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Rail transport corridors in the CAREC region: Long-term supply chain resilience and short-term shocks

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ADB Working Paper Series

**RAIL TRANSPORT CORRIDORS IN
THE CAREC REGION: LONG-TERM
SUPPLY CHAIN RESILIENCE AND
SHORT-TERM SHOCKS**

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Abstract

International supply chains are dependent on ease of crossing borders and efficient connectivity in terms of price, speed, and reliability. Initially responding to demand from automobile and electronics firms to connect their European and Chinese supply chains with faster and more reliable freight services than maritime shipping, the Eurasian rail transport corridor was established in the 2010s. The rail Landbridge was resilient through deteriorating EU–Russian Federation relations after 2014 and the 2020–2021 COVID-19 epidemic. However, following the Russian invasion of Ukraine and inclusion of the Russian rail company in western sanctions in February 2022, traffic growth along the main Landbridge routes stalled. This paper analyzes the response of supply chain managers in 2022–2023 to the sanctions, and the role of public policy in creating reliable alternative routes. Diversification and strengthening of Eurasian rail corridors benefit Central Asia Regional Economic Cooperation (CAREC) members through revenues from transit fees. More important is the reduction in transport costs for trade among CAREC members and with other countries, which can support economic strategies aimed at economic diversification.

Keywords: supply chains, connectivity, Eurasia, Landbridge

JEL Classification: F13

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1. INTRODUCTION

A major feature of CAREC's transport and trade facilitation work has been the identification of corridors, along which hard and soft infrastructure improvements can be coordinated to facilitate trade. An important step towards evidence-based policymaking was the establishment of the Corridor Performance Monitoring and Management program, currently run under the aegis of the CAREC Institute, whose headline measures report speed along corridors, highlighting the importance of time as well as cost for facilitating supply chain trade. In terms of rapid growth in traffic and increased speed, a subset of corridors forming a rail Landbridge between the People's Republic of China (PRC) and Europe and involving almost all CAREC member countries stands out.

International supply chains are dependent on ease of crossing borders and on efficient connectivity in terms of price, speed, and reliability, and efficient supply chain management relies on just-in-time delivery and minimization of inventories, whether held at production points or in transit. Nonstop rail services between the PRC and Europe were established in the 2010s to meet demand from European car companies sending components to factories in the PRC and from electronics firms sending computers and printers from the latter to their European marketing centers.¹ Over long distances, rail is faster than sea transport and has more reliable arrival times, as well as being more environmentally friendly than maritime, road, or air freight.

The next section describes the expansion of trade along the rail Landbridge, updating material in a previous ADBI volume (Azhgaliyeva and Kalyuzhnova eds. 2021).² The hard infrastructure was already in place. Success depended on governments agreeing transit rules and on the (state-owned) rail companies collaborating over schedules and rates. Beyond that, development of the Landbridge was market driven. As services and routes expanded, the number of customers increased and the Landbridge flourished, despite deteriorating EU–Russian Federation relations after 2014, shifting EU–PRC political relations after 2017, and the COVID-19 epidemic in 2020–2021.

The main Landbridge routes all passed north of the Caspian Sea and transited the Russian Federation. Section 3 analyzes efforts by the PRC and, to a lesser extent, the EU to develop alternative routes, although routes across or south of the Caspian Sea had significant disadvantages compared to the mainlines. In 2022, the potential for disruption was dramatically and unexpectedly revealed during the Russian invasion of Ukraine was followed by sanctions that made Russian Railways an unacceptable partner to many Landbridge customers. Section 4 analyzes the ensuing intensified search for alternative routes, indicating the Landbridge's value and the resilience of supply chains. Section 5 relates these developments to the economic prospects of CAREC members. The sixth section draws conclusions.

¹ The intensification of international supply chains during the last four decades has been easier in some parts of the world than others and so-called "global value chains" have been primarily regional value chains, centered on East Asia, Europe, and North America (Johnson and Noguera 2017). The regional supply chains were only linked at the final step of sending finished products to markets in high-income countries, typically by ocean shipping, until the Eurasian rail Landbridge established the first major overland link between regional value chains.

² Sections 1.3–1.5 of the introductory chapter (Kalyuzhnova and Pomfret 2021) review the emergence of the main Landbridge line, the Middle Corridor option, and the impact of COVID-19. Pomfret (2019a; 2021a) provides more details on this history. A model-based World Bank project found large benefits to countries along the Landbridge (Bird, Lebrand, and Venables 2020) as did an EU-focused study by Mau and Seuren (2023).

2. ESTABLISHMENT AND DEVELOPMENT OF THE LANDBRIDGE, 2011–2021

Between 1500 and 2000, trade between Europe and East Asia was almost entirely by sea. As ships increased in size, costs fell. Although rail track had been laid across Eurasia in the late 19th and early 20th centuries, rail could not compete with sea transport for freight services between East Asia and Europe.³ The situation started to change between 2007 and 2010 as German car manufacturers chartered trains to transport components from Europe to their joint venture factories in northeast PRC via the TransSiberian Railway or through the Russian Federation and Kazakhstan.⁴ Driven by demand from car companies sending components to the PRC and from electronics companies wishing to link their production facilities in the PRC to marketing centers in Europe, regular train services were established in 2011 between Chongqing and Duisburg and between Chengdu and Łódź.⁵

Regular rail services connecting an increasing number of cities broadened the range of customers willing to pay more than sea freight for faster more reliable transport but unwilling to pay for air freight. Travel times were reduced as competing termini and freight forwarders and other intermediaries increased efficiency, and as the change of gauge process was simplified at the PRC–Kazakhstan and Belarus–Poland borders. The Chongqing–Duisburg service became daily in 2016. By 2017, train journeys from Chongqing to Duisburg, which could take longer than ships before 2011, had been cut to around 15 days, while the same route by river and sea took between 35 and 50 days, depending on congestion along the Yangtze, the weather, piracy, and queues to enter the Suez Canal.⁶ Meanwhile, air freight rates increased, and ocean shipping adopted slow-steaming to economize on fuel and reduce pollution.

