



# DIGITALIZATION OF RAILWAY AND MULTIMODAL TRANSPORT IN NORTH AND CENTRAL ASIA

A SUBREGIONAL INVENTORY OF  
RELEVANT NATIONAL POLICIES,  
STRATEGIES AND PROGRAMMES

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# ABBREVIATIONS

<b>ABADA</b>	Azerbaijan International Road Carriers Association
<b>AH</b>	Asian Highway Network
<b>AI</b>	Artificial intelligence
<b>AIMS</b>	Automated measuring instruments
<b>ATO</b>	Automatic of train operation
<b>ATP</b>	Automatic train protection
<b>BCP</b>	Border crossing point
<b>BIM-technology</b>	Building information modeling
<b>CA</b>	Central Asia
<b>CAREC</b>	Central Asia Regional Economic Cooperation Program
<b>CARs</b>	Central Asia Road Links Program
<b>CBTC</b>	Communication-based train control
<b>CCTT</b>	Coordinating Council for Trans-Eurasian Transportation
<b>CIS</b>	Commonwealth of Independent States
<b>CIS CRT</b>	CIS Council for Railway Transport
<b>COVID-19</b>	Coronavirus disease 2019
<b>DESA</b>	United Nations Department of Economic and Social Affairs
<b>DPADM</b>	Division for Public Administration and Development Management
<b>EAEU</b>	Eurasian Economic Union
<b>ECMT</b>	European Conference of Ministers of Transport
<b>GDP</b>	Gross domestic product
<b>GHG</b>	Greenhouse gas
<b>GIS</b>	Geographic Information Systems
<b>GNI</b>	Gross National Income
<b>GPS</b>	Global Positioning System
<b>ICT</b>	Information and Communications Technology
<b>ICTEC</b>	International Centre for Trade and Economic Cooperation
<b>IIoT</b>	Industrial Internet of Things
<b>INDC</b>	Intended Nationally Determined Contribution
<b>INSTC</b>	International North-South Transport Corridor
<b>IoT</b>	Internet of Things
<b>IRU</b>	International Road Transport Union
<b>ITF</b>	International Transport Forum
<b>ITS</b>	intelligent transportation system
<b>ITU</b>	International Telecommunication Union

<b>JICA</b>	Japan International Cooperation Agency
<b>JSC</b>	Joint-stock company
<b>KPI</b>	Key performance indicator
<b>KTZ</b>	Kazakhstan Temir Zholy
<b>LLDCs</b>	Landlocked Developing Countries
<b>LPI</b>	Logistics Performance Index
<b>LTL</b>	Less than-truckload
<b>NDC</b>	Nationally Determined Contribution
<b>NRI</b>	Network Readiness Index
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>RAP</b>	Regional Action Programme for Sustainable Transport Development for Asia and the Pacific
<b>SDGs</b>	Sustainable Development Goals
<b>SWC</b>	Single Window Centre for Foreign Trade
<b>SWIS</b>	Single Window Information System
<b>TAF-UTP</b>	OTIF Telematics Applications for Freight - Uniform Technical Prescription
<b>TAFTSI</b>	EU Telematics Applications for Freight - Technical Specification for Interoperability
<b>TIR</b>	Transports Internationaux Routiers (eng: International Road Transport)
<b>UN</b>	United Nations
<b>UN-OHRLLS</b>	United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States
<b>UNCTAD</b>	United Nations Conference on Trade and Development
<b>UNDP</b>	United Nations Development Programme
<b>UNECE</b>	United Nations Economic Commission for Europe
<b>UNeGovKB</b>	United Nations e-Government Knowledge Base
<b>UNESCAP</b>	United Nations Economic and Social Commission for Asia and the Pacific
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>WB</b>	World Bank

## EXECUTIVE SUMMARY

Central Asia has always played a crucial role in bridging Asian and European markets. Nevertheless, the growth of maritime transportation in the 15th century and the Central Asian States' long-standing landlocked status served as barriers to the development of inland freight transportation in recent history. However, the expansion of multimodal freight transport, enabled by improvements in the transport and logistics industry, the widespread and affordability of ICT and broadband connectivity, as well as the development of innovative and smart transport monitoring and forecasting technologies, has allowed Central Asia<sup>1</sup>, Azerbaijan, and the Russian Federation to reclaim their positions.

Notwithstanding, to keep the region connected, it is important to build new and update outdated roads and rail lines to meet the needs of the 21st century markets and supply chain. This is especially true given the location of the countries studied in this report and the uniqueness of their landscapes, which include steep mountainous terrain, highlands, plains that cover large areas, steppes, and deserts, as well as considering their climatic extremes.

