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ARMENIA INVESTMENT COUNCIL

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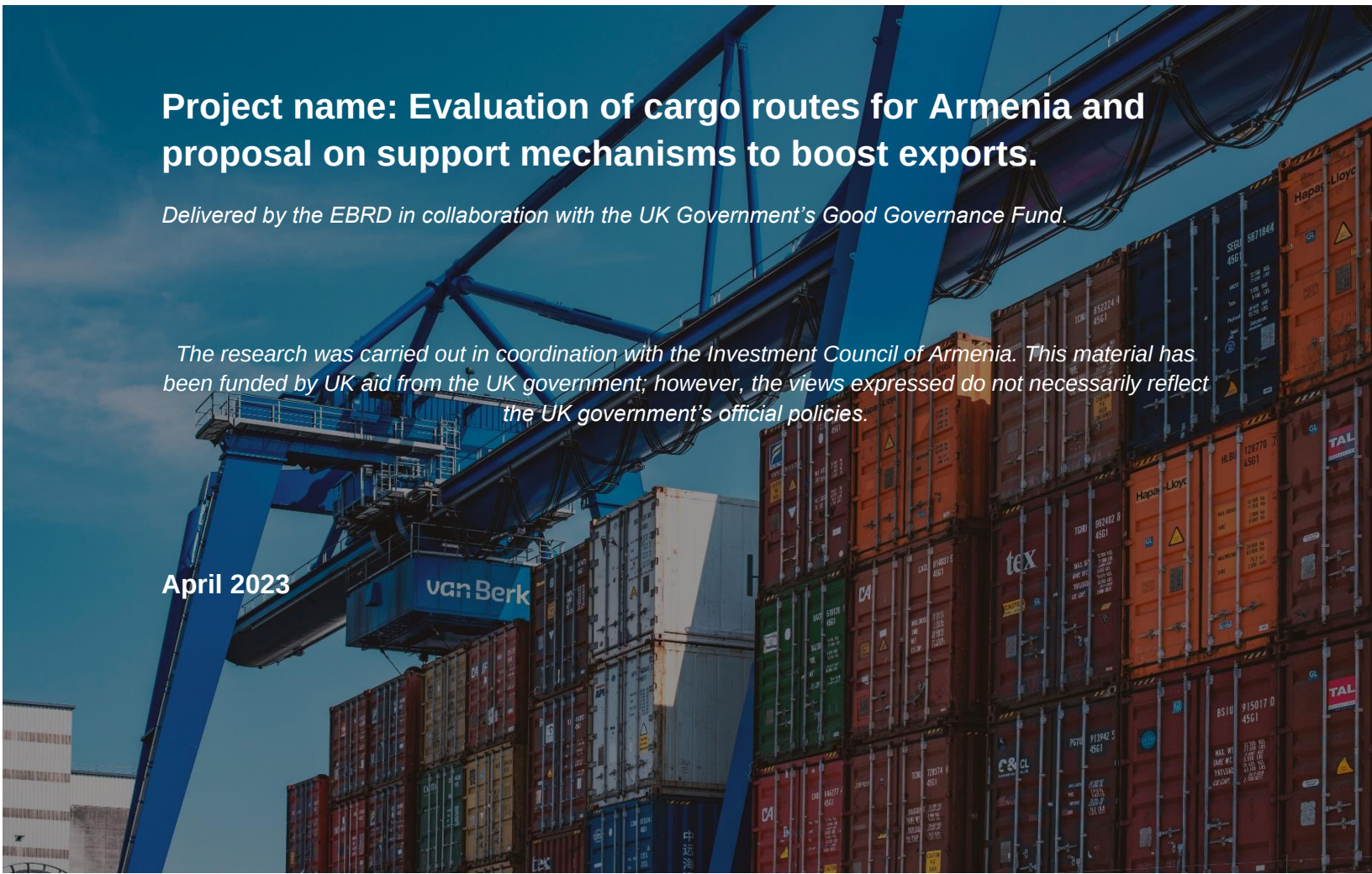
Analysis of main cargo & logistics routes of Armenia



Project name: Evaluation of cargo routes for Armenia and proposal on support mechanisms to boost exports.

Delivered by the EBRD in collaboration with the UK Government's Good Governance Fund.

The research was carried out in coordination with the Investment Council of Armenia. This material has been funded by UK aid from the UK government; however, the views expressed do not necessarily reflect the UK government's official policies.

April 2023

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1 Introduction and executive summary

1.1 Introduction

The project is delivered by EBRD through the Investment Council of Armenia. IC Armenia is one of 11 Investment Councils currently supported by EBRD, as part of the Bank's Investment Climate and Governance Initiative (ICGI). IC Armenia is delivered by the EBRD in collaboration with the UK Government's Good Governance Fund.

The IC Armenia works in close coordination with the Ministry of Economy and plays a central role in supporting the government's response to the economic impacts in Armenia due to COVID-19 pandemic and conflicts, including through the development of business-supportive approaches and reform initiatives to restore confidence in the economy.

Being a landlocked country with two closed borders, over the past two decades' logistics is critical for Armenia's exports competitiveness in external markets. The outbreak of COVID-19 in 2020 and, especially, the war in Ukraine have exacerbated the issue. Given the suspended activities on transport infrastructure through the territory of Ukraine, Russia and Belarus (main goods in transit, originating from other countries), it has become critical to assess alternative cargo (air, land, sea) routes for Armenia. The Armenian Government has expressed the need to develop a data-driven approach to the SMEs who have faced challenges amidst the ongoing crisis.

In this context EBRD has contracted MB Consulting CJSC to identify the Armenia-produced goods with export potential and high viability to increased transportation costs and based on the latter to propose support mechanisms to the SMEs in Armenia that can be offered by the Government of Armenia.

The project has following main outputs:

1. An analysis of exported and imported goods, along with a selection of export products with high potential, earmarked for further study.
2. A comprehensive evaluation of current and prospective logistic routes.
3. Recommendations regarding support mechanisms tailored to SMEs, focusing on their export-related transportation and logistics operations.
4. An economic impact assessment model illustrating the potential effects of the recommended support mechanisms.

This report is the second deliverable that contains following information:

1. A thorough overview of Armenia's geographic position and its available connectivity options,
2. An analysis of current and potential cargo routes within the existing connectivity framework,
3. A comprehensive review of Armenia's logistics performance,
4. An overview of a detailed logistics cost analysis.

Project team

This report has been prepared by following team of key experts:

- Davit Manukyan, CFA, PhD - Team Leader, Financial Expert and Transport Economist,
- Dr. Athanasios Ziliaskopoulos - International Logistics and Transportation Expert,
- Hayk Adlikhanyan, PhD – Economist.

1.2 Background

- Armenia's relatively small market size, closed borders with two of its four neighbors (Turkey and Azerbaijan), limited connectivity and international sanctions on the third neighbor (Iran) severely hinders access to international corridors, markets and has an impact on trade and economic growth.
- Armenian production and commerce rely mostly on freight corridors through its northern neighbor Georgia and to a lesser extend to its southern one to Iran; the air freight mode is also available, but it is not developed well enough to consist of a viable alternative to most commodities.
- In addition, besides the disadvantages due to the geography and political situation, there are a few inefficiencies within the country that are related to the regulatory environment, customs procedures inefficiencies, lack of digitalization of the logistics sector, etc. that increases cost and if addressed can substantially improve the logistics sector of the country. Most of these issues are captured by the Logistics Performance Index of the World Bank (hereafter LPI), which will be discussed later.
- Despite the above-mentioned difficulties, the Armenian freight-forwarding community seems to have been adopted well enough to the conditions and offers competitive tariffs and access to most international markets.
- We have identified eight (8) available routing options out of Armenia to the world, single mode as well as intermodal. Six (6) of these routes are transiting through Georgia, one through Iran and the air freight option through Zvartnots International Airport. The two major ones through Georgia serve (1) the overwhelming dominating truck-based traffic is the Northern border crossing point (BCP) of Lars to Russia, which is by far the largest trading partner of Armenia, and truck is the preferred mode; (2) the rail and intermodal trucks which carries most of the cargo destined to the Ports of Poti and Batumi and from there to the world. We will analyze these options in terms of cost, lead time, capacity, reliability, security, and resiliency and entertain options to further improve their reliability and competitiveness.
- Special attention is given to options available to smaller quantity shipments, even less than a truckload (typically shipped by SMEs) including perishable and other high inventory value products as identified in the report on Products with high export potential.

1.3 Executive summary

Geography and connectivity options

- Armenia's geographic position itself is close to main crossroads, however **external environment and regional conflicts limit opportunities for optimal logistics operations**. Armenia's borders with Azerbaijan to the east and Turkey to the west are blocked, leaving open the northern border with Georgia and the southern border with Iran.
- **While there is rail connection to Georgia, it is limited only to Georgia**, which is not directly anymore connected by rail to Russia as the connection through the Abkhazia was disrupted. The Armenian freight rail wagons are banned for either crossing into Azeri territory at Boyuk Kesik or accessing any part of the Baku-Tbilisi-Kars (BTK) corridor which was built with Azeri money.
- **Connection to Iran is limited to trucking only,** as the former soviet rail connection though Julfa is going through the Nakhichevan Azerbaijani enclave and is closed for Armenia. There are critical difficulties with Iranian options as well: (1) International sanctions to Iran that has reduced direct maritime services to only a handful of liners from China and feeders from India; no direct service exists from Bandar Abbas to Europe, US, Singapore and Oceania. (2) Further exacerbates the problem the poor transportation infrastructure and protective Iranian market practices.
- **The Middle Corridor west ward through the BTK line as well the whole east ward direction is not accessible by Armenian shipments** which excludes the country from a major growing corridor.
- **Poti is the main port of Armenia**, and **Black Sea is the main sea for Armenia** connecting to the outside world. The Black Sea port system is generally considered as a secondary port system in the European port scene. The Black Sea region accounts for only 2.5% of global seaborne trade. The container port system consists of 11 ports with annual container traffic of about 2.6M TEU (2019). The peculiarity of the Black Sea is that only few ports are called at directly by shipping lines. As from 2003, the size of the container vessels entering the Black Sea grew from 2,500 TEU up to 10,000 TEU, which is the max size of vessels at the present time. Roughly, half of the current containers handled in the Black Sea ports are shipped using direct calls, while the other half is feedered from hub ports in the East Med, such as Ambarli/Istanbul, PCT/Piraeus and to a lesser extent Thessaloniki and Gioia Tauro. The Black Sea maritime traffic in many ways is regulated by Turkey that controls the straights. With the 1936 Montreux Convention, even today with the war in Ukraine, Turks play a decisive role since they decide if, and which, civilian vessels and military warships can pass through the Dardanelles and Bosphorus straits, which form the seagoing link between the Black Sea and the Mediterranean. **Poti and Batumi are rather small ports and do not attract major shipping lines**, thus its connectivity is limited to the other major ports of Odessa (Ukraine), Constanta (Romania), Varna (Bulgaria), Novorossiysk (Russia), and Samsun (Turkey). **The Port of Odessa is blocked due to the war** and many shipments go through Constanta and Varna/Burgas to Europe; both Ports have reasonably good access to the TEN-T European Railway Network. The Port of Constanta has access to the Danube River, which provides barge options to Belgrade (Serbia), Budapest (Hungary), Vienna (Austria) and Bratislava (Slovakia).
- **Airfreight is an option that clearly is not affected by the landlocked state of the country** and should attract special attention by the GoA; however, the o**nly cargo plane service (outside Russia) is once a week flight to Liege**, Belgium by Coyne Air[1]. Almost 20 thousand tons were transported in and out Zvartnots International Airport, most of air cargo is **transported in the**

[1] https://coyneair.com/

baggage compartment of regular passenger services. The demand for air freight is in general limited by cost, typically priced 4–5 times that of road transport and 12–16 times that of sea transport. Air freight rates generally range from USD 1.50–USD 4.50 per kilogram, while the value of air cargo typically exceeds USD 4.00 per kilogram. Commodities shipped by air thus have high values per unit or are very time-sensitive, such as documents, pharmaceuticals, fashion garments, production samples, electronics consumer goods, and perishable agricultural and seafood products.

Current Single Mode and Multimodal Logistic Routes

Route option	Details
RO1: By truck through Georgia-Lars to the Russian Federation and EAEU countries (truck)	▪ This is the main way of accessing the Russian and EAEU market. Consumer and agricultural products traded by SMEs typically follow this route. ▪ The cost of the route is high (USD 3.500-5,000 depending on the market) and it adds substantially on the marketed price in Russia, especially for low inventory value commodities, such as tomatoes and liquor. ▪ Another significant drawback of this route is the uncertainty, especially in the winter due to the weather conditions. Customs procedures at both BCP to Georgia and to Russia are also adding to the unreliability of the route depending on the congestion level.
RO2: By truck through Georgia-Poti/Batumi and vessel to the EU/Russia/World (multimodal)	▪ Option 2.1. By train to Poti/Batumi where a rail ferry transports (RA-RA) the wagons to the other side in Kavkaz and Odessa. Note that although such service also exists at Burgas, Varna and Samsun due to the railway gauge difference it was not practical to move cargo with this option. ▪ Option 2.2. By truck to Poti/Batumi from where a ferry boat (RO-RO) transports the truck and the tractor to the other Ports of the Black Sea (almost every port can accommodate such ferries) and from there the truck continues. Option 2.2 is the main route for Armenian trucks to Europe, as they cannot access it through either Russia/Belarus or Ukraine these days. Usually, RO3 is a preferred option when the shipment is trucked by Georgian truck. In general, this is a more expensive option compared to RO7/RO8.
RO3: By truck through Georgia-Tbilisi and through Turkey to the EU/world (truck)	▪ This is the best potentially route to reach the Turkish and EU market with a single mode (truck). The infrastructure through Turkey is generally good and the reliability reasonable. ▪ When investigating the impact of unblocking border crossing points with Turkey, this and the rail option will appear as the dominant ones both for shipments to EU but also to the world through the Aegean and Mediterranean ports of Turkey.
RO4: By truck through Iran to the Gulf/India/World (truck-multimodal)	▪ This is the only way to reach the Iranian market but with many difficulties for Armenian trucks as the Iranian bureaucracy, discriminatory pricing of diesel, the quality of the infrastructure, etc. create many obstacles. Many shipments are being also transported by Iranian trucks which still appears to be a costly option for the distance the products travel.

