Future Potential of the Trans-Caspian Corridor: A Comprehensive Review of Opportunities and Challenges

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The Trans-Caspian Corridor, also known as the Middle Corridor, has emerged as a strategically significant transportation and trade route connecting Asia and Europe through Central Asia, the Caspian Sea, the South Caucasus, and Türkiye. Growing geopolitical uncertainties, supply chain disruptions, and and increasing demand for trade route diversification have enhanced the importance of this corridor in regional and global commerce. This review examines the current development, opportunities, challenges, and future potential of the Trans-Caspian Corridor by analyzing existing literature, policy initiatives, and infrastructure projects. The study highlights the corridor's role in improving connectivity, reducing transit times, facilitating international trade, and strengthening economic cooperation among participating countries. Furthermore, it explores key challenges, including infrastructure bottlenecks, regulatory inconsistencies, logistical constraints, and geopolitical risks that may hinder its full operational capacity. The review finds that ongoing investments in transport infrastructure, digitalization, customs harmonization, and regional cooperation are likely to enhance the corridor's competitiveness and sustainability. The findings suggest that the Trans-Caspian Corridor possesses significant potential to become a major Eurasian trade route, contributing to regional economic integration and global supply chain resilience. Future policy efforts should focus on improving multimodal transport efficiency, strengthening cross-border collaboration, and promoting sustainable transport practices to maximize the corridor's long-term benefits.

Keywords: Trans-Caspian Corridor, Middle Corridor, Eurasian Connectivity, International Trade, Transport Infrastructure, Regional Integration

Introduction and Background:

Situated between Asia and Europe, the Caspian Sea is the world's biggest inland body of water [1], surrounded to the west by the Caucasus Mountains and to the east by the vast Central Asian steppe [2]. There are five nations: Russia, Azerbaijan, Kazakhstan, Turkmenistan and Iran are two countries in Asia and Europe that border the Caspian Sea [1]. The Caspian Sea also runs through Armenia, the eastern region of Georgia, the western region of Uzbekistan, and the northeastern region of Turkey. In summary, the Trans-Caspian International Transport Route (TITR) "comes from Southeast Asia and China, runs through Kazakhstan, the Caspian Sea, Azerbaijan, Georgia to European countries" [3]. It is also known as the Middle Corridor and the Caspian Sea Corridor. The TITR "is a multilateral institutional development linking the containerized rail freight transport networks of the People's Republic of China (PRC) and the European Union through the economies of Central Asia, the Caucasus, Turkey, and Eastern Europe," as succinctly stated by [4]. This creates an alternate transportation route to the one that passes through Russia. Traditionally, freight and trade have been conducted more along the north-south axis than the east-west [5]. This is a relatively demanding and new route in the area.

Nonetheless, trade with China increased significantly over the preceding ten years, aiding in the growth of the latter freight axis [6][7].

The TITR is a component of the People's Republic of China's (PRC) "Belt and Road" (B&R) or Belt and Road Initiative (BRI), formerly known as the One Belt One Road Initiative (OBOR; see Table 1 for details). The phrase refers to both the seafaring "21st Century Maritime Silk Road" [8] and the land-based "Silk Road Economic Belt" [9]. It is a strategic endeavor to connect Asia with Europe and Africa via land and sea in order to enhance regional integration and promote economic growth through increased trade.

Table 1. Main countries and their functions in the Middle Corridor

Country	Role in Corridor
China	Origin Market
Kazakhstan	Transit Hub
Turkmenistan	Alternative Transit Route
Azerbaijan	Caspian Gateway
Georgia	Black Sea Gateway
Türkiye	European Gateway
European Union States	Destination Markets

By providing an overview of the economic, political, and infrastructural aspects of the Trans-Caspian trade route, the current review expands on the body of existing material and allows for a close examination of the route's effects on the nations and areas that profit from it. In addition to using the framework developed throughout the study, two interviews were performed to compare the scientific and practical perspectives for the goal of a comprehensive assessment of the route's impact on Finland's and Estonia's linkages.

The purpose of this essay is to address the following queries:

How is the Trans-Caspian transportation route doing in terms of infrastructure, politics, and the economy?

