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Rail transport between China and Europe on the New Silk Road in times of crisis

Abstract: The aim of this article is to synthetically assess the impact of crisis phenomena on transport volumes in rail cargo transport between Asia and Europe on the rail Silk Road. The analysis of secondary sources and the analysis of transport results in traffic between China and Europe was carried out on the basis of data and statistical quantities obtained as part of analytical and research work in the field of freight traffic within the framework of the Organization for Co-Operation between Railways (OSJD). The analysis confirmed that freight traffic between China and Europe has shown its stability in transport volumes. The actions taken by the railways of the member states of the OSJD to counteract the crisis phenomena resulted in the achievement of positive transport results and an increase in container transport in international rail traffic between Asia and Europe on the rail Silk Road. The results of the analyses showed an increase in container transport in the China-Europe-China relations in the rail transport corridors operating under the New Silk Road concept. Nevertheless, the crisis has highlighted changes in transport on the Northern Corridor and efforts to search for alternative transport corridors. The main indicators of international rail transport in transit transport between Asia and Europe turned out to be the speed of transport and the time of delivery of goods. The transport results were influenced by work on the development and organization of container transport in international traffic, including the organization of container block trains, digitization of service processes at border crossings, and the CIM/SMGS consignment note.

Keywords: Crisis; Supply chain; Container transport; New Silk Road (NJS); Digitalization; Digital CIM/SMGS consignment note; OSJD

Introduction

Contemporary supply chains are an integral part of the global economy, providing transport and distribution of goods on a worldwide scale. For the purposes of these considerations, a supply chain will be understood as a management system for processes that include the delivery of goods and services from raw materials to finished products and their delivery to the end consumer using transportation means [23]. This process is dynamic and requires coordination among the various entities involved in the time-space transformation of products. A supply chain can also be defined as a sequence of business activities that link producers, suppliers, wholesalers, distributors, and retail intermediaries, utilizing transportation, forwarding, and logistics companies in order to deliver products or services to the end customer [5]. Within the supply chain, there is a flow of information, products and services, and financial resources between the various entities [4]. Coordination processes occur in accordance with customer requirements. With the development of globalization, supply chains have lengthened, become more complex, and more susceptible to crises/disruptions that can have negative effects on companies, individual links in the supply chain, and entire industries [34]. Supply chains are exposed to many different types of risk [32] that can lead to delays in deliveries, product damage, financial losses, and other problems [6].

A crisis [10, 30] is a process that can last an indefinite period of time and is characterized by a changing situation or a period that heralds an unexpected change. Crises most often arise as a result of the occurrence of three factors: the possibility of a threat and the surprise associated with it, time pressure, and the awareness that the threat is the result of the circumstances in which it appeared. A crisis can be analyzed from the perspective of where it occurs, as a process, a phase of a process, or as problems within the developmental concepts of enterprises. It should be emphasized that crises in supply chains are becoming more frequent and can lead to serious problems for companies, especially in the context of globalization and increased competition [9]. Among the types of crises, the classification by B. Jankowska [13] is notable, as it specifies the types of crises in supply chains. These include political crises, such as armed conflicts, riots, changes of governments and state policies, problems with borders and the flow of goods between countries, or the imposition of embargoes on specific goods, as well as natural disasters—such as calamities (floods, earthquakes, hurricanes, epidemics)—which can cause transportation to be interrupted and hinder the availability of goods. In order to counteract crisis phenomena, it is essential to conduct risk analysis [17], have alternative solutions, and increase the flexibility of the supply chain through the implementation of information technologies and the standardization of processes. Managing information and communication to ensure the efficient functioning of the supply chain becomes a critical element in times of crisis [34]. The growing complexity of global supply chains and their susceptibility to various types of crises consequently have negative effects on companies and industries. The classification of crises related to the supply chain includes those associated with raw materials, logistics, financial or economic problems, as well as natural disasters or other random events [9]. Therefore, companies operating in the global business environment must be aware of the various types of crises and be prepared for their possible occurrence.

