A comparative assessment of the efficiency of the “South-West” and “North-South” transport corridors and prospects for their development

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Abstract. In order to ensure the development of the national economy, it is necessary to expand foreign economic ties and increase the volume of trade in foreign economic activity. The solution to this problem will be facilitated by the “New Silk Road” mega-program implemented by China, which, as a result of the implementation of the “One Road – One Belt” project, should contribute to the deepening of economic and cultural ties between the countries of this belt. The formation of international transport corridors “North-South” and “South-West” will allow different countries to participate in this mega-program enabling to organize cargo flows of goods from China, India, the countries of Southeast Asia to Russia, the Baltic countries and the European Union more effectively. This study is devoted to the formation, analysis and comparative assessment of the effectiveness of alternative routes “North-South” and “South-West”.

Key Words: Logistics, international transport corridors, transportation of cargo.

1 Introduction

The development of international transport corridors and logistics infrastructure is one of the main directions of increasing the efficiency of cargo flow management, reducing costs in logistics supply chains and increasing the competitiveness of the national economies.

The mega-program “New Silk Road” proposed by the People’s Republic of China is aimed at solving these problems and will contribute to the development of related international transport corridors, which will allow the formation and deepening of mutually beneficial economic relations between the countries participating in the “One Road – One Belt” project.

The formation of international transport corridors “North-South” and “South-West” will allow individual countries to participate in this mega-program and more effectively organize cargo flows of goods from China, India, Southeast Asian countries to Russia, the European Union and other countries.

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2 Materials and methods

Cost reduction in logistics supply chains depends on the level of development of international transport corridors and logistics infrastructure in the country. The continuous development of international transport corridors, roads and logistics infrastructure is the basis for ensuring the development of the national economies and contributes to the integration of the national economies with the international transport system and international programs for the development of the world economy.

International transport corridors “South-West” and “North-South” are recognized as alternative ways to ensure the transportation of goods from Asia to the European countries. An analysis of alternative options for the formation of transport routes in the considered international transport corridors will allow assessing their level of efficiency.

3 Results

The International Transport Corridor “South-West” is designed to provide transport communication between China, India, the countries of South and Southeast Asia and the countries of Europe. Cargo turnover along this corridor in 2021 amounted to about 200 million tons. All goods exported and imported between these countries, which were transported by rail, were included in the volume of cargo turnover. This volume of cargo turnover does not include oil and gas, precious and semi-precious stones and metals, perishable goods.

Research results show that in 2021, 115.5 million tons of goods were exported from China, India, countries of South and Southeast Asia to the European countries, and 83.4 million tons of goods were exported from Europe to these countries. China is the main trading partner of the European countries among the countries of South and Southeast Asia, both in terms of exports and imports. In 2021, 83.8 million tons of goods were exported from China to the European countries, which is 72.5% of the total volume of exports from the countries of South and Southeast Asia, and 52.2 million tons were imported from the European countries to China, which is 62.6% of the total volume of imports. India ranks second (18.5% and 14.7%, respectively) [1].

The following EU countries have the highest indicators of foreign trade with the countries of South and Southeast Asia: Belgium, the UK, Germany, Spain, Italy, the Netherlands, and France (Table 1).

<table>
<thead>
<tr>
<th></th>
<th>Volume of goods imported from the countries of South and Southeast Asia</th>
<th>Volume of goods exported to the countries of South and Southeast Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>9.2</td>
<td>8.4</td>
</tr>
<tr>
<td>UK</td>
<td>15.1</td>
<td>6.2</td>
</tr>
<tr>
<td>Germany</td>
<td>14.7</td>
<td>14.8</td>
</tr>
<tr>
<td>Spain</td>
<td>8.3</td>
<td>5.7</td>
</tr>
<tr>
<td>Italy</td>
<td>12.4</td>
<td>4.2</td>
</tr>
<tr>
<td>Netherlands</td>
<td>18.0</td>
<td>8.7</td>
</tr>
<tr>
<td>France</td>
<td>12.0</td>
<td>9.5</td>
</tr>
<tr>
<td>Total</td>
<td>89.7</td>
<td>57.5</td>
</tr>
</tbody>
</table>

In order to form and improve the international transport corridor “South-West”, it is necessary to study the alternative routes and assess the level of economic efficiency.
The authors present an analysis and general characteristics of alternative routes of the international transport corridor “South-West” (SW).

