



## PROSPECTS FOR THE FORMATION OF THE TRANSPORT AND LOGISTICS HUB OF GEORGIA

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### ABSTRACT

The paper discusses the development prospects of the transport and logistics corridor of Georgia in a new context. The demand for the transport corridor of our country has increased. In such conditions, Georgia has a chance to establish a favorable transit hub image among alternative destinations.

**Objectives:** The purpose of the study is to study the perspective of the development of the transport-logistics corridor of Georgia in a new context, to reveal the existing transit potential in this area and to develop recommendations for its implementation.

**Methods/Approach:** Methods of data collection and observation were used during the processing of the paper. The method of data collection is mainly used in the transit-logistics system of Georgia, on the basis of which the existing potential in the field of transit shipments of Georgia was identified and the possibilities of its implementation were analyzed.

**Results:** In order to increase the competitiveness of the transit-logistics channels of Georgia, it is necessary to improve the connections between the individual links of the logistics chain. In order to increase the transit capacity of Georgia, it is necessary to properly manage its logistics systems. Significant and rapid changes in the global supply chain provoked by the Covid-19 pandemic can become an opportunity for Georgia to rationally use the country's geo-economic location. Due to the disruption of the global supply chain due to the pandemic, the so-called New Silk Road is becoming important for Georgia. The formation of the "Middle Corridor" will further strengthen the potential of Georgia's logistics hub.

**Conclusions:** In order to increase the competitiveness of the transport and logistics chain of Georgia, it is necessary to:  
1. Revealing the competitive advantages of Georgian transport and logistics companies and a complex study of their development; raising the professional knowledge of the staff employed in these companies, training their managers at all levels of management;  
2. Implementation of an information technology system in order to obtain the right information on time and develop the right strategy.

**Keywords:** Management of logistics systems, transport hubs, distribution and exchange of products, Transit potential, synchronization of logistics chain links.

**JEL classification:** O18, R41, R42

**Paper type:** Case Study;

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### INTRODUCTION

In the post-pandemic period, the issue of developing new routes of the Europe-Caucasus-Asia transport corridor, in which Georgia occupies a strategic place, has been put on the agenda in a new way. In such conditions, the study of the transit potential of Georgia is very relevant in the field of accelerating the rate of economic growth of Georgia. In particular, in recent months, the interest of Kazakhstan, Uzbekistan and



Turkmenistan in the transit of their goods to the European market through the Georgian transport corridor has increased. In such conditions, Georgia has a chance to establish the image of the most favorable, attractive, main transit node among the alternatives of the trans-Caucasian transport and logistics corridors. It is important that the Government of Georgia adequately respond to the demands and challenges created in the field of transit transport, promote the dismantling of existing barriers in this field, reduce freight transport rates and increase Georgia's transit capacity.

**The aim of the study** is to determine the transit potential of Georgia in the Europe-Caucasus-Asia transport-logistics corridor and to determine the ways of their implementation in the new reality. Statistical methods of material collection, grouping and analysis were used to realize this goal.

**The hypothesis of the paper** is that if European and Asian manufacturers prefer to send their products to Europe from our country to Asia or vice versa, Georgia will not have difficulty establishing its role and place in the Eurasian region.

**The methodological basis of the paper** is the works of Georgian and foreign scientists in the field of logistics system management, data collection and analysis methods.

Many works on the transit potential of Georgia have been developed by Georgian and foreign scientists, but their research is mainly focused on the possibilities of restoring the historical "Silk Road" of Georgia. Many works on the transit potential of Georgia have been developed by Georgian and foreign scientists. Their research is mainly focused on the possibilities of restoration of the historical "Silk Road" of Georgia. The flaw in their research is that, They believe that the success of Georgia as a small country is due to the systematic development of many interrelated components in international logistics. They argued that at the modern stage only the geographical transit location cannot ensure the possibility of the country becoming an inevitable logistics center.

**The potential usefulness of the proposed** study lies in the fact that the transit potential of Georgia is studied in the new reality of the Transcaucasian Corridor, against the background of the ongoing hostilities between Russia and Ukraine in the Black Sea region.

#### ***Opinions of scientist-economists about the transit potential of Georgia.***

Consider the opinion of some scientists and researchers about the transit and logistics potential of Georgia. For example, scientist Irakli Danelia in his article "Georgia - a logistics hub" notes that "the success of a small country like Georgia in international logistics is determined by the orderly development of many interrelated components, and at the modern stage, only a geographically transit location cannot provide the inevitable opportunity to become a logistics hub." (Danelia, 2022: 12).

Georgian researcher, Zaal Giorgadze, in his work: "Perspectives for the establishment of a regional hub in Georgia", notes that "the inclusion in the transport and communication networks of the European Union opens



completely new opportunities for the citizens and businesses of Georgia and contributes to the economic growth of the country: Georgia is the transport hub of two large transport markets of Europe and Asia It becomes one of the important centers connecting the road." (Giorgadze, 2019: 3).