The crisis related to the COVID-19 pandemic forced organizations and society to undertake a rapid digital transformation in order to maintain continuity of operations and communication without the need for physical contact [20]. L. Ojala [26] stated that companies involved in supply chains, under the influence of the COVID-19 pandemic, should modify their operations by developing new business strategies for future, redesigned supply chains by taking into account new indicators, such as:

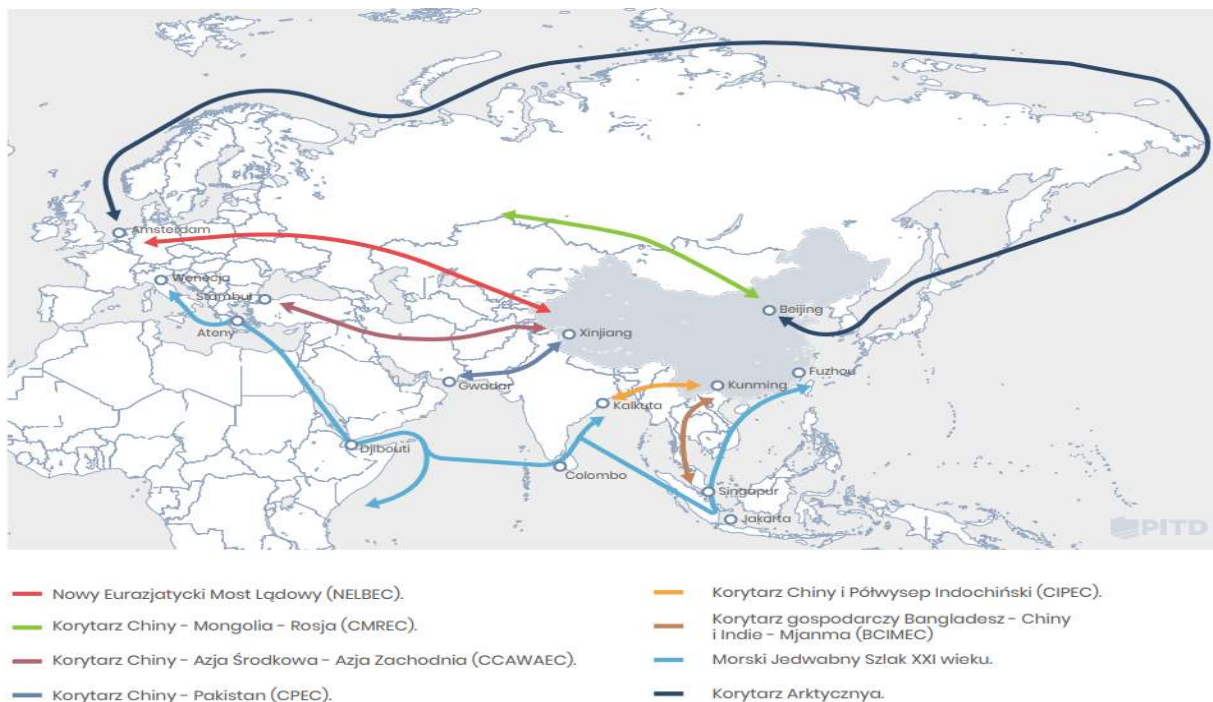
- resilience to external factors,
- responsiveness (the ability to react quickly),
- the capability for rapid reconfiguration of supply chain parameters (reconfigurability).

Crises such as pandemics, armed conflicts, natural disasters, or disruptions in the supply of raw materials significantly affect the functioning of supply chains by generating delays, increased costs, shortages in assortment, and loss of customer trust. In such situations, appropriate crisis management methods become extremely important for the survival and success of enterprises [33]. One of the key strategies in crisis management within supply chains is building resilience and flexibility. Additionally, it is important to build internal stability within the intermediary links of the supply chain. Hence, as R. Pyffel [18] notes, the Silk Road, due to its role and the need for stable transport development because of the unfavorable geopolitical situation, is bending toward the south.

Supply Chains of Products Transported by Rail between China and Europe

International rail transport between China and Europe has become an important link in the trade exchange between China and Western Europe. The above issue is analyzed in the context of both supply chains involving rail transport and the volume of goods carried within the rail transport corridors connecting Asia and Europe [25]. Actions aimed at stabilizing and enhancing the resilience of transport in the Eurasian space have focused on modernizing and

improving the technical and operational parameters of these corridors, as well as streamlining the legal and organizational solutions at border crossings. Rail transport corridors are widely used for planning and organizing the operation of container trains in international traffic between Asia and Europe. In the member countries of the International Union of Railways (OSŻD), there are 13 international rail transport corridors operating within the Eurasian rail area. In today’s highly unstable geopolitical and economic environment, the variability of corridor solutions within the concept of the New Silk Road—an element of the broader Chinese Belt and Road Initiative—has become crucial. This concept is presented in Illustration 1 [38]. Equally important are the infrastructural capabilities and potential of the countries through whose territories both the main and alternative transport routes run. An alternative approach to rail transport between China and Europe is presented in Illustration 2 [16].