The growth in Landbridge traffic was sustained by a virtuous circle of more services (part-container loads, refrigerated containers, multimodal connections) and new routes that stimulated further demand and increased the number of trips. By 2017, over 30 cities in the PRC were offering nonstop freight services to Europe. In Europe, the main termini were Duisburg and Łódź, but cities far from these hubs, such as Madrid or Budapest, initiated direct regular services. The most popular lines were

³ The extensive rail network established in the late Ottoman Empire is in ruins, and today “from Morocco to Iraq not a single train crosses borders”; Murder of the Orient Express, *The Economist Christmas Special* 18 December 2021: 41.

⁴ UNECE (2020, 41) provides an example of TransContainer (the Russian Federation) and Far East Land Bridge (Austria) arranging the transport of BMW automobile parts from Germany to the PRC in September 2010, reporting that block trains provided door-to-door service from Europe to the PRC in 22–25 days. Similar bespoke services between Lianyungang and Andijan supplied Korean components to the Daewoo/GM factory in Uzbekistan. It is difficult to document all such one-off services.

⁵ A trigger for the services from Chengdu and Chongqing was the PRC’s 2001 “Go West” policy, which had encouraged firms such as Foxconn (assembler of Apple products), HP, Intel, and Acer to establish large factories in the region. The firms’ intention had been to export products along the Yangtze River to Shanghai, but the river became congested (Pomfret 2021a). The PRC’s increased infrastructure spending in 2007–2008 to preempt contagion from North Atlantic financial crises included a high-speed rail network that facilitated inland cities’ participation in supply chains.

⁶ Variability of time may be even more important than average time (Ansón et al. 2020). The more predictable arrival time for a train than for a ship is especially important for supply chains, which rely on just-in-time delivery and for which inventories are anathema. Sandkamp, Stamer, and Yang (2022) highlight the number of piracy incidents affecting ships sailing between the PRC and Europe (200 reported incidents in 2017 with 166 hostages and three deaths), and the costs of rerouting to avoid notable trouble spots.

PRC–Kazakhstan–Belarus–EU or the Trans-Siberian Railway between northeast PRC and Europe.

Traffic along the rail Landbridge grew rapidly in the decade after 2011. There is no consistent single data source (see Appendix). Numbers reported by the Eurasian Rail Alliance (UTLC) for the mainline through Kazakhstan, the Russian Federation, and Belarus show rapid growth in container shipments to over half a million in 2020 (Table 1). The UTLC numbers understate total freight, because many customers, especially from northeast PRC, use the TransSiberian Railway. The Chinese data in Table 1 cover all routes, and try to exclude bilateral trade with Kazakhstan, Mongolia, or the Russian Federation, but it is not always clear where to draw the line, e.g. trains to Russian Baltic ports are mostly Landbridge traffic to Scandinavia or Germany rather than to a Russian destination. In sum, both series in Table 1 may understate the extent of Landbridge traffic, but the time-path is consistent.

Table 1: Volume of Traffic on PRC–EU–PRC Container Trains

Year	Number of Twenty-foot Equivalent Containers (TEUs)	Number of Trains to and from the PRC
2011		17
2012		42
2013		80
2014		308
2015	46,000	815
2016	100,500	1,702
2017	175,800	3,673
2018	280,500	6,376
2019	333,000	8,225
2020	546,900	12,406
2021	692,500	15,000

Sources: **Column 1** UTLC website at www.utlc.com; **Column 2** Chinese official data cited in *The 2021 Silk Road Numbers Are There: What Do They Tell Us?* Posted at <https://www.railfreight.com/specials/2022/01/14/the-2021-silk-road-numbers-are-here-what-do-they-tell-us/> 14 January 2022. The Appendix discusses data sources.

The Landbridge has brought financial benefits to those providing and using the services. The state-owned national rail companies, led by Deutsche Bahn, responded to profitable opportunities.⁷ Participation of freight forwarders and of courier services such as DHL, Fedex, and UPS were profit driven. European countries establishing rail connections to the PRC benefited through increased exports. Based on 1996–2018 trade data, Mau and Seuren (2023) find that, following the initiation of a Landbridge route, the increase in bilateral trade between the PRC and the EU was led by the HS2-digit sectors electrical equipment, motor vehicles, and machinery and equipment, illustrating the importance of time-sensitive deliveries along international supply chains. They also find that the EU members benefiting most from the impact of rail connections on exports were countries in Central, Eastern, and Southeast Europe, with economic