Also, the researcher of the transit potential of Georgia: Nukri Kvlividze, in his work: "Problems of creating a logistics cluster in Georgia", notes that "Georgia is a key country of the Europe-South Caucasus-Central Asia transport system. It has a key transit function. Therefore, the improvement of transport infrastructure and means of transport is a necessary prerequisite for the economic and social development of the country." (Kvlividze, 2020: 34).

In his work "Logistics in the Georgian Economy", Leri Makharadze notes that "Georgia disposes of the countries of the Caucasus by means of logistics, as it is the only country that passes through the Black Sea and has the greatest maritime potential towards Europe. Georgia's good-neighborly political relations with the neighboring countries, Azerbaijan, Armenia and Turkey, are important. Transport Movement from Azerbaijan to Turkey via Armenia, or vice versa from Turkey to Azerbaijan, is impossible due to political conflicts between these countries, which at this stage is favorable for Georgia as a country that conducts logistics channels." (Makharadze, 2019: 3).

In their article "The role of logistics in the development of the Georgian economy", Eter Sheverdashvili and Shota Totikashvili note that "taking into account the favorable geographical location, Georgia has the potential to become the main logistics hub of the Caucasus and Central Asia. Logistics has an important place for the development of the Georgian economy, therefore, effective transport and logistics Creating a system is one of the main and necessary factors for increasing the country's competitiveness. (Sheverdashvili et al., 2017: 1).

Thus, as can be seen from the analysis of the studies carried out so far by Georgian and foreign scientists on the transit potential of Georgia, due to its strategically important geographical location, Georgia has a key transit function in the Caucasus and beyond. The state of Georgia's logistics system and prospects for future development are reviewed in detail in the works on Georgia's transit function. In their studies, the geographical potential of Georgia and the ways of its proper use have been studied, so that the country can take a proper place in the region and become the main link connecting Europe and Asia. The problems of the development of the logistics system of Georgia and the ways to solve them are studied in detail in the works of Georgian scientists. While studying the transit potential of Georgia, Georgian and foreign scientists came to the conclusion that Georgia needs logistic know-how. Today, the demands made by foreign suppliers to Georgian shipping companies are becoming clear. My original vision in the work, unlike other scholars, is that it discusses the prospects of the formation of the transport and logistics center of Georgia in the new reality of the modern post-covid period, when European and Asian countries have radically revised their transit channels.



Part of the previously unsolved problem in the field of the formation of the transport and logistics center of Georgia, to which the article is devoted, is the finding of new opportunities created in the Europe-Asia transit corridor and their use in order to identify and implement Georgia's transit potential.

## METHODOLOGY

**The methodological basis of the paper** is the works of Georgian and foreign scientists in the field of logistics system management, data collection and analysis methods (Abuselidze, 2021; Ji *et al*, 2021; Putkaradze *et al*, 2020; Tsuladze, 2020). The work is built on the relevant base of the research of the ideas of theoretical concepts in the field of transport logistics. The work is based on research-intellectual works prepared by Georgian and foreign researchers in the field of transport and logistics. The statistical (data collection, grouping and analysis) methods used during the research of the paper are in accordance with the direction of research in the field of transport and logistics.

## RESULTS

### **Logistics challenges in the transit area of Georgia**

There are a number of logistical problems in the transit sector of Georgia. In particular, the tax code of Georgia for shipping companies is difficult to understand and vague, transport infrastructure is not well developed, Tariff benefits are imposed in a selective, discriminatory manner, Georgia's geopolitical alignment and interests are not well represented, Often, the interests of shipping companies are taken into account at the expense of the common interests of the country, Domestic transport tariffs are high, which hinders the development of transport companies, as well as reduces the volume of cargo passing through Georgia, the efficiency of regional transport corridors and the development of intra-country transport.

For the development of the transport hub of Georgia, political or private competitive commercial interests, in many cases, are negatively perceived by the main suppliers or harm the free movement of cargo flows, which has a negative impact on the country's economy. There are certain commercial organizations in the Eurasian region that influence transit shipments. They have administrative-political resources and in many cases, they use it to promote their personal interests, in certain commodity deals and for the companies they are associated with. As a result, there has been a continuous decline in cargo volumes in the Caucasus transit corridor in favour of alternative routes, which has a negative impact on service companies, terminals, ports, the economy and the development of the region as a whole.

For the development of the transportation industry, the development of Internet reservation technology is necessary. Only the development of a fair and open online booking platform can ensure increased transparency and simplification of administrative procedures, trouble-free organization and management of logistics business. Such services will contribute to the free movement of cargo flows in the Caucasus region. Online



shipping booking platform should be monitored by independent institutions to avoid possible intervention and human factor influence.