SW1. China (India) – Iran – Armenia – Georgia – Bulgaria – EU countries.

This route will allow cargo to be transported from the southern border of Armenia with Iran to the border with Georgia (Megri – Yerevan – Ashtarak – Gyumri – Bavra), and from there to the European countries through the Black Sea ports. The distance between Iran and Romania along this transport route is 4,727.3 km.

SW2. China (India) – Iran – Armenia – Georgia – Bulgaria – EU countries.

This route will be used in the event of the restoration and resumption of work of the Yeraskh – Julfa – Ordubad – Megri – Horadiz railway (340 km). In case of resumption of this railway’s operation, goods can be transported along the railway route Bandar-Abbas – Tehran – Tabriz – Julfa – Yeraskh – Masis – Airum – Tbilisi – Poti, and from there to Bulgaria and the European countries. The distance between Iran and Romania along this route is 4,857.5 km.

SW3. China (India) – Iran – Azerbaijan – Georgia – Bulgaria – EU countries.

On this route, cargo transportation will be carried out along the railway route Bandar-Abbas – Tehran – Qazvin – Rest – Astara (Iran) – Astara (Azerbaijan) – Baku – Tbilisi – Poti, and from there to Bulgaria and European countries. The distance between Iran and Romania along this route is 4,854.1 km.

SW4. China (India) – Iran – Azerbaijan – Georgia – Turkey – Bulgaria – EU countries.

On this route, cargo transportation will be carried out along the railway route Bandar-Abbas – Tehran – Qazvin – Rest – Astara (Iran) – Astara (Azerbaijan) – Baku – Tbilisi – Kars – Istanbul – Ruse (Bulgaria) – Bucharest. This route includes the Baku – Tbilisi – Kars railway, built in recent years, 850 km long. The distance between Iran and Romania along this transport route is 6,206.1 km.

SW5. China (India) – Iran – Turkey – Bulgaria – EU countries.

On this route, cargo will be transported along the railway route Bandar-Abbas – Tehran – Van – Istanbul – Ruse (Bulgaria) – Bucharest or by sea from the Black Sea ports of Turkey: Samsun, Trabzon to Bulgaria, and from there to the European countries. The distance between Iran and Romania along this route is 5,570.2 km.

The main and alternative routes of cargo transportation along the international transport corridor “South-West” are presented on the map (Fig. 1).
Iran actively promotes the idea of creating a transport corridor “Persian Gulf – Black Sea”, which, in addition to the Islamic Republic, includes Armenia, Azerbaijan, Georgia, Bulgaria and the EU countries. If this project is successfully implemented, Armenia can become one of the important transit countries of this corridor.

Transport route SW1 also includes trucking, therefore, in a comparative analysis and assessment of the economic feasibility of “South-West”’s alternative routes, it was not considered as the rest of the presented routes involve rail and sea transportation. However, it should be noted that this route is approximately 130 km shorter than the alternative route SW3 with the participation of Azerbaijan. It is economically expedient to build the Iran – Armenia railway, since the cargo transportation via the transport route China (India) – Iran – Armenia – Georgia – Bulgaria – EU countries (along the Iran – Armenia – Georgia railway corridor) will be more efficient than along the alternative transport route China (India) – Iran – Azerbaijan – Georgia – Bulgaria – EU countries (SW3). The length of the railway line Iran – Armenia – Georgia is approximately equal to the length of the SW1 transport line. More precise calculations related to this route will be carried out in subsequent studies.