⁷ The rail companies' revenues are confidential, but an Asian Development Bank source reported that Kazakhstan earned over one billion dollars in transit fees in 2015 (Pomfret 2019b, 267), the *Astana Times* reported in October 2019 that transit revenues had been \$2 billion over the past year (Yergaliyeva 2019), and Kazakhstan's 2015–2019 Nurly Zhol investment program envisaged transit revenues of \$4 billion in 2020.

structures more oriented towards “railway adopting industries” than the more services-oriented western European members.⁸

International trade was negatively impacted by the COVID-19 epidemic, but the impact on different modes of transport varied (Pomfret 2023). In the Russian Federation, Central Asia, and the Caucasus, air freight essentially stopped and transport by road was disrupted by requirements for drivers to be tested for COVID at border crossing points and by other regulations.⁹ Sea freight was disrupted by quarantine and other restrictions that stranded ships in the wrong place. Even as lockdowns were eased and factories started up again, containers and ships were out of location as managers dealt with crew safety issues and dockside biosecurity. Journey time for cargo ready at the East Asian port of departure to delivery at the European port of arrival increased from less than 60 days in 2019 to over 100 days by the end of 2021; price data also present a picture of disruption and increased costs. Unreliability of maritime delivery times was highlighted by the closure of the Suez Canal for a week in March 2021 after the *Ever Given*, one of the world’s largest container ships with a capacity of over 20,000 TEUs, became wedged.

Rail transport was less affected by anti-COVID measures, and the acceleration of digitalization and paperless trade may even have improved the efficiency of international rail transport. Manufacturers, distributors, and logistics agents, who had previously relied upon maritime transport between East Asia and Europe, turned to overland freight routes; the overland alternatives often turned out to be easier and more profitable than anticipated as users experienced reliable delivery schedules. In May 2020, at the height of the COVID crisis in Europe, UTLG reported that 52,500 TEUs were shipped on the Landbridge, the highest figure for a single month up to that date. The number of containers shipped between the PRC and the EU by rail through Kazakhstan increased from 333,000 in 2019 to 546,000 in 2020 and to almost 700,000 in 2021 (Table 1). Supply chains using the Landbridge had proven resilient to the exogenous shock of COVID-19.

3. PROMOTING ALTERNATIVES TO THE MAIN LINES

The Landbridge is a key element of the Belt in the PRC’s Belt and Road Initiative (BRI), although the rail services were established before the first announcement of the Belt in September 2013 and were well developed by the time the BRI was formally launched in May 2017. As part of the overland “Belt,” the PRC government has been active in promoting alternatives to the main lines, which run north of the Caspian Sea. Experimenting with alternative routes aimed in part to serve new destinations, but also to avoid the possibility of hold-ups by a key transit country.

⁸ Eastern European countries (especially Czechia, Hungary, Poland, and Slovakia) have been active participants in EU regional value chains (Pomfret and Sourdin 2018). Łódź quickly established itself as the Eastern European hub for EU–PRC rail freight (Jakóbowski, Popławski, and Kaczmarek 2018).

⁹ Air freight and road transport appear to have recovered in 2021. A World Bank study (Arvis, Rastogi, and Saslavsky 2022) reported EU–PRC–EU trade in 2021 by value to be €698 billion (67% by sea, 28% by air and 5% by rail) and EU–Central Asia–EU trade in 2021 by value to be €25 billion (9% by air, 27% by road, 60% multimodal, and 3% “other”).

Immediately after the easing of UN sanctions on Iran in January 2016, President Xi visited Tehran. The first train from the PRC reached Tehran in February.¹⁰ The PRC has established regular services from the Ningxia Autonomous region and from Yiwu to Iran. So far, no trains from the PRC have gone beyond Tehran. Although the track exists from Tehran to Istanbul and the Marmaray Tunnel eliminates the need for transfer by ship across the Bosphorus, many parts of the Iran–Türkiye rail journey are slow, including a four-hour ferry across Lake Van in eastern Türkiye.¹¹

More attention has been paid to the Middle Corridor that runs through Kazakhstan, crosses the Caspian Sea from Aktau to Baku, and then goes through Georgia either to link with the Turkish railway system or to cross the Black Sea by ship (Azhgaliyeva and Kalyuzhnova eds. 2021). This route had been proposed by the EU in the 1990s as a way to link Central Asia and the Caucasus to Europe, but with little success.¹² The hard infrastructure has since been improved by completion of the Zhezkazgan–Beyneu railroad in 2014, reducing the length of the east–west rail journey across Kazakhstan, and of the Baku–Tbilisi–Kars (BTK) railroad, which became operational in November 2017 and provided an overland link from Azerbaijan to Türkiye. Other improvements included the opening of a Kazakhstan–Turkmenistan–Iran line in 2013, the Marmaray Tunnel under the Bosphorus, and improvements of port and other facilities at Aktau and Turkmenbashi and the new Alyat port in Azerbaijan. The first PRC–Türkiye train from Xian in November 2019 used the BTK and crossed under the Bosphorus by the Marmaray Tunnel before continuing to Prague (Pepe 2021).