### **Development prospects of the logistics system of Georgia**

From the beginning of 2020 until now, the pandemic waves have significantly disrupted the smooth process of the global supply chain and caused major shocks, which ultimately increased the price of sea freight sharply - by about 300-400 percentage, despite the sharp increase in demand for containerized shipping and, therefore, price increases. Supply growth in the maritime industry is not projected for the next few years, which means that the increased demand for freight will have to be allocated to other types of transport. As a rule, the first alternative is container rail transport, when we are talking about intercontinental freight, followed by road transport over relatively short distances or at the regional level. Thus, since our country has a natural geographical distribution between the West and the East, and for a long time, we have been trying to develop the so-called Middle Corridor. This is the time when it is possible for this transit function to work at full capacity. During the pandemic period of 2020, cargo traffic from China to Europe and vice versa increased sharply and reached about 1.3 million TEU, which is a 50% increase compared to the same data of last year 2019. Obviously, competitors are becoming active in cargo transportation between China and Europe, but the demand is growing so much that their resources are not enough and without much effort it is possible to drop the cargo in our corridor as well, but for this it is necessary to meet certain criteria, which will make Georgia's possibilities of becoming a logistics hub real.

At present, in order to make container shipments in the Middle Corridor intensive and regular, it is important to improve the transport infrastructure and increase the capacity both by sea and by rail, simplify the border crossing procedure in the direction of Azerbaijan and Turkey, and achieve competitive penetration rates between the state railway operators of China, Kazakhstan, Azerbaijan, between the sides of Georgia and Turkey, promoting the creation of quality logistics services by introducing 3PL and 4PL services, which is possible by attracting international investors, and ensuring traceability in the transit corridor is one of the most important components that determine the competitiveness of the corridor and ultimately the reduction of transit time.

In the conditions of the pandemic situation and against the backdrop of disruptions in the global supply chain systems, it becomes important to diversify internal and external regional supplies and, accordingly, to establish a niche of attraction in new transit corridors. Thus, parallel to the above-mentioned New Silk Road or Middle Corridor, the so-called Raising the importance of our transit function in the Viking transit corridor (Scandinavian countries-Lithuania-Belarus-Ukraine-Georgia-Caucasus and Central Asia), which will further strengthen the potential of Georgia's logistics hub.

Among the above-mentioned components, the issue of logistics infrastructure and capacity is singled out as the most important. It is important to develop services and introduce multimodal transport infrastructure. On the other hand, one of the most important issues is the traceability of freight in the corridor, which is directly related to the digitalization of the transit corridor, which will increase the visibility of container



shipments in any country of the corridor, between vehicles and state customs authorities and most importantly between the sender and receiver of cargo.

Which is a unified electronic platform intended for all parties involved in international shipping, such as government agencies (customs institutions), seaports, railways, transport and logistics companies, as well as cargo owners themselves. So, they can automatically control their shipments and related administrative, operational, traceability information. It is believed that the introduction of the platform will significantly contribute to raising the level of logistics provision of the country, the development of the transit function at a very fast pace, and increasing the competitiveness of the middle corridor, since digitization/digitalization of the transit corridor is one of the important criteria for the greater activation of our corridor in relation to competing transit routes. In October, within the framework of the UN Global Transport Conference the mentioned platform was presented to the high-level representatives of the member states. Thus, if the global electronic platform is adapted within the TRACECA member states, it will definitely help to increase the competitiveness of the corridor and, first of all, to accelerate the formation of Georgia as a logistics hub.

Georgia's geopolitical and geoeconomic location, as well as its transit potential, is an important factor for improving the technological environment of our country. Georgia is located at the crossroads of Europe and Asia, but the country makes a choice in favour of Europe and "it can be said without exaggeration that the country has always tried to be a part of Europe, not only geographically; Unfortunately, in the past centuries, due to one-sided desire, the dream could not come true" (Danelia I., 2022). Georgia's coastal location gives the country an advantage compared to Azerbaijan and Armenia. Georgia connects the countries of the Black Sea region through the Black Sea, and the countries of the Mediterranean Sea through the Bosphorus and Dardanelles Straits. It is possible to connect to the whole world through the Strait of Gibraltar and to the countries of Eastern and Central Europe through the Danube River.

Georgia has unique location on the Eurasian continent. Georgia is quite small, but has a very strategic geographical location. Georgia connects the Asian part with the Black Sea region and the European part. After the collapse of the Soviet Union, the Georgian government correctly realized the strategic role and place of our country in the civilized world. The role of Georgia, as a connecting link between two continents, is the development of transport highways and the implementation of the transit concept Strengthening the transit energy corridor is of great importance for Georgia due to its strategically important geographical location. Thanks to the transit and energy corridors, Georgia has gained the status of a geopolitically strategic country that supports the balancing of economic interests between European and Asian countries. "Georgia's well-developed transport, energy, logistics and agricultural infrastructure is one of the most important factors that can increase the competitiveness of our country and realize its full transit potential.