To this end, as well as to increase the effectiveness of transportation infrastructure and lower transport associated risks, a number of international organizations and development partners, especially the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), have been working closely with their member states to support the adoption of a range of legislative instruments and policy guidelines through national and regional projects and technical assistance. These projects aimed to harmonize transportation and logistics rules, norms, and technical standards, as well as to remove non-physical barriers in the transportation and logistics industries.

Taking all of this into account and knowing that the Asian Highway and Trans-Asian Railway networks, as well as multimodal transportation hubs like dry ports, are important parts of the subregion's transportation and logistics infrastructure, Within the framework of international agreements, ESCAP aims to increase regional connectivity and contribute to the efficiency of freight transport through the widespread use of paperless document flow by customs authorities; standardization of technical standards; mutual recognition of registration certificates; harmonization and simplification of border crossing procedures; and the introduction of innovative smart solutions for freight transport monitoring and forecasting (UNESCAP, 2020c).

This study was started as part of the ESCAP project "New technologies and digital transformation for more resilient and competitive railway operations." Its goal is to find and fix inefficiencies that slow down cross-border rail transport; help set up modern rail and multimodal transport systems; and make transportation networks and operations more reliable. The goal of this study is to do a full literature review of national digitization policies, development strategies, laws, and best practices and tools that are already in place. This will help researchers figure out how digitization could make transportation and freight more efficient and productive, as well as find barriers and problems that are already there. It will also point out the lessons that can be learned from the experiences of countries with more advanced levels of digitalization in transport and freight, as well as how those lessons can be used to help policymakers make the rules and policies that are needed in their own countries.

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<sup>1</sup> **Central Asia** is defined as consisting of the following five countries for the purposes of this report: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

needed to drive the use of digitalization in the transport and freight sectors in their own countries. An inventory will be compiled of policies, best practices, existing gaps, and lessons to be learned regarding the application of new technologies and digital transformation for increasing operational efficiency, resilience, and crisis-response, covering infrastructure and operational aspects, as well as multimodal transport hubs (including dry ports). This study, together with pertinent ESCAP recommendations on digitization of rail and multimodal transport and dry ports, will guide the design of a customized capacity-building program in the future.

### **Why multimodal transport and dry ports?**

One way to meet the growing demand for goods and people's need to move around while reducing the damage that the transportation industry does to the environment is to make sure that people and goods can move easily and in a way that doesn't hurt the environment. This is called "seamless and sustainable transport connections." For an intermodal transport corridor to work well, it is necessary to set up intermodal facilities as important hubs where the many technological, operational, and institutional connections that make up these transport corridors can be handled effectively. This is necessary to ensure that rules and procedures can be processed quickly and efficiently, and that freight can change modes without disruption or damage. Kazakhstan and Kyrgyzstan may also use the Eurasian Economic Union to make it easier for goods to move from China through Russia and Belarus to Europe. Within this Union, both commodities and road transport services may move freely, allowing for the expansion of freight traffic and increasing the need for multimodal transport facilities.

### **The importance of digitalization and infrastructure for crisis response**

It is possible to increase the subregion's transit potential, but first the transport and logistics sector and related infrastructure must be upgraded and digitalized. During the COVID-19 pandemic, when the transportation and logistics sector was one of the worst hit, this became more and more important. However, the need to contain the spread of the virus as well as demand for goods and services resulted in the advancement and improved efficiency of electronic documentation exchange solutions and border crossing operations. This, in turn, reduced the amount of physical contact while speeding up product transit from origin to receiver. Even though the degree of adoption varies, all the states looked at in this study have digitized their customs procedures and made a number of changes to make them easier. The implementation of these systems, however, necessitates the development of quick, dependable broadband networks, a reliable energy infrastructure, a strong ICT infrastructure, and the human capacity to use newly adopted technologies.

### **Barriers and challenges**

In recent years, transportation planning, management, and control have evolved dramatically on all fronts. But the ways that transportation policies and infrastructure are made need to be more consistent, clear, and based on evidence. Subregional transit routes need to be made more efficient, especially by controlling, monitoring, and managing freight flows and infrastructure at international multimodal transport centers with the help of modern technology and ICT solutions.

At the same time, each country in the subregion is starting to compete with the others to be the bridge between Europe and Asia, which is a good economic position to have. Given the landlocked nature of Central Asian countries and Azerbaijan means their inclusion into global

markets would necessitate the liberalization of foreign trade policy as well as an increase in bilateral and multilateral transport and transit cooperation. The benefits of such agreements should be considered first in terms of subregional gains and then in terms of indirect national benefits.

Because there is no system in place to check for compliance with the conditions and requirements of signed and ratified agreements, not all of them are being enforced. Different countries still have different rules about the maximum weight and axle loads for large vehicles, as well as the formal procedures and rules for entering and passing through the country. This shows that there isn't enough cooperation and harmonization in the region.