A strong economic motive for establishing multiple routes between the PRC and Europe is to avoid dependence on a single route. Such dependence could allow a transit country to hold up traffic, extorting higher transit fees until the returns to service providers are driven down to the break-even point. With multiple transit countries along a single route, each may try to extract more rent and, in the absence of effective cooperation, the outcome will be a tragedy of the anticommons.¹³ Besides avoiding a tragedy of the anticommons, multiple options encourage trade-facilitating competition along many dimensions.¹⁴

¹⁰ The route crossed Kazakhstan almost to the Caspian Sea where it followed the rail link through Turkmenistan to Iran, bypassing Uzbekistan whose transit regulations were too onerous. Following the death of Uzbekistan’s President Karimov in September 2016 and his succession by the more outward-looking President Mirziyoyev, PRC–Iran trains took the more direct route through Uzbekistan. Construction of the Kashgar–Andijan link will make this route even shorter.

¹¹ The ferry service is, however, being improved with new boats able to carry a 500-meter train across the lake in a faster time (Pepe 2021).

¹² Under the TRACECA program, the EU promoted a route from Central Asia across the Caspian Sea to Baku and then by rail through Azerbaijan and Georgia to the Black Sea and ship to Europe. Despite support from Azerbaijan and Kazakhstan, the route attracted little PRC–EU freight due to the inconvenience of transferring freight from train to ship and back to train, twice.

¹³ The tragedy of the commons arises when too many people have access to a common resource, e.g., a fishing ground may be overfished or pastureland overgrazed; too much activity leads to eventual destruction of the resource. The tragedy of the anticommons arises when too many people can access the rents; as each participant maximizes their own rents while ignoring the behavior of the others, excessive rent-seeking eliminates an otherwise profitable business; too little activity is the source of loss (Buchanan and Yoon 2000).

¹⁴ The global empirical evidence that agents are aware of differences between routes in terms of efficiency as well as price (e.g. Barthélémy 2021; Treb and Arkolakis 2020) is from regions other than CAREC and mostly for sea ports and road connections, but it is strong. Based on sea and air transport, Ganapati and Wong (2023) stress the danger of not identifying alternatives to currently preferred routes and failing to reduce exposure to choke points. An example in the Landbridge context is the response to congestion and delays due to the change of gauge at the Belarus–Polish border; Lithuania and Finland, which both use the Russian gauge, have boosted their hub facilities and ports to transfer goods to north German and other Baltic ports.

However, the Middle Corridor attracted less than 5% of Landbridge freight in 2021. The rail–sea–rail mode change remained an unattractive feature and a Black Sea crossing from Georgia to Romania or onward rail from Istanbul to Europe still had problems (e.g., transiting non-EU countries).

4. THE RUSSIAN INVASION OF UKRAINE AND EURASIAN RAIL CONNECTIONS

When disruption of the northern Landbridge routes occurred in February 2022, it was a result of the Russian invasion of Ukraine and subsequent sanctions. The war impacted demand for rail services by shifting customers' location and encouraging transshipment rather than direct EU–Russian Federation routes. These transitory effects will be addressed briefly. The long-term impact is likely to be an acceleration of the search for alternative routes as sanctions highlighted the risk of dependence on a single transit country.

The war and associated sanctions encouraged some companies to relocate from the Russian Federation to Central Asia and the Caucasus.¹⁵ Sanctions also encouraged trade diversion as some CAREC products were substituted for Russian products and, more importantly, the trade with Russian Federation was deflected through Central Asia and the Caucasus to avoid sanctions (Chupilkin, Javorcik, and Plekhanov 2023). Exports from Central Asia and the Caucasus to Russia in March–November 2022 were 63% greater than in the same period in 2021, and half of these were re-exports (Hugot and Mogilevskii 2023: 37). Re-exported products included printers, parts of electrical engines, and tractors from Kazakhstan, automatic locks and packaging equipment from the T Republic, and printers and some types of plastics from Uzbekistan; Central Asian imports of these products increased, mostly from the EU and the PRC.¹⁶ Chupilkin, Javorcik, and Plekhanov (2023) find that exports to the Russian Federation from the PRC and Türkiye (the Russian Federation's main nonsanctioning non-EAEU trade partners) increased compared to previous trends after a 2–4-month lag: the authors suggest that this is evidence of the time needed to establish new international supply chains. These changes are all likely to have affected demand for Landbridge services in aggregate and with differential impact on alternative routes, but the overall impact is likely to be small relative to the direct impact of sanctions on choice of routes.

An immediate effect of the February 2022 Russian invasion of Ukraine was to end Landbridge traffic via Ukraine.¹⁷ However, in 2021 only around 2% of PRC–EU overland trade passed through Ukraine. The wider Landbridge trade began to be paused or rerouted in January 2022 as tensions from the invasion mounted and was

¹⁵ Apart from many small and medium-sized Russian companies that relocated, Hugot and Mogilevskii (2023: 35) mention international companies such as US firms Nvidia, which opened a research center in Yerevan, and Honeywell, which transferred its regional office and opened a plant in Almaty.

¹⁶ The impact varied substantially with the smaller EAEU member countries showing large increases in exports to the Russian Federation in 2022 (Armenia 195% and the Kyrgyz Republic 151%), while other countries showed negligible increase (Azerbaijan 6% and Georgia 7%). Hugot and Mogilevskii (2023) suggest that these flows were new flows, in part reflecting investment relocation. Chupilkin, Javorcik, and Plekhanov (2023) place greater emphasis on rerouting of imports intended for the Russian Federation through Central Asia, especially through nonsanctioned EAEU members (Armenia, Kazakhstan, and the Kyrgyz Republic).