Logistics, as one of the fastest growing sectors of the modern world, will allow Georgia to use its transit and trade potential. Accordingly, the state policy should be aimed at the development of this sector, including through infrastructure development, attracting investments in the sector and integrating the country with international and regional transport systems" (Danelia I., 2022). The implementation of large-scale regional



projects (transnational projects in the fields of energy and transport) in which Georgia is involved is an important factor in creating new jobs and strengthening the country's competitiveness.

The construction of highways, the Transcaucasian transit highway and the development of infrastructure in our country led to high rates of economic growth. The advantage of the geographical location of Georgia increased with the construction of Baku-Suf and Baku-Tbilisi-Ceyhan pipelines. Thanks to these pipelines, Georgia "acquires a very important international economic function... the pipeline for Georgia is a "guarantee of security" for strategic investors" (Sheverdashvili E., 2017). The Western Route Export Pipeline (WREP), like the famous Baku-Sufsi pipeline, is the first investment of an international oil consortium in Georgia. Through this pipeline, crude oil from the Chirag oil field on the Caspian Sea goes through the Sangachal terminal to the Supsi terminal on the Black Sea coast of Georgia. The intergovernmental agreement on the construction of the pipeline was signed between Georgia, Azerbaijan and Turkey in 1999 at the Istanbul Summit of the OSCE. Baku-Tbilisi-Ceyhan (BTC) is the first and shortest oil transportation route between the Caspian and Mediterranean seas. The total length of this one of the longest pipelines in the world is 1768 km. Among them, 443 km stretch through Azerbaijan, 249 km through Georgia and 1076 km through Turkey.

BTC transports oil from the Azeri-Chirag-Guneshli field to the Turkish Mediterranean port of Ceyhan. It is the second longest pipeline in the world. The longest is the "Druzhba" pipeline, which carries oil from Russia to Central Europe (Makharadze L., 2019, p. 17).

In addition to the above-mentioned geo-economically strategic and important pipelines, there are two more important gas pipelines in Georgia - North-South and Baku-Tbilisi-Erzrum pipelines. The North-South gas pipeline was built in the second half of the 20th century. Thus, Russian gas is supplied to Georgia and Armenia. The Georgian section of the pipeline is 221 km long. The South Caucasus Pipeline (SCP) also known as Shah Deniz, was built to transport natural gas from Shah Deniz and other Caspian fields to Turkey, and then from Turkey to European markets. Construction of SCP was completed in 2006. Georgia received gas from this pipeline in 2007. According to the agreement on the pipeline project Georgia is not only a transit country, but also a natural gas consumer (Makharadze L. 2019: p. 34). Georgia has the opportunity to purchase 5% of the gas transported from Azerbaijan to Turkey at the desired price. In addition, during the first 20 years of the project's operation, Georgia will purchase an additional amount of gas (half a billion cubic meters of gas annually) from the project's investors at a special price.

In the future, it is planned to connect the pipeline with Turkmen and Kazakh producers. 5 million tons of oil per year through the Baku-Sufsi pipeline, 50 million tons of oil through the Baku-Tbilisi-Ceyhan pipeline, and 30 billion cubic meters of gas per year through the South Caucasus Pipeline (SCP). BP, the largest shareholder of the consortium, manages the project in Georgia. BP is one of the largest investors in Georgia, having invested more than 1.5 billion dollars in infrastructure and social projects. During the negotiations held in 2009-2010 within the Southern Corridor, an agreement was reached to develop a new gas transportation route.



The agreement provided for the implementation of the AGRI-Azerbaijan-Georgia-Romania-interconnector project, which provided for the transportation of natural gas (in liquid form) to Romania, and then to the European market via Georgia and the Black Sea. AGRI responds to some of Europe's challenges, such as energy diversification and the design of alternative routes for gas suppliers. It has international support (Sheverdashvili E., 2017). New energy corridors through Georgia are opening not only because of the increase in oil exports in the Caspian Sea region, but also because of the desire of Kazakhstan and Azerbaijan to diversify their oil flows and be less dependent on the direction of Russia. Full use of its transit capacity will be beneficial for Georgia from both political and economic point of view.

Georgian Railways plays an important role in utilizing the transit potential. Railway transport in Georgia has almost 140 years of history. The Georgian railway with its developed infrastructure is a determining factor for the successful operation of the Europe-Caucasus-Asia transit corridor. Baku-Tbilisi-Kars railway (Silk Road) has crucial importance, the beginning of a new era in terms of increasing Georgia's transit opportunities and developing new businesses. "The construction of the New Silk Road underscores Georgia's transformation into a multi-regional trade gateway connecting Europe, East Asia, India, Central Asia and the Middle East. Thanks to Georgia, billions of consumers in Asia and Europe will have easy access to both companies and individuals, as well as Asian commodities and energy resources.

