack thereof. In Malaszewicze, trains are bound to queue up for the transhipment procedure. For some operators, it is possible to run directly to Brest and avoid the queues in Poland. However, this is not for everyone.
In theory, there is enough capacity on the Polish side of the border, and there are several terminals, public and private ones. However, the infrastructure is such that every train needs to cross through the terminal of PKP Cargo to reach the other terminals, resulting in congestion. After the terminals on the way to Belarus, there is a bridge. All trains need to pass a bridge to get to Brest, which is the only construction crossing the Bug River. According to PKP Cargo’s information, there is a second bridge under construction and due to be completed in two years. Until the end of construction in the next two years, this unfinished bridge would create the troubles if the volume of cargoes will increase significantly.

At the moment, the capacity of Malaszewicze is restricted, and according to the Center for Integration Studies of the Eurasian Development Bank (EDB), the Polish side accepts only 9–10 trains per day, instead of the agreed 14 trains per day. At this border crossing, it is often downtime up to 3 500 wagons. Major shippers, such as Hewlett-Packard (HP), have repeatedly expressed concern that the company’s trains on the Chongqing-Duisburg route are idle for 2-3 days. At the same time, trains from other Chinese cities can stand idle on the route for 5-6 days.
Other border crossings are a bit more to the north of Malaszewicze, and there are
Siemianovska – Svisloch and Kuznitsa – Bruzhi. Both of these border points are
operative, each with a capacity to handle four trains per day or 60 thousand TEUs per
year. UTLC - ERA has operated a container service between Poland and China via
Bruzhi since August 2017. The border crossing via Svisloch is lesser known. However,
some experts are expecting that volumes at this border point will grow soon.
A fifth border crossing is Czeremcha – Wyskolitowsk. At the moment this entry point
does not seem to be used for Eurasian traffic. Little information is available about this
border crossing.
However, under the EU financial program (Multiannual Financial Framework for 2014–
2020) € 10.2 billion has been allocated for the development of Poland’s railway
infrastructure and, perhaps in the short term, the above problems at the border will be
resolved, and the border crossing capacity will increase.

5.2.2 Differences in the lengths of the trains
Another factor limiting the development of the Silk Road is the differences in the length
of container trains. If on the Russian railways, on average, the train consists of 71
wagons or 994 meters, on the Belarusian railways it is from 57 to 65 wagons or up to 910
meters, in Poland, by technical regulations, the length of the train cannot exceed 600
meters.
That is, the trains leaving the Polish station Malaszewicze include a maximum of 43
wagons. As a result, containers have to overload and form additional trains. It leads to a
loss of time and increased costs.

5.3 Technical challenges within Europe
Rail transport in Europe is characterized by its diversity, both technical and
infrastructural. So there are many challenges which able to affect the BRI project.
Rail networks in Western and Central Europe are often well maintained and well
developed, whilst Eastern, Northern and Southern Europe often have less coverage
and/or infrastructure problems. Electrified railway networks operate at a plethora of different voltages AC (Altering Current) and DC (Direct Current) varying from 750 to 25,000 volts, and signalling systems vary from country to country, hindering cross-border traffic.

The European Union aims to harmonize standards, making cross-border operations easier as well as to introduce competition to national rail networks. Let’s review what kind of differences between countries are there.

5.3.1 Rail gauge
While most railways in Europe use 1,435 mm standard gauge—in some other countries, like on Iberian Peninsula, or countries which territories used to be a part of Russian Empire and Soviet Union: widespread broad gauge exists. For instance in Spain it is 1,668 mm (also known as Iberian gauge), while in Russia, Ukraine, Moldavia, Belarus, Finland, Baltic States gauge width is 1,520 mm or 1,524 mm (also known as Russian gauge). Ireland uses the somewhat unusual 1,600 mm gauge, which is referred to in Ireland as "Irish Gauge". Here, as well as on the border of Kazakhstan and China, the difference of the gauge is the weak part of the project and creates almost similar troubles that we considered earlier in the sub-chapter Belarus - Poland.