## **Conclusion**

Integrating international transit networks into national freight transit networks can help the subregion expand its domestic markets and strengthen freight transit infrastructure. Realizing this potential requires coordinated and long-term efforts to expand roads, railroads, and air routes; build logistics and transport hubs or dry ports of international importance in strategic locations; and then construct efficient and improved transport transit corridors connected to the monitoring, forecasting, and control systems. Because sender and receiver are so far apart, promoting train travel as a sustainable and effective way to move freight is especially important for the subregion. Therefore, the rail network's efficiency, attractiveness, and train speed must be improved by building infrastructure to eliminate missing links and bottlenecks; restoring and improving track conditions; optimizing border crossing procedures and time; and increasing train speed. Multimodal transport centers and dry ports of international importance are key to introducing digital solutions to product turnover and increasing good transportation. Increased transportation connections could make economic integration better, which could lead to better use of resources and more international trade.

One of the biggest obstacles to developing multimodal transportation and creating integrated logistics solutions is the "digital divide" - significant disparities in the level of digitization between modes of transport and different transport and logistics providers. The transportation sector also faces competition for IT personnel from other sectors, such as banking, commodities, and telecommunications, which can offer better benefit packages.

The following factors negatively impact the development of the transport and logistics sector, as well as the economic integration of the region, including the digitalization of the transport system:

- low population density.
- poor connectivity.
- underdeveloped and outdated infrastructure.
- remoteness from European markets.
- differences in regulations and customs documents.
- significant climatic and topographic differences exist.



## INTRODUCTION

Historically, Central Asia had an important role in connecting Asian and European markets, as seen by the Ancient Silk Road, which passed through North and Central Asia. This paradigm, however, was altered by the widespread development of sea transportation in the 15th century, and the region has since been largely cut off from global market routes. The Russian Federation was the main transit country for a relatively small share of rail and road freight, while landlocked developing countries played an even smaller role. However, in the last decade, the situation has improved as rail freight between China and Europe has grown to become more appealing, thanks in part to transit transport corridors and streamlined customs processes (ITF, 2017).

As a crucial transit hub between Europe and Asia, Central Asia, Azerbaijan, and the Russian Federation are strategically important for the development of regional and international multimodal freight transport. In this setting, it is critical to build an efficient and sustainable transportation and logistics network that enables more efficient transportation of products and services while also contributing to economic growth by improving competitiveness and global commerce. However, being landlocked developing countries, Central Asian countries and Azerbaijan are disadvantaged by greater transit and logistical costs. This is aggravated further by the fact that Central Asian economies are resource-based and lack strong and stable regional links that may increase supply and transit chain efficiency and boost transport sector growth (UN-OHRLLS, 2018).

ESCAP assumed a leadership position among the international development community following the fall of the Soviet Union to support the socio-economic growth of its member states. With regards to the transport and logistics sector, it promotes the transformation and digitization of the transportation industry while concentrating on a variety of transportation-related areas, including a) Asian Highway Network; b) Environmentally Sustainable Transport; c) Trans-Asian Railway Network; d) Dry Ports and Intermodal Transport; e) Connecting to the Global Supply Chain; and f) Safe and Inclusive Transport (UNESCAP, 2022a). Furthermore, the “Regional Action Programme for Sustainable Transport Development for Asia and the Pacific (RAP) 2022–2026” identified digitalization of transport as a separate thematic area of work after it was noted by ESCAP member states at the Ministerial Conference on Transport in December 2021 as an imperative direction in the development of transport. Therefore, ESCAP aims to address the following through the introduction of digitization and digital solutions: (a) wider deployment of smart transport systems to improve the efficiency, resilience, and social and environmental sustainability of transport; (b) increased awareness of innovative technologies and the use of “big data” to improve traffic and other urban transport issues; (c) interconnection of maritime and port systems; and (d) a shift towards regional transport networks with smart transport systems, among others (UNESCAP, 2022c).

The following policy background documents have been produced by ESCAP to better encourage the development of multimodal transportation and logistics systems among their member states:

- ESCAP Cooperation Framework for Facilitation of International Railway Transport;
- Regional Framework for the Development, Design, Planning and Operation of Dry Ports of International Importance;

- Draft framework for enhancing the efficiency of railway border crossings along the Trans-Asian Railway network and beyond.