The historical "Silk Road" connects the countries through Georgia by a short land route. Georgia's geographical location really helps "the country to become a regional hub". Roads are one of the most important determinants of the current situation and development prospects of Georgia's transit potential. The length of public roads in Georgia is 6901 km. The total length of transit roads of international importance is 1603 km, and the length of secondary roads is 5298 km. On average, transit through Georgia is about 24.5 million tons of goods and 257 million passengers per year. Road transport has a large share (about 59.9%) of the total transit goods (Kvividze N., 2020). The Asian Development Bank (ADB) supports the development of Georgia's national transport policy and the relevant action plan, which will help increase the efficiency of the transport sector and improve competitiveness, attract additional investments, develop multimodal transport and integrate transport systems (Giorgadze Z. (2019, p. 36).

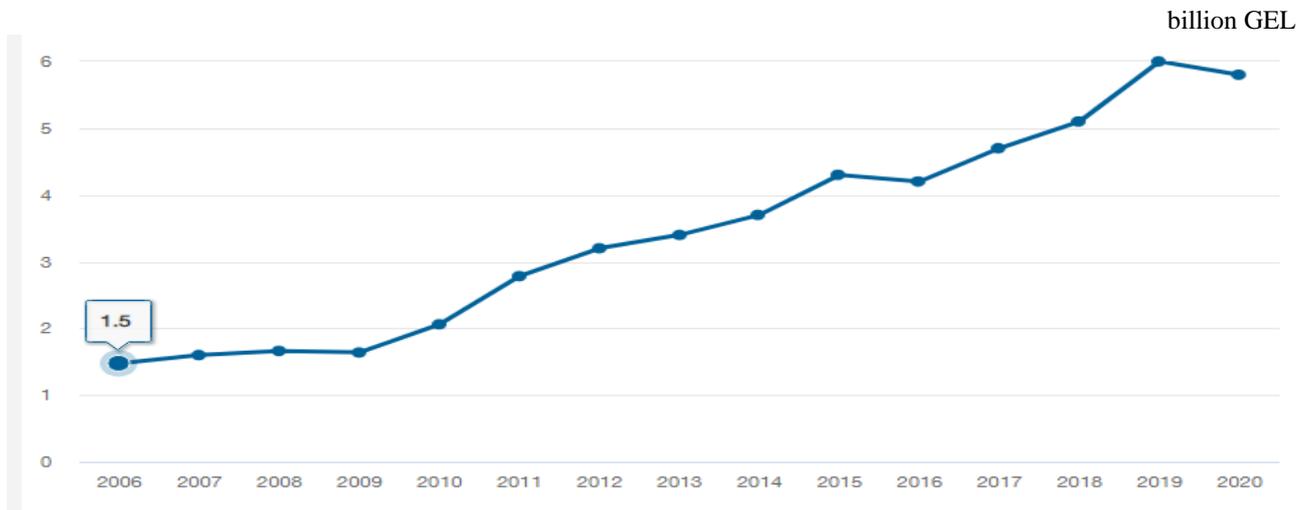
Georgian aviation plays an important role in the transit potential of Georgia. However, due to the COVID-19 pandemic in 2020-2021, the number of passengers has decreased dramatically, and since February 24. , 2022. Due to hostilities between Russia and Ukraine, the number of passengers arriving in Georgia from Ukraine, Russia, Moldova and Belarus has increased.

Georgia has strategically important ports and terminals such as Batumi, Poti and Kulev, which are directly connected to the railway lines of Azerbaijan, Ukraine, Russia and Bulgaria. (Giorgadze, Z., 2019, p. 34).

The diagrams below give information about the situation in the field of logistics (transport-warehousing) in Georgia. As can be seen from these diagrams, the transit-logistics potential of Georgia in 2006-2020 is characterized by a growth trend according to all parameters (turnover volume of enterprises engaged in transportation and warehousing in this field, released products, number of employees, purchase of goods and