¹⁷ Hungary and Slovakia had promoted routes through Ukraine, and trains from Changsha and other Chinese cities went to Kyiv; Majorie van Leijen, *How Important Is Ukraine on the New Silk Road?* Posted 25 February 2022 at <https://www.railfreight.com/specials/2022/02/25/how-important-is-ukraine-on-the-new-silk-road/>.

more seriously hit when sanctions were imposed at the end of February. The financial and export sanctions imposed by the United States (US) and the EU on the Russian Federation on Friday 25 February meant that European companies could face issues with money transactions when doing business there. A few days later, both the EU and the US added Russian Railways to their sanctions lists. Customers began abandoning the northern corridor, concerned about the legal implications of working with a sanctioned company and about potential problems such as insurance coverage being invalidated by "Act of War" clauses.

The actual situation is difficult to assess. Arvis, Rastogi, and Saslavsky (2022: 42) report that rail connections continued to function, subject to additional procedures to check sanctions compliance, and, although international payments to Russian railways could be difficult, freight charges could be paid in the PRC. The ULTC website continued to report substantial traffic (614,100 TEUs over the first 11 months of 2022) and EU companies continued to work with Russian Railways. However, informed commentators saw a larger decline in EU–PRC–EU traffic, with considerable variation in EU countries' sanctions compliance. For example, using disaggregated UTLC data for 2022, Chengfan Zhao found substantial decline in the use of the Landbridge by Belgium and the Netherlands while eastbound freight from Germany only fell by a fifth, with cars and components, mechanical equipment, and optical products the main goods continuing to transit the Russian Federation.¹⁸

Alternatives to transiting the Russian Federation were sought immediately. In late February 2022, a train went from the PRC to Istanbul and then the containers went by sea to Trieste.¹⁹ The Istanbul–Trieste segment avoided delays in southeast Europe at non-EU borders and due to rail works in Slovenia. This example highlights that, after traversing the Caspian Sea, the Middle Corridor typically involves a further sea crossing. Destinations in the EU can be reached either by crossing the Black Sea from Georgia to enter the EU through Romania or Bulgaria or by crossing the Adriatic Sea from Istanbul or the Mediterranean Sea from Mersin to avoid passing through non-EU members in southeast Europe. Mersin can also be a gateway to the Middle East and North Africa.²⁰

Kazakhstan has used the TransCaspian route for grain, oil, minerals, and uranium for many years, and the route's popularity was increased by the Russian invasion of Ukraine (Sánchez 2023). Kazakhstan also sends new export products through the Middle Corridor, e.g., 20 containers of lentils to Türkiye in January 2023. In September 2022, a train from Uzbekistan used the Middle Corridor to carry twenty-four 40-foot containers mainly filled with fertilizers via Turkmenistan, Azerbaijan, and Georgia across the Black Sea to Constanta in Romania.²¹ In December 2022, a train with 46 containers of copper concentrate left Tashkent for Burgas (Bulgaria), a train of

¹⁸ *China–Europe Trains in 2022; East–West imbalance and drops in volume*, posted 15 February 2023 at <https://www.railfreight.com/beltandroad/2023/02/15/china-europe-trains-in-2022-east-west-imbalance-and-drops-in-volume/>.

¹⁹ Majorie van Leijen, *A Bypass Route to Duisburg: Is this the New Normal?* Posted 8 March 2022 at <https://www.railfreight.com/beltandroad/2022/03/08/a-bypass-route-to-duisburg-is-this-the-new-normal/>.

²⁰ The Middle Corridor route to Mersin was used to send Chinese humanitarian aid (tents, etc.) to victims of the February 2023 earthquake in the Turkey–Syria border area.

²¹ Nikos Papatolios, *ADY Container Transports Uzbek Fertilisers to Europe for the First Time*, on 6 September 2022 at <https://www.railfreight.com/corridors/2022/09/06/ady-container-transport-uzbek-fertilisers-to-europe-for-the-first-time/>.

fertilizers went from Uzbekistan via Turkmenistan–Azerbaijan–Georgia to Lithuania, and a train from Izmir (Türkiye) brought household appliances to Tashkent.²²

The Trans-Caspian International Transport Route (TITR) Association reported 33,700 TEUs shipped along the Middle Corridor in 2022, a 34% increase over 2021 but only 5% of UTLC reported traffic along the main Landbridge lines in 2022.²³ Scaling up the Middle Corridor faced capacity constraints associated with the Caspian Sea crossing as well as congestion at Constanta port and on parts of the Turkish rail network. The two boats operating between Azerbaijan and Kazakhstan at the start of 2022 had a combined capacity of 250 containers, i.e., freight from five or six trains. A third ship with a capacity of 350 containers was operating in April 2022. With a transit time of 3–4 days per roundtrip, the three vessels could provide five departures per week and a maximum capacity of 1,450 containers, which is equivalent to 30–40 trains. With the addition of three new ships in September, this capacity doubled to 60–80 trains per week—a substantial increase, but still less than a quarter of the northern corridor traffic in 2021 (Table 1).²⁴ Constanta faced congestion because freight previously intended to pass through Odessa to Ukraine or to Moldova shifted to Constanta.