How might Finland and Estonia benefit from the Trans-Caspian transportation route in terms of its infrastructure, politics, and economy?

Using the Trans-Caspian corridor as an example, the current analysis fills a research gap by proposing a methodology for examining the infrastructure, politics, and economy of a logistical route. In order to explore the potential of the Trans-Caspian transport route for Finland and Estonia, the framework is put into practice through research interviews with sector stakeholders. The article's findings can help the aforementioned nations build resilient supply chain policies.

The article is organized as follows: Section 1 (Introduction and Background) contains Sections 1.1 (Legal Context) and 1.2 (Importance). Section 2 (Materials and Methods) and Section 3 (Results) come after the introduction. The five components of the findings section—Section 3.1 (Route Characteristics), Section 3.2 (Policies and Trade), Section 3.3 (Alliances), Section 3.4 (Infrastructure), and Section 3.5 (Challenges)—form a framework for evaluating the route's current situation. Sections 4.1 (Implications to Finnish and Estonian Economies) and 4.2 (Further Research) are included in Section 4 (Implications and Conclusions).

Table 2. Comparison of Eurasian transport corridors

Corridor	Main Route	Key Advantage
Northern Corridor	China–Russia–Europe	Established infrastructure
Middle Corridor	China–Kazakhstan–Caspian–Türkiye–Europe	Diversification from Russia
Southern Corridor	China–Iran–Türkiye–Europe	Shorter route in some sectors
Maritime Route	Asia–Suez Canal–Europe	Lowest transport cost

Legal Background:

After 20 years of negotiations, five Caspian Sea littoral governments signed the "Convention on the Legal Status of the Caspian Sea" on August 12, 2018 [10]. Treatment for the Caspian Sea not as a sea or lake in accordance with the treaty, but rather as a topic of a "special legal status" [10][11].

The treaty confirms the conditions that allow new energy projects, including underwater gas and oil pipelines, to be planned and carried out bilaterally on the agreement with the state the infrastructure or facility would cross, even though it leaves some of the issues discussed during the negotiations unresolved [11][12]. However, the specifics of the project should be shared with the other convention parties. Laying trunk undersea pipelines on the Caspian Sea bed requires adherence to international environmental standards and regulations

Article 5 of the convention states that "the water area of the Caspian Sea shall be divided into internal waters, territorial waters, fishery zones and the common maritime space". Each of the five nations has territorial waters up to 15 nautical miles wide (Article 7) next to an exclusive fishery zone on the Caspian Sea that is 10 nautical miles wide.

It is typical to have land utilized for peaceful purposes that is not impacted by territorial seas and fishing rights, where non-signatory governments are not permitted to use armed troops. More than four years later, it is still unclear if the other littoral governments would be able to fully utilize the opportunities provided by the pact, despite the fact that two major Caspian Sea powers, Iran and Russia, had to make significant concessions.

Table 3. Key provisions of the Convention on the Legal Status of the Caspian Sea

Article	Main Provision
Article 5	Division of maritime zones
Article 7	15 nautical mile territorial waters
Fishery Zone	Additional 10 nautical miles
Security Clause	No armed forces of non-signatories
Pipeline Provision	Bilateral approval for pipelines

The significance:

The Trans-Caspian Gas Pipeline (TCP), which has the ability to carry about 30 billion cubic meters of Turkmen gas annually, is one of the major energy projects that the pact will facilitate for the Western world.

The Caspian Sea to Azerbaijan and then into gas pipelines in Europe, allowing the EU to improve its energy security. This amount of gas would be especially useful now that the Western world has cut off supply channels from Russia.

The Caucasus corridor, whose advantages and disadvantages as a safe transit corridor for gas and oil have already been recognized decades ago [13], partially overlaps with the entire TITR corridor, which provides an alternate route from Asia to Europe.

After the situation in Ukraine escalated at the end of February 2022, transportation routes other than those that cross Russia have become even more crucial. The sanctions package that was put into effect on February 25, 2023, is already the tenth one [14] and does not contain a complete ban on rail travel through Russia, as some nations, such Estonia [15], suggested during the 2022 talks.