Route option	Details
RO5: By air through Zvartnots Airport to the World (air)	▪ Air services are typically utilized for shipments of goods and commodities that require speed-to-market. These goods may include perishable commodities (such as fresh fruit, vegetables, flowers, as an example), or precious goods (high value or specialized items, such as precious metals, medical supplies and equipment, machinery spare parts) that need to travel quickly to or from cities and markets rather than bulk transportation which is typically used for high volume, lower value consignments that do not require the speed and ease of air transportation. ▪ The cost tends to be quite high (10 times more expensive than a truck to reach Moscow or Germany) but of course much faster and more reliable.
RO6: By truck to Georgia-Tbilisi airport and by air to the world (multimodal)	▪ This would make sense only for destinations served directly by Shota Rustaveli airport. ▪ Note that besides certain direct flights to Central Asia and one to China, no flight from Tbilisi or Yerevan serves overseas destinations (to Americas or Australia).
RO7: By container train to Georgia-Poti/Batumi and by vessel to Russian Federation, Ukraine, EU (multimodal)	▪ South Caucasus Railway (SCR) offers two scheduled container line service with 40 and 20 ft containers from Yerevan to Poti. At the port, the export containers undergo 3 operations: (1) shunting at the landside railway station (GR's)-to port's terminal railway station (e.g. APM terminal2) by a shunting engine (2) unloading at the port's yard and (3) yard-to quayside. ▪ In both Georgian ports these operations are expensive and time consuming compared to similar sized ports elsewhere (both for rail and trucks). After the containers are loaded on containerships they are headed to destinations in Russia, Romania, Bulgaria, Turkey within the black sea or with more infrequent services to Greece, Italy, Spain where they are transshipped from feeders to motherships to Americas and China/India. In fact, this is probably the main route to both to EU but also to Indian/Chinese markets. ▪ From the beginning of 2023 new container ferry tested operations in the direction of Batumi-Novorossiysk, and most probably will become regular. GoA announced that the maritime section will be fully subsidized for six months (potentially can be continued). This ferry service can support RO8 as well.
RO8: By truck a container to Georgia-Poti/Batumi and a containership to the world	▪ As noted above, this appears to be the only option most shipping companies offer from Yerevan to the World (Maersk, Hapag-Lloyd, Zim, etc). ▪ In general, it is considered more flexible for less than a block train shipment. In addition, the truck is much more flexible within the Port where a train has capacity issues for accessing the terminals.

[2] https://www.apmterminals.com/en/about/our-company

Micro-Level Analysis of Logistics Options Based on Destination and Commodity

Destination Country	Transport Mode	Type of Commodities	Transit Country	Cost per ton	Sources of Un-Reliability	Potential Improvements
Russia, Europe, Ukraine, South-East Asia, India, Africa, Americas	Rail-Ship	Bulk-Liquid	Georgia-Ports	Low	Lack of Regularity, Maritime-Port transshipment	Regular Shipping lines
Russia, Europe, Ukraine, South-East Asia, India, Africa, Americas	Rail-Ship	Containers (anything that goes into containers)	Georgia-Poti	Medium	Lack of regular rail services, lack of capacity at Poti, lack of coordination with shipping lines, long lead time due to many intermediate calls	Develop a maritime policy and provide a seamless rail-ship services Yerevan to Poti with minimal delays at the port
Russia, EAEU Countries	Truck	Consumer Products Low Inventory Value	Georgia-Lars	Medium	Weather, 2 BCPs, Long routes and potential traffic incidents	Custom facilitation, green lanes for trusted traders, digitalization
Russia, Europe, Ukraine, SE Asia, India, Africa, Americas	Air freight	Perishable, High Inventory Value	None, Georgia-	High		More frequent direct flights to cargo airports, Air-freighters, Cargo airport
Iran, Iraq, Middle East	Truck	All	BCP Meghri	Medium-High	Regulatory environment in Iran, Long route and potential incidents	N-S Highway within Armenia, Infrastructure in Iran

Source: The Consultant analysis

Logistics Performance

Armenia's ranking in the World Bank's Logistics Performance Index is not impressive, however the progress between 2016-2023 is impressive. According to the last LPI evaluated and published by the World Bank in 2023, Armenia ranked 97th out of 160 countries, with a 2.5 LPI rate.

Country	Year	LPI Rank	LPI Score	Customs Score	Infrastructure Score	International Shipments Score	Logistics Competence and Quality Score	Timeliness Score	Tracking and Tracing Score
Armenia	2023	97	2.5	2.5	2.6	2.2	2.6	2.7	2.3
Armenia	2016	141	2.21	1.95	2.22	2.22	2.21	2.6	2.02

The improvement is enormous, and it can probably be attributed to major reforms that involved mostly the modernization of customs administration through the introduction of an electronic platform that supports the full automation of customs clearance procedures. However, the LPI ranking of Armenia is still lagging for a few reasons, such as:

1. Road network and reliability of routes;
2. Railway monopoly and limited market oriented initiatives;
3. Lack of major logistics parks and/or dry ports;

4. Low LPI of neighboring countries.

Logistics Costs

- Depending on the mode of transportation, a logistics service provider (LSP) could be a trucking company, a shipping line, a railway, or an airline. The trucking, also known as over-the-road transportation (OTR) is the main single mode option and a dominant one available today to SMEs in Armenia. If efficient trucking is available this is the most effective option. The detailed cost analysis of trucking is discussed in the relevant section.
- A typical multimodal trip from Armenia involves the following: a truck picking from the shipper's/exporter's dock the shipment and transporting it to the Port; this is like a single mode OTR trip. As soon as it arrives at the Port the truck must either be stripped or if it hauls a container over a trailer, move it by a reach stacker from the trailer to the outbound area of the Port. Usually, in Poti and Batumi this is easier with a truck that in fact moves next to the terminal's outbound area and no further movements are needed by the truck. The train has additional difficulties as it usually gets to the GR's terminal at Poti and from there the train needs to be shunted and move in small groups of wagons or individual wagons to the outbound terminal. The loaded vessel departs from Poti/Batumi and arrives at the destination port. Note that there may be intermediate ports. Especially the Port of Ambarli in Turkey tends to be a frequented port where the containers are transshipped from one vessel to another by many shipping lines depending on the destination. Note that often these charges are hidden from the shipper/freight forwarder and appear as a single Ocean Freight tariff. However, it is important to know these intermediate transshipment ports as they always decrease the reliability of the route. A direct route should always be preferable even if the cost is higher.
- We analyzed from Yerevan to various destinations in a distance up to 1,000km from the final port. The distribution of the costs and lead times for each of the above discussed legs of a multimodal trip were indicatively computed would be USD 4500- 5000 with the lead time 20-30 days. Detailed analysis of breakdown of this cost is presented in the respective section.
- Total logistics costs relate not only to the direct costs of transporting products. Goods in transit incur indirect costs such as inventory holding costs, as well as uncompetitive delivery times and reliability. These costs can also reflect lost opportunities, as when critical inputs cannot reach manufacturing plants in time or perishable commodities cannot reach markets in time—or when production plants must hold higher-than optimal levels of raw material inventories to cover for logistics delays. Total logistics costs include direct transportation costs, transit overheads and hedging costs: in transit moving inventory costs and induced costs to hedge unreliability inventory and warehousing costs or shift to faster more expensive mode of transportation.

2 Geography & connectivity options

2.1 Land connectivity options for Armenia

Armenia's geographic position and the current external environment are the major disadvantages that limits opportunities for optimal logistics operations. Armenia has four neighboring countries out of which borders with Azerbaijan to the east and Turkey to the west are blocked, thus leaving open the northern border with Georgia and the southern border with Iran only operational links to the world economy.

The available modes through Georgia involves both trucking and rail options; unfortunately, the railway connection is limited only to Georgia, which is not directly anymore connected by rail to Russia as the connection through the Abkhazia was disrupted.

Georgia is connected to Azerbaijan and Turkey (through the Baku-Tbilisi-Kars (BTK) corridor) but access for the Armenian freight rail wagons is banned for either crossing into Azeri territory at Boyuk Kesik or accessing any part of the BTK corridor which was built with Azeri money and was agreed with the Georgian Government and Georgian Railways not to allow Armenian cargo on it.

While through Iran only the trucking option is available as the former soviet rail connection though Julfa is going through the Nakhichevan Azerbaijani enclave.

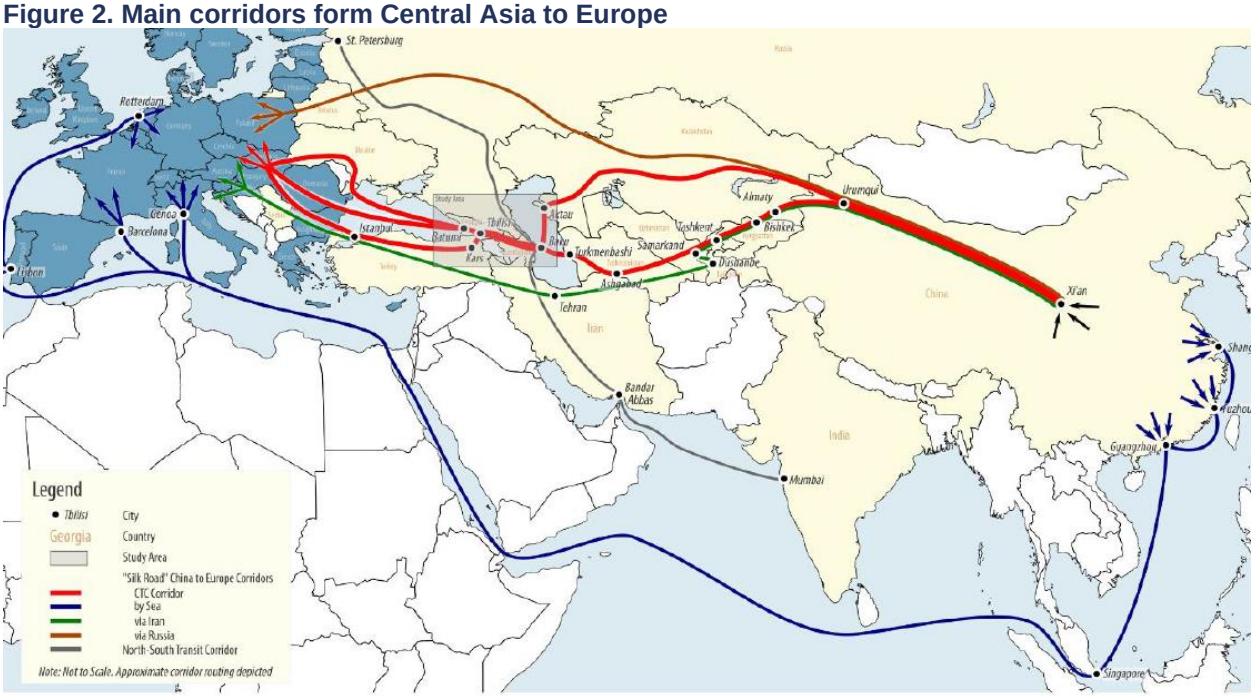
Figure 1. South-Caucasus Rail Network

Source: https://www.railwaygazette.com/infrastructure/naxcvan-railway-reopening-proposed-as-work-starts-on-baku-link/58576.article

Note that obstacle of using East-West connection via Georgia is becoming increasingly important due to the rapid growth of the Middle Corridor, which is partly based on the BTK corridor and provides a connectivity to Central Asia and China in the East and through the Turkish Railways to Europe in the West (alternative to the Black Sea shipping).

The Middle Corridor west ward through the BTK line as well the whole east ward direction is not accessible by Armenian shipments which excludes the country from a major growing corridor.

Figure 2. Main corridors form Central Asia to Europe



Source: https://openknowledge.worldbank.org/server/api/core/bitstreams/44313ea3-6d0a-5bb0-a058-8ac116b1beee/content

The main option for accessing the Central Asian markets (that are many of them EAEU countries) is through Russia through Georgia and the Lars BCP. Transport costs are relatively high through this option making Armenian products uncompetitive. Note also that Lars BCP creates a chokepoint for Armenian trade towards Eurasian Economic Union countries as it is mountainous passing with many weather problems especially in the winter. Internal barriers within the EAEU and uncertainty around the implementation of EAEU standards and regulations also create additional difficulties.

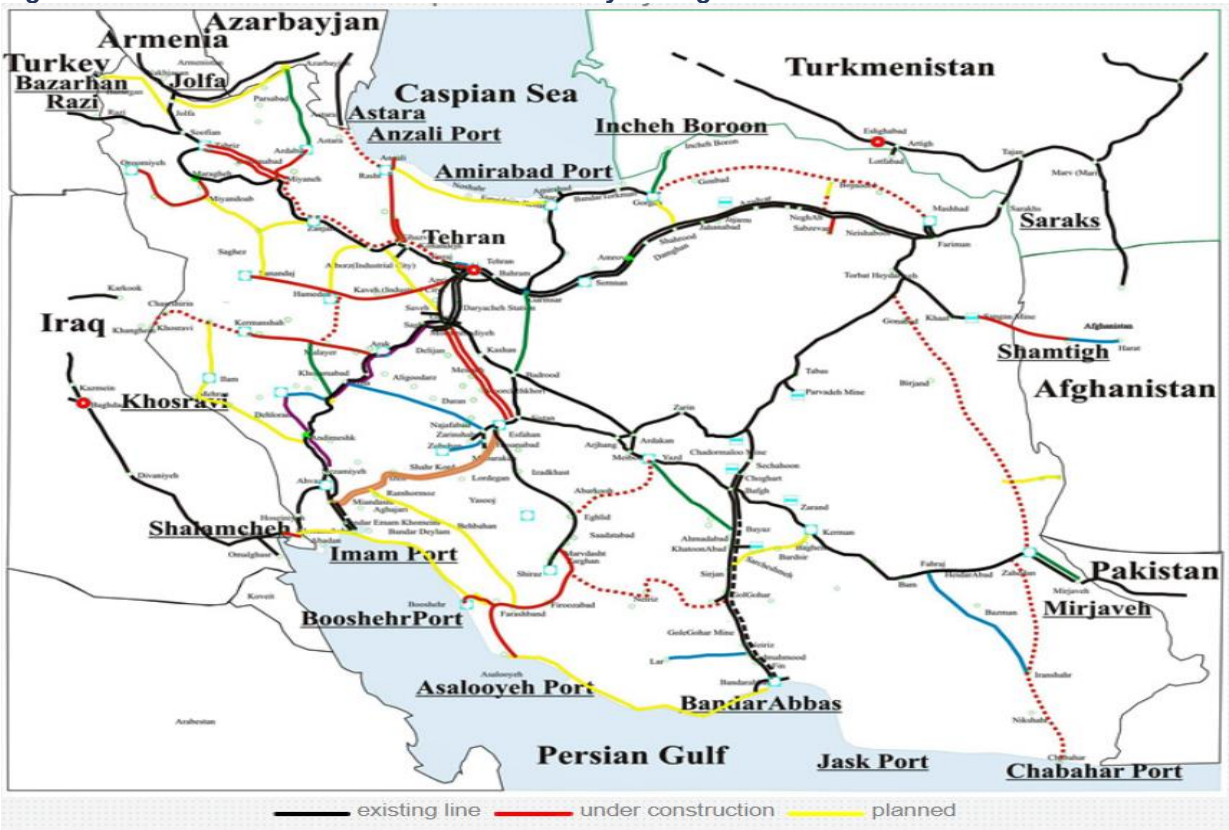
There is also option to connect Central Asia via Iran, however this route is not used due to extreme inefficiencies.