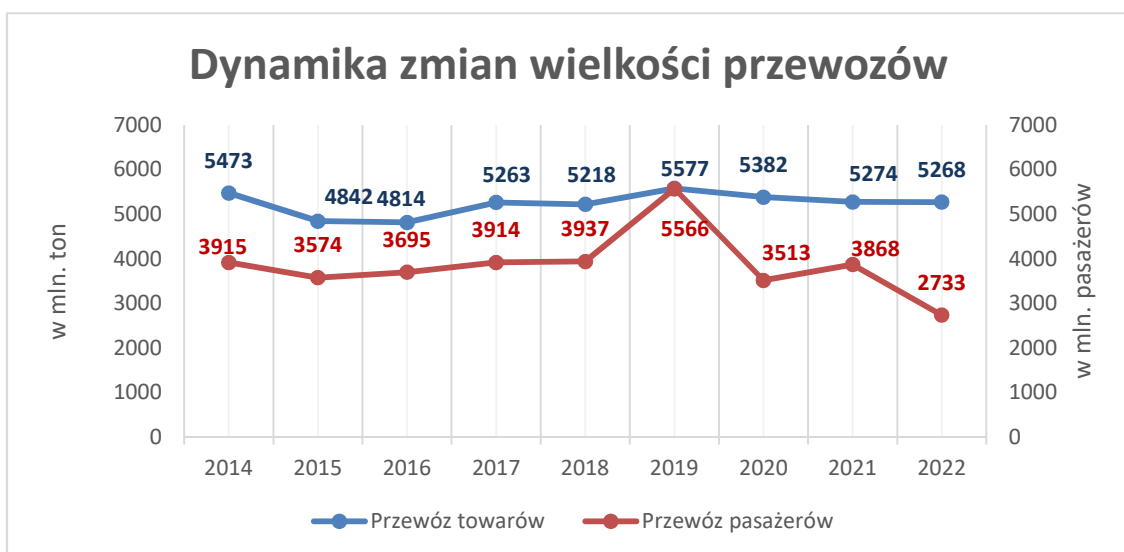
1. Belt and Road Initiative, source: [38]



2. Railway corridor initiatives between Asia and Europe, source: [16]

Rail connections between China and Europe remained a reliable transport corridor linking the two continents during the COVID-19 pandemic. The primary competitive factors in international rail transport were the speed of transport, delivery times, infrastructure quality, and, according to G. Bessonov and N. Stepanova, an optimal pricing policy [3]. In general, while cargo transport volumes in the OSJD member countries remain at a relatively stable level, passenger transport has experienced significant declines. These declines were caused by restrictions imposed due to the COVID-19 pandemic. In 2022, the negative trends in the transport market were further exacerbated by the geopolitical situation between the transit countries through which the rail Silk Road corridors run (namely, the OSJD member countries Russia and Ukraine). This situation also led to measures affecting rail transport, namely, a shift of interest by operators on the northern corridor of the New Silk Road towards the Middle Corridor (Middle Corridor, TITR).