As the focal point of the Caspian Sea Treaty, TITR, and BRI in the region, Kazakhstan has been stepping up diplomatic negotiations and pushing other Asian nations to utilize the Trans-Caspian international corridor. In April 2022, Kazakh Prime Minister Smailov made this announcement at China's Boao Forum for Asia [16].

Materials and Procedures:

Since the academic research ignores political and administrative trends, the current study expands on significant scientific works on the subject.

The Diplomat's policy speeches and research from the Asian Development Bank Institute and the United Nations are also examined.

The PRIMO database [17], which was accessed through LUT University in Finland in October and November of 2022, was used to complete the literature search. All major and ranked academic publishers were involved, and the keywords "Trans-Caspian logistics," "Belt and Road Caspian," and "OBOR Central Asia" were used in that order. There were no matches for the keyword "TITR." A total of about forty books and papers were carefully examined. The items included here were chosen based on how they linked to the general political and economic framework around the trans-Caspian international transportation route. The authors of this study looked for a certain level of generalization, hence articles pertaining to specific projects and/or nations were ignored. The most recent sources were included because of the significant shift in the geopolitical landscape following Russia's invasion of Ukraine in February 2022 [18].

The authors identified five important economic, political, and infrastructural aspects of the Trans-Caspian trade route through a review of the literature. They then synthesized these aspects into a framework that can be applied to other similar contexts in addition to being used to systematically study the Trans-Caspian trade route itself. The results of the literature analysis were utilized to investigate two particular nations because similar parts of the route were examined in interviews with two professionals in the transportation sector, one from Finland and one from Estonia.

The interviewees were specialists in the transportation business with decades of experience organizing international commerce routes for their nations. Stakeholders in the public and private sectors were chosen for the interviews based on the scope of their jobs worldwide. Due to the tiny populations of Finland (about 5.54 million) and Estonia (about 1.33 million), only two or three individuals who satisfied the qualifications were found in each country; among these, one representative from the public sector and one from the private sector were chosen.

They were asked to share their realistic opinions about the Trans-Caspian trade route. The framework suggested in the current research was adhered to during the interviews. For the sake of this investigation, both interviews were anonymised and transcribed.

As a result, these two interviews served as additional evidence for the framework in addition to the scholarly research that was regularly compared to the authors' practical knowledge acquired through projects aimed at assisting the maritime-related organizations in Kazakhstan and Georgia to raise their profile in international transport.

Rationale for Including the Articles:

The following are the primary sources on the Trans-Caspian International Transport Route that are discussed here: (1) "The Trans-Caspian Corridor: Kazakhstan's Silk Road?" by Wilder and (2) "What Will Russia's Invasion of Ukraine Mean for China's Belt and Road?" by Forough (2022) [19]; (3) "Potholes and Bumps Along the Silk Road Economic Belt in Central Asia" by Li-Chen and Aminjonov (2020) [20]; (4) "Is Transportation Infrastructure Important to the One Belt One Road (OBOR) Initiative? Yii et al. (2018) [21], "Empirical Evidence from the Selected Asian Countries," and Pradhan (2019) [22], "Petropolitics and Pipeline Diplomacy in Central Asia: Can India Afford to Wait in the Wings?" These five articles address a wide range of important issues surrounding the Trans-Caspian logistics corridor, including politics (1, 2, 3), infrastructure (4), funding and geoeconomics (2, 3), the impact of the conflict in Ukraine (2), and a broader view than just China and its Belt and Road Initiative (5).

The Diplomat journal published three papers (1, 2, 3), "India Quarterly: A Journal of International Affairs" (5), and "Sustainability" (4).

Apart from the aforementioned five articles, two other studies were reviewed: "Middle Corridor—Policy Development and Trade Potential of the Trans-Caspian International Transport Route" by [4] published by the Asian Development Bank Institute, and "Progress

update on the operational capacity of the Trans-Caspian and Almaty-Istanbul Corridors" by the United Nations Economic and Social Council (2022) [23].