Iran is a major transport hub of the “South-West” transport corridor, through which goods from China, India, South Korea, the countries of Southeast and South Asia can be transported to Europe [2]. Since the transport routes from these countries to the border of Iran are created, a comparative analysis of the economic efficiency of alternative routes of the international transport corridor “South-West” is presented within the Iran – Europe framework. The results of the comparative analysis show that transport routes SW2 (Iran – Armenia – Georgia – Bulgaria – Romania, 4,857.5 km) and SW3 (Iran – Azerbaijan – Georgia – Bulgaria – Romania, 4,854.1 km) have approximately the same length. In terms of distance, the third route is SW5 with the participation of Turkey (5,570.2 km), which is 14.7% longer than SW2 passing through the territory of Armenia. The longest route is SW4 with a length of 6,206.1 km.
The agreement on the creation of the international transport corridor “North-South” between Russia, India and Iran was concluded on September 12, 2002. Later, Armenia, Azerbaijan, Kazakhstan, Belarus, Tajikistan, Kyrgyzstan, Oman, Syria, Turkey, Ukraine, and Bulgaria joined this agreement [3]. The purpose of creating this international transport corridor is to activate the economic cooperation of the countries participating in the project with other states of the Persian Gulf and South Asia [4] and to ensure a more efficient transport connection between India and the countries of South Asia with the Russian Federation, the Baltic countries and Scandinavia. The transit time of goods along this corridor is 15-18 days, which is almost twice as short as compared to the sea route through the Suez Canal [5].

Cargo transportation along the “North-South” international transport corridor is arranged via the following three main routes [6]:

NS1. Eastern: India – Kazakhstan (Uzbekistan) – Turkmenistan – Iran – Russia – Baltic and Scandinavian countries;

NS2. Trans-Caspian: India – Iran – Russia – Baltic and Scandinavian countries;

NS3. Western: India – Iran – Armenia (Azerbaijan) – Russia – Baltic and Scandinavian countries.

The first route NS1 is the longest land route (the distance between India and Russia along this transport route is 8,716.4 km, including Iran – Russia (St. Petersburg) 6,797.3 km). Cargo is carried by railway Bandar-Abbas – Gorgan – Etrek – Bolashak – Astrakhan – St. Petersburg – Baltic and Scandinavian countries.

Cargo along the NS2 route (the distance between India and Russia along this route is 7,449.4 km, including Iran – Russia (St. Petersburg) 5,530.3 km) is carried by sea from India to the Iranian ports of Bandar-Abbas, Chabahar, and from there to the ports Nowshahr, Amirabad, Bandar-Enzaly on the coast of the Caspian Sea and further along the Caspian Sea to the Russian ports of Makhachkala, Olya, Astrakhan, and then to St. Petersburg and the Baltic and Scandinavian countries.

Cargo along the NS3 is carried by two alternative options: through Armenia along the route India – Iran – Armenia – Russia – Baltic and Scandinavian countries; through Azerbaijan along the route India – Iran – Azerbaijan – Russia – Baltic and Scandinavian countries.

The way through Armenia is formed by the following three routes. The first route, when cargo is carried by land along the route Tabriz – Megri – Bavra – Poti, and then by sea to the Russian port of Novorossiysk and from there to St. Petersburg by rail (the distance between India and Russia along this route is 7,872.8 km, including Iran – Russia (St. Petersburg) 5,953.7 km). The second route, when cargo is carried by rail Tabriz – Julfa – Yerevan – Tbilisi – Senaki – Ochamchiri – Sukhum – Adler – Moscow – St. Petersburg – Baltic and Scandinavian countries (the distance between India and Russia along this route is 7,903.4 km, including Iran – Russia (St. Petersburg) 5,984.3 km). This route can be operated only after the resumption of freight operations on the Yeraskh – Julfa – Ordubad – Megri – Horadiz and Georgia – Abkhazia – Russia railways. The third route, when cargo is carried along the railway corridor Tabriz – Merand – Megri – Airum – Tbilisi – Senaki – Ochamchiri – Suhum – Adler – Moscow – St. Petersburg – Baltic and Scandinavian countries (the distance between India and Russia along this route is 7,850.8 km, including Iran – Russia (St. Petersburg) 5,931.7 km). This route can be used only after the construction of the Armenian – Iranian railway, which has strategic importance for both Armenia and Iran. In the event of the restoration of the Georgian – Abkhazian railway, transportation along this route will be much more efficient than along the Iran – Azerbaijan – Russia railway.