5.3.2 Electrification
Likewise, electrification of lines varies between countries. 15 kV AC has been used in Germany, Austria, Switzerland, Norway and Sweden since 1912, while the Netherlands uses 1500 V DC, France uses 1500 V DC and 25 kV AC, and so on. All this makes the construction of truly pan-European vehicles a challenging task and, until recent developments in locomotive construction, was mostly ruled out as being impractical and too expensive.

The development of an integrated European high-speed rail network is overcoming some of these differences. All European high-speed lines, outside of Germany, Austria and Italy use 25 kV AC electrification (Electrification of high-speed rail in Italy is mixed
3 kV DC and 25 kV AC). This means that by 2020 high-speed trains can travel from Italy to the United Kingdom, or Portugal to the Netherlands without the need for multi-voltage systems or breaks of gauge.

### 5.3.3 Signalling

Multiple incompatible signalling systems are another barrier to interoperability. The EU countries have 19 different signalling systems. A unified signalling system, ETCS (European Train Control System) is the EU’s project to unify signalling across Europe. The specification was written in 1996 in response to EU Directive 96/48/EC. ETCS is developed as part of the European Rail Traffic Management System (ERTMS) initiative, and is being tested by multiple Railway companies since 1999. All new high-speed lines and freight main lines funded partially by the EU are required to use level 1 or level 2 ETCS signalling.

### 5.3.4 Loading gauge (gabarit)

The table below shows the differences in loading gauge and it shows what difficulties exist within Europe in the field of railways.

<table>
<thead>
<tr>
<th>Loading gauge</th>
<th>Static reference profile</th>
<th>Kinematic reference profile</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>UIC and/or TSI</td>
<td>Static reference profile</td>
<td>Kinematic reference profile</td>
<td>Comments</td>
</tr>
<tr>
<td>UIC and/or TSI</td>
<td>Static reference profile</td>
<td>Kinematic reference profile</td>
<td>Comments</td>
</tr>
<tr>
<td>Width</td>
<td>Height</td>
<td>Width</td>
<td>Height</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>UIC and/or TSI</strong></td>
<td><strong>Static reference profile</strong></td>
<td><strong>Kinematic reference profile</strong></td>
<td><strong>Comments</strong></td>
</tr>
<tr>
<td>G1 / UIC 505-1</td>
<td>T 11</td>
<td>Width</td>
<td>Height</td>
</tr>
<tr>
<td>GA</td>
<td>T 12</td>
<td>3.150 m</td>
<td>4.280 m</td>
</tr>
<tr>
<td>GB</td>
<td>T 13</td>
<td>4.320 m</td>
<td>4.350 m</td>
</tr>
<tr>
<td>GB1 / GB+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GB2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G2</td>
<td>T 14</td>
<td>Width</td>
<td>Height</td>
</tr>
<tr>
<td>DE3</td>
<td>not defined</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 28: Loading gauge

**Transcript:**

UIC - International Union of Railways;

TSI - Technical Specifications for Interoperability;

RIV - International Wagon Regulations;

TEN-T - Trans-European Rail network.

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Figure 32: Loading gauge (gabarit)
5.3.5 Low speed of freight trains in EU countries

The poor performance of rail freight transport regarding volume and modal share in the EU is not helped by the average commercial speed of freight trains. Simply put, freight trains run slowly, and their speed has not significantly increased over the last decade. On some international routes, freight trains run at an average speed of only around 18 km/h. This is also due to weak cooperation between the national infrastructure managers. In central and eastern European Member States, the average speed is between 20 and 30 km/h. For example, in Poland, in 2014 the average commercial speed of freight trains was 22.7 km/h. At that moment, Poland is in the last place for the speed of freight trains among European countries. At the same time, the cost of transportation in Europe is much higher than, for example, in Russia or Belarus. The average local train speed on the territory of the Eurasian Economic Union (Belarus, Kazakhstan and Russia) is 44 km/h, while in the EU, freight trains move at an average speed of 18.2 km/h.