Turkmenistan’s rail network has increased from 2,120 to 3,839 kms since independence, with substantial funding from the Asian Development Bank and the Islamic Development Bank. However, the system has been underused by transit traffic due to governance and corruption issues. Although the Turkmenistan–Azerbaijan Caspian Sea crossing is shorter than that from Kazakhstan, significantly higher port costs and lower efficiency at Turkmenbashi compared to Aktau have encouraged greater use of Kazakhstan rather than Turkmenistan connections to the Caspian Sea. In 2020, Azerbaijan sources reported 21,000 TEUs arriving in Baku from Aktau, compared to 19,300 from Turkmenbashi.²⁵ Similar issues appear responsible for the western North–South corridor from Iran to the Russian Federation via the Caucasus outcompeting the eastern corridor through Turkmenistan and Kazakhstan despite fairly new track on the latter.

The EU moves more slowly than the PRC, but it has increased focus on the Middle Corridor. In 2019–2020 the EU announced the intention to bring its Trans-European Transport Network (TEN-T) in line with EU–PRC links. Revisions of TEN-T regulations announced in April 2022 focused on three pillars. Pillar number one makes the infrastructure for longer and heavier intermodal trains universal for the whole TEN-T

²² Turkmenistan is looking to expand its fertilizer production following two large commitments of investment by Hyundai and Daewoo in western Turkmenistan: Sesung Oh and Jong-Pil Park “Hyundai, Daewoo sign Turkmenistan fertilizer plant deals”, *The Korea Economic Daily* (Global edition), 30 November 2022.

²³ Reported by Lidya Parkhomchik of the Institute of World Economics and Politics (IWEP Kazakhstan) in a presentation on the CTTN Dialogue/CAREC CHAI webinar *The Impact of the Russia–Ukraine Conflict on the CAREC Region*, hosted by the CAREC Institute on 27 April 2023.

²⁴ PortsEurope *Three more container ships to double the cargo capacity of the Middle Corridor between Aktau and Baku*, posted 19 April 2022 at [https://www.portseurope.com/three-more-container-ships-to-double-the-cargo-capacity-of-the-middle-corridor-between-aktau-and-baku/#:~:text=Free%20read-,Three%20more%20container%20ships%20to%20double%20the%20cargo%20capacity%20of,Corridor%20between%20Aktau%20and%20Baku&text=Aktau%2C%20Kazakhstan%20\(PortSEurope\)%20April,increase%20from%20three%20to%20six](https://www.portseurope.com/three-more-container-ships-to-double-the-cargo-capacity-of-the-middle-corridor-between-aktau-and-baku/#:~:text=Free%20read-,Three%20more%20container%20ships%20to%20double%20the%20cargo%20capacity%20of,Corridor%20between%20Aktau%20and%20Baku&text=Aktau%2C%20Kazakhstan%20(PortSEurope)%20April,increase%20from%20three%20to%20six). The doubling of container ships operating between Turkmenistan and Azerbaijan in 2022 from one to two added new Middle Corridor options.

²⁵ Trend: “Port of Baku Expands Azerbaijan’s Transit Potential through Digitalization and Int’l Co-op,” at <https://en.trend.az/business/transport/3452914.html> 20 July 2021. Horák (2023: 181) reports several estimates that port costs in Aktau are less than half of those at Turkmenbashi.

network.²⁶ Pillar number two requires the creation of adequate capacity to ensure a defined number of 740-meter-long trains per hour on every TEN-T line, to elevate the punctuality of freight trains to 90%, and to enable the crossing of an internal EU border within 15 minutes. The third pillar concerns mandatory modernization of existing intermodal terminals and the construction of intermodal terminals where capacity is lacking. The revised regulations are to be supported by significant investment. The EU commitment to Central Asia was restated at the EU–Central Asia Connectivity Conference in Samarkand in November 2022, attended by the EU High Representative for Foreign Affairs, Josep Borrell, and the foreign ministers of the five Central Asian countries.²⁷ Allocated EU funding for Central Asia is 300 million euros over four years.

5. COSTS AND BENEFITS TO CAREC MEMBERS OF ALTERNATIVE ROUTES

For Middle Corridor countries, interest is driven by the substantial transit fees earned by Kazakhstan, while also being aware of the costs of being bypassed. Türkiye’s goal is to capture 30% of Landbridge traffic. On 31 March 2022, Georgia, Azerbaijan, Türkiye, and Kazakhstan agreed to create a joint venture that would provide high-quality intermodal transport and logistics services, harmonize cross-border rates, and introduce a unified IT platform to fully automate cargo transport services from the PRC to Türkiye, and the Black Sea ports. The statement emphasized the importance of cooperation between the countries along the route and of investment in infrastructure development to integrate the Trans-Caspian transport corridor into the international transport system. A priority is to accelerate works to increase the capacity of the BTK rail line.

The outcome of the 2020 Azerbaijan–Armenia war raised the prospect of a rail link through Armenia’s Zangezur Corridor to link Azerbaijan to its Nakhichevan exclave. Linking Nakhichevan to Türkiye’s Kars rail hub would create an all-Turkic route from the Caspian to Istanbul (Eldem 2022). However, such plans are contested by Armenia, and by Iran which fears disruption of its rail link through Armenia to Georgia and the Russian Federation if Armenian sovereignty is sacrificed for the rail lines (Kaleji 2022).