Trade with Iran is restricted:

(1) By international sanctions to Iran that has reduced direct maritime services to only a handful of liners from China and feeders from India; no direct service exists from Bandar Abbas to Europe, US, Singapore and Oceania.

(2) Further exacerbates the problem the poor transportation infrastructure, protective Iranian market practices and most importantly the interrupted railway service at Julfa that was traditionally the main transshipment junction between Iran and the whole former Soviet Union.

Figure 3. Iranian rail network and its connectivity through Julfa



Source: https://logistix.ir/general-info/iran-neighboring-countries-borders/

2.2 Black Sea connectivity

The Black Sea port system is generally considered as a secondary port system in the European port scene. Though located next to the East Med ports, it is not situated along the main east-west shipping routes, due to the existence of the Bosporus Strait, which forms a nautical link between the two seas. The region's economic position is being affected by a range of developments of a more global nature such as (i) nearshoring, (ii) the shift of the European Development Centers from West to Central and Eastern Europe, (iii) SECA [3] regulations in the North and Baltic Seas, (iv) the growth of East Med ports, (v) the Silk Road project revitalization, (vi) Suez Canal expansion, etc. However, the political and economic instability of the Black Sea states (mainly Russia and Ukraine) could counterwork global trends and prevent the region from potential dynamic development. The aforementioned global and regional circumstances can significantly affect the configuration of shipping patterns to/from Europe and thus alter the position of Black Sea ports in the global shipping network. Notwithstanding the fact that the Black Sea region accounts for only 2.5% of global seaborne trade, (while the leading European

[3] *Sulphur Emission Control Area(s)*

trade regions - the North Sea and Mediterranean Sea - account for about 17% and 15%, respectively) it is an important area of development due to its geographical size and resource/consumption base.

The Black Sea container port system is among the world's fastest growing markets with a cargo growth rate 1998-2019 of 14%; in the same period, the global CAGR amounted to 9%. The Black Sea container port system consists of 11 ports with annual container traffic of about 2.6M TEU (2019). What became clear in recent decades is the growing share of container traffic in the Black Sea region, which traditionally specializes in bulks, as a heritage of the former Soviet period. In the late 1970s, container traffic represented no more than 2.5% of the total, followed by 5.0% one decade later, 13.4% in the late 1990s, and 25.7% in 2008.

Such a trend mainly occurred at the expense of bulks, with solid bulks and liquid bulks declining from 29.0% and 53.3% in 1977 to 19.4% and 35.9% in 2008, respectively and even more since then. This reflects a growing diversification of Black Sea ports, as reflected by world trends (Ducruet[4], 2017) but at the same time, the direct effects of liner shipping strategies and actions performed in the region. The main container lines serving the Black Sea are MSC, Maersk, Zim, Arkas, Emc.

The peculiarity of the Black Sea is that only few ports are called at directly by shipping lines: Constanta (Romania), Odessa and Illyichevsk (Ukraine), and since 2011 also Yuzhnyi (Ukraine) and Nororossyisk (Russia). As from 2003, the size of the container vessels entering the Black Sea grew from 2,500 TEU up to 10,000 TEU, which is the max size of vessels at the present time. A significant restriction on vessel size in the Black Sea is the Bosporus Strait on account of its physical constraints. Thus, container shipping lines can deploy vessels of up to 10,000 TEU for the Black Sea, while vessels of up to 18,000 TEU are already calling at ports in the Mediterranean. Shipping lines call at the Black Sea basin mainly in a shared calling pattern (Table 1). There are only two (out of four previously existing) direct services left between the ports of the Black Sea and the Far East: the Asia-East Med Express service of Zim/OOCL and joint Ocean three/Yang Min service. Other weekly services are the Ecumed service (Maersk Line, South America, annual capacity of 150,000 TEU) and a Maersk service connecting the Indies and the Middle East to the Black Sea. These services involve line-bundling operations with calls at 3 to 4 Black Sea ports. Roughly, half of the current containers handled in the Black Sea ports are shipped using direct calls, while the other half is feedered from hub ports in the East Med, such as Ambarli/Istanbul, PCT/Piraeus and to a lesser extent Thessaloniki and Gioia Tauro. As from the mid-1990s, the Mediterranean witnessed an active development of hub-feeder container systems, as well as short sea shipping networks driven by the growth of the container volumes serving the southern part of Europe (Notteboom[5], 2010).

[4] Ducruet C. (2017) Multilayer dynamics of complex spatial networks: the case of global maritime flows (1977-2008). *Journal of Transport Geography,* 60: 47-58.

[5] Notteboom T.E. (2010) Concentration and the formation of multi-port gateway regions in the European container port system: an update. *Journal of Transport Geography,* 18(4): 567-583

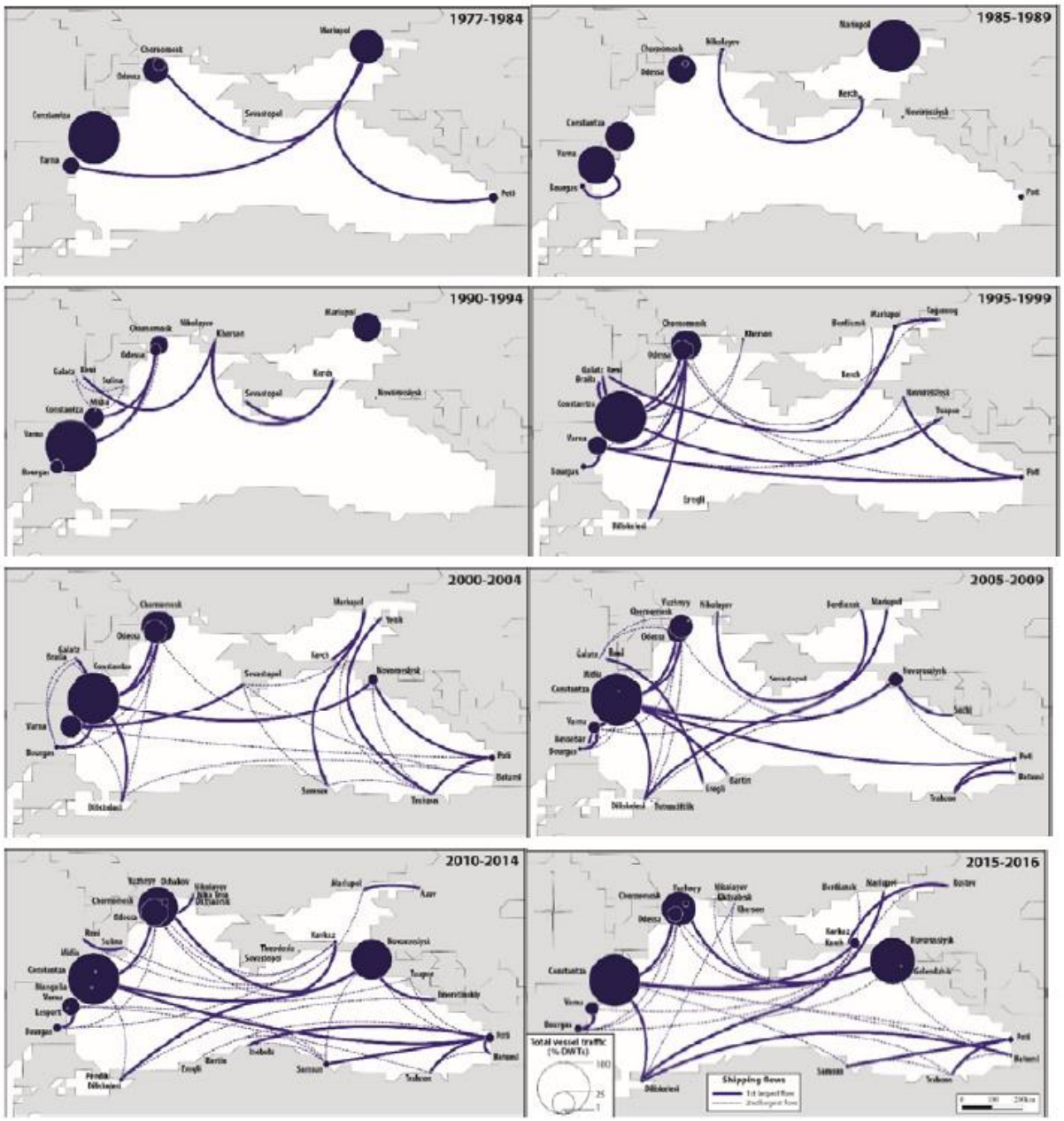
Table 1. Direct calls to Black Sea ports (2016)

Shipping Company	Liner Services	Vessel size (TEU)	Rotation
Caribbean			
Maersk Line	Med-Caribbean-Panama service - String of Ecumed	2800-3200	Algeciras, Marsaxlokk, Izmit Korfezi, Istanbul-Ambarli, Yuzhny, Novorossisk (NCSP), Istanbul-Ambarli, Istanbul-Evyap, Izmir, Marsaxlokk, Algeciras, Caucedo, Manzanillo (Pan) ...(WCSA)... Manzanillo (Pan), Algeciras
Middle East-India			
Maersk Line	Black Sea-East Med-Middle East-India service (ME-3 / Prime 3)	4200-5000 8 x 5 500	Port Said (SCCT), Mersin, Istanbul-Ambarli, Izmit Korfezi, Novorossisk (Nutep), Izmit Korfezi, Istanbul-Ambarli, Izmir, Mersin, Jeddah, Jebel Ali, Pipavav, Hazira, Mumbai-Nhava Sheva, Jebel Ali, Salalah, Port Said (SCCT)
East Asia			
CSCL / K Line / Yang Ming / PIL / Wan Hai Suspended	Asia-Black Sea service (ABX / CBX / SB 1 / SBS) (Zim : ABS)	5500	Piraeus, Istanbul-Ambarli, Ilichevsk, Constantza, Port Kelang, Shanghai, Ningbo, Shekou, Singapore, Port Kelang, Piraeus
2M (Maersk / MSC) Temporarily suspended	Asia-Med Loop 5 (AE-3 / Black Sea / BEX)	8500	Istanbul-Evyap (Izmit), Istanbul-Ambarli, Constantza, Odessa. Ilichevsk, Istanbul, Piraeus, Port Said (SCCT), Singapore, Xiamen, Busan, Qingdao, Shanghai, Ningbo, Yantian, Chiwan, Singapore, Port Kelang, Istanbul-Evyap
O3/YM (CMA CGM / CSCL / UASC / Yang Ming)	Asia-Black Sea service (AE-3 / BEX) (Bosphorus Express)	11 x 8 700 / 9 300 teu (2 sailings skipped)	Port Said, Beirut, Piraeus, Iskenderun, Istanbul-Evyap (Izmit), Istanbul-Ambarli (Avcilar), Constantza, Odessa, Istanbul-Ambarli (Avcilar), Piraeus, Port Kelang, Dalian, Xingang, Kwangyang, Busan, Shanghai, Ningbo, Chiwan, Port Kelang, Port Said
Zim / OOCL	Asia-East Med Express service (EMX) (CSCL : AMX 2)	4250	Ashdod, Haifa, Istanbul-Ambarll, Novorossisk, Odessa, Istanbul-Ambarli, Haifa, Mumbai-Nhava Sheva, Port Kelang, Dachan Bay, Busan, Shanghai, Ningbo, Dachan Bay, Ashdod

Source: https://hal.science/hal-01623644/file/Routledge2017_Chp8_BlackSea.pdf

The Black Sea maritime traffic in many ways is regulated by Turkey that controls the straights. The 1936 Montreux Convention, an international agreement regarding the Straits established Turkey as a key player. Even today with the War in Ukraine, Turks play a decisive role since they decide if, and which, civilian vessels and military warships can pass through the Dardanelles and Bosphorus straits, which form the seagoing link between the Black Sea and the Mediterranean. The Port of Ambarli in Istanbul is pretty much the main transshipment port for most traffic (especially containerships) between the Black Sea and the rest of the world.

Figure 4. Black Sea shipping network linkages (1977-2016)

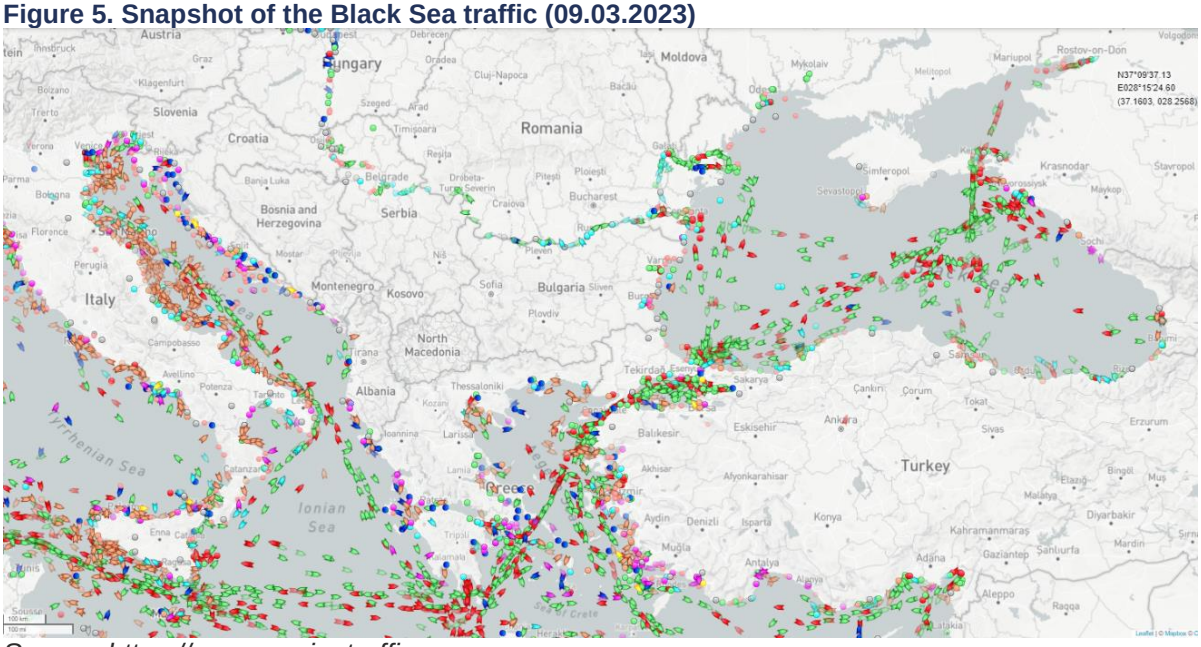


Source: https://hal.science/hal-01623644/file/Routledge2017_Chp8_BlackSea.pdf

Note that Poti and Batumi are rather small ports and do not attract major shipping lines, thus its connectivity is limited to the other major Ports of Odessa, Constanta, Varna, Novorossiysk, and Samsun. The Port of Odessa is blocked due to the war and many shipments go through Constanta and Varna/Burgas to Europe; both Ports have a reasonably good access to the TEN-T European Railway Network. The Port of Constanta has access to the Danube River, which provides barge options to Belgrade, Budapest, Vienna and Bratislava. However, most containers are transshipped in Ambarli Kumport (Turkey) to liners that call the Adriatic ports of Koper (Slovenia), Trieste (Italy) and

Rijeka (Croatia) for Central European destinations, as well as, to Piraeus (Greece) and the rest of the world.