Outcomes:

The United Nations Economic and Social Council conducted a report titled "Progress update on the operational capacity of the Trans-Caspian and Almaty-Istanbul Corridors" [23] undertaken for the Economic Commission for Europe was presented to the Inland Transport Committee in Geneva on September 5–7, 2022. The topic will continue to be worked on for "an extra informal document with a double purpose: i. To assemble full and up-to-date datasets for all of countries in both corridors; and ii. To create a collection of visual assets that highlight the potential of both transit corridors, such as maps, charts, and diagrams [23]. The report provides a broad overview of the topic's significance, showing that the USD 3.1 trillion trade volume between Asia and Europe is at its pinnacle despite the USD 486 billion trade imbalance between the two regions. China now holds the top spot in EU imports and is the third-largest export partner due to the steady growth of trade. Due to the increased expense of returning empty wagons, the trade deficit of about USD 400 billion (USD 280 in EU exports to China and over USD 700 billion in imports) has a notable economic impact on transportation costs [23]. According to statistical data, container volumes on the Middle Corridor that passes through Georgia have steadily increased since 2015 (Table 1) [23]. Additionally, whether of or in spite of the war situation, the statistic for the first five months of 2022 is greater than for the previous year. The route benefits the economies along the corridor, as the UN report [23] also states, and demonstrating the dependability of this connection makes it possible to compare it with the ocean option. However, it is important to note that 1.46 million twenty-foot equivalent units (TEUs) were served by the Northern Corridor in 2021 [23], and this corridor most likely expanded in 2022 as well (despite the Ukrainian conflict and all the sanctions between the West and Russia, [24]). According to estimates published in newspapers, the TITR handled 33,600 TEU containers in 2022 [25].

Table 4. Growth of container traffic along the Trans-Caspian Corridor

Year	Container Volume (TEU)
2015	4,900
2016	7,000
2017	9,000
2018	15,200
2019	26,000
2020	21,000
2021	25,200
Jan–May 2022	14,000
2022 Total	33,600

The railway capacity is far greater than the present trade volumes on the Georgian portion of the Middle Corridor, which are only about 10,000 TEUs. The table below (Table 2) summarizes each nation's railway capacity. For the sector experts' estimates of the passing trade volume, please see Section 4.1.

Table 5. Railway infrastructure capacity of corridor countries

Country	Railway Length (km)	Annual Capacity (Million Tons)
China	146,300	4,000
Kazakhstan	16000	27
Azerbaijan	4,285	15
Georgia	1,443	27
Türkiye	13,022	17

Features of the Path:

According to the World Bank Logistics Performance Index (LPI), Turkey ranks first when considering the following "six dimensions of trade: (1) customs, (2) infrastructure, (3) international shipments, (4) logistics competencies, (5) tracking & tracing, and (6) timeliness" [26] then Iran, Ukraine, Kazakhstan, Uzbekistan, Georgia, and Turkmenistan when considering the 2018 [23], which most likely have altered at least considerably given the conflict in Ukraine and the associated logistical modifications. Turkey and Iran stand out in comparison to the other group that is aligned with the over-Soviet 1520 mm railway gauge in the table above, which still provides information on the length and capacity of the railway despite the war.

Since the Middle Corridor serves as a physical link between Asia (China) and Europe, it is evident that this volume of trade necessitates equitable transportation capabilities and safe land and sea routes. In order to promote the route, major players including the US government and the EU have reached strategic agreements [3] in the region. The UN study included a SWOT analysis of the Trans-Caspian corridor that illustrates the current state of this mode of transit [23]. Strong governmental commitment is its greatest asset. This is supported by numerous ongoing international initiatives and infrastructure projects, such as investments in ports in Georgia (Poti) and Azerbaijan (Baku), as well as rail projects in Turkey [23]. A number of shortcomings are noted, including a number of disorganized attempts, a lack of centralization and/or integration, and restricted scheduled services for trains and ferries [21]. The advancements in and harmonization of the digital realm, as well as interoperability issues (gauge width and customs rules), are directly linked to the entire picture, including opportunities and threats [23]. Not to be overlooked is the fact that all investments require funding, which is currently largely supplied by powerful nations like the US, China, and the EU.