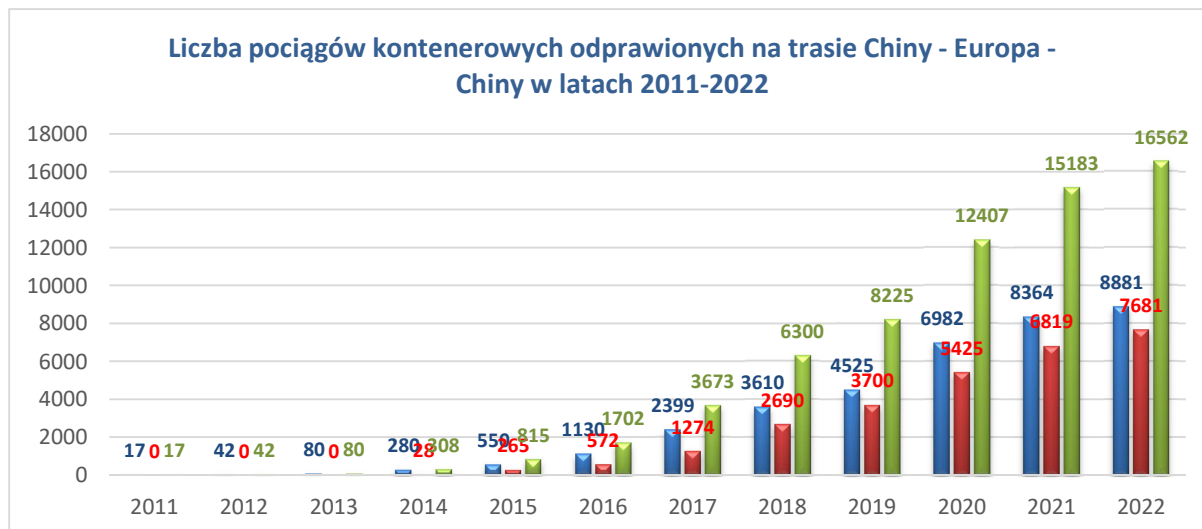
Basic transport volumes and the dynamics of changes are presented in Illustration 3 (original work based on [14]). Due to the restrictions resulting from the spread of coronavirus infection, railways proved to be a reliable means of transporting goods—including, for example, the delivery of medical supplies needed to combat the COVID-19 pandemic. During the COVID-19 pandemic, freight trains on the China–Europe route carried large quantities of anti-epidemic supplies and parcels sent via cross-border e-commerce, as well as goods that were previously delivered by sea or air. Since 2020, freight transport has shown noticeable stagnation.



3. Dynamics of changes in freight transport volumes in the OSJD countries, source: [14]

The organization of container trains on the China–Europe route contributed to international cooperation in epidemic prevention and to the stabilization of supply chains among countries located along the Belt and Road Initiative (“One Belt, One Road”). The dynamics of these changes are presented in Illustration 4 (original work based on [22]). This progress was also aided by measures taken within the framework of international agreements, such as the “Joint Declaration on Ensuring the Smooth Functioning of Global Supply Chains,” signed by the International Union of Railways (OSJD), the Intergovernmental Organization for International Rail Transport (OTIF), and the World Customs Organization (WCO), or the “Joint UNESCAP-OSJD Declaration on Strengthening International Rail Transport on and off the Trans-Asian Railway Network under COVID-19 Conditions.” The significance of these issues is continually emphasized in the context of improvements at border crossings for international rail transport in the Eurasian space [7, 31]. Additionally, the

implementation of the OSŻD “Agreement on the Transport of Containers in Container Trains in International Traffic” has provided further developmental impetus for transport between Asia and Europe as part of the rail Silk Road. It should be noted that, using the infrastructure of OSŻD member countries, over 13,000 container trains have traversed 200 routes. On these routes, trains run regularly and depart according to the established timetable.



Lata	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
tam	17	42	80	280	550	1130	2399	3610	4525	6982	8364	8881
z powrotem	0	0	0	28	265	572	1274	2690	3700	5425	6819	7681
liczba pociągów	17	42	80	308	815	1702	3673	6300	8225	12407	15183	16562



Miesiące	styczeń	luty	marzec	kwiecień	maj	czerwiec	lipiec	sierpień	wrzesień	październik	listopad	grudzień
tam	712	707	586	582	714	737	775	820	824	851	785	788
z powrotem	592	467	577	588	626	524	732	781	715	676	696	608
liczba pociągów	1304	1174	1163	1170	1340	1261	1507	1601	1539	1527	1481	1396

4. Changes in freight volumes on the China-Europe-China direction, source: own study based on [22]

Analyzing the presented data, it should be noted that in 2022 a total of 16,562 container trains were dispatched by rail on the China–Europe–China route, which represents an approximate 10% increase compared to 2021. However, there is a noticeable slowdown in the growth rate compared to previous years. In 2022, 8,881 trains were dispatched on the China–Europe connections, marking an increase of about 7% compared to 2021, while 7,681 trains were dispatched on the Europe–China connections, representing an increase of around 13% compared to 2021. Monthly analyses indicate stagnation in February, March, and April, followed by a recovery trend; from August onward, a downward trend is observed. It should be emphasized that achieving such transport volumes was made possible through improvements in container transport, such as [1]:

- **Ensuring uninterrupted movement** through border crossings and undertaking modernization of border crossing infrastructure, as well as actively increasing the capacity for delivering, transloading, and receiving goods.
- **Innovations in transport organization** and promoting efforts to flexibly replace the broad and standard gauge tracks in cooperation with Russia, Kazakhstan, and Mongolia.
- **Improving the efficiency** of utilizing empty wagons and containers on the return journey [15].
- **Organizing work on the exchange of electronic data**, based on the existing mechanism of interaction with Kazakhstan, Russia, and Mongolia, as well as actively studying the use of electronic digital signatures in transport through electronic technology – for example, as part of the UN project “Transport and Trade Communications during the Pandemic,” concerning the delivery of goods (sulfate pulp) from the Republic of Belarus to Serbia. PLASKE JSC, an expert from the United Nations Economic Commission for Europe (UNECE), presented the results of a study on the application of international standards and data models for electronic documents used in inland waterway transport—including transport corridors along the Danube and Dnieper. As part of the UNECE project, a reference data model for multimodal transport (UN/CEFACT MMT RDM) was compared with documents used in actual business operations on these routes, and proposals were prepared for implementing transport forms in accordance with UN/CEFACT requirements. Technologically neutral multimodal standards can serve as a basis for interoperability using XML, JSON API, blockchain, or other new technologies.
- **Promoting innovations in customs clearance** at the border by organizing work on electronic data exchange with customs authorities.
- **Popularizing the use of the CIM/SMGS consignment note**, also in electronic form [27].

In the first half of 2023, the asymmetry in freight transport on the New Silk Road in the China–Europe–China route deepened. It should be noted that—as reported by the Chinese Railway Administration (data obtained as part of joint working analyses with Chinese Railways)—in the first half of 2023, 8,624 trains were launched towards Europe. In most cases, the destinations for these transports are located in the Russian Federation. Analyses conducted by UTLC ERA (a holding of Russian, Belarusian, and Kazakh railways) indicate approximately a 50% decline in transport towards Europe. Both the geopolitical situation and the economic situation in China have an impact on transport volumes and directions. According to analyses by the Poland–Asia Chamber of Commerce [29], the economic situation in China is changing—for example, China’s foreign trade turnover fell by about 14%, and the Purchasing Managers’ Index (PMI) for the Chinese industry in the first half of 2023 dropped below 50 points. The average annual GDP growth in China for the years 2023–2030 is estimated to be in the range of 4–6%. Macroeconomic data and geopolitical

phenomena (such as the armed conflict in Ukraine) indicate a slowdown in trade exchange, which translates into decreasing transport volumes on the China–Europe–China route.

Crisis and Alternative Solutions

The geopolitical crisis and its associated challenges have led both the transport–logistics sector and the proponents of the New Silk Road (NSR) concept to intensify efforts aimed at utilizing alternative transport corridors in both the east–west and north–south directions. One significant solution is the development of the Middle Corridor (TITR, Trans-Caspian International Transport Route, also known as the Trans-Caspian East-West Middle Corridor Initiative), the route of which is shown in Illustration 5 [21]. The Middle Corridor is intended to contribute to an increase in freight transport from China to Turkey and the European Union, as well as in the reverse direction. It constitutes an alternative to the Russian TRANSSIB corridor, the main overland route by which goods currently arrive in EU countries from China, Korea, or Taiwan. The geopolitical crisis has led to the development of a “roadmap” for the development and increased utilization of the corridor for the period 2022–2027. The primary goal has been to increase the corridor’s capacity, shorten transit times, and ensure the regularity and smooth flow of freight. It is worth mentioning that PKP Linia Hutnicza Szerokotorowa became the first Polish company to help create the Middle Corridor.