The NS3 route through Azerbaijan goes by sea from India to the Iranian ports of Bandar-Abbas, Chabahar, and on the Iranian section by rail Tehran – Qazvin – Rest –
Astara (Iran) to the border of Azerbaijan. On the Azerbaijani section, it goes along the route Astara (Azerbaijan) – Baku – Yalama to the Russian border. On the Russian section, along the route Derbent – Makhachkala – Astrakhan – Volgograd – Saratov – Moscow – St. Petersburg – Baltic and Scandinavian states (the distance between India and Russia along this route is 7,514.7 km, including Iran – Russia (St. Petersburg) 5,595.6 km).

The Trans-Caspian route (NS2) 7,449.4 km long is the most effective in terms of distance from the considered routes in the “South-North” direction.

The Western route NS3 (India – Iran – Azerbaijan – Russia – Baltic and Scandinavian countries), passing through the territory of Azerbaijan (the length from India to Russia is 7,514.7 km, including Iran – Russia (St. Petersburg) 5,595.6 km), is only 4.9% shorter than the second NS3 route, which passes through the territory of Armenia (7,903.4 km). It should also be noted that the third NS3 route through the territory of Armenia, after the construction of the Armenian –Iranian railway, may become the shortest railway route in the “South-North” direction and will have great competitive advantages compared to the considered NS3 routes (the distance between India and Russia along this route is 7,850.8 km, including Iran – Russia (St. Petersburg) 5,931.7 km).

The main and alternative ways of transporting goods along the international transport corridor “North-South” are presented on the map (Fig. 2).

![Map of transport corridors](image)

Fig. 2. Main and alternative routes of cargo transportation along the international transport corridor “North-South”.

4 Discussion

Iran is a major transport hub in the international transport corridors “North-South” and “South-West”, through the territory of which goods from China, India, Japan, the countries of Southeast and South Asia can be transported both in the northern direction to Russia, the Baltic countries and Scandinavia, and in the western direction to the EU countries.

The creation of alternative ways of transporting goods via the presented international transport corridors will contribute to the formation of a single economic belt, which will contribute to increasing the efficiency and competitiveness of the economy of these countries.
A comparative analysis of the obtained data shows that Armenia has great reserves for becoming an active participant in the international transport corridors “South-West” and “North-South”. For this, in Armenia, it is necessary to improve the logistics infrastructure, to develop railway tracks and to connect the national railway with the railway of Iran, which will be the shortest path of the international transport corridor “South-West”.

Transport routes in the Persian Gulf – Black Sea corridor provide for multimodal transportation and can become part of the international transport corridor “South-West” and the mega project “New Silk Road”. China shows great interest in this transport corridor, the creation of which will increase the level of efficiency of cargo transportation between China, the countries of Southeast and South Asia, and the EU countries.

With the successful implementation of these projects, Iran will become the largest transport hub in the region.

5 Conclusion

The results of the analysis show that the formation of the “South-West” and “North-South” transport corridors will contribute to the development of transport routes and logistics infrastructures in the countries under consideration, which will deepen the integration processes between these countries and increase the level of economic efficiency there.

Armenia has sufficient reserves for the improvement of the transport system, the logistics infrastructure of the country and the development of international railway corridors, the use of which will allow to successfully participate in the processes of formation of international transport corridors “South-West” and “North-South”.

The development of the presented international transport corridors will contribute to the advanced development and integration of the economies of the participating countries, being one of the main conditions for the formation of friendly and good-neighborly relations between the countries of this complex region.

References