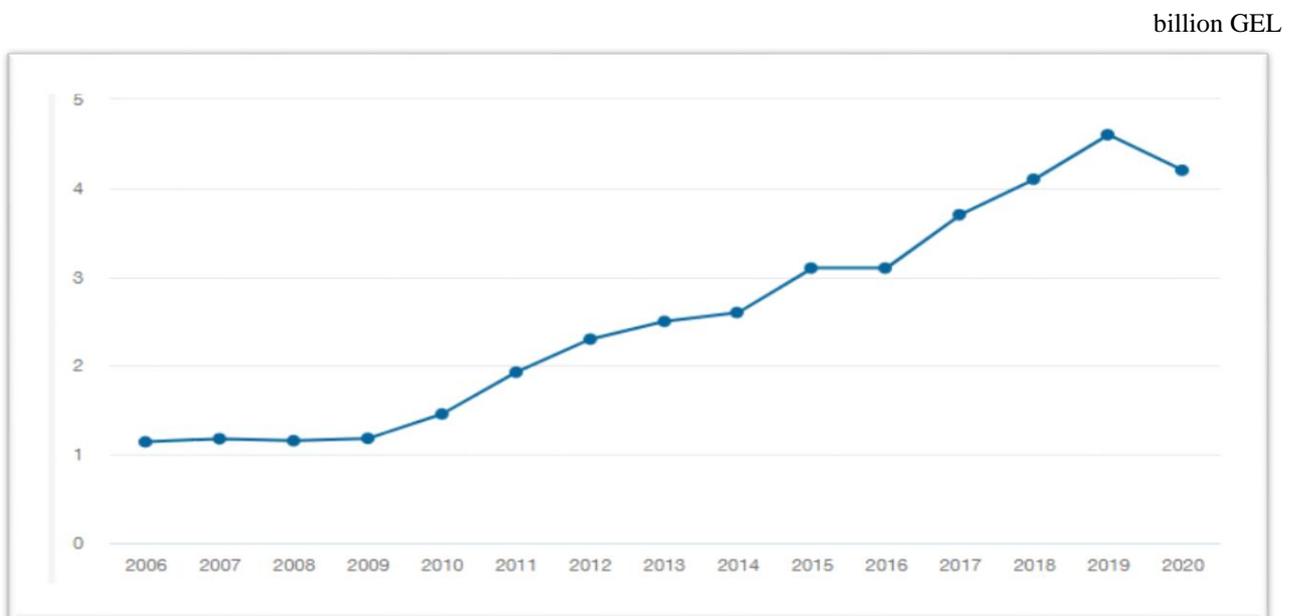


services, and investments made). In particular, the enterprises operating in the field of logistics in Georgia in 2006-2020 reached the highest figures in all directions in 2019, then experienced a decline, which was caused by the COVID-19 pandemic. In particular, in 2020, the volume of turnover in enterprises engaged in transportation and warehousing amounted to 5.8 billion GEL (see fig. 1).



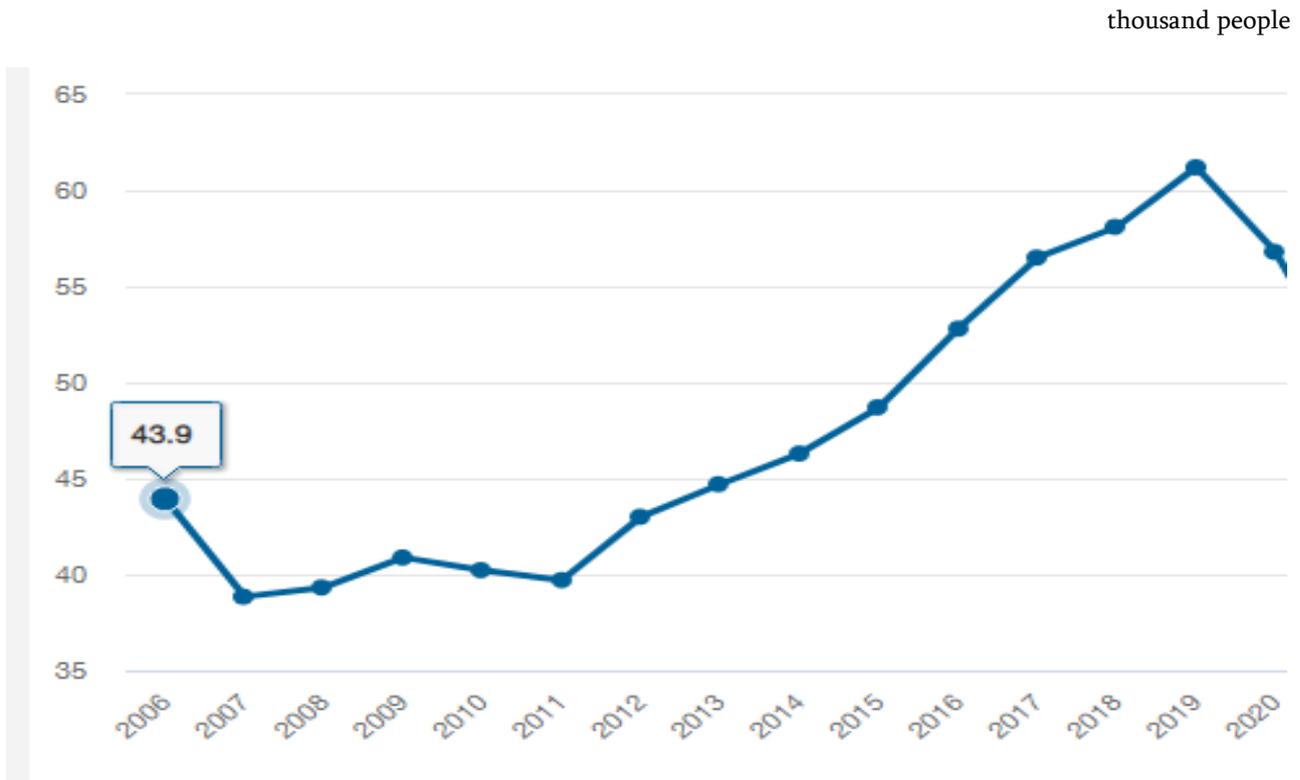
**Fig 1.** Turnover volume of enterprises engaged in transportation-storage.  
Source: <https://www.geostat.ge> Service statistics. Transport and storage. Rotation.