5.4 Economic challenges

5.4.1 Subsidies for containers

The reality is that maritime trade is, and will remain, overwhelmingly dominant. During 2016, maritime shipping carried 94% of China-Europe trade by weight and nearly two-thirds of trade by value.

For increasing attractiveness of the railway corridor in direction China – Europe Chinese Government subsidises shippers, and they can range from US$1,000 to US$5,000 for each 40-foot container, accounting for up to half the total cost. The future of rail subsidies is a critical factor. Some logistics experts believe these subsidies could be phased out in 2019 or 2020. Nobody knows how it affects the amount of shipment from China to Europe by railways. However the overall impact of these changes will be modest. The vast majority of the geographic space the railways pass through will experience no difference. Despite the Silk Road’s popular appeal, the emergence of
China-Europe railways does not signal the return of a world in which overland trade dominates. The railways have found speed, but their scale remains limited.

5.4.2 Subsidies only for full 41 containers

Only fully loaded trains may depart from China to the west. This is the latest restriction on Eurasian rail freight traffic, implemented by the Chinese government in October 2018. A train with 40 full containers and one empty will not be subsidised. Only trains with 41 full containers may be operated.

The new rules were made for increasing the efficiency of the China-Europe railway lines. The costs of running a train to Europe runs into several hundreds of thousands. In general, 20-60 per cent of the operating costs are subsidised. However, at the same time, the new rules can cause delays, fewer departures and even cancellations of the trains.

5.4.3 The probable solution for keeping attractiveness of the China-Europe corridor after termination of subsidies and analysis of railway rates of the company JSC “UTLC ERA”

In recent years, the volume of transit container railway transportation has increased significantly. Along with the increase of the delivery speed, the service cost reduces, which makes this type of cargo transportation even more attractive. At present, tariff rates for railway transit have become competitive with sea transportation. The difference in tariffs between container transportation by rail and transportation by sea is less than US$1,000 per a 40-foot container, and take into account the additional cargo owner’s cost savings, owing to shorter delivery time and the railways can be an optimal solution for the even more significant number of customers.

Joint-stock company “United Transport and Logistics Company – Eurasian Rail Alliance” (JSC “UTLC - ERA”) was established in 2014 by the railway administrations: JSC “Russian Railways”, National Union “Belarusian Railway” and JSC “National Company Kazakhstan Railways”.
JSC “UTLC - ERA” forms and provides the integrated transportation of cargoes in containers with regular container trains which run by a precise timetable in transit. The company also provides a full range of logistics services at the railway infrastructures of Russia, Kazakhstan, Belarus on the route Dostyk / Altynkol - Brest from China and South-East Asia to Europe, and in the opposite direction. The balance of East-West and West-East container flows served as one of the main factors of cost reduction and it allowed reducing the complex rate for the clients by almost 30% since 2015. So the rate was US$3800 and has become US$2750. Moreover, it will be even less, as the number of transit cargoes has been increasing. In previous years, only 50 containers out of 100 shipped from Asia to Europe returned, while at present the percentage of return loading is significantly higher. At the end of this year, JSC “UTLC - ERA” expects it at 75% level.

The significant changes have taken place in the range of the goods transported by the company. In 2018, cargo owners began shipping less valuable goods regularly, such as cellulose, along with transit routes. This trend indicates that when choosing a mode of transportation, such an advantage of container rail service as delivery speed becomes fundamental.

According to the results of 2018, the United Transport and Logistics Company – Eurasian Railway Alliance (UTLC ERA) forecasts the traffic volume in a range from 275 to 280 thousand TEUs. In 2017, the traffic volume totalled to 175.8 thousand TEUs. In 2019, it is scheduled to transport about 350 thousand TEUs.