Trade and Policies:

"Middle Corridor—Policy Development and Trade Potential of the Trans-Caspian International Transport Route" [4] is a paper by Kenderdine and Bucsky that was was also investigated to broaden the scope of the study by the Asian Development Bank Institute. The report evaluates the demand-side development for Europe and offers policy recommendations for institutional development. It also covers the region's political institutions, economic geography, rail freight, and infrastructure policies and realities. "Trans-Eurasian and intra-Eurasian rail freight development remains fundamentally policy- and subsidy-driven on the China side, yet dependent on European Union demand-side drivers to create traffic flow volumes," the study says. It is also acknowledged that the corridor's development is entirely voluntary, and the relevant governments see significant advantages in it. The study concludes that while "supply-side-policy evidence suggests that growth in transcontinental containerized rail transport is politically feasible" in China, "demand-side factors suggest that trade development potential is largely limited to greater extra regional connectivity from the Middle Corridor economies with little economic rationale for increased China–Europe transcontinental freight flows." The report also cautions against the disparate political cultures and best practices that could impede Western donors' strategic and economic efforts in these governments. The study's primary (only) focus on China and exclusion of other developing economies is a flaw, even if the EU will profit in the future from multilateral ties with emerging countries. In his paper "Petropolitics and Pipeline Diplomacy in Central Asia: Is India Able to Wait in the Wings? [22] that the fight for oil and energy "has led to aggressive foreign policy formulations and strategic calculations" by key global powers in the West and the East, characterizing the scenario as a "New Great Game" centered "around pipeline democracy and petropolitics." The literature on the topic serves as the foundation for the article. As supply chains have become increasingly globalized and the energy trade imbalance has increased significantly since 1956 [27], energy has drawn increasing attention in international politics.

Therefore, the paper by Pradhan shifts our focus to the key issue of the key Asian region, which is the excavation of energy carriers and their transportation.

It is asserted that even though the energy reserves and resource potential are lower than those.The Central Asian "region undoubtedly has at least 3 to 4 percent of global proven reserves of oil and gas" in the Middle East/Gulf region [22]. The piece not only brought attention to the energy difficulties directly, but it also highlighted the interest of other nations, particularly India, in the region despite important players like the US, China, Russia, and the EU being one step ahead.

The Caspian Basin and its littoral states are thought to contain at least 7% of the world's gas [28]. Central Asia has "remained the hinterland of Kremlin, Beijing has made its presence in the region in a massive way while the United States through its democratic card and human rights philosophy was able to influence the region heavily threatening Russian influence in its backyard," as Pradhan [22] succinctly summarizes. However, this was only until recently, when, in relation to the war in Ukraine, Central Asian countries have started looking for and have found independent ways to make business.

According to, international sanctions against Russia have an impact on other nations in the region, and the Russian military activities in Ukraine have "drastic consequences" on world politics. Since the Trans-Caspian transport corridor has not yet realized its full potential, it receives the greatest support among alternatives to the TransRussian transport corridor. The writers acknowledge the following: (1) The existence of a corridor linking the southeast region of Europe with Central Asia via the Caucasus and the Black Sea is not new; and (2) The countries in the corridor are arranged through several memberships in various political and economic organizations (e.g., Turkic Council, CIS, EAEU, etc.). Despite not being a part of the aforementioned blocks, Georgia maintains strong ties with Kazakhstan. The infrastructure, "with ports on both sides of the Caspian, and a complex system of railways," is already in place, according to the authors, but the corridor "needs more harmony and cooperation" amongst the participating states. Along with the Armenia-Azerbaijan border dispute, border crossing and tariffs are crucial. Establishing the TITR joint venture is a promising step. The war presents new chances for the region and Kazakhstan in the center, and the creation of this alternate westward channel is crucial for the export diversification of the Caspian states [29].

Partnerships:

According to "geoeconomics" is the combination of geography and economics that "profoundly reconfigured" the Russian invasion of Ukraine. The article's usefulness lies in its collection of international development initiatives linked to transportation infrastructure, including: • "The Belt and Road Initiative (BRI) of China;
The Global Gateway of the European Union;
The Blue Dot Network (BDN), which is led by the United States;
Japan's Quality Infrastructure Investment (QII), the G-7's Build Back Better World (B3W),
The Eurasian Economic Union (EAEU) of Russia;
Russia, Iran, and India are driving the International North-South Transport Corridor (INSTC).