Agreement on the route and financing of a rail link between Kashgar (Kashi), the furthest west point in the PRC’s rail network, and Uzbekistan via the Kyrgyz Republic was announced at the Samarkand summit of the Shanghai Cooperation Organization in September 2022; two months later, the Kyrgyz Republic government announced that construction would start in the fall of 2023. The line will provide an alternative east–west route to the Caspian, avoiding both the Russian Federation and Kazakhstan and reducing journey times to southern Europe and to the Middle East and North

²⁶ Minimum infrastructure parameters along the entire long distance freight network are set for train length (740 m), axle load (22.5 t), P400 loading gauge, and electrification and interoperability of signaling systems.

²⁷ In the previous month, the President of the European Council Charles Michel visited Kazakhstan and Uzbekistan. The press statement with President Mirziyoyev of Uzbekistan emphasized: “Creation of sustainable transport corridors has been specified as a key factor for increasing mutual trade, including exploring options for further development of the Trans-Caspian Multimodal Route... The presidents discussed the importance of expanding port capacities, increasing ferry and rail fleets, harmonizing customs procedures, introducing digital solutions for cargo handling and border crossing.”

Africa. Several rail lines to the east link Kashgar to the PRC's large cities and Kashgar is the terminus of the PRC–Pakistan Economic Corridor.²⁸

In the longer term, currently difficult routes south of the Caspian Sea could be feasible. A route through Uzbekistan and Turkmenistan to Iran could connect to the Turkish rail network or to Iran's ocean ports, although US sanctions on Iran may be an obstacle for some potential customers. Afghanistan is a CAREC member, and several proposals aim to create an Afghan rail network or construct lines connecting Central Asia to Iran or Pakistan via Afghanistan.

If the postwar settlement is appropriate, the main lines of the Landbridge could revive. What would be the impact on alternative routes? The market test is clear: The Middle Corridor and services to Iran are already in use, although traffic is far less than that carried on the main Landbridge routes prior to the Russian invasion of Ukraine. The attractiveness of the alternative routes will be increased if the countries involved can reduce delays by simplifying customs procedures for trains in transit and prioritizing the through trains, by setting reasonable but not excessive freight rates, and by investing to improve choke points such as change of gauge.

Improved long-distance Eurasian rail services along the Middle Corridor or south of the Caspian Sea could benefit CAREC member countries seeking to diversify their exports from a narrow range of primary products. So far, the Central Asian and Caucasus countries have been almost totally absent from international supply chains. Diversifying exports and becoming attractive supply chain partners will require domestic reforms to reduce the costs of doing business in general, and of international trade in particular. An encouraging sign is the generational change in leaders from presidents whose outlook was molded in the Soviet era to presidents whose adult lives have been mostly spent in post-Soviet economies (Pomfret 2021b).

Construction of the line between Uzbekistan and Kashgar will strengthen the CAREC rail network, especially if supplemented by links to a wider domestic rail network in the Kyrgyz Republic and Tajikistan. Kashgar has already been linked by several recently constructed rail lines to areas of the PRC and a line through Pakistan to the Indian Ocean is a planned element of the PRC–Pakistan Economic Corridor.

Improvements in rail connectivity are undoubtedly beneficial to CAREC members, but the various proposals will create winners and losers. Increased use of the Middle Corridor will divert traffic from the northern corridor, especially after the Kashgar–Andijan link is operational. The “all-Turkic” route via Nakhichevan would weaken transport flow through Georgia.²⁹ More speculatively, a no-modal-change route via Turkmenistan and Iran to Türkiye would weaken Azerbaijan's transport flow.

6. CONCLUSIONS

The rapid evolution of the Landbridge highlighted the importance of appropriate connectivity for international supply chains. The Landbridge remained robust to potential threats of disruption in 2014 and 2020, but the Russian invasion of Ukraine in 2022 highlighted the dangers of relying on a system with a key choke point

²⁸ The PRC is making Kashgar into a rail hub for western PRC. The Kashgar–Hotan line opened in 2010 and the 825 km Hotan–Ruoqiang line that opened in 2022 completed the connection to Golmud, a major junction on the Xining–Lhasa line and with lines to Dunhuang (Gansu) and Chengdu.

²⁹ Such potential threats have implications for long-life investment decisions. Container yard and warehouse facilities in Georgia need to be extended if transit traffic is to increase substantially, but how much should be invested? I am grateful to Radkha Meneshova for highlighting the potential bottlenecks.

(i.e., transiting the Russian Federation). The rapid response to war-driven disruption reflected the demand for transit services and the potential win-win gains for service providers as well as customers. Moreover, the long-term prospects for rail freight are positive; electric trains along well-maintained track are a more environmentally friendly mode of international transport than ships or planes.³⁰

The CAREC region will continue to benefit from improved rail infrastructure. The transit fees, i.e., revenue from exporting transport services, that have been substantial for Kazakhstan over the dozen years before 2023 will be shared more widely as alternative corridors prosper, although beneficiaries will change as routes' popularity waxes and wanes. Potentially more important, improved infrastructure facilitates intra- and extra-regional trade, providing an opportunity especially for the Central Asian countries and Azerbaijan to diversify beyond their limited export bundles by exporting manufactured or agri-food products and joining international supply chains.

