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Eurasian Rail Alliance Index

Report

DIGITAL SOLUTIONS FOR EXPANDING EAEU'S RAILWAY TRANSIT POTENTIAL

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INTRODUCTION

In the face of changes in the international political situation, developing transport corridors in Eurasia has become a matter of vital importance. The reliability of the traditional route across the Suez Canal has been repeatedly called in question in recent years, especially in light of the Red Sea crisis.

The EAEU's transit potential is in the spotlight amid burgeoning trade between China and the EU, the world's two largest economies. The EAEU's key transit advantages include the single customs territory, lower administrative barriers due to the use of digital technologies, and the cutting-edge transport infrastructure.

Against the backdrop of mounting protectionist sentiments inherent in the current global trade, the EAEU is promoting the concept of creating a space of mutual trust and stability within this region. Putting together the potential of the markets and resources of the EAEU member countries creates an environment for harmonised growth that precludes the adoption of unilateral measures. The sanctions policy re-orients EAEU trade and economic relations towards Asian markets.

The expansion of the transport industry goes hand in hand with the transition to legally binding electronic document management, the use of artificial intelligence and electronic navigation seals, which combine to form an ecosystem of digital transport corridors, thus bringing all digital technologies together and maximising the transparency and efficiency of the cargo transport process.

In this regard, forming and expanding digital transport corridors has taken on particular importance and will promote efficiency of cargo transport within the Union and beyond its borders with neighbouring countries. Ultimately, it will help unlock the EAEU's transit potential and improve the region's transport connectivity.

DIGITAL SOLUTIONS WITHIN THE CONTEXT OF UNLOCKING THE EAEU'S TRANSIT POTENTIAL

Considering the challenging international agenda, the EAEU's main objective is to establish cooperative ties within the association and with other Eurasian countries, to develop the infrastructure, and to build more logistics routes and supply chains. Given the circumstances, the comprehensive plan for expanding Eurasian transport corridors to 2025 adopted by the EAEU members is of particular importance when it comes to streamlining transport routes.

Expanding the EAEU's transit capabilities is high on the Union's agenda and vastly depends on improving operation of overland transport through the all-out introduction of digital technologies. The East-West-East Rail routes play a special role in transit cargo transport, including as part of connectivity with China's Belt and Road Initiative.

The efforts to digitalise transport corridors cover several areas. Within the EAEU, a project to form an ecosystem of digital transport corridors (DTC ecosystem) is being implemented by the EAEU (Directive №. 4 of the Eurasian Intergovernmental Council of January 31, 2020). The project focuses on forming an open ecosystem of transport and logistics information services that provide mutually beneficial relationships between carriers and cargo owners from all EAEU member states, as well as in third countries. The DTC ecosystem offers a number of advantages that help improve the economy and the region's transport system:

1. Improved transport and logistics efficiency: DTCs help streamline routes, cut delivery time and boost vehicle productivity.

2. Commerce and sales promotion: DTCs facilitate the establishment of uniform standards and processes for physical flow of inventory, simplify customs clearance procedures and paperwork, which, in turn, speeds up transit and cuts the costs involved in transporting goods.

3. Improving the competitiveness of the region's economy: DTCs improve business environment, reduce transport costs and ensure better market accessibility, which helps attract investment and promotes trade and the economy, more broadly.

Once implemented, the project should boost the EAEU's transit potential through:

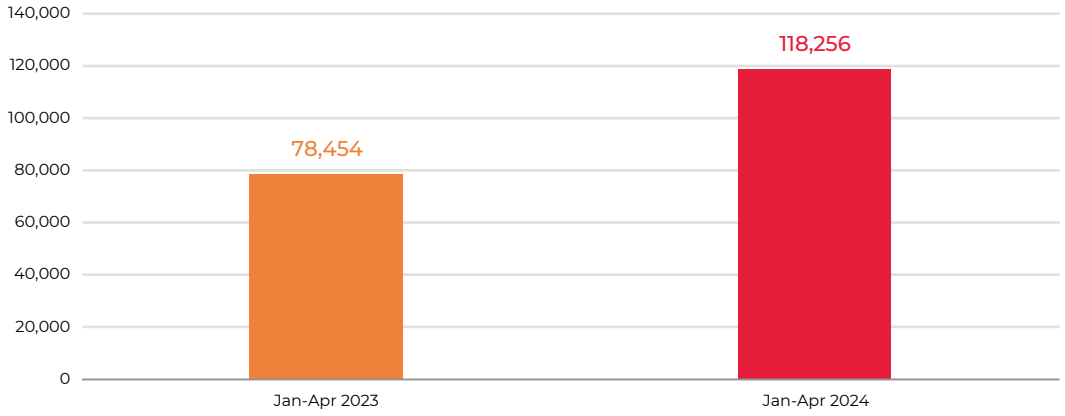
- eliminating paper-based media in transport and logistics transactions and transitioning to a unified digital data use;
- establishing common standards for transport and logistics services;
- cutting the cost and time of cargo transport;
- streamlining the itineraries based on the infrastructure's utilised capacity;
- increasing throughput capacity;
- transitioning to a transparent integrated surveillance system relying on data analysis, which will relieve logistics operators of administrative work.