Figure 5. Snapshot of the Black Sea traffic (09.03.2023)



Source: https://www.marinetraffic.com

Note that the war in Ukraine has also blocked routes to Europe through the Russian/Belarussian and Ukrainian territories that used to be inexpensive routes for accessing the EU market, therefore the above-mentioned options are the main ones from Poti/Batumi.

2.3 Air connectivity

Approximately 20,000 tons of cargo were transported to and from Zvartnots International Airport, most of them in the baggage compartment of regular passenger services. Reportedly a few shipments are trucked to Tbilisi and fly them out of the Shota Rustaveli airport; however, data on such transshipments are not easily obtainable. Below table shows top export and import destinations for air transport.

Table 2.Top 10 air export- import destinations

		2019	2020	2021		2019	2020	2021
	in ton per annum	Export			Import			
1	Russian Federation	1,281	4,503	6,587	Russian Federation	6,952	8,103	8,292
2	Qatar	548	3,453	629	China	12,977	1,544	2,319
3	Iraq	592	539	597	Viet Nam	113	426	520
4	Ukraine		133	85	USA	167	302	306
5	USA	15	22	67	Germany	351	185	300
6	Kuwait	172	1,531	64	Belarus	465	48	221
7	Germany	3		21	France	166	152	165
8	Kazakhstan	10	12	14	Italy	248	99	164
9	Uzbekistan	9	12	14	Belgium	40	78	160
10	Belarus	7	29	12	Mexico	27	13	144

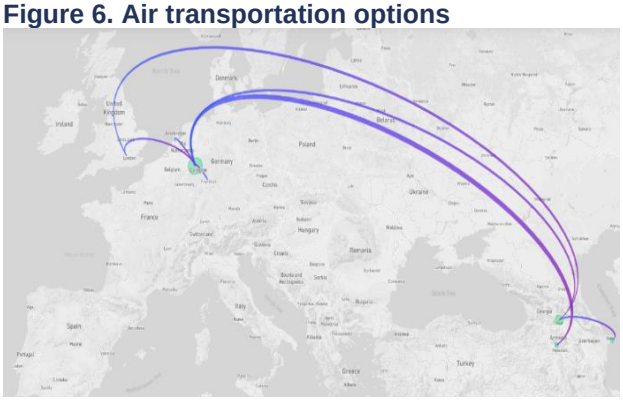
Source: UN comtrade

Table 3.Top 10 export commodities by air transportation

	Ton per annum	2019	2020	2021
1	Vegetables; edible, n.e.c. in chapter 07, fresh or chilled		202	1,192
2	Flowers, cut; flowers and flower buds of a kind suitable for bouquets or ornamental purposes, dried, dyed, bleached, impregnated or otherwise prepared	2	58	1,173
3	Sound or video recording or reproducing apparatus; parts and accessories thereof, other than pick-up cartridges		1,978	779
4	Sheep; live	751	5,225	690
5	Cattle; live, other than pure-bred breeding animals	592	533	597
6	Plants and parts (including seeds and fruits) n.e.c. in heading no. 1211, of a kind used primarily in perfumery, in pharmacy or for insecticidal, fungicidal or similar purposes, fresh, chilled, frozen or dried, whether or not cut, crushed or powdered	1	160	535
7	Fish; live, n.e.c. in heading 0301	79	272	328
8	Flowers, cut; flowers and buds of a kind suitable for bouquets or ornamental purposes, fresh, other than roses, carnations, orchids, chrysanthemums or lillies		115	276
9	Fruit, edible; strawberries, fresh	36	256	233
10	Stones; precious (other than diamonds) and semi-precious stones, (other than rubies, sapphires and emeralds), worked other than simply sawn or roughly shaped, not strung, mounted or set	46		179

Source: UN comtrade

Figure 6. Air transportation options



Source: https://coyneair.com/services/

Airfreight is an option that clearly is not affected by the landlocked state of the country and should attract special attention by the GoA; however, the only cargo plane service (outside Russia) is once a week flight to Liege, Belgium by Coyne Air[6]. Cargo transportation is carried out once a week. The flights have a capacity of up to 20 tons. The major benefit from flying a shipment to Liege Cargo Airport is that it can be conveniently and efficiently transshipped to a practically direct flight anywhere in the world.

The demand for air freight is in general limited by cost, typically priced 4–5 times that of road transport and 12–16 times that of sea transport. Air freight rates generally range from USD 1.50–USD 4.50 per kilogram, while the value of air cargo typically exceeds USD 4.00 per kilogram. Commodities shipped by air thus have high values per unit or are very time-sensitive, such as documents, pharmaceuticals, fashion garments, production samples, electronics consumer goods, and perishable agricultural and seafood products. They also include some inputs to meet just-in-time production and emergency shipments of spare parts. Demand for air freight exports has been limited from landlocked developing countries because most enterprises ship small volumes of low value goods. The main exports shipped by air from developing countries are cut flowers, electronic parts, and fresh fruits and vegetables. Imports by air typically include high value consumer goods. However, without a significant outbound

[6] https://coyneair.com/

flow, the inbound air freight rates are higher — reducing the types and quantities of goods transported by air.

To facilitate air freight, landlocked countries, such as Armenia, need to improve operations at their airports, if possible, develop a cargo airport to reduce landing and service cost, and liberalize access for foreign airlines. But until those countries become major exporters, it is unlikely that scheduled air cargo operators will have significant operations. Instead, most air cargo will move as belly cargo on passenger airlines, with some complementary use of chartered air freighters during shipment peaks. Landlocked countries should therefore provide greater access to foreign passenger airlines.

As the volume of air freight grows, there is a natural progression from passenger aircraft to chartered cargo planes of increasing size and ultimately to scheduled cargo services. The challenge with using passenger aircraft is capacity since priority goes to passengers and their baggage. **For narrow-body aircraft with a high load factor, the available capacity is typically less than two tons**, or about **12 cubic meters**. Although load factors vary from flight to flight, shippers usually have a fixed shipment schedule based on the minimum available. Tourism can generate substantial freight capacity, but its cargo space is available only during the tourist season.

Chartered aircraft provide the shipper with more reliable capacity, but the freight rates are higher, especially for smaller cargo aircraft or for high load factors in only one direction (on a round trip or a triangular route). Capacity may also be a problem during peak seasons when all exporters compete for the available fleet capacity.

Most international scheduled air freight services operate on global east-west routes. They serve airports that are major generators of air cargo, avoiding airports that already have a significant amount of wide-body passenger aircraft traffic. They maintain high load factors throughout the year by using a mix of aircraft sizes and by periodically reallocating their fleet to different sectors.

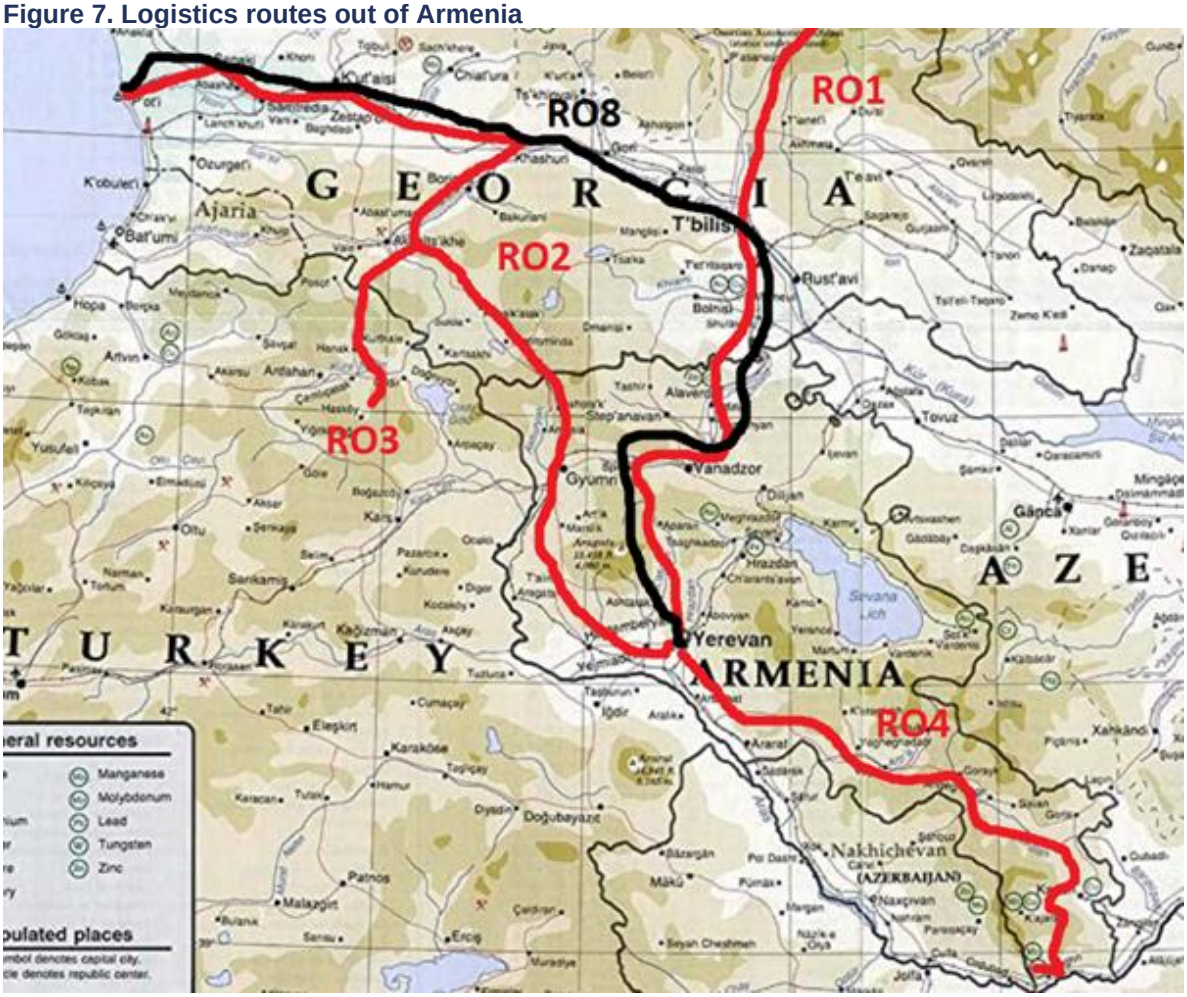
To meet the demands of shippers exporting small volumes or cargos of median value, three so called hybrid services have been developed:

- The first relies on consolidators, which combine shipments to generate enough volume to obtain reasonable freight rates. The consolidated shipments are then flown to the nearest major transshipment hub where they are re-consolidated for their final destinations.
- The second involves freight forwarders who arrange for road transport from the cargo origin to the nearest hub airport. This involves a one-day (or at most two-day) trip and includes a border crossing if the hub airport is in a neighboring country (we see this happening between Tbilisi and Yerevan). This type of road-air service is increasingly provided as part of an airline road-freight service, with goods transported by truck under the airway master bill.
- The third involves air and sea freight. An air-sea combination is typically used when there are convenient flights to a hub airport that has a major seaport nearby (Singapore, Dubai). Exports move from the point of production to the gateway port using air transport. This arrangement is used when exports have missed their shipment date and need to be loaded on a specific cargo vessel or when land transport to the gateway port in another country is costly, unreliable, or involves a difficult border crossing. The sea-air combination offers a lower freight rate than for an all-air shipment. For landlocked countries, this intermodal movement could be combined with initial movement by road.

3 Current single mode & multimodal logistic routes

A few routing options are available to Armenian trade despite the geographic and political constraints. These routes are discussed briefly next:

Figure 7. Logistics routes out of Armenia



Source: The Consultant

RO1: By truck through Georgia-Lars to the Russian Federation and EAEU countries (truck)

This is the main way of accessing the Russian and EAEU market. Consumer and agricultural products traded by SMEs typically follow this route. The cost of the route per truck is high (USD 3.500-5,000 depending on the market) and it adds substantially on the marketed price in Russia, especially for low inventory value commodities, such as tomatoes and liquor. Products with market price less than 1 USD/kg are obviously outpriced by the logistics cost (transport cost contributed more almost 25% of the wholesale value). Obviously similar products can these markets obtain from producers at a lesser cost. Another significant drawback of this route is the uncertainty, especially in the winter due to the weather conditions. Customs procedures at both BCP to Georgia and to Russia are also adding to the unreliability of the route depending on the congestion level.

RO2: By truck through Georgia-Poti/Batumi and vessel to the EU/Russia/world (multimodal)

This is an alternative to RO1 for the Russian market which is mostly used though when the Lars option becomes unpassable due to weather or if very long delay exists. In general, it is less predictable, more complicated, and often longer and more expensive. This route involves few multimodal sub-options:

2.1 By train to Poti/Batumi where a rail ferry transports (RA-RA) the wagons to the other side in Ports Kavkaz and Odessa. Note that although such service also exists at Burgas, Varna and Samsun due to the railway gauge difference it was not practical to move cargo with this option.

2.2 By truck to Poti/Batumi from where a ferry boat (RO-RO) transports the truck and the tractor to the other Ports of the Black Sea (almost every port can accommodate such ferries) and from there the truck continues.

Note that Option 2.2 is the main route for Armenian trucks to Europe, as they cannot access it through either Russia/Belarus or Ukraine these days. Usually, RO3 is a preferred option when the shipment is trucked by Georgian truck.

In general, this is a more expensive option compared to RO7/RO8 as the tariffs for RO-RO ships are high since they carry the whole truck and cannot of course stack it, thus maximizing the carrying capacity of the ship.