Despite the fact that the B&R program is geographically oriented around Afro-Eurasia, may be accurate given that this article was published on March 18, 2022. The author of cautioned about any "unintended consequence" of the Western decoupling with Russia in conjunction with the joint endeavors of China and Russia, but it remained unclear in 2022 whether China was eager to take sides in the Ukrainian crisis. This warning might be pertinent once more in view of the March 2023 presidential negotiations between China and Russia [30].

According to there was opposition to the 17 + 1 cooperation platform between China and the 17 CEE countries prior to the war, with the cooling of Sino-American relations being one of the causes. Nevertheless, the "rapid Western-Russian/Belarusian decoupling and the destruction of Ukrainian infrastructure practically destroys any short- to medium-term chances

of a strong 17 + 1 platform, creating challenges for China. "In the short term, China has to go back to the basics," the author contends. Good old sea connections, which have proven more resilient than road or rail networks, will be more important for China-EU connectivity. It is important to keep in mind that over 80% of international trade still takes place by sea. For the time being, China's excitement for rail connectivity will need to be severely restrained. Additionally, argues that the global "bifurcation" between East Asia, led by China, and the West, led by the United States, must be taken into account.

Table 6. Major geopolitical initiatives influencing the corridor.

Initiative	Leading Actor
Belt and Road Initiative (BRI)	China
Global Gateway	European Union
Blue Dot Network	United States
Build Back Better World (B3W)	G7
Eurasian Economic Union (EAEU)	Russia
International North-South Transport Corridor (INSTC)	Russia–Iran–India

Infrastructure:

Infrastructure is highlighted by Yii and his colleagues (Malaysian academics), who state that the "crucial challenge encountered in OBOR initiative is the different gauge standards from different countries in the development of railway along the Silk Road". Along with infrastructure, the piece covers labor, education, trade, the impact on inflation, and the significance of OBOR for economic expansion. Infrastructure is the main topic of this review, with other aspects of economic growth playing a supporting role.

Three geographic regions are the focus of the Yii et al. investigation: East Asia, which includes China and Mongolia; ASEAN, which includes Malaysia, Vietnam, Thailand, and Indonesia; and Central Asia, which includes Uzbekistan, Tajikistan, Kyrgyz Republic, Turkmenistan, and Kazakhstan. Since the Trans-Caspian route is the subject of the current literature study, the Central Asian nations are the primary focus of the debate.

The results show that GDP is positively impacted by transportation infrastructure. Remarkably, there is a negative correlation between GDP and education. In light of this, policymakers are advised to push OBOR nations to develop and modernize their systems in terms of education, culture, human capital, and transportation infrastructure. It is widely accepted that seamless railway connections are unachievable due to the disparate railway gauge requirements of the nations the rail network travels through. Thus, "the existing transport capacity and service quality are not easily able to meet the requirements of modern freight and passenger transport," as the authors of this research similarly conclude. Some of the nations are covered separately in the article: "Kyrgyzstan's trading policy is established with the cheapest and most effective trading between China and Central Asia." Nevertheless, there is no additional preparation for trade liberalization, which causes conflict between the two nations. As an insight, this is therefore intriguing.

In order to address the importance of infrastructure for a nation's economic development, the article presents pertinent theoretical frameworks and concepts from earlier research (salient paradox theory, equilibrium model, incentivizing through transportation infrastructure, the macro- and micro-paradox, the Granger causality test, vector error correction model, etc.). There are several important theories and writers as a result of the topic's robust literature review.

The authors cite an Economist article [31] that supports R. Palu's thesis, "The Dichotomy of Old and New Cities: Soviet Tallinn and Independent Tallinn," which highlights the influence of the ruling class on the built environment's design [32], of which large infrastructure projects are a notorious component. Both Palu and article provide evidence that

democratic nations develop their infrastructure gradually, taking into account a variety of viewpoints and interests, while autocratic nations are able to grow with significant leaps as the procedures they undertake, and their effects and mitigation are not as strictly regulated or demanded.