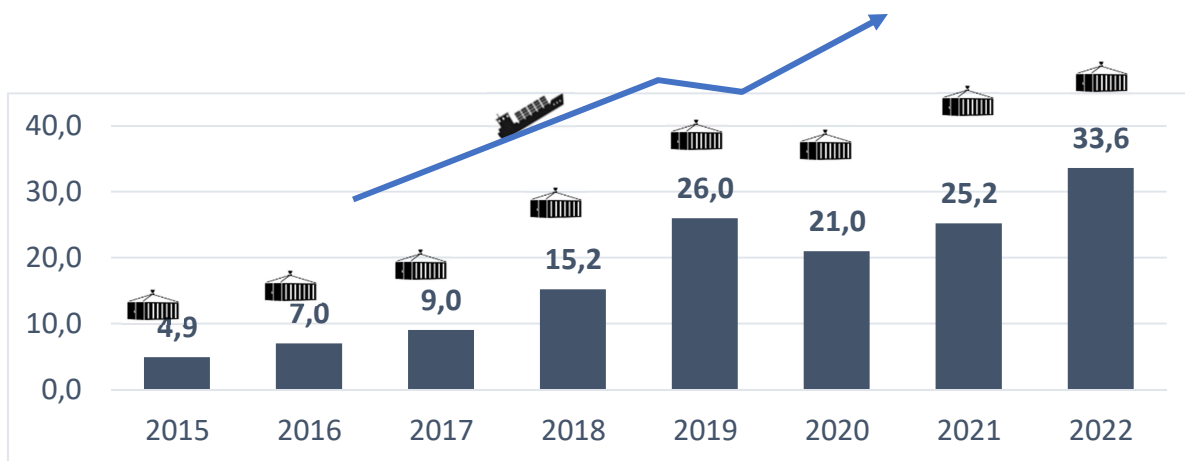


5. The Central Corridor (TITR), source: [21]

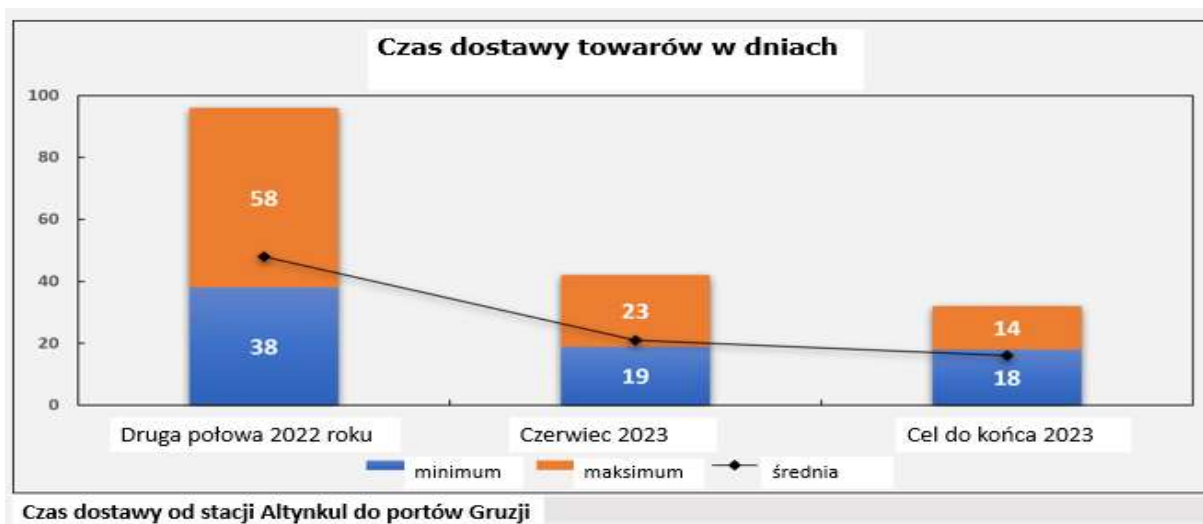
In 2022, TITR transported 1.5 million tons of goods—a 250% increase compared to the previous year—and 33,600 TEU containers, i.e., 33% more than in 2021. The transport performance results are shown in Illustration 6 [35]. These increases are also a result of China’s inclusion of TITR in the Belt and Road Initiative and the EU’s incorporation of it into the Union’s Silk Wind program, which streamlines distribution processes in trade with China. According to data from Kazakhstan, during the first six months of 2023 the volume of cargo transported along the Middle Corridor increased by 77% to 1.3 million tons. A significant shortening of the transit time is anticipated, as shown in Illustration 7 [2]. International bilateral and multilateral cooperation is becoming increasingly important. For example, in June 2023, Kazakhstan, Azerbaijan, and Georgia Railways signed a trilateral agreement on the basic principles for establishing and operating a joint venture (JV) to develop the Trans-Caspian International Transport Route (TITR), which connects China with European countries via Kazakhstan, the Caspian Sea region, Azerbaijan, Georgia, and Turkey. Another

example of such cooperation is the Memorandum between China and Kazakhstan, under which the parties agreed to:

- stimulate and increase the export, import, and transit of container trains along the TITR corridor,
- undertake measures aimed at improving the efficiency of transport and creating competitive tariff conditions on the TITR route,
- optimize logistics and transport operations on railways, in ports, and in maritime transport, shorten transit times, and improve the quality of services provided,
- assist in reducing administrative barriers related to customs clearance at control points as well as the handling of cargo and containers in ports and at hub stations.