In addition to a number of cargo transport-digitalising procedures adopted within the Union, for geographical reasons, the focus is also on EAEU-China joint work. Thus, the Eurasian Intergovernmental Council adopted an action plan for digitalising rail cargo transport to promote trade and economic cooperation between the EAEU and its member states, on the one hand, and China, on the other hand (Directive №. 17 of the Eurasian Intergovernmental Council of 20 August 2021). The thrust of the plan was to transition to paperless technology in cargo transport, including the transition to legally binding electronic document management.

As a priority area, building digital transport corridors is a key focus of the roadmap signed by the EAEU and China in February 2023.The section includes the description of a phased-in approach to the full transition to electronic document management for rail cargo transport using electronic digital signatures. Once implemented, the roadmap will speed up the passage of goods through border crossings and epitomise the strategic nature of ties between the parties.

The EAEU's transit potential is particularly important for China-Europe-China rail cargo transport. Above all, the transit of cargo across the EAEU member states using the Eurasian rail route via Kazakhstan, Russia and Belarus is the shortest route for transporting cargo between China and the EU. In the first four months of 2024, physical cargo traffic along the route increased by 51 percent compared to the same period the year before.

CARGO CARRIED IN THE FIRST FOUR MONTHS OF 2023 AND 2024, IN THOUSANDS TEU



Source: ERAI

Despite the political challenges in the international arena, the tried-and-tested continental route for delivering Chinese and European cargoes offers shippers a number of advantages amid the Red Sea crisis. Meanwhile, new digital solutions offer extra benefits for expanding transit.

ECOSYSTEM OF DIGITAL TRANSPORT CORRIDORS IN TRANSIT RAIL CARGO TRANSPORT

Digital solutions excel when it comes to the investment/output ratio to boost transit potential and include electronic navigation seals, electronic document management harmonised with partner countries, and the introduction of artificial intelligence in rail transport.

Electronic navigation seals

Implementing the shipment tracking mechanism using electronic navigation seals (ENS) is a separate area of the digitalisation effort. An ENS installed on a container means cargo will move non-stop and seamlessly through border crossings at a higher speed across the EAEU countries and with fewer number of violations of the EAEU customs legislation.

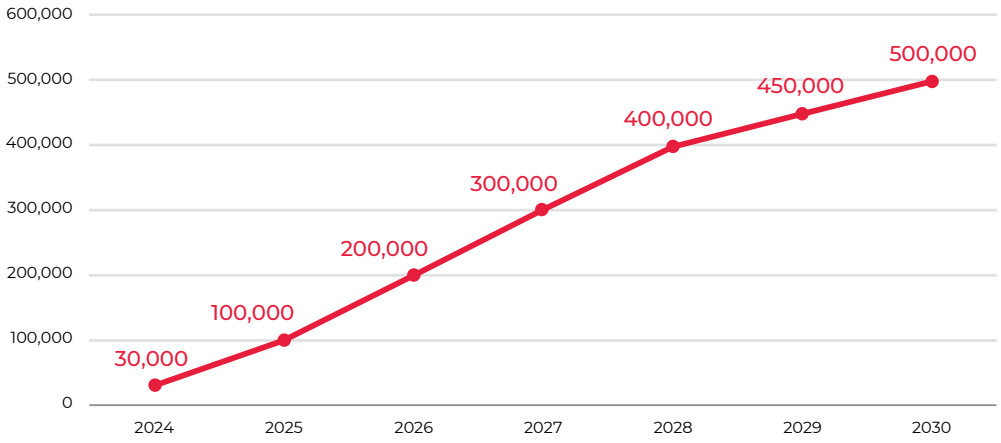
In April 2023, an agreement on using navigation seals in the EAEU to track shipments, both export-import and transit, entered into force. According to Article 2, the scope of the agreement is limited to using navigation seals to track transport across the territories of two or more member states. Once implemented, the agreement will contribute to unlock the transit potential of the Eurasian rail route through Kazakhstan, Russia and Belarus by cutting the time it takes to cross the border and improving cargo transport safety.