In the same year, the products produced by these enterprises amounted to 4.2 billion GEL (see fig. 2).



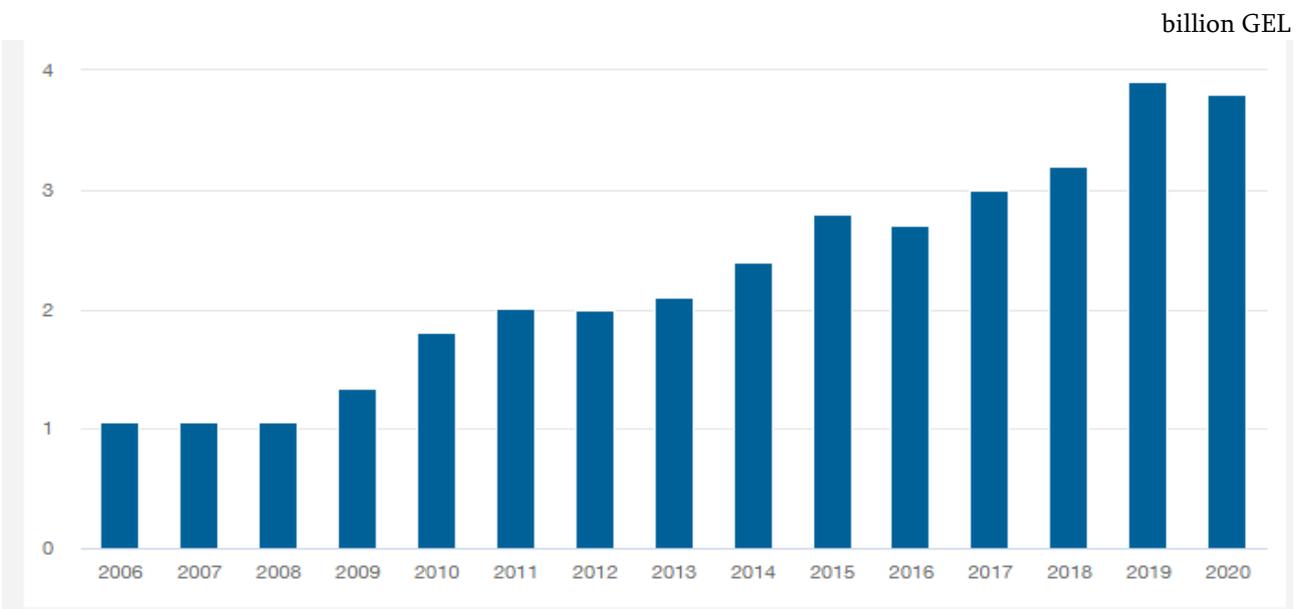
**Fig. 2.** The Release of products by enterprises engaged in transportation and warehousing  
Source: <https://www.geostat.ge> Service statistics. Transport and storage. product release.

In 2020, the number of people employed in these enterprises amounted to 56.8 thousand people (fig.3).



**Fig. 3.** Number of employees in enterprises engaged in transportation and warehousing

Source: <https://www.geostat.ge>. *Transport and storage. number of employees.*



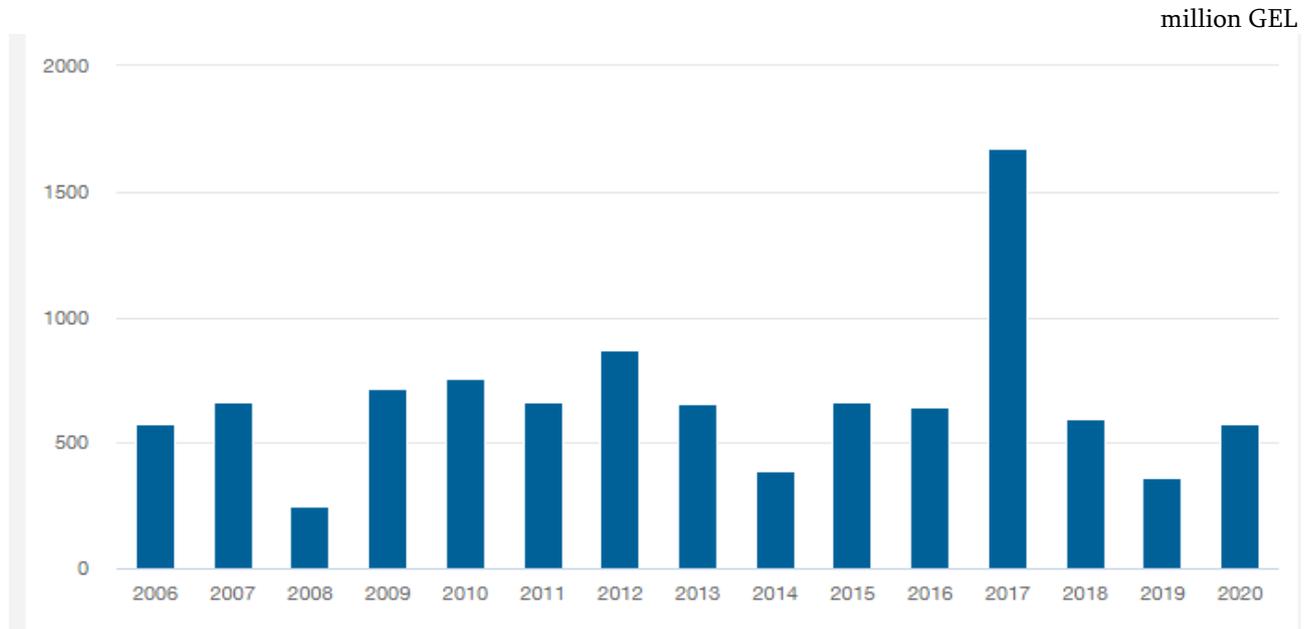
**Fig. 4.** Volume of purchase of goods and equipment by enterprises engaged in transportation and warehousing