According to the authors of these Chinese provinces' GDP growth is positively impacted by infrastructure investments linked by the OBOR railway. However, the writers explain that "by implementing the Chongqing–Xinjiang–Europe International

Rail transport delivers products faster than sea transport. Therefore, the OBOR initiative can reduce transportation costs and enhance global welfare. However, this claim may be contested because shipment times do not always indicate reduced transportation costs when compared to maritime or rail transportation, since the volume effect of maritime transportation still beats rail.

[21] draws a number of conclusions, some of which are in line with what is already known. These conclusions include the following: OBOR greatly boosts the world economy by facilitating trade; trade openness is derived from the improvement of institutional quality, which in turn has a favorable effect on economic growth; and international trade has a positive effect on economic growth. Furthermore, the bilateral trade framework improves the multilateral trade framework, regulates risks, supports the home economic structure, and preserves global competitiveness. There is currently no correlation between GDP and the rate of inflation, according to a particularly persuasive finding.

Despite the misleading title of article, which focuses on infrastructure while also discussing a number of other factors influencing economic growth, it is worthwhile to familiarize oneself with the research in the article because it validates a number of concepts related to infrastructure development in relation to B&R.

Table 7. Major infrastructure projects supporting corridor development

Project	Country
Port of Baku Expansion	Azerbaijan
Port of Poti Development	Georgia
Baku–Tbilisi–Kars Railway	Azerbaijan–Georgia–Türkiye
Aktau Port Modernization	Kazakhstan
Caspian Ferry Services	Kazakhstan–Azerbaijan

Obstacle:

According to [20] corruption in the context of building infrastructure development projects funded by China. They contend that the Central Asian the Silk Road Economic Belt's rail lines to the Middle Corridor portion in Turkey via Kazakhstan and the Caspian Sea make this region, which is at the heart of the B&R projects, attractive since it is less vulnerable than sea routes and more dependent on American marine might. In addition to the logistics, Central Asia proved to be crucial due to its natural resources (minerals and hydrocarbons) and the claim that Chinese companies control more than 25% of Kazakhstan's oil production, as well as supplies of rare earth and other metals required for China's high-tech products like solar panels and capacitors. The report also highlights another crucial component of China's B&R strategy: distributing loan funds among the nations the project travels through. The fact that commerce between China and Central Asian nations has "doubled to almost $40 billion between 2007 and 2018" and that China is the primary investor in important industries including infrastructure, industry, and energy highlights how dependent Chinese trade is on these nations.

The difficulties associated with the Silk Road Economic Belt (SREB) are listed below:

Inadequate governance and lack of transparency; (2) Sovereign debt; (3) Limited support for regional economy;

Sinophobia; (5) Taking advantage of powerful neighbors. According to [20], "by participating in the SREB, Central Asian states hope to balance the demands of the region's traditional cultural and security hegemon, Russia, against those of its economic hegemon, China." Central Asian nations are not passive participants in the process, particularly when it comes to the TITR initiative. China has established a global cross-border loan and rescue lending system for the concerns of debt-ridden nations, as a recent study by [33] highlights. While this system helps those in need, it may also cause these nations to become even more dependent.

Table 8. Main challenges facing the Trans-Caspian Corridor

Challenge	Impact
Corruption	Higher transaction costs
Sovereign Debt	Financial risks
Limited Regional Integration	Operational inefficiency
Gauge Differences	Delays in rail transport
Customs Barriers	Border delays
Geopolitical Competition	Strategic uncertainty
Sinophobia	Reduced local acceptance
Infrastructure Bottlenecks	Reduced capacity

Conclusions and Implications:

The following are the primary components of the current study: (1) A comprehensive overview of the current economic, political, and infrastructural state of the Trans-Caspian trade route is provided by the conclusions and implications drawn at the literature review level; (2) This research establishes a framework for similar transport route studies; and (3) This research concludes with the opportunities available for the Finnish and Estonian states.