In May 2023, the Government resolved to conduct an experiment involving the use of electronic navigation seals in transporting goods by rail and road between Kazakhstan, Kyrgyzstan and Russia. The ENS is affixed on cargo compartments of railway vehicles at the Biklyan railway station, Kuibyshev Railway, and removed at the Magnitogorsk-Gruzovoy railway station, South Urals Railway. According to the Government resolution, once activated, the ENS sends the data to the information system run by an authorised operator in Russia, Kazakhstan and Kyrgyzstan, with which the ENS is registered, and transmitted to information systems of other authorised operators.

In December 2023, the authorised ENS operators from the EAEU countries signed an agreement on cooperation, which will come in effect in the first half of 2024. The use of navigation seals will ensure safety and reliability of cargo transport and minimise the need for monitoring along the way.

ENSs play an important role in streamlining customs control during transit rail cargo transport. Above all, the seals significantly reduce the customs costs, and installing a sensor takes just 15 minutes, which provides for the efficient use of available time resources. As an efficient digital solution, navigation seals help speed up the customs procedures. According to forecasts, by 2030, the number of ENS-enabled cargo shipments will reach the 500,000 mark.

PLANNED NUMBER OF CARGO TRANSPORT USING ENS TO 2030



Source: compiled by the authors based on the data provided in the Directive № 3097-r of the Government of the Russian Federation dated November 3, 2023 On Approval of the Strategic Area in the Field of Digital Transformation of the Transport Industry of the Russian Federation to 2030.

The ENS-enabled cargo tracking mechanism will speed up customs procedures and cut transport costs, which will increase the EAEU countries' transit appeal. At the same time, the Eurasian railway route is a platform for testing the innovative technology as the most efficient transit route in the EAEU.

Legally binding electronic document flow

Paperless document management is part of the action plan for digitalising rail cargo transport in the EAEU. According to the plan, paperless technologies will not only increase the competitiveness of transit rail cargo transport due to higher speed, but will also expand international rail cargo transport with neighbouring countries, primarily China.

The roadmap outlines an action plan with phased-in steps for transitioning to electronic data exchange. However, in order to complete the switch to electronic transport documents within the EAEU, it is important, primarily, to regulate the use of electronic (digital) signature (ES). In August 2023, the EEC Board adopted a decision regarding the rules for recognising ES in an electronic document, which listed 14 areas that require ES recognition as a priority.

The EEC launched a project to develop a tool that would enjoy credibility with all five member states and could be used for confidential document flow. Today, ES is recognized through a trusted third party mechanism, such as an accredited certification authority, or through a bilateral agreement on mutual recognition of ES. Thus, in April 2024, the governments of Russia and Belarus signed an agreement defining the principles, conditions and procedure for recognising ES in an electronic document, including electronic transport documents. By late 2023, almost all railway cargo transport in Russia and Belarus with the exception of certain categories of cargo had switched to paperless digital technologies.

After the EEC and EAEU member states have completed the common customs process, paperless technology will be the only technology used in the customs transit procedure within the EAEU. This process provides for the exchange of electronic documents and information between the customs authorities of the EAEU member states in the process of monitoring transit cargo. According to EEC, this project will be implemented by 2025.

The complexity of transitioning to digitalisation of the paper-based document flow for rail cargo transport can also be felt at the level of operators, i.e. B2B. The challenge is that the transition must be completed by all market participants at the same time. However, cargo transport may involve two or more participants, with each of them having its own national set of documents, rules and requirements. An experiment was conducted on the Eurasian rail route, where empty fitting platforms were transported under paperless arrangements across international border crossings in Kazakhstan, Russia and Belarus from Dostyk to Brest. The next stage will include paperless transport of empty containers in the same direction. Following the experiments with the empty transport, the transition to paperless transport of loaded containers will begin.