As a result, over the years, the transportation and logistics industries of ESCAP member states expanded to meet the growing demand for goods and services, and for countries researched under this study (Azerbaijan, Kazakhstan, Kyrgyzstan, Russian Federation, Tajikistan, Turkmenistan, and Uzbekistan), totaled \$602.01 billion in 2019. It should be noted that the overall score of the Logistics Performance Index (LPI)<sup>2</sup> of the researched countries has not improved significantly over the years, despite numerous improvements and changes in the transportation system and logistics network. This is partly due to the overall development of the global trade and logistics sectors, as well as underdeveloped energy and ICT infrastructure, vast distances between border points and limited investment opportunities for the development of secondary roads and infrastructure in the countries covered by this report. Nevertheless, bilateral and multilateral agreements fostering the development of transit transport corridors are significantly contributing to the transformation of the region, while multimodal freight transport, dry ports,<sup>3</sup> and energy and ICT infrastructure development drive the change and regional integration into global markets even further.

**Table 1: Country Overview Data**

	AZE	KAZ	KGZ	RUS	TJK	TKM	UZB
Population (mln)*	10.10	18.75	6.58	144.10	9.54	6.03	34.23
GDP per capita (current US\$)*	4 221.4	9 122.2	1 175.7	10 126.7	859.1	—	1 750.7
Rail lines (total route-km)**	2 139	16 060	424	85 494	620	7 680	4 642
Railways, goods transported (million ton-km)***	4 492	219 927	949	2 597 778	224	—	22 940
Air transport, freight (million ton-km)*	2 030.4	23.5	0.0	4 314.6	1.9	4.3	20.0
LPI: Overall (1=low to 5=high)***	—	2.8	2.6	2.8	2.3	2.4	2.6
Average time to clear exports through customs (days)**	2.9	9.0	1.8	15.6	2.1	—	3.7
Exports of goods and services (current US\$ billions)**	23.63	66.20	3.13	481.54	1.24	9.24	17.03
<b>Note:</b> * data for 2020; ** data for 2019; *** data for 2018 <b>Source:</b> The World Bank Group, World Development Indicators.							

It should be noted that one of the most crucial steps in the development of multimodal transportation networks is the digitalization of the transportation and logistics industry to

<sup>2</sup> **Logistics Performance Index (LPI)** is an interactive benchmarking tool created by the World Bank to help countries identify the challenges and opportunities they face in their performance on trade logistics and can be done to improve their performance (WB LPI, n.d.)

<sup>3</sup> **Dry Ports** are common user facilities with public authority status, equipped with fixed installations and offering services for handling and temporary storage of any kind of goods (including containers) carried under customs transit by any applicable mode of transport, placed under customs control and with customs and other agencies competent to clear goods for home use, warehousing, temporary admissions, re-export, temporary storage for onward transit and outright export (UNCTAD, 1991).

ensure that the import, export, and storage of containers and freight are tracked in real-time using cutting-edge ICT and innovative digital solutions. The use of real-time ICT-based container and freight tracking systems improves freight transit dependability and safety while also streamlining customs and other procedures. The digitalization of different phytosanitary and veterinary certifications as well as transport documentation for further logistical processing might all help to increase the pace at which freight is delivered. In Central Asia, however, both remain undeveloped, and a sizable portion of information is frequently only available in print format.

Digitalization is the process of transferring non-digital information by digitizing it and distributing the resulting, and occasionally processed, data in real-time to all parties involved in the supply chain for freight transportation (Attaran, 2020). This enables greater efficiency and prompt decision-making to improve resource utilization. In an ideal world, all digital data is combined into a single operational dashboard or platform where users can view the movement of relevant freight in real-time, along with delays, alerts, and other information broken down by type and location. These systems are connected to a variety of sensors, including but not limited to water leakage, gas, shock, and noise sensors, and may also show weather forecasts and violent crime warnings. In order to correctly coordinate arrival and transit times and prevent congestion and heavy traffic, traffic cameras outside dry ports and warehouses may communicate data to truck drivers and warehouse management. Automated loading and unloading solutions for freight and storage that make use of automated robots can be used in a chain to automatically generate the best freight loading and unloading schedules as well as the order of their handling to utilize warehouse space and resources as effectively as possible.

**Table 2: Internet and telecommunications coverage**

	AZE	KAZ	KGZ	RUS	TJK	TKM	UZB
Population covered by a mobile-cellular network (2020)	100%	98%	99%	99%	90%	96%	99%
Individuals owning a mobile phone (2020)	84%	91%	NA	97%	NA	NA	72%
Households with Internet access at home (2020)	85%	92%	70%*	80%	27%**	49%***	94%
Individuals using the Internet, total (2020)	85%	86%	51%***	85%	22%**	21%**	71%
Mobile broadband basket as a % of GNI p.c. (2021)	1.7%	0.9%	2.8%	0.9%	7.0%	5.1%	1.1%
<b>Note:</b> * 2018 data; ** 2017 data; *** 2019 data <b>Source:</b> International Telecommunication Union (ITU). <a href="https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx">https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx</a>							