Further, there are given more detailed railway rates of JSC “UTLC - ERA” that is valid until December 31, 2018. The company offers rates in the following directions and stations:

- U WEST (Dostyk / Altynkol – Kaliningrad (Russia)) and U EAST (Kaliningrad (Russia) – Dostyk / Altynkol);
- U WEST (Dostyk / Altynkol – Kolyadichi (Belarus)) and U EAST (Kolyadichi (Belarus) – Dostyk / Altynkol);
- U WEST (Dostyk / Altynkol – Brest/Bruzhi/Svislac (Belarus, Poland)) and U EAST (Brest/Bruzhi/Svislac (Belarus, Poland) – Dostyk / Altynkol).

We review the rates in the third direction because it is the most popular and there is no possibility to describe and analyse the rates for each direction separately.

For a complete understanding of the railway rates, explanations are given to the data, and they are common to all tables.

**Special Rates** are valid for the shipments to be 50% balanced by U East service, otherwise basic rates to be applied.

**Base Rates** are transport rates for a full container.

**Transport rates for full container** include:

- Railway fares and customs inspection fees at Kazakhstan, Russian and Belorussian Railways;
- Transit customs declaration at Dostyk railway station;
- Handling operations at Dostyk railway station;
- Providing of flat wagon;
- Cargo convoy charges;
- Freight forwarder’s fee.

**Transport rate for empty containers** includes:

- Railway fares and customs inspection fees at Kazakhstan, Russian and Belorussian Railways;
- Transit customs declaration at Brest North / Bruzgi / Svislach railway stations;
- Handling operations at Brest North / Bruzgi / Svislach railway stations;
- Providing of flat wagon;
- Cargo convoy charges;
- Freight forwarder’s fee;
- Sealing of empty container.
U WEST (Dostyk station – Brest/Bruzhi/Svislach station – 5430 km)

<table>
<thead>
<tr>
<th>Type of container</th>
<th>Size of container, feet</th>
<th>Special Rate (US$)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>laden 0%</td>
<td>laden 18%</td>
<td>empty 0%</td>
<td>empty 18%</td>
</tr>
<tr>
<td>Standard</td>
<td>20’</td>
<td>1 750</td>
<td>1 750</td>
<td>2 450</td>
<td>2 450</td>
</tr>
<tr>
<td>Standard</td>
<td>40’</td>
<td>2 940</td>
<td>2 940</td>
<td>3 500</td>
<td>3 500</td>
</tr>
<tr>
<td>Standard</td>
<td>45’</td>
<td>2 940</td>
<td>2 940</td>
<td>3 500</td>
<td>3 500</td>
</tr>
<tr>
<td>Reefer</td>
<td>45’</td>
<td>2 940</td>
<td>2 940</td>
<td>3 500</td>
<td>3 500</td>
</tr>
<tr>
<td>Tank-container</td>
<td>20’</td>
<td>2 000</td>
<td>2 000</td>
<td>2 700</td>
<td>2 700</td>
</tr>
</tbody>
</table>

Table 28: U WEST (Dostyk station – Brest/Bruzhi/Svislach station)

U EAST (Brest/Bruzhi/Svislach station– Dostyk station – 5430 km)

<table>
<thead>
<tr>
<th>Type of container</th>
<th>Size of container, feet</th>
<th>Base Rate (US$)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>laden 0%</td>
<td>laden 18%</td>
<td>empty 0%</td>
</tr>
<tr>
<td>Standard</td>
<td>20’</td>
<td>1 550</td>
<td>1 550</td>
<td>2 650</td>
</tr>
<tr>
<td>Standard</td>
<td>40’</td>
<td>2 650</td>
<td>2 650</td>
<td>3 350</td>
</tr>
<tr>
<td>Standard</td>
<td>45’</td>
<td>2 650</td>
<td>2 650</td>
<td>3 350</td>
</tr>
<tr>
<td>Reefer</td>
<td>45’</td>
<td>2 650</td>
<td>2 650</td>
<td>3 350</td>
</tr>
<tr>
<td>Tank-container</td>
<td>20’</td>
<td>1 800</td>
<td>1 800</td>
<td>2 550</td>
</tr>
</tbody>
</table>

Table 29: U EAST (Brest/Bruzhi/Svislach station– Dostyk station)