6. Freight volumes on the TITR corridor, source: [35]



7. Delivery time on the central corridor from China to ports in Georgia, source: [2]

A special monitoring group has also been commissioned to oversee the development of freight transport—including the corridors [28]—along with outlined development plans within the framework of the Belt and Road Initiative (BRI).

In the development of the Southern Corridor, attention is also drawn to corridors established under the international TRACECA transport program, which was initiated by the Caucasus and Central Asian countries in cooperation with the EU [39] to create a comprehensive multimodal system of transport corridors spanning the Black Sea, the Caucasus, the Caspian Sea, and reaching Central Asian countries. The aim was also to create

the possibility for the effective development of the transport network and to contribute to an increase in transport from the Asia-Pacific region to destinations in Central Asia, the Caucasus, and Europe. Activities within TRACECA cover four sectors: trade facilitation; road transport; rail transport; and maritime transport. The TRACECA railway system consists of the following routes: the Trans-Russian, Trans-Caucasian, and Iranian–Turkish routes. TRACECA strives for more efficient use of the Caspian Sea transport corridor so that transport becomes less expensive. The role of the corridor via the Caspian Sea is now a priority due to the current geopolitical situation. It should be noted that, according to A. Asavbayeva—the Secretary General of TRACECA (data from the TRACECA plenary session held in Tbilisi in 2023)—initiatives such as the development of multimodal transport connections, increasing traffic in the corridor, and an agreement on a single transit contract will help carriers operate under one permit in all countries, thereby significantly simplifying the shipment of goods by this route. Regardless of the Trans-Caspian route, attention should be drawn to the Iranian–Turkish route from China, whose development is of interest to the Organization of Turkic States, which includes Azerbaijan, Kazakhstan, Kyrgyzstan, Turkey, and Uzbekistan. Turkmenistan and Hungary are also observing these developments. Additionally, attention should be paid to the KTI corridor (Kazakhstan–Turkmenistan–Iran Railway Corridor) and the branch of the Trans-Caspian corridor to Turkey “Baku–Tbilisi–Kars.” In both cases, pilot projects are underway regarding the implementation of the CIM/SMGS consignment note, the use of a new container train transport contract, and an international transit tariff.

The main freight corridors, including the Southern Corridor, are presented in Illustration 8 [21].



8. Basic transport corridors including the Southern Corridor, source [21]

These activities fall within the scope of the development of Corridor No. 6 of the International Union of Railways (OSŽD). In 2021, transport in this corridor amounted to approximately 8 million tons of cargo and is showing an upward trend.

Summary

The economic and geopolitical situation is extremely unstable. While container transport from China to Europe via the NSR’s northern corridor has experienced a decline, the importance of the route remains. Due to sanctions, customers are also choosing other rail routes, for example, the TITR from China through Kazakhstan, Azerbaijan, and Georgia to Turkey. Investment activities are being undertaken in alternative routes. Investments in transport corridors are seen as a source of economic cooperation among countries and regions, especially since key features of a transport corridor include, among other things, the developed economic and production potential of the regions located at the ends of the corridor and the possibility of applying multimodal transport technologies. An example is the

investments in Caspian Sea ports, including in Baku, where, ultimately, after the completion of the second phase of the Green Port, 500,000 TEU will be transshipped.

The geopolitical crisis and economic slowdown in Europe have not led to a complete freeze of the Rail Silk Road. After the initial shock in the global transport industry, which resulted in the suspension of many connections between China and the EU, the northern route still operates despite a significant decline [37]. The transport market in Asia–Europe relations is undergoing a significant transformation. Modern solutions for transport are being sought in the current situation, and appropriate transport systems are being selected for container transport [8]. Full utilization of the Middle Corridor will be possible in the perspective of the next few years, with the support of the European Union, China, and the countries interested in its development. These activities will benefit trade among the countries of Central and East Asia that are seeking alternative routes to Europe via Turkey. Goods shipped from the EU to China—when rail routes through Russia cannot be used—may return to logistics chains based on maritime and air transport.

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