The authors of the chosen publications are from the United States (1), Arab nations (2), the Netherlands (2), the United Arab Emirates (3), Malaysia (4), and India (5), which further supports the comprehensive perspective on the Trans-Caspian corridor's advancements, as several authors implement their national or regional approaches, which are also regarded as these articles' baseline. The literature evaluation included two main studies: "Progress update on the operational capacity of the Trans-Caspian and Almaty-Istanbul Corridors" by the United Nations Economic and Social Council (2022) and "Middle Corridor—Policy Development and Trade Potential of the Trans-Caspian International Transport Route" published by the Asian Development Bank Institute provide a thorough overview of the corridor; the first, which was commissioned by the UN, provides a more technical overview of the corridor's potential, while the second, which is more policy-focused and takes a broader view of the countries involved. Together with the methodical and statistical information from the international institution's publications, the five articles that are discussed each address a different aspect of this relatively complicated subject, creating a comprehensive picture of the corridor's progress. Despite their divergent methods, all of these writers agree that the Trans-Caspian corridor is vital to trade between Asia and Europe. The study done by the writers of the publications also makes it clear that both European and Asian scholars are interested in the corridor. Their shared goal is to talk about opening up the Middle Corridor as a substitute for the Northern Corridor and, eventually, as a substitute for maritime connections. The authors contend that multifaceted advancements and infrastructure projects must align with information and communication technology (ICT) initiatives. For example, the Georgian government seeks to develop and integrate ICT and information in the transportation and logistics sectors in order to establish Georgia as a hub for regional transportation and logistics. The United Nations Economic and Social Council identified some shortcomings and difficulties that may be addressed by this feature, which should be examined in greater detail. These papers generally lead to the conclusion that, despite the difficulties, there are still a lot of untapped prospects in this trade channel, particularly now

that Russia has been virtually excluded from the geoeconomic scene. The studies discuss potential policy options and strategic perspectives for the Middle Corridor, but they have been trapped for the past few decades in the dominant Asian narrative that centers on China rather than expanding to include other growing markets, particularly India. The route's five features are as follows: (1) Route characteristics; (2) Trade and policies; (3) Alliances; (4) Infrastructure; and (5) Challenges. These features offer a framework for evaluating the route's condition that is applicable to other routes as well.

Consequences for the Economies of Finland and Estonia:

According to the respondents (refer to the interview outline in Appendix A), the Trans-Caspian transport route is an anticipated substitute for the route that passes through Russia, on which the associated nations—both those on the route and those gaining from the alternative, such as Finland and Estonia—have been attempting for decades to use the route for commerce arriving in their nations. The Russian Railways' refusal to approve the MES plans for the European market led to the creation of the Trans-Caspian route. While the Arctic route is predicted to be unusable for any meaningful transportation for another 100 years or possibly never be usable, the Trans-Caspian route is regarded as a viable alternative, despite being 1.7 times more expensive and possibly two times more time consuming to Finland. Since it is possible to simply use a portion of the route and to reroute cargo through different countries—for instance, after leaving Georgia, it is possible to choose Turkey, Romania, or Ukraine—the exact numbers on the actual cargo transported over the route are not publicly available and change. According to sector experts, the actual amount of cargo moved along the Trans-Caspian route is four times greater than what Georgian Railways reports, based on data dispersed throughout the network. Due to its strategic location and strong connections to Finland and Sweden, Estonia is regarded as the greatest hub for containerized cargo coming north from Asia. Despite the fact that the Trans-Caspian transport route may be crucial to Estonia's and Finland's trade between Asia and Europe, both countries' transport sectors have had to deal with conditions and sanctions related to the conflict in Ukraine, and adjusting to the new circumstances has hindered their capacity to further enhance development projects.

Additional Study:

A similar paradigm can be used to conduct a more thorough analysis of Finland and Estonia. Any economy ready to benefit from this or any other path might use the same framework of political, economic, and infrastructure elements.

The authors intend to analyze the rail infrastructure project Rail Baltica's North-South connection, which stretches from Helsinki and up north the Arctic Sea to south Europe through Tallinn, as a potential regional extension of the transport route starting from Asia, using the same five aspects of the framework: the features of the route, policies and trade, alliances, infrastructure, and challenges.

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