U WEST (Altynkol station – Brest/Bruzhi/Svislach station– 5479 km)

<table>
<thead>
<tr>
<th>Type of container</th>
<th>Size of container, feet</th>
<th>Special Rate (US$)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>laden 0%</td>
<td>laden 18%</td>
<td>empty 0%</td>
<td>empty 18%</td>
</tr>
<tr>
<td>Standard</td>
<td>20’</td>
<td>1 600</td>
<td>1 600</td>
<td>2 300</td>
<td>2 300</td>
</tr>
<tr>
<td>Standard</td>
<td>40’</td>
<td>2 650</td>
<td>2 650</td>
<td>3 350</td>
<td>3 350</td>
</tr>
<tr>
<td>Standard</td>
<td>45’</td>
<td>2 650</td>
<td>2 650</td>
<td>3 350</td>
<td>3 350</td>
</tr>
<tr>
<td>Reefer</td>
<td>45’</td>
<td>2 650</td>
<td>2 650</td>
<td>3 350</td>
<td>3 350</td>
</tr>
<tr>
<td>Tank-container</td>
<td>20’</td>
<td>1 850</td>
<td>1 850</td>
<td>2 550</td>
<td>2 550</td>
</tr>
</tbody>
</table>

Table 30: U WEST (Altynkol station – Brest/Bruzhi/Svislach station)
### U EAST (Brest/Bruzhi/Svislach station – Altynkol station – 5479 km)

<table>
<thead>
<tr>
<th>Type of container</th>
<th>Size of container, feet</th>
<th>Base Rate (US$)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>laden</td>
<td>empty</td>
</tr>
<tr>
<td>Standard</td>
<td>20’</td>
<td>1 400</td>
<td>1 400</td>
</tr>
<tr>
<td>Standard</td>
<td>40’</td>
<td>2 450</td>
<td>2 450</td>
</tr>
<tr>
<td>Standard</td>
<td>45’</td>
<td>2 450</td>
<td>2 450</td>
</tr>
<tr>
<td>Reefer</td>
<td>45’</td>
<td>2 450</td>
<td>2 450</td>
</tr>
<tr>
<td>Tank-container</td>
<td>20’</td>
<td>1 650</td>
<td>1 650</td>
</tr>
</tbody>
</table>

Table 31: U EAST (Brest/Bruzhi/Svislach station – Altynkol station)

If we compare the rates, we note that although the stations Dostyk and Altynkol are practically at the same distance, the prices in the direction of the West differ and, for example, for a 40-foot loaded container the difference is US$290 (Special rates) and US$150 (Base rates). In the direction of the East, there is also a difference in the rates between the stations of Dostyk and Altynkol and the difference is equal to US$200. There is no special rate in the direction of the East, but the difference between the Western and Eastern directions for Dostyk is US$290, for Altynkol US$200. Further, the company offers discount rates for large shippers, but only from Dostyk station. Discounts start with a thousand containers per month or more.

**Discount scale of rates for the U EAST and U WEST services:**

<table>
<thead>
<tr>
<th>The monthly average number of carried containers in TEUs in the previous reporting period.*</th>
<th>Brest/Bruzhi/Svislach – Dostyk</th>
<th>Dostyk – Brest/Bruzhi/Svislach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>laden</td>
<td>empty</td>
</tr>
<tr>
<td>Up to 1000 TEU</td>
<td>2 650</td>
<td>2 650</td>
</tr>
<tr>
<td>between 1000 and 1500 TEU</td>
<td>2 620</td>
<td>2 620</td>
</tr>
<tr>
<td>between 1501 and</td>
<td>2 580</td>
<td>2 580</td>
</tr>
</tbody>
</table>
Given the downward trend in rates and the annual increase in the number of containers, soon, perhaps, the transport services market will come to that, the prices for rail transportation in the direction of China - Europe can easily be compared, or minimise the gap with rates for maritime transport. To do this, transport operators such as JSC “UTLC-ERA” make every effort to reduce rates and attract more customers.