Among other things, at a meeting of the Eurasian Intergovernmental Council in February 2024, the heads of state railway companies from Belarus, Russia and Kazakhstan signed a memorandum of commitment to the harmonised development of the transport and logistics capacity of railway transport. The memorandum is aimed at ensuring the transition to legally binding electronic document management (LBED) and avoiding the use of the traditional paper CIM/SMGS consignment note for transit cargo transport along the Eurasian railway route across the territories of the EAEU member states, namely Kazakhstan, Russia and Belarus. The transition to the LBED will cut transport costs, which are included in the cost of final goods, from 20 percent to 12–15 percent, and the time involved in cargo transport along the Eurasian corridor will decrease by approximately 11 hours.

Thus, the full transition to the electronic exchange of transport and shipping documents between the participants of transit rail cargo traffic makes it possible to cut the time spent on customs operations at rail border crossings and reduce the load on border stations, accordingly.

Artificial intelligence

Transport and logistics hold a lot of promise for using artificial intelligence (AI). The use of AI-technology in organising the transport process on all types of transport and transport infrastructure facilities contributes to creating proper conditions for improving the efficiency of transport, and forming whole new areas of activity for the economic entities. AI can be useful in automating planning, forecasting and management decision-making processes, automating routine production processes and operations, using autonomous intelligent equipment, intelligent logistics management systems, and improving occupational safety.

According to recent studies, the demand for advanced digital technologies in the field of transport and logistics in Russia, which amounted to 89.4 billion roubles in 2020, will grow by 21 percent annually to reach 626.6 billion roubles by 2030. At the same time, the share of AI and neurotechnologies should reach 35 percent, and the annual growth rate will stand at 40 percent. In addition, in the context of all industries, transport and logistics companies may become one of the key consumers of AI-based solutions in or before 2030.

When it comes to using AI in transport and logistics, solutions based on computer vision technology are making the greatest strides, which is in line with the global trends. In railway transport, control systems using AI are deeply embedded in the technological processes such as:

— planning maintenance and repairs based on fault detection and prediction;

— assisting dispatchers in train traffic control;

— AI systems enhanced with video analytics for driver assistance.

A tentative national standard of the Russian Federation (TNS), Artificial Intelligence in Railway Transport, came into force in April 2024. The TNS provides a list of options for using AI systems in railway transport, including equipment monitoring and maintenance, transport and information security, train control and automation systems, dispatch control systems and train passage planning, as well as freight services. However, there are already instances of practical use of AI in railway transport and, in addition, work is underway to implement a number of systems that use AI technology.

1. **Automatic registration and recognition of train car numbers** improves economic security by eliminating the human factor and greatly simplifies handling claims. The system reads the number of a railway container from both sides, puts the recognition results together and checks for compliance with the control value. Neural networks and mathematical algorithms independently find the location of the number in the frame, recognising even partially rubbed-off symbols, and enter the entire railway train in the database.

The system independently finds barcodes on the surface, regardless of their number or location. Even if a mark is rubbed off or the seal surface is dirty, the task is completed successfully in 99 percent of cases.

Anticipated effects:

- at least doubling the speed of logistics operations;
- cutting 10 percent of operating costs;
- business accounting and precise monitoring of cargo movement — full 24/7 year-round and all-weather remote control.

2. **The system for detecting train cars with negative dynamics** is designed to detect train cars with increased body vibrations (or negative dynamics) to detect transverse and vertical vibrations (train car bucking).

The system relies on using laser scanners to measure the distance to the surface of the side and upper parts of the rolling stock units. After that, a model of an object is built in the form of a cloud of points in a 3D coordinate system and then analysed to detect signs of negative dynamics.

Alarm readings are formed as a result of the analysis, and the information is then sent to the automated workplace (AWP), where it is displayed in a form that is convenient for the operator.

Anticipated effects from implementing the system:

- defective train cars will be kept off the railway network;
- time for train car technical inspection will be cut at least in half.

3. **The locomotive driver assistance system** allows using technical vision and artificial intelligence to detect objects on the railway, including other trains, switches, tracks, people, traffic lights, etc.

The system can assess the situation, issue danger warning signals to the driver, and make the necessary decisions if he fails to react. The system can ensure safety in any weather (rain, snow, or fog) and during the night.