Source: <https://www.geostat.ge>. *Transport and storage. Purchases of goods and services.*

In 2020, the purchases of goods/services made by these enterprises amounted to 3.8 billion GEL (fig.4)



and the investments made by these enterprises in 2020 amounted to 573.8 million GEL. In terms of investment, in the period of 2006-2020, the highest figure was reached in 2017 and amounted to 1602.8 million GEL (see fig. 5).



**Fig. 5.** Investments in transportation and warehousing enterprises  
*Source: <https://www.geostat.ge>. Transport and storage. Investments in fixed assets.*

As can be seen from the analysis of the data presented here, the transport and logistics system of Georgia is characterized by a growth trend according to all parameters. Accordingly, Georgia has all the capabilities and resources to respond to the challenges and requirements in the field of transit shipments between Europe and Asia.

## DISCUSSION

The study of the paper allowed the authors to hold a short discussion, through which it was possible to answer the question: does Georgia really have the prospect of becoming a transport and logistics center. As can be seen from the above analysis, Georgia really has the opportunity to fulfil the function of the main connecting transit link of two grand regions - Europe and Asia in the new reality.

The results of the paper's research were reflected in the following recommendations:

1. The development potential of Georgia's transit-logistics corridor should be studied in a new context - against the background of hostilities between Russia and Ukraine;
2. As a result of the research, it was revealed that Georgia really has the opportunity to increase cargo flows from Asian countries to European markets;
3. The transit corridor of Georgia is the most favourable, attractive, main transit route among the alternative options of transport and logistics corridors between Europe and Asia;



4. It is necessary for the Government of Georgia to ensure a stable transit environment, to lower transport, customs tariffs, and logistics fees in order to adequately respond to the demands created in the field of transit shipments.

## CONCLUSION

Therefore, based on the above, we can conclude that for such a small transit country like Georgia, success in international logistics depends on the consistent development of many interrelated processes in this field, because at the modern stage, only geographically transit location does not give an inevitable opportunity for the country to become a logistics hub. The article shows that Georgia should monitor the current processes in the world logistics supply network and create the function of a logistics hub in the field of transportation of cargo flows in Europe and Asia.

The significant and rapid changes in the global supply chain caused by the Covid-19 pandemic can be used by Georgia as an opportunity to make the most of its geographical location in the process of transporting Asian and European cargo.

In conclusion, we can offer recommendations to transport companies to increase the competitiveness of the transport-logistics chain of Georgia.

In particular, transport and logistics companies operating in Georgia should study their competitive advantages and determine the possibility of their implementation; Transport companies should take care of raising the competencies and professional skills of their staff, training, retraining and qualification of their managers; Logistics companies should implement a proper information technology system in order to obtain information on time and develop the right strategy; It is necessary to ensure the coordination of goods placement-shipping-operations between the separate logistics links included in the logistics systems of Georgia; Transport companies correctly and rationally approached the technological process of transporting goods; Logistics companies operating in Georgia should purchase additional equipment so that there is a constant coordinated action among the participants in the process of transportation and placement of transit products to organize the technical side of the logistics system and improve the technological equipment of cargo flows; Shipping companies must synchronize logistics network operations to optimize the placement of transit cargoes in order to reduce shipping costs and increase efficiency. The results of the research will be useful for European and Asian cargo transportation companies by air, rail, sea and road.

## Author Contributions:

Conceptualization, D.K.; methodology, D.K.; formal analysis, D.K.; investigation, D.K.; project administration, G.K.; data curation, G.K.; resources, G.K.; supervision, G.K.; validation, G.K.; writing—original draft preparation, D.K.; writing—review and editing, G.K.

All authors have read and agreed to the published version of the manuscript.



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### Conflict of interests

The authors declare no conflict of interest.

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