RO3: By truck through Georgia-Tbilisi and through Turkey to the EU/world (truck)

This is the best potentially route to reach the Turkish and EU market with a single mode (truck). The infrastructure through Turkey is generally good and the reliability reasonable. When investigating the impact of unblocking border crossing points with Turkey, this and the rail option will appear as the dominant ones both for shipments to EU but also to the world through the Aegean and Mediterranean ports of Turkey,

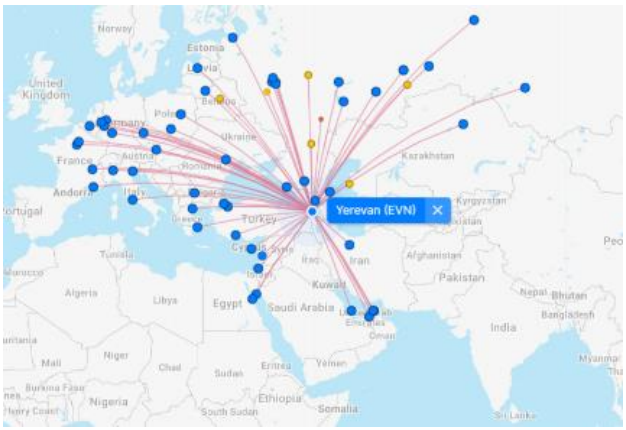
RO4: By truck through Iran to the Gulf/India/World (truck-multimodal)

This is the only way to reach the Iranian market but with many difficulties for Armenian trucks as the Iranian bureaucracy, discriminatory pricing of diesel, the quality of the infrastructure, etc. create many obstacles. Many shipments are being also transported by Iranian trucks which still appears to be a costly option for the distance the products travel. Of course, for products with a very high inventory value-weight ratio this is quite OK besides the airfreight option. For example, this option seems to be the dominant on for transporting Tobacco products from Armenia to the middle east (e.g., Iraq).

RO5: By air through Zvartnots Airport to the World (air)

For air freight, air services are typically utilized for shipments of goods and commodities that require speed-to-market. These goods may include perishable commodities (such as fresh fruit, vegetables, flowers, as an example), or precious goods (high value or specialized items, such as precious metals, medical supplies and equipment, machinery spare parts) that need to travel quickly to or from cities and markets rather than bulk transportation which is typically used for high volume, lower value consignments that do not require the speed and ease of air transportation.

Figure 8. Air connectivity potential



The cost tends to be quite high (10 times more expensive than a truck to reach Moscow or Germany) but of course much faster. The cost of the air cargo transportation is of course much higher than any other mode, but it can be more competitive if the flights are performed with cargo planes (rather than passenger) and of course if the flights are out of a cargo airport, that typically has much lower landing and service fees.

Source:
h*ttps://professionals.aero/author/simonruss/*

RO6: By truck to Georgia-Tbilisi airport and by air to the world (multimodal)

Figure 9. Air connectivity via Tbilisi

Source:https://professionals.aero/author/simonruss

This would make sense only for destinations served directly by Shota Rustaveli airport. Note that besides certain direct flights to Central Asia and one to China, no flight from Tbilisi or Yerevan serves overseas destinations (to Americas or Australia). Therefore other than opportunity cost and frequency there is little benefit of trucking air-cargo to Tbilisi, which effectively adds to cost and travel time. In the meeting with the Zvartnots air cargo department, they reported cases that shipments may arrive either Yerevan or Tbilisi with a single consolidated shipment and then partly shipped to the other country, and this is confirmed by the cargo air operator schedule. Understanding the potential demand and likelihood of attracting market share, a methodology is used by airlines to justify and supplement the frequency of air services into the region. When the potential country markets are identified, the analysis drills down further into sustainability of routes or city pairs that could be served. An example would be the significant expansion of demand to Georgia from the EU, facilitated by a multi-lateral air services agreement, but attractive to EU airlines to begin flying new city pairs where demand existed (high GDP, propensity to travel, traffic mix demand – business and leisure travelers).

RO7: By container train to Georgia-Poti/Batumi and by vessel to Russian Federation, Ukraine, EU (multimodal)

SCR offers two scheduled container line services with 40 and 20 ft containers from Yerevan to Poti. At the port, the export containers undergo 3 operations: (1) shunting at the landside railway station (GR's)-to port's terminal railway station (e.g. APM terminal) by a shunting engine (2) unloading at the port's yard and (3) yard-to quayside. Unfortunately, in both Georgian ports these operations are expensive and time consuming compared to similar sized ports elsewhere (both for rail and trucks). After the containers are loaded loaded on containerships they are headed to destinations in Russia, Romania, Bulgaria, Turkey within the black sea or with more infrequent services to Greece, Italy, Spain where they are transshipped from feeders to motherships to Americas and China/India. In fact, this is probably the main route to both to EU but also to Indian/Chinese markets. In fact, the imports from all these destinations are much higher than exports, thus they are offered in the market in a fairly competitive price by the shipping lines. However most shipping lines calling Poti/Batumi offer the option to reach Yerevan and vice versa mainly by truck (RO8). This is remarkable since the cost by rail appears to be less than RO8, indicating that SCR/GR have difficulty marketing their services to shipping lines.

From the beginning of 2023 new container ferry tested operations in the direction of Batumi-Novorossiysk, and most probably will become regular. GoA announced that the maritime section will be fully subsidized for six months (potentially can be continued). This ferry service can support RO8 as well.

RO8: By truck a container to Georgia-Poti/Batumi and a containership to the world

As noted above, this appears to be the only option most shipping companies offer from Yerevan to the World (Maersk, Hapag-Lloyd, Zim, etc). In general, it is considered more flexible for less than a block train shipment. In addition, the truck is much more flexible within the Port where a train has capacity issues for accessing the terminals. Specifically, a truck arriving at the port with export containers undergoes 2 operations: landside-to-yard and yard-to quayside instead of 3 that enables faster handling (though the cost still is higher than railways). This option is the fastest grown one but unfortunately the transport leg from Armenia to the Vessel (EXW-FOB) costs more than 35% of the overall trip and takes 35% of the time (see Section 5).

Figure 10. Two options of direct shipping through the Black Sea

Source: https://www.searates.com/schedules

Stripping a container is occasionally preferred, especially if there is a shortage of empty containers. It adds to the cost and often to lead time, but it is common if the shipment was a groupage for both countries and offers options for a less than truckload shipments.

Each of the routes above has complexities of their own and typically are rarely selected by the shipper but rather by the freight-forwarder. Unfortunately, freight forwarders tend to have preferred routes that they would use occasionally at additional cost and lead time to the shipper. Initiatives on the ground have not always been backed up by a good analytical understanding of the impact of these operations or of the elements that produce the most value for the money allocated.

A key objective of this work is to offer an operational framework to better understand the causes and the structure of logistics costs, using microlevel analysis of the cost, time, and reliability of international trade supply chains that concern Armenia.

Table 4. Micro-level analysis of logistics options

Route option	Details
RO1: By truck through Georgia-Lars to the Russian Federation and EAEU countries (truck)	▪ This is the main way of accessing the Russian and EAEU market. Consumer and agricultural products traded by SMEs typically follow this route. ▪ The cost of the route is high (USD 3.500-5,000 depending on the market) and it adds substantially on the marketed price in Russia, especially for low inventory value commodities, such as tomatoes and liquor. ▪ Another significant drawback of this route is the uncertainty, especially in the winter due to the weather conditions. Customs procedures at both BCP to Georgia and to Russia are also adding to the unreliability of the route depending on the congestion level.
RO2: By truck through Georgia-Poti/Batumi and vessel to the EU/Russia/World (multimodal)	▪ Option 2.1. By train to Poti/Batumi where a rail ferry transports (RA-RA) the wagons to the other side in Kavkaz and Odessa. Note that although such service also exists at Burgas, Varna and Samsun due to the railway gauge difference it was not practical to move cargo with this option. ▪ Option 2.2. By truck to Poti/Batumi from where a ferry boat (RO-RO) transports the truck and the tractor to the other Ports of the Black Sea (almost every port can accommodate such ferries) and from there the truck continues. Option 2.2 is the main route for Armenian trucks to Europe, as they cannot access it through either Russia/Belarus or Ukraine these days. Usually, RO3 is a preferred option when the shipment is trucked by Georgian truck. In general, this is a more expensive option compared to RO7/RO8.
RO3: By truck through Georgia-Tbilisi and through Turkey to the EU/world (truck)	▪ This is the best potentially route to reach the Turkish and EU market with a single mode (truck). The infrastructure through Turkey is generally good and the reliability reasonable. ▪ When investigating the impact of unblocking border crossing points with Turkey, this and the rail option will appear as the dominant ones both for shipments to EU but also to the world through the Aegean and Mediterranean ports of Turkey.
RO4: By truck through Iran to the Gulf/India/World (truck-multimodal)	▪ This is the only way to reach the Iranian market but with many difficulties for Armenian trucks as the Iranian bureaucracy, discriminatory pricing of diesel, the quality of the infrastructure, etc. create many obstacles. Many shipments are being also transported by Iranian trucks which still appears to be a costly option for the distance the products travel.

Route option	Details
RO5: By air through Zvartnots Airport to the World (air)	▪ Air services are typically utilized for shipments of goods and commodities that require speed-to-market. These goods may include perishable commodities (such as fresh fruit, vegetables, flowers, as an example), or precious goods (high value or specialized items, such as precious metals, medical supplies and equipment, machinery spare parts) that need to travel quickly to or from cities and markets rather than bulk transportation which is typically used for high volume, lower value consignments that do not require the speed and ease of air transportation. ▪ The cost tends to be quite high (10 times more expensive than a truck to reach Moscow or Germany) but of course much faster and more reliable.
RO6: By truck to Georgia-Tbilisi airport and by air to the world (multimodal)	▪ This would make sense only for destinations served directly by Shota Rustaveli airport. ▪ Note that besides certain direct flights to Central Asia and one to China, no flight from Tbilisi or Yerevan serves overseas destinations (to Americas or Australia).
RO7: By container train to Georgia-Poti/Batumi and by vessel to Russian Federation, Ukraine, EU (multimodal)	▪ South Caucasus Railway (SCR) offers two scheduled container line service with 40 and 20 ft containers from Yerevan to Poti. At the port, the export containers undergo 3 operations: (1) shunting at the landside railway station (GR's)-to port's terminal railway station (e.g. APM terminal7) by a shunting engine (2) unloading at the port's yard and (3) yard-to quayside. ▪ In both Georgian ports these operations are expensive and time consuming compared to similar sized ports elsewhere (both for rail and trucks). After the containers are loaded on containerships they are headed to destinations in Russia, Romania, Bulgaria, Turkey within the black sea or with more infrequent services to Greece, Italy, Spain where they are transshipped from feeders to motherships to Americas and China/India. In fact, this is probably the main route to both to EU but also to Indian/Chinese markets. ▪ From the beginning of 2023 new container ferry tested operations in the direction of Batumi-Novorossiysk, and most probably will become regular. GoA announced that the maritime section will be fully subsidized for six months (potentially can be continued). This ferry service can support RO8 as well.
RO8: By truck a container to Georgia-Poti/Batumi and a containership to the world	▪ As noted above, this appears to be the only option most shipping companies offer from Yerevan to the World (Maersk, Hapag-Lloyd, Zim, etc). ▪ In general, it is considered more flexible for less than a block train shipment. In addition, the truck is much more flexible within the Port where a train has capacity issues for accessing the terminals.

Source: The Consultant analysis

[7] https://www.apmterminals.com/en/about/our-company

4 Logistics performance of Armenia

Since the year 2007, the World Bank assess the logistics performance of most countries around the world and reports their Logistics Performance Index (LPI). The LPI is based on surveys and data obtained from the governments and the industry (shippers and forwarders). The LPIs of countries are published by the World Bank every two years. LPI consists of 6 dimensions and each country's scores are calculated for each dimension. The 6 dimensions of LPI as follows:

- Efficiency of the customs clearance process such as speed, simplicity, predictability of formalities at customs and customs control points.
- Quality of transportation and commercial infrastructure such as ports, roadways, railways, logistics parks, information technologies, port community systems, tracking and etc.
- Ease of shipments and competitive pricing (transparency, lack of corruption, etc.).
- Quality and adequacy of logistics services of the private industry (carriers, 3PLs, outsourcing, 4PLs, freight forwarders, value added services, control towers, etc.).
- Traceability of shipments and accountability in case of damage and theft.
- The frequency services are offered and timeliness in terms of shipment is delivered consignees.

Table 5. LPI ranking of Armenia

Country	Year	LPI Rank	LPI Score	Customs Score	Infrastructure Score	International Shipments Score	Logistics Competence and Quality Score	Timeliness Score	Tracking and Tracing Score
Dominican Republic	2023	88	2.6	2.6	2.7	2.4	2.6	3.1	2.4
Guatemala	2023	88	2.6	2.3	2.4	2.8	2.7	2.6	2.7
Guinea-Bissau	2023	88	2.6	2.7	2.4	2.9	2.9	2.4	2.3
Mali	2023	88	2.6	2.6	2	2.6	2.5	3.1	2.7
Nigeria	2023	88	2.6	2.4	2.4	2.5	2.3	3.1	2.7
Russian Federation	2023	88	2.6	2.4	2.7	2.3	2.6	2.9	2.5
Uzbekistan	2023	88	2.6	2.6	2.4	2.6	2.6	2.8	2.4
Albania	2023	97	2.5	2.4	2.7	2.8	2.3	2.5	2.3
Algeria	2023	97	2.5	2.3	2.1	3	2.2	2.6	2.5
Armenia	2023	97	2.5	2.5	2.6	2.2	2.6	2.7	2.3
Bhutan	2023	97	2.5	2.7	2.2	2.3	2.6	2.6	2.3
Central African Republic	2023	97	2.5	2.4	2.6	2.1	2.9	2.6	2.4
Congo, Dem. Rep.	2023	97	2.5	2.3	2.3	2.5	2.4	2.8	2.5
Ghana	2023	97	2.5	2.7	2.4	2.4	2.5	2.7	2.2
Grenada	2023	97	2.5	2.6	2.5	2.6	2.2	3.1	2.3
Guinea	2023	97	2.5	2.4	2.4	2.2	2.7	2.5	2.7

The scores give feedback to countries to identify the strengths and weakness of their logistics sector and usually multinationals pay close attention to a country's score before they enter the market. In general, every company must respond quickly to consumer demands, reduce lead times, maintain quality at the right cost, and be flexible to achieve the competitive advantage.

Therefore, LPI also shows the commercial ability of a country. Because it gives an opinion about whether the goods can be delivered at the right time, reliably and within minimum obstacles at the BCP with transparent procedures, without kickbacks (or bribes to expedite processes!). These are the most important elements of the supply chain of any company.

More than 160 countries were assessed by the WB and their relative LPI were reported; Armenia was ranked 97 in 2023. While Armenia's 2023 score is not impressive it is quite impressive in terms of its progress. In fact, it managed to jump over 45 countries from 2016 (when it was ranked 141) to 2023.

According to the last LPI evaluated and published by the World Bank in 2023, Armenia ranked 97th out of 160 countries, with a 2.5 LPI rate.