Anticipated effects from implementing the system:

- over 6.5 million roubles per year in fuel savings;
- over 2 million roubles per year in human resource savings;
- high payback rate and streamline costs due to zero incidents.

4. **The Digital Assistant to Shunting Dispatcher project** makes it possible to build a specialised data model that takes into account many factors, including time spent on certain technological activities at the marshalling yard, infrastructure limitations, train arrival order and rolling stock distribution across the station tracks. For example, the Digital Dispatcher service at the Chelyabinsk-Glavny railway station made it possible to cut the down load/unload time of a transit car by 20 percent.

5. **Implementing the Digital Railway Station project** combines AI systems to form a digital twin of a freight railway station. The solution based on intellectual modeling allows for planning the station operation 24 hours in advance with minimal human participation, and also makes it possible to analyse the current situation at the station, to form an operation-specific list of tasks and monitor the work of the personnel. The use of innovative technologies makes it possible to significantly increase the throughput capacity of marshalling freight stations, increase the speed of making up cars into train, and improve safety through automation and robotisation of processes.

6. **The Automated System for Commercial Inspection of Trains and Train Cars project uses** AI to inspect moving rolling stock and cargo and containers on it and to detect improperly secured cargo (sensors detect cargo displacement) and other defects. There are 39 commercial inspection points in Russia equipped with automated diagnostics technology.

7. **Railway safety monitoring system:** the Recording Safety Rules Violations on the Railway Infrastructure app allows for automated monitoring without human involvement, automatically checks the photo material against the police database, identifies the violator, and issues an administrative offence report.

Artificial intelligence is able to recognise safety rules violations. The system automates the process of accumulating statistical data and generating report, and provides the administrator with the ability to customise reporting forms that make it possible to obtain data about the system elements and objects in different sections.

Anticipated effects from implementing the system:

- Reducing mortality at certain sections of the railway by 15 times in four years;
- Cutting the number of violations on the roads in half.

8. **The monitoring system for pre-failure condition of freight cars** makes it possible to estimate and forecast the reliability and readiness of rolling stock for transport, preventing the failure of cars or its parts in the process of operation. Thanks to a single integrated train car control system, data is automatically collected and predictive models are formed using AI technology.

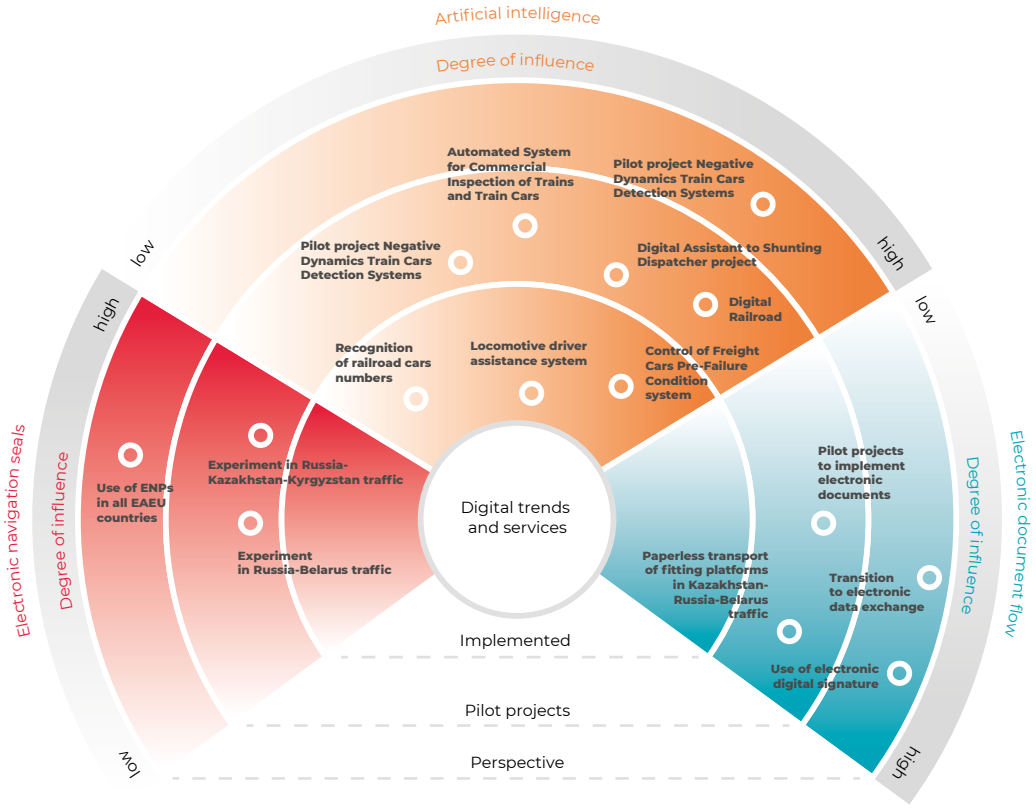
Anticipated effects from implementing the system:

- reducing the number of train car uncouplings during ongoing uncoupling repairs en route (up to 10 percent per year on average);
- cutting costs associated with the down time of the train cars waiting for repairs;
- ensuring train traffic safety using timely detection of pre-failure condition of freight cars and parts.

AI technology continues to be widely used in railway transport thus increasing the throughput capacity of hubs and stations, streamlining labour costs involved in planning, maintenance and repairs to infrastructure and rolling stock, cutting downtime and costs and, most importantly, AI diminishes the importance of the human factor, but does not completely eliminate it, since the decision-making process remains the prerogative of humans.

Thus, the three main digital solutions — electronic document management, electronic navigation seals and systems and projects using AI — have a significant potential for increasing the efficiency and speed of rail cargo transport. Digital services can cut the time of cargo delivery, reduce customs clearance costs and provide increased security for transit cargo. Each of these areas has a different time horizon and degree of impact. Eventually, implementing the above digital services, especially if they are used as a package, will help fully tap the potential of the transit rail cargo transport.

IMPLEMENTATION AND DEGREE OF IMPACT OF MAJOR DIGITAL SOLUTIONS ON RAIL TRANSIT CAPACITY



Source: compiled by the authors

CONCLUSION

Sustainable transport connectivity is the cornerstone for expanding trade relations. The logistics crisis in the Red Sea has exacerbated the demand for overland routes for cargo transport between China and the EU. The transit railway corridor across the EAEU countries (Kazakhstan, Russia, and Belarus) serves as the main continental route.

In the context of expanding the EAEU transit potential, the introduction of digital transformation is of great importance. Notably, the digitalisation process in rail transport can significantly improve the efficiency of transport. The most advanced technologies are already used in transport along the Eurasian rail route, and the corridor itself is a "regulatory sandbox" for testing new solutions. For example, high-tech electronic navigation seals and AI technology are widely used to track, monitor and control speed of the cargo transport.

The transition to legally binding electronic document management, which makes railway transport even more transparent for shippers and speeds up the process of document execution is the main driver for expanding transit cargo transport across the EAEU. However, in order to accelerate the transition to the legally binding electronic document management, it is imperative to mutually recognise electronic signatures in the EAEU countries.

Despite the advantages, the EAEU digital transport corridors are facing a number of issues that make implementing and using them more complicated:

— using different information systems that are not harmonised with each other;

— difference in the level of digital infrastructure (lack of broadband communication networks);

— difference in approaches to implementing digital corridors at the state level;

— need for significant financial investment.

To overcome these challenges, cooperation between the EAEU states, development of common standards and legislative framework, as well as investment in technical infrastructure is needed.

A unified digital ecosystem of EAEU transport corridors will create a new impetus for expanding the railway industry through the introduction of digital solutions and will be a step towards the full realisation of the idea of seamless logistics in the Eurasian space. The introduction of digital solutions in transit transport is the most promising solution due to its cross-border nature and integration potential for the EAEU.

In May 2024, at the meeting of the Supreme Eurasian Economic Council, the heads of the EAEU member states proposed a number of measures to create a single Eurasian digital corridor. In addition to the importance of completing the work on recognising electronic digital signature as soon as possible, the head of Kazakhstan stressed the importance of introducing a mechanism for remote verification of all shipping documents using QR codes.

As a result, expanding transport infrastructures of the member states will give an additional boost not only to the growth of trade within the EAEU, but also to transit cargo traffic through the Union countries. Coordination of the efforts to jointly develop digital transport corridors through digital services is a significant resource for integration and a way to turn the EAEU into a bridge between Europe and East Asia.

At the same time, digital transformation in logistics also has an impact on payment and settlement infrastructure, including through the creation of digital currency, the use of smart contracts, and more.