³⁰ Air freighting a 12,000-kilogram load from Chengdu to inland Western Europe produces about 54 tonnes of carbon dioxide, shipping by maritime and rail routes produces 3.3 tonnes, and rail-freighting across the Landbridge produces 2.8 tonnes (EUCCC 2020: 17). Regulations to reduce sulfur and other emissions between 2020 and 2050 will add to the cost of maritime freight (Tonchev 2020).

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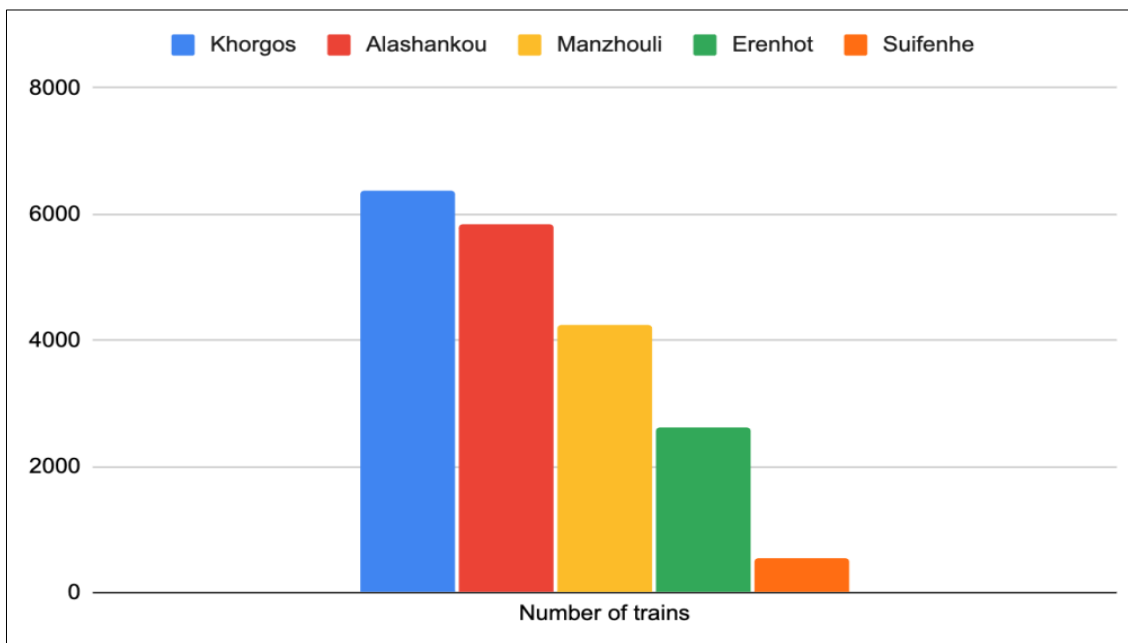
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APPENDIX: MEASURING TRAFFIC ALONG THE LANDBRIDGE

There is no consistent single data source (Bucsky 2019). In part, this is a matter of units: Should we count trains or containers? More importantly, it is unclear which routes qualify as Landbridge trade. The Chinese data in Table 1 report the number of trains to and from the PRC, but do not distinguish whether they go to the EU.¹ The Chinese data try to exclude bilateral trade with Kazakhstan, Mongolia, or the Russian Federation, but it is not always clear where to draw the line, e.g., trains to Russian Baltic ports are mostly Landbridge traffic to Scandinavia or Germany.

The number of containers reported on the Eurasian Rail Alliance (UTLC) website are easily accessed and commonly used. The UTLC was founded by Belarus, Kazakhstan, and the Russian Federation in 2014 to provide services for container trains running between the PRC and Europe along the main Landbridge route. According to Bucsky (2019: 9), 80% of PRC–Europe trains used the Kazakhstan corridor, 11% the Mongolian corridor, and 9% the northern TransSiberian Railway corridor in 2018. Chinese data on border crossing points show a different pattern, with around 12,000 trains crossing the Kazakhstan border at Khorgos or Alashankou, 4,500 crossing at Manzhouli or Suifanhe for the Russian Federation-only TSR route, and c.2,500 using the Mongolia–TSR route via Erenhot. In sum, the UTLC data may be missing between a fifth and a third of Landbridge traffic.



Source: Chinese official data cited in *The 2021 Silk Road Numbers Are There: What Do They Tell Us?* Posted at <https://www.railfreight.com/specials/2022/01/14/the-2021-silk-road-numbers-are-here-what-do-they-tell-us/> 14 January 2022.

¹ Numbers are not necessarily balanced in both directions. In 2018, of the 1,442 trains on the most frequent route, Duisburg–Chongqing, 728 were from the EU and 714 from the PRC.

Despite the uncertainty surrounding the numbers, the two series in Table 1 paint a consistent picture. Starting from a low base, traffic along the Landbridge roughly doubled each year between 2011 and 2017. The growth continued over the next 5 years and was, noticeably, not disrupted in 2020 and 2021 despite the COVID-19 shock.

The situation in 2022 and 2023 is more complex as the numbers are distorted by the war conditions. Since the imposition of sanctions, the Russian Federation has suspended publication of trade statistics and other key economic indicators, and there are doubts about the reliability of UTLC data since February 2022. Chinese data are problematic because increased trade from the PRC to the Russian Federation is not separated from trade beyond the latter. Data on southern and Middle Corridor routes are sketchy because there are no consistent long-time series comparable to those in Table 1.