In general, intra-country logistics infrastructure is considered adequate: all major areas are connected by roadways that can serve trucks, the market is open to competition with oligopolies limited to railway services and thus shipment prices are competitive, with small percentage of late deliveries. In addition, Armenia is considered a technologically developed country and the use of smartphones, track & trace devices are broadly used.

Table 6. Progress of Armenia in LPI ranking

Country	Year	LPI Rank	LPI Score	Customs Score	Infrastructure Score	International Shipments Score	Logistics Competence and Quality Score	Timeliness Score	Tracking and Tracing Score
Armenia	2023	97	2.5	2.5	2.6	2.2	2.6	2.7	2.3
Armenia	2016	141	2.21	1.95	2.22	2.22	2.21	2.6	2.02

The improvement is enormous, and it can probably be attributed to major reforms that involved mostly the modernization of customs administration through the introduction of an electronic platform that supports the full automation of customs clearance procedures (including data entry and direct registration). The customs score jumped from 1.95 to 2.5[8] and probably influenced also timeliness.

[8] The GoA employed international standards (including the Single Administrative Document) based on UN/CEFACT Recommendation No. 34 on Data Simplification and Standardization for Single Windows and Recommendation 36 on Cross-Border Interoperability of Single Windows. The platform, which is being developed using a home-grown ICT system, also features a risk assessment function that automatically assigns cargo to clearance/control channels (green for clearance without examination; yellow for documentary examination required; red for documentary and physical examination).
As of the end of 2018, the platform was still not fully operational but the benefits were tangible in the field, though it was used mostly for processing customs declarations for imports of vehicles and medicine, with access granted to registered customs representatives (i.e., brokerage companies) with at least two certified employees who have successfully completed the training requirements. The platform was also used for calculating customs fees and charges associated with importing used passenger cars. A notable improvement, also was interoperability, e.g. the connection with the management information system of the Food Safety Inspection Body (FSIB).
The platform currently fully supports the electronic permits and licenses system, which is managed by the Ministry of Territorial Administration and Infrastructure. Migration to paperless trade is proceeding in tandem with the streamlining and simplification of cross border trade-in fulfilment of the country's commitments with the Eurasian Economic Union Customs Code and the WTO Agreement on Trade Facilitation. As of March 2019, the Government has implemented 71 percent of these commitments , including those associated with: disciplines on fees and charges; appeal procedures; border cooperation;

Studies have shown that different levels of income countries can have different levels of logistics performance. The income alone cannot explain logistics performance and logistics performance cannot explain income level. However, in a study conducted for EU countries, a strong relationship was found between GDP per capita and LPI scores. Accordingly, it has been observed that countries with low GDP scores have low LPI scores (Bîzoi et al, 2015[9]). The reason that a country is more suitable for trade if it has competitive logistics performance. If the logistics costs in a country are high, economic growth slows down. It is known that trade activities of countries with developed logistics infrastructure are more effective and efficient. Economic growth relies on trade, exports, imports, manufacturing, primary and secondary industries and etc. and the recovery in the economy leads to an increase in GDP.

However, the LPI ranking of Armenia is still lagging for a few reasons:

(1) **Road network and reliability of routes**: being a landlocked country and the main roads to the north and south of the country are mountainous with many issues during the winter adds to reliability of the logistics routes. In addition, these issues result is higher transport costs as well higher equipment maintenance cost. There is an on-going roadway infrastructure initiative to improve the North-South Road Corridor, which is a major infrastructure project aiming connecting the Southern border of the country with its Northern point by means of a highway to be built or reconstructed in accordance with the highest international standards and providing access to international markets. The reconstruction and development of North-South Road Corridor will enable facilitation and intensification of both domestic and foreign transport and trade. The project implementation will lead to the development of efficient transit roads. North-South Road Corridor is 556 km-long and its implementation period was planned to be from 2009 to 2017. However, the road is still under construction and deadlines for road construction completion had not been met.

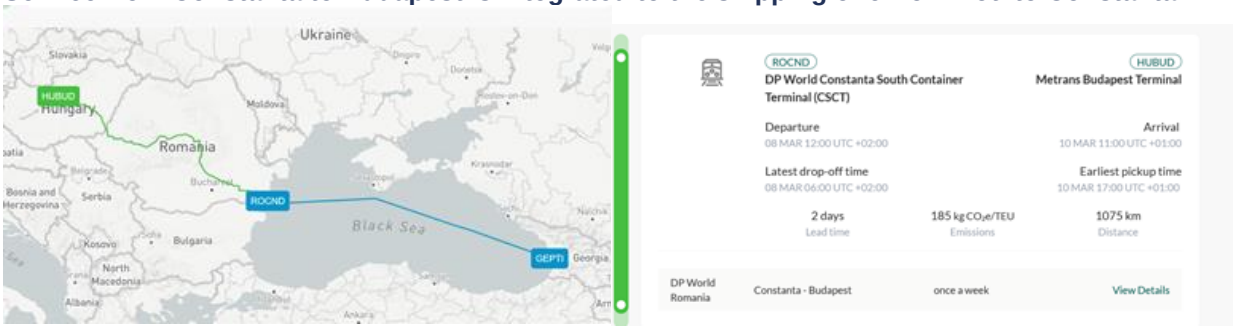
(2) **Railway monopoly and limited market oriented initiatives:** The railway infrastructure of Armenia is in a reasonable condition and serves both regular passenger and cargo trains. The whole railway system is under a concession to SCR (a subsidiary of RZD) and they seem to be kept so far in a functional shape and reasonably maintained. The freight services are profitable, and they also support the money losing passenger services. Rail freight traffic-based exports account for 18% of total freight tonnage in 2019 and the imports for 25%. The average domestic haul is only 269km, though for international services to Poti/Batumi the distance is well above the competitive threshold of 500km that makes rail competitive to road transport. However, since most of the domestic traffic is related to bulk shipments that cannot easily switch to trucks (minerals, grains, petroleum products, chemicals and construction material) this is considered captive demand. SCR is performing 2 container services to Black Sea Ports. However, these services are not quite properly designed and certainly are not properly executed. They do not seem to have attributes that the market could

perishable goods; movement of goods intended for import under customs control; documentation requirements; pre-shipment inspection; rejected goods; temporary admission; post clearance audit; freedom of transit; and, customs cooperation.
In addition, the Government is in the process of integrating the entire set of national non-tariff measures legislation into the United Nations online Trade Analysis Information System (TRAINS). The system, which classifies legislation at the HS-based tariff line level (HS 6-digit), is an important tool for improving transparency.

[9] Bîzoi, C., Popescu, A., Sipos, G., Sipos, C. (2015). The Transportation And Logistics Sector's Performance And The Social Development-A Comparison Within The European Union, Studia Universitatis Babes-Bolyai, 60:68

effectively utilize such as fixed schedule, high reliability, fully integrated with the maritime services schedules, coordination at the BCP of Ayrum with GR for minimal delays and inspections, coordination with terminals in Poti to speedily process these containers, options to transport temperature controlled containers (not even gen-set equipped let alone electric plugs on the train) as cold chain is major part of the supply chain out of Yerevan.

Figure 11. If a service from Yerevan to Budapest by Hapag-Lloyd is requested the Metrans Rail Service from Constanta to Budapest is integrated to the shipping one from Poti to Constanta

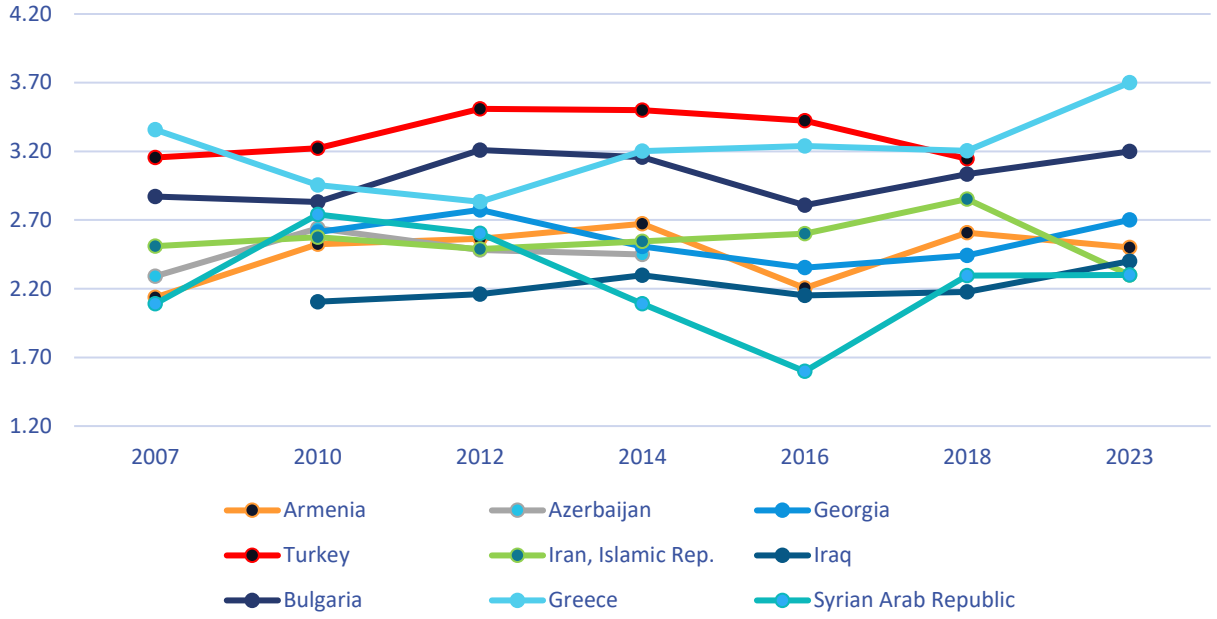


Source: https://solutions.hapag-lloyd.com/quick-quotes/#/

It is not a surprise that from all major shipping companies listed above not even one markets integrated door-to-door service to Yerevan by rail. This means that only overweight, dangerous, and other captive commodities are transported by rail. If the service was properly designed, marketed, and executed it can have much lower cost due to better utilization (compared to trucking), improved reliability market responsive and it would be of course more profitable. Currently, about 30,000 containers (70% of them 40 feet long) are transported annually through Georgia's port of Poti on the Black Sea. Railway services handle about 30% of them, while the rest are transported by private transport companies, who have branches in Georgia and Armenia. Clearly, SCR can easily deploy 5 weekly trains and if properly offered they would all be full as the volumes are sufficient to support such a frequency. An almost daily train will drastically improve the performance of the service as the shipping lines will have the choice to use a train for every possible arrival at Poti, instead of wondering whether a given day there is a service or not in which case they should book a truck. Of course, if additional operators in Georgia and Armenia existed, then the market would be much more competitive and market driven and these solutions would not have to be government initiated.

(3) **Lack of major logistics parks and/or dry ports.** Unfortunately, there is no organized neutral logistics facility in Armenia. The two existing ones are controlled by Apaven and SCR and though they work well and contribute to the efficiency of the sector they cannot possibly offer state-of-the-art services currently required by the shipping lines and the market. The lack of neutrally operated logistics parks do not give options to independent logistics providers to use public warehouses for their clients' shipments, transshipping options and facilities where they can offer on demand value added logistics services. Especially if an organized facility like this offers all required services by truckers and other freight forwarders (from banking and customs clearance to hotels, restaurants, and repair shops).

Figure 12. Overall LPI scores of Armenia and neighboring countries



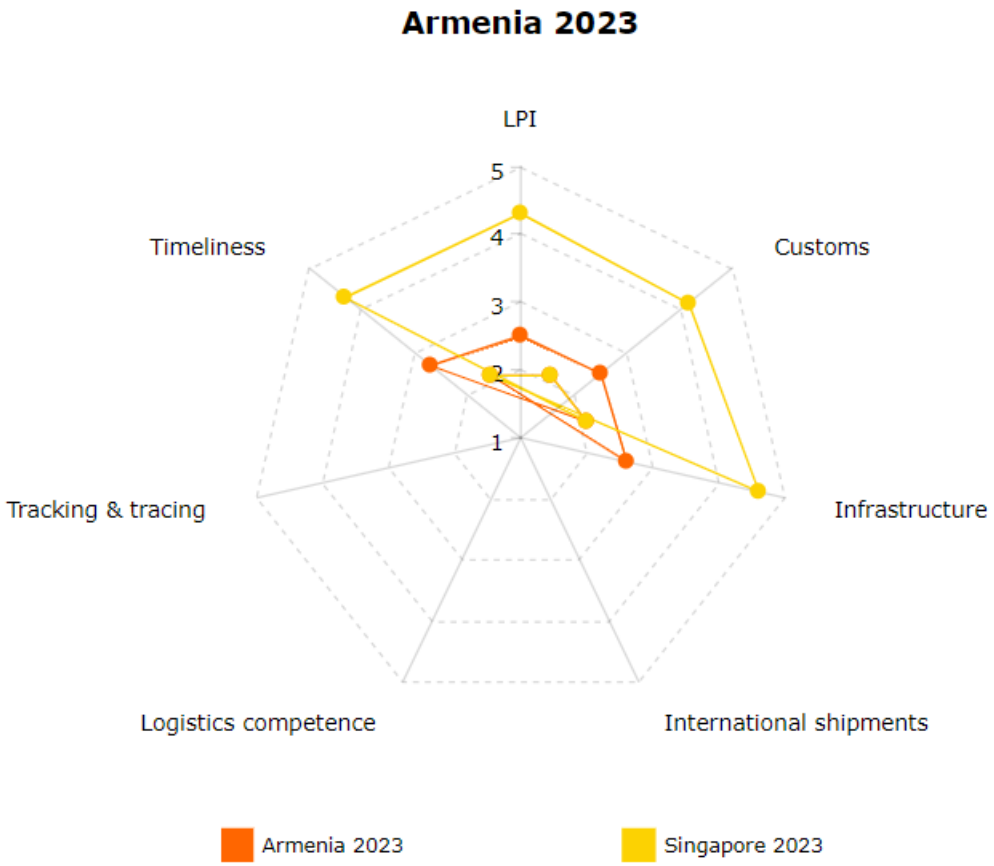
Source: Produced by the authors based on data from https://lpi.worldbank.org/

(4) **Low LPI of neighboring countries**: According to Arvis [10]et al 2010, usually a landlocked country's LPI is strongly affected by the LPIs of its neighbors. This is also observed even for non-landlocked countries, but especially for landlocked ones if a neighbor transit country underperformed it would detrimentally affect their logistics sector. As one can see from figure above, one of Armenia's neighbors Iran, is underperforming to Armenia's LPIs.

In general, Armenia's domestic distribution channels are judged adequate for the country's size, population, and internal market. The main storage facilities and wholesale companies are based in Yerevan, the hub for domestic distribution. Domestic distribution most commonly takes place via truck by family-owned companies that seem to compete well. Retail and wholesale operations are often combined. Armenian and foreign freight-forwarding companies have in general established a reliable system for transporting goods to and from Armenia. Armenian producers, importers, and freight forwarders seem to have been adopted to the external environment and offer competitive services to world, albeit expensive and a longer lead times.

[10] Arvis, J.-F., Mustra, M. A., Ojala, L., Shepherd, B., & Saslavsky, D. (2010). Connecting to Compete: Trade Logistics in the Global Economy - The Logistics Performance Index and Its Indicators, World Bank Report: Retrieved from https://openknowledge.worldbank.org/

Figure 13. Logistics Performance Index of Armenia to leading Singapore for comparison



Source: Produced by the authors based on data from https://lpi.worldbank.org/

In the above figure, for comparative reasons, we display the LPI of Armenia against the leading Singapore; it is clear that there is plenty of room for improvements besides the capital-intensive dimension of Infrastructure in non-monetary reforms. For example, regulatory reforms that improves efficiency of the clearance process, simplicity and predictability of formalities by border control including Customs. A significant initiative that is directly related to the private sector such as digitalization so that international shipments can be easily arranged and the ability to track & trace shipments can be facilitated by the government by issuing low-cost loans and grants to enable even SMEs to be digitalized. In addition, the logistics sector can improve its competence and the provision of wide range quality logistics services if a certification system for logistics professionals and companies is established by the government.

In general, customs brokers and freight forwarders play an important role in facilitating export and import activities. They are considered as authoritative information sources on applied trade rules and procedures; they are called upon to handle documentary requirements and customs clearance and, in the case of forwarders, are given the additional task of arranging transport. This role reflects at once the traders' limited capacity and, for many, modest experience in international trade. It is becoming all

the more vital in light of the ongoing reforms, the regulatory and administrative consequences of which remain unclear for exporters and importers.

However, freight forwarders charge what traders described as prohibitive fees, while the brokerage industry has been weakened by the dissolution of the Customs Association in 2016. While a new body was created, it remains understaffed, handled by one customs broker who volunteered his time to liaise with the State agencies and keep the brokerage community abreast of new/revised regulations and procedures. Customs brokers noted that it would be difficult to sustain these arrangements. There are also concerns over the role of customs brokers under the EAEU Union Customs Code. The code has introduced important changes. Brokerage activities are now restricted to companies, and not individuals as were the case prior to Armenia's accession to the EAEU. The companies referred to the Union Customs Code as customs representatives, should have at least two certified employees. These are granted brokerage licenses for an indefinite period, after the successful completion of the training course, and should adhere to the obligatory training every three years. Thus, the entire industry must be recreated in an organized and formally certified manner. Moreover, the line is blurred when it comes to the responsibilities of the brokers.

Producers complained that at 20 percent, the value added tax (VAT) is too high. They suggested reducing VAT levels to 15 percent, while others proposed granting traders longer payment period. In addition, an exporter noted that VAT payment is often complicated by the delayed receipt of required documents from EAEU buyers. Traders noted that they find themselves unable to benefit from the zero VAT rate and/or excise tax relief, with their partners, particularly Russian buyers, providing the confirmation of tax payment well beyond the 180 days deadline designated by law.

5 Logistics cost analysis

The quality and performance of logistics services differ markedly across countries. In Kazakhstan it takes 93 days to export a 20-foot full container load (FCL) container of cotton apparel, and in Mali 67 days, while in Sweden it takes only 6 days. In Namibia the costs of all trade-related transactions for a 20-foot FCL container, including inland transport from the ocean vessel to the factory gate, amount to slightly more than $3,000, and in Georgia to slightly less than $3,000. In Germany these costs amount to only $813, and in Sweden to a little more than $500.

These variations in time and cost across countries stem from differences in the quality and cost of infrastructure services, as well as differences in policies, procedures, and institutions. They have a significant effect on trade competitiveness. Many empirical studies have examined the effect of transport costs on trade flows. Hausman et al (2005)[11] reports a robust statistical link between transport costs and international trade flows. They also argue that a clear link exists between the quality of infrastructure and transport costs—and thus conclude that infrastructure investments are important for export-led economic growth. Other studies find that differences in logistics performance are driven only in part by poor quality of physical infrastructure services such as road, rail, waterways, port services, and interfaces. Instead, the inadequacies often are caused by (nontariff) policy and institutional constraints—such as procedural red tape, inadequate enforcement of contracts, poor definition, and enforcement of rules of engagement, delays in customs, delays at ports and border crossings, pilferage in transit, and highly restrictive protocols on movement of cargo.

There are factors that affect the cost of logistics. Depending on the mode of transportation, the Incoterms, headhaul and backhaul opportunities, figuring out how to allocate and control costs can be confusing. When purchasing logistics services either directly or through a third party, determining the purchase price results from both market supply and demand. As a logistics professional, the ability to maximize profits is determined by finding the balance between cost from a service provider's perspective and price from the service purchaser's perspective.

5.1 Single mode routes: trucking

Depending on the mode of transportation, a logistics service provider (LSP) could be a trucking company, a shipping line, a railway, or an airline. We next focus on trucking, also known as over-the-road transportation. We focus on trucking as it is the main single mode option and a dominant one available today to SMEs in Armenia. In the analysis that follows we present all cost items related to trucking that an SME needs to be aware of so that he can effectively negotiate a reliable well priced service, by trying to adjust to the LSPs needs. Trucking, like all LSPs, has both fixed and variable costs. A key characteristic of the OTR industry is high variable costs and low fixed costs. The fact that roadways are funded through public revenues contributes significantly to the low fixed costs of the OTR industry. Approximately seventy percent of all costs in the OTR industry are variable costs and attributable to operational costs. (Atri & Murray, 2021)[12].

[11] Warren H. Hausman, Hau L. Lee, and Uma Subramanian, 2005, Global Logistics Indicators, Supply Chain Metrics, and Bilateral Trade Patterns, World Bank Policy Research Working Paper 3773

[12] Atri, L., & Murray, D. (2021, November 23). *An analysis of the operational costs of trucking: 2021 update*. American Transportation Research Institute. https://truckingresearch.org/2021/11/23/an-analysis-of-the-operational-costs-of-trucking-2021-update/

Fixed costs in trucking are those expenses that will need to be paid regardless of whether or not the operation is hauling any freight.

The Service Purchaser's Perspective: A purchaser of logistics services is a company requiring freight to be transported from one location to another. Understanding the market rate for a move is imperative to operate an efficient supply chain. As a transportation service purchaser, the ideal outcome is to have goods delivered at the right time to the right location at the right price. Market factors such as supply and demand impact the price charged by OTR carriers. Truck driver supply dramatically affects the availability and price of OTR services. A buyer of logistics services needs to be in tune with crucial industry factors such as a truck driver shortage.

Breaking Down the Elements of Moving Freight: Understanding how transportation is priced is not as straightforward as it may seem. Several factors must be considered when establishing a pricing model. First, every driver has a maximum number of driving hours and a maximum number of on-duty hours set per day and per week. In many countries the regulated driver rest time is mandated. All driving and rest hours must be recorded and maintained in the driver's logbook. In today's trucking industry, many logbooks are maintained electronically. Strategic decisions regarding driver configuration and service hours need to be considered before setting a price for a transportation move. Preceding the driver configuration decision is the challenge of fully understanding each component of delivering freight. Underestimating how the components of a freight move fit together and how to allocate a cost to each segment could be the difference between operating profitably or the LSP losing money.

The elements of a move are as follows:

- Deadhead or bobtail: moving the tractor without a trailer.
- Freight pick-up (PUD): freight pick-up and delivery. The freight pick up strategy will depend on whether the load is priced as a live load, a drop and hook, or a terminal drop off.
- Live load: the driver backs into a dock with an empty trailer and waits while the freight is loaded. During a live load, the truck stays connected to the trailer.
- Drop and hook: the driver picks up a trailer of freight that has already been loaded and is waiting in the customer's yard.
- Terminal pick up: the freight is loaded and transported by a PUD driver to a terminal, where the load awaits a highway driver to move the freight to the destination.
- Bill of lading (BOL) preparation
- Highway miles
- Freight delivery: Once the freight has reached the delivery location, the pricing model should consider the delivery methodology. Will the freight be live offloaded, dropped off in the customer's yard, or will the freight be left in a terminal?
- Delivery instructions: The driver will wait for instructions at the delivery location regarding the load. Details such as where to park the load or which dock will receive the live load will be provided to the driver. Also, instructions on where to drop off the required delivery paperwork would be provided.
- Backhaul or deadhead: Once the freight is unloaded, the driver will either pick up a return load (a backhaul load) from the vendor or deadhead to the following trailer pickup location. Deadhead miles need to be considered into the costing model. If they are missed, the lane can quickly turn unprofitable.

Cost Per Kilometer, Cost Per Kilogram, Cost Per Hour or a Combination? Most often, full truckloads are priced on a rate-per-km basis. The service provider needs to calculate a rate per km for headhaul loads and a separate rate-per-km for the backhaul portion. Frequently trucking companies will establish a required annual rate-per-km that must be driven to break even. Equipment utilization and rate-per-mile have an inverse relationship. As equipment utilization increases and nears 100 percent, the required breakeven rate-per-km decreases.

Less than truckload (LTL) pricing per load is based on either the weight of the freight, cubic size, or a combination of both. Often LTL loads include an element of load consolidation, and as such, computing the required cost per pound involves a material-handling element. Due to the complexity of coordinating the elements of an LTL shipment, the cost is higher than a full truckload shipment. Charging an hourly rate for trucking is often associated with a shunting service or short PUD shipments.

Driver Configuration: Another decision point for the service provider is configuring the operator/driver component of a move. A single driver configuration occurs when one driver will complete the entire move from the point of origination, shipment pick up, delivery, and return. The single driver stays with the equipment for the duration of the move.

A slip seat move involves two or more operators. Each driver will operate the equipment for a set time interval - usually based upon the maximum allowable drive hours - and then a new driver will switch or relieve the previous driver.

Tandem or team drivers operate similarly to a slip seat move; however, both drivers stay with the equipment in a team driver approach. One driver rests in the cab while the other driver operates the truck in this configuration. Once driver A has exhausted their hours, driver B continues the route, and driver A rests in the cab or sleeper unit. An important note is that a tandem team is paid by the km as a whole; each driver is not paid separately by the km.

Route Planning: For a trucking company, effective route planning is critical. The ability to link headhaul and backhaul loads will maximize equipment utilization, revenue generation, and operator compensation. Taking into consideration of known or expected delays at BCPs or other bottlenecks is also critical: “If the wheels aren’t turning’, no one is earning'” applies here too, meaning that freight needs to be moving from location to location loaded, minimizing deadhead kilometers, so that a service provider can optimize revenue. The operation will lose revenue if a route has too many deadhead moves or inefficient slip seat driver exchange locations.

Fleet Management and Equipment Consideration: One element that a service purchaser underestimates are the trailer requirements of a service provider. Depending on the type of delivery agreement (drop and hook or live unload), the number of trailers required to fulfill a delivery requirement could fluctuate - the greater number of trailers required to service a customer, the greater the equipment cost. The greater the equipment cost, the greater the cost per km charge required to break even. In a live unload/reload scenario, the driver remains attached to the truck. In this type of delivery, one trailer is sufficient to service the customer. However, if the contract calls for a drop and hook delivery, a minimum of two trailers are required to service the customer. If the contract also calls for dunnage delivery, the contract could require three or more trailers to service the contract.

Understanding Lanes: When a logistics provider is responding to a request for a quote or invited to provide a bid, the bid is often based on a delivery route, also known as a lane. A service purchaser often specifies the delivery lane requirements. For example, if an OEM requires a truckload of product picked up in Moscow, Russia and delivered to Yerevan, that will constitute a lane. The lane could be a return route or a single leg. A return route means that the service provider would be required to pick up in Yerevan, deliver to Moscow– this could be classified as one complete turn.

The freight forwarders are usually the LSPs mediating between the exporter and the trucking company, and they are very aware of the issues above. Often, they try to maximize their own profit by taking advantage of opportunity costs on return trips with available capacity, but they tend to keep the difference, usually charging a published price to the exporter. If the shipper/exporter is a large entity they have the power to negotiate better tariffs and terms, which is not the case for the SME. Often SMEs attempt to by-pass the freight forwarder and deal directly with the trucking company. In this case, if they do not understand well the cost structure of the trucking company, they cannot secure a competitive price. Often times also they overlook the issue of reliability and quality of service, thus suffering long delays and occasionally damaged cargo (especially in the cold chain industry).

If the LSP market is professional, well trained and certified as explained above, then the costs can be driven down. The profit margin of the LSP will be benefitted from arranging shipments that fully adjust to the trucking company's requirements, so their cost is minimized and ultimately benefit themselves. Securing a return loaded trip is essential for a good freight forwarding company. In addition, they can benefit enormously by developing long-term contracts with trucking companies on specific lanes.

5.2 Multimodal routes

The main multimodal routes as discussed above are by train or truck to Poti/Batumi and from there by a vessel to a destination port, and the last mile to the door of the consignee.

The trucking component has the same structure as above. The only benefit of dealing with a truck in this setting is that it is easy for an exporting to the Port truck to find importing shipment and the Port is a major generator of such demand.

In this report we will not deal with the logistics cost analysis for vessels or trains as this is beyond our scope. However, we will consider all stages of multimodal transport for the sake of understanding the issues that may help form policy recommendations for the Government.

A typical multimodal trip from Armenia involves the following:

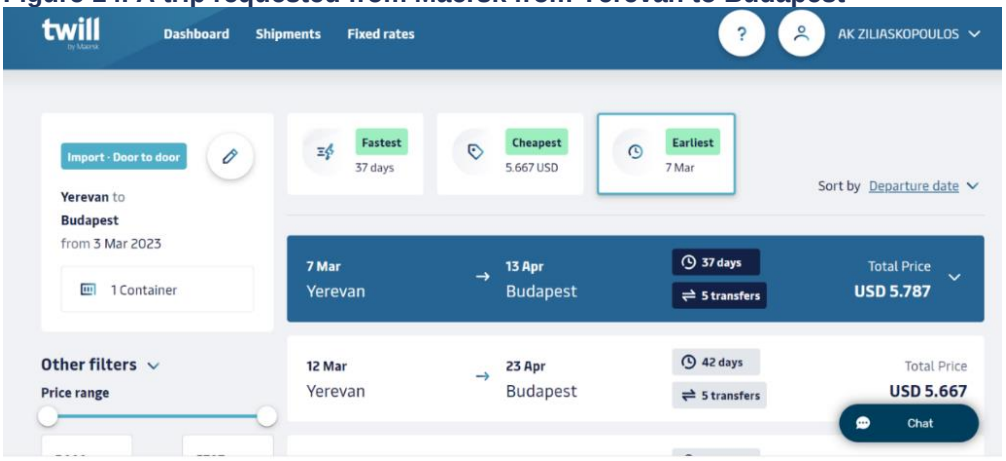
1. A truck picking from the shipper's/exporter's dock the shipment and transporting it to the Port; this is like a single mode OTR trip, and it was detailed above.
2. As soon as it arrives at the Port the truck must either be stripped or if it hauls a container over a trailer, to move it by a reach stacker from the trailer to the outbound area of the Port. Usually, in Poti and Batumi this is easier with a truck that in fact moves next to the terminal's outbound area and no further movements are needed by the truck. The train has additional difficulties as it usually gets to the GR's terminal at Poti and from there the train needs to be shunted and moved in small groups of wagons or individual wagons to the outbound terminal.
3. The Port performs at least two handling actions on a container: picking it up from the trailer and setting it on the ground (or stack of containers) and picking it again with a crane and loading it on the departing ship. This is a significant charge that contributes to the overall cost of the route.

4. The loaded vessel departs from Poti/Batumi and arrives at the destination port. Note that there may be intermediate ports. Especially the Port of Ambarli in Turkey tends to be a frequented by many shipping lines port where the containers are transshipped from one vessel to another depending on the destination. Note that often these charges are hidden from the shipper/freight forwarder and appear as a single Ocean Freight tariff. However, it is important to know these intermediate transshipment ports as they always decrease the reliability of the route.

A direct route should always be preferable even if the cost is higher.

In the figures below, one can see that MAERSK to transport a container from Yerevan to Budapest will need 37 days and USD 5,787. The analysis of the itinerary of the trip reveals 5 transfers that are outlined in Appendix A.

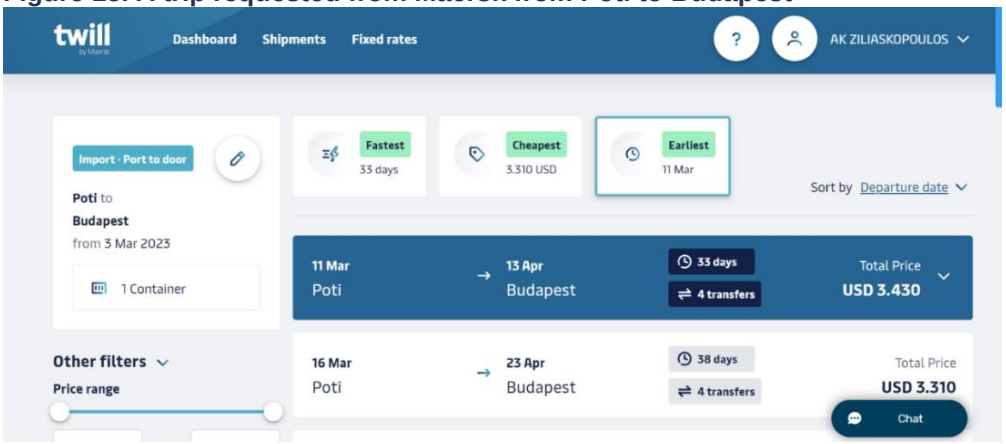
Figure 14. A trip requested from Maersk from Yerevan to Budapest



Source: Twill online booking

By simple inspection one can see that most of the time the container is transshipped at a Port. In addition, Maersk prefers to use Bremerhaven, Germany as a final port of entry into Europe instead of Varna, Burgas, Constanta or even Koper/Rijeka in Adriatic because it better consolidates that way the containers on its vessels.

Figure 15. A trip requested from Maersk from Poti to Budapest



Source: Twill online booking

In addition, by requesting another price quote this time from Port of Poti (which is the loading port) instead of Yerevan, the cost drops to USD 3,310, meaning that it charges USD 2,300 for the trucking leg, which though one can independently negotiate with an Armenian trucking company to less than USD 1,200.

A quote requested from Hapag-Lloyd that has direct service from Poti to Constanta and an integrated rail service from Constanta to Budapest responded that they do not offer a service from Yerevan. When we requested it from Poti or Tbilisi the cost came close to USD 4,000- and 20-days lead time but less frequent service.

The final leg is similar to the first one and involves over the land by truck or train transport to the final destination and unloading/handling the cargo at the consignee's dock.

In consultation with a maritime freight forwarding company, we developed Table 7 below where we took a sample of quotes from Yerevan to various destinations in a distance up to 1,000km from the final port. The distribution of the costs and lead times for each of the above discussed legs of a multimodal trip were indicatively computed.

Table 7. Freight cost calculation

Cost item	Cost, USD per container	Cost Distribution	Time (Days)	Time Distribution
Origin Land freight	1,200	26.21%	3	15.00%
Terminal Handling Origin (Poti)	368	8.26%	4	20.00%
Security fee	10			
Ocean Freight	1,200	33.89%	6	30.00%
Marine Fuel Overcharge	332			
Inspection Fee	20			
Terminal Handling Destination	289	6.53%	3	15.00%
Terminal Security	10			
Destination Land freight (Rail/Truck)	1,000	25.11%	4	20.00%
Handling at Door	150			
Total	**4,579**	**100.00%**	**20**	

Source: The Consultant

5.3 Total economic cost of logistics

Efficient logistics services play an essential role in the worldwide flow of goods and services and in the ability of countries to attract and sustain investment. Inefficiencies in logistics are highlighted as an important constraint on firms' productivity and competitiveness in developing countries by almost all related studies.

Logistics inefficiencies harm the competitiveness of private firms through their effects on both cost and time. **The costs relate not only to the direct costs of transporting products; goods in transit incur indirect costs such as inventory holding costs** (Kumar et al, 2018)[13]. The longer the transit time, the higher the costs. Hummels and Shaur (2012)[14] finds that shippers are willing to pay a premium for faster delivery. **Other indirect costs are incurred when delivery times and reliability are uncompetitive**, severely affecting a country's position in highly competitive international markets demanding just-in-time delivery. Product value often declines with time while in transit. For perishable products, spoilage or wastage may increase with transit time. Products with time-sensitive information, such as newspapers, decline sharply in value as that information becomes obsolete. Seasonal and fashion apparel has similar time sensitivity. **These costs can also reflect lost opportunities, as when critical inputs cannot reach manufacturing plants in time or perishable commodities cannot reach markets in time—or when production plants must hold higher-than optimal levels of raw material inventories to cover for logistics delays.**

The cost of unreliability of the transport chain for importers of Armenian products

The cost of unreliable supply chains has been a topic of extensive research in international literature. While various econometric models have been proposed, most of them are country, commodities, and industry specific, though some generalizations could be made as there are commonalities on the findings of the published research. Hummels and Schaur (2012) used US imports data that provide rich variation in the premium paid for air shipping and in time lags for ocean transit to extract consumer's valuation of time. They estimated that each day in transit is equivalent to an ad-valorem tariff of 0.6 to 2.3 percent and that the most time-sensitive trade flows are those involving parts and components trade. Jin and Shams (2016)[15] presented the findings of a valuation study recently conducted in Florida to quantify the freight users' willingness to pay (WTP) for the improvement of transportation-related attributes, particularly reliability. A stated preference (SP) survey was developed and administered between January and May 2016. The survey collected responses from 150 shippers, carriers, and forwarders. After rigorous data checking and validation, econometric models, including mixed and multinomial logit models, were developed to estimate the users' WTP for the improvement of transportation time and reliability. The econometric model which indicated that the value of reliability (VOR) ranged from $17.00 to $177.00 per shipment-hour and $1.38 to $10.20 per ton-hour, while the value of time (VOT) values ranged from $12.00 to $277.00 per shipment-hour and $0.50 to $23.00 per ton-hour among the user groups. Carriers were found with the lowest willingness to pay (WTP)

[13] Utsav Kumar, Ben Shepherd, and Roselle Dime, 2018, Trade Costs , Time, and Supply Chain Reliability, Asian Development Bank

[14] David Hummels and Georg Schaur, 2012, Time as Trade and Barrier, National Bureau of Economic Research.

[15] Xia Jin and Kollol Shams, 2016, Examining the Value of Travel Time Reliability for Freight Transportation to Support Freight Planning and Decision-Making, Transportation Statistics Office, Florida Department of Transportation

compared to other freight users. Raballand and Marteau (2007)[16] has documented probably the most relevant to Armenia's case (though dated) on capturing the reliability through the concept of **Total Logistics Cost** which includes three (3) broad components as follows:

The Three Components of Total Logistics Costs

$\boldsymbol{TC = C1 + C2 + C3}$**, where**:

- **TC** is Total logistics cost;
- **C1** is Transportation Costs = Fees paid for actual transit transportation services to truckers or rail operators;
- **C2** is Other Logistics Costs = (2a) transit overheads: fees, procedures, facilitation payments + (2b) Fixed costs of shipments;
- **C3** is Delay Hedging Costs = (3a) in transit moving inventory costs + (3b) induced costs to hedge unreliability inventory and warehousing costs or shift to faster more expensive mode of transportation.

Especially for landlocked countries the fragmented transit chain and variance in processing time not only causes long lead times but also uncertainty and unpredictability. This increases the logistics cost for economic operators who are willing to pay premium for reliable logistics solution or need to maintain high inventories.

Reportedly, for maritime transport, a standard deviation of 20% of transport time increases transport costs by nearly 45%. Although difficult to quantify, the non-transport costs may be even more for shippers. They also argue that for emerging markets, non-transport-related logistics costs were 10% of the GDP and this was almost equal to the extent of transport costs in total logistics costs.

In general, studies demonstrate that increasing transit time and variance in transit time causes higher inventories and ultimately higher logistics costs. Due to uncertainty, companies need to maintain high safety stocks to avoid any shortage of raw materials or intermediate products.

For example, in the textile industry, product quality, reliability and time to supply goods from developing countries to Europe or the US are as important as the price. Importers with suppliers in landlocked developed countries tend to maintain much higher safety stocks in their warehouses for every commodity they import, which they claim can double the logistics cost. Similarly for importing commodities to countries with unreliable supply chains: for example, for two branches of auto-parts supplier of the same automobile maker, while the inventory level reached 7 days for the branch located in Italy, inventory level was 35 days for the branch located in Morocco. The value of reliability is related to (3,5) the reliability hedging costs which according to the authors can be up to 61% of the direct transport costs, while consignees are willing to pay on average an additional 100% of the transport cost for just-in time zero deviation delivery time logistics.

Raballand and Marteau (2007) further suggested that complementary research is required in at least three areas:

[16] Gael Raballand and Jean-Francois Marteau, 2007, The Cost of Being Landlocked: Logistics Costs and Supply Chain Reliability, World Bank

1. An understanding of the mechanisms linking the structure and magnitude of logistics costs (especially the cost of uncertainty) and competitiveness;
2. Deeper understanding of the necessary preconditions and enabling policies to implement efficient transport and transit schemes: trucking sector reform, case of small shipment, political economy of transit friendly reform; and
3. Empirical investigation of supply chain performance and its nexus with traders' behavior, inventory holdings or modal choices needs detailed assessment, when shipment level data is available for various type products. In terms of donor funding, most actions above do not require major investment, except for critical infrastructure but the donor community's intervention may be critical to provide an external "honest broker" role (and to crystallize sometimes conflicting positions within stakeholders).

Glossary

The Consultant	MB Consulting CJSC
3PL	Third-party logistics
4PL	Fourth-party logistics
ADY	Azerbaijan Railways
APM	APM Terminals , https://www.apmterminals.com/en/about/our-company
BCP	Border crossing point
BOL	Bill of lading
BTK	Baku-Tbilisi-Kars
CAGR	Compound annual growth rate
CEFACT	Center for Trade Facilitation and Electronic Business
CFA	Chartered Financial Analyst
CIS	Commonwealth of Independent States
CJSC	Close Joint Stock Company
EAEU	Eurasian Economic Union
EBRD	European Bank for Reconstruction and Development
EU	European Union
EUR	Euro
FCL	Full container load
FEZ	Free economic zone
FSIB	Food Safety Inspection Body
GDP	Gross domestic product
GoA	Government of Armenia
GR	Georgian Railways
HS	Harmonized system of commodity codes
IC	Investment Council
ICGI	Investment Climate and Governance Initiative
ICT	Information and communication technology
kg	Kilogram
km	Kilometer
LPI	Logistics Performance Index
LSP	Logistics service provider
LTL	Less than truckload
M	Million
mm	Millimeter
n.e.c.	not elsewhere classified
N-S	North-South
OEM	Original equipment manufacturer
OTR	Over-the-road
PCT	Piraeus containers terminal

PHD	Philosophy Doctor
PUD	Pick-up & delivery
RBCP	Railway border crossing point
RO-RO	Roll-on/roll-off
RZD	Russian Railways (Rossiyskie zheleznye dorogi)
SCR	South Caucasus Railway
SE	South East
SECA	Sulphur Emission Control Area(s)
SME	Small and medium enterprise
SP	Stated preference
TEN-T	Trans-European Transport Network
TEU	Twenty-foot equivalent unit
TRACECA	Transport Corridor Europe-Caucasus-Asia
TRAINS	Trade analysis information system
UK	United Kingdom
UN	United Nations
US	United States
USD	United States Dollar
VAT	Value added tax
VOR	Value of reliability
VOT	Value of time
WB	World Bank
WTO	World Trade Organization
WTP	Willingness to pay

Appendix A - Full Schedule and Itinerary for the above requested trip

Full schedule & deadlines

7 Mar
03:00
ESTIMATED PICK-UP
Yerevan
Truck
9 Mar
03:00
ESTIMATED ARRIVAL
Poti, Georgia
Poti Port Terminal, Poti
11 Mar
03:00
ESTIMATED DEPARTURE
Poti, Georgia
Barge
Vessel: BERNARD A
Voyage number: 310W
14 Mar
19:00
ESTIMATED ARRIVAL
Ambarli Port Istanbul, Turkey
Marport Terminal - Ambarli, Ambarli Port Istanbul
15 Mar
19:00
ESTIMATED DEPARTURE
Ambarli Port Istanbul, Turkey
Truck
15 Mar
20:00
ESTIMATED ARRIVAL
Ambarli Port Istanbul, Turkey
Kumport Terminal - Ambarli, Ambarli Port Istanbul
20 Mar
12:00
ESTIMATED DEPARTURE
Ambarli Port Istanbul, Turkey
Ocean
Vessel: JAZAN
Voyage number: 310N
4 Apr
14:00
ESTIMATED ARRIVAL
Bremerhaven, Germany
NTB North Sea Terminal Bremerhaven, Bremerhaven
9 Apr

20:00
ESTIMATED DEPARTURE
Bremerhaven, Germany
Rail
12 Apr
03:00
ESTIMATED ARRIVAL
Budapest, Hungary
Mahart, Budapest
13 Apr
15:00
ESTIMATED DEPARTURE
Budapest, Hungary
Truck
13 Apr
17:00
ESTIMATED DELIVERY
Budapest