At that moment, the volumes of traffic on the New Silk Road are much dependent on Chinese subsidies, yet these subsidies are expected to be discontinued sometime after 2020. Although some have argued that rail services between Europe and China will not be feasible without the Chinese support, but the logistics operators are a bit more positive.

The New Silk Road will continue to exist as long as the is sufficient volume of freight and the eastbound - westbound balance is in place. Some experts believe that this will be the case and the market mechanism will do its part and the balance will be there once the subsidies are pulled out.

<table>
<thead>
<tr>
<th>4100 TEU</th>
<th>2 500</th>
<th>2 500</th>
<th>2 800</th>
<th>2 800</th>
</tr>
</thead>
<tbody>
<tr>
<td>more 4100 TEU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 32: Discount scale of rates for the U EAST and U WEST services
6. Conclusions

In this work, we tried to understand the scale and estimate the potential of the BRI project, especially the Kazakhstan part through which the two main transport corridors lie. The BRI project is very large, and therefore it is not possible to describe each direction and each mode of transport. For a common understanding, we began with a short description of the project as a whole and considered in more detail projects related to Kazakhstan. I conditionally divided into two phases the implementation of the BRI project in a time interval and described the infrastructure and transport facilities that were implemented before the announcement of the BRI project, which were later integrated. In another part, I described the objects that were built after the announcement of BRI and were initially intended to integrate with the project. In two parts, such modes of transport as road, sea, rail and pipelines, as well as technological applications to improve and increase the processing speed of wagons and containers along the route were affected. After understanding the general situation and determining the technical characteristics and capabilities of each object, based on the data on the transport of the Statistics Committee of the Republic of Kazakhstan, we tried to determine the traffic volumes and development dynamics for each type of transport. Also, using data on domestic traffic, we determined the mutual influence of passenger and freight traffic on the transit of goods by rail. According to statistics, road and rail transports show a gradual growth starting from 2010, and if the current growth rates of the economy and population are maintained, then the current capacities of Kazakhstan’s transport networks should be enough for the next 30-40 years. For pipelines, and especially for gas pipelines, growth is expected soon due to increased demand in the domestic market after the construction of new "Saryarka" gas branch. The most unstable and showing negative growth is sea transport. So far, the new port of Kuryk does not operate at full capacity and therefore has not yet had a significant impact on the increase in the volume of transit freight traffic. We hope that the situation will improve after the inclusion of new railway lines in full capacity, connecting
Azerbaijan, Georgia and Turkey. The last chapter described the technical and economic challenges faced by the project, and in particular the direction of China - Europe. The Kazakhstan part is an essential component of this direction, and therefore we have considered problems in general in this area and particular problems on the borders of China - Kazakhstan and Poland - Belarus and within Europe itself. Also in the same chapter, some possible solutions to existing problems were proposed. From all this, it follows that difficulties in the short and medium term are entirely solved by attracting additional funds and some of these problems will soon be solved, as is the case at the border of Poland and Belarus. However, long-term difficulties, such as different gauge, slow modernisation of railway networks within Europe and the early cancellation of monetary compensation to shippers by the Chinese state may affect the viability and attractiveness of the project. The aim of the project is not a complete replacement of sea transport for rail transport but is the construction of an alternative for the fast delivery of goods at an affordable price. It must be remembered that China annually sends about 23 million TEUs to Europe annually, 94% of the total in 2016 was transported by sea, and if in the direction China-Europe even 1 million TEUs will be transported by rail in 2020, it will be only less than 5% of the total. Therefore, the strength of this project is the speed of delivery and it is necessary to focus on maintaining and increasing the speed of cargo delivery to Europe in the future. In general, the BRI project is designed for the next 30-40 years, and all this time it will be built, expanded and improved. Therefore, given that only 5 years have passed since the announcement, then quite a lot of work has been done during this time, but not enough to evaluate the entire project. Therefore, intermediate conclusions can be made in 5-10 years, when the project will work at full capacity, and there will be an opportunity to evaluate the full potential of the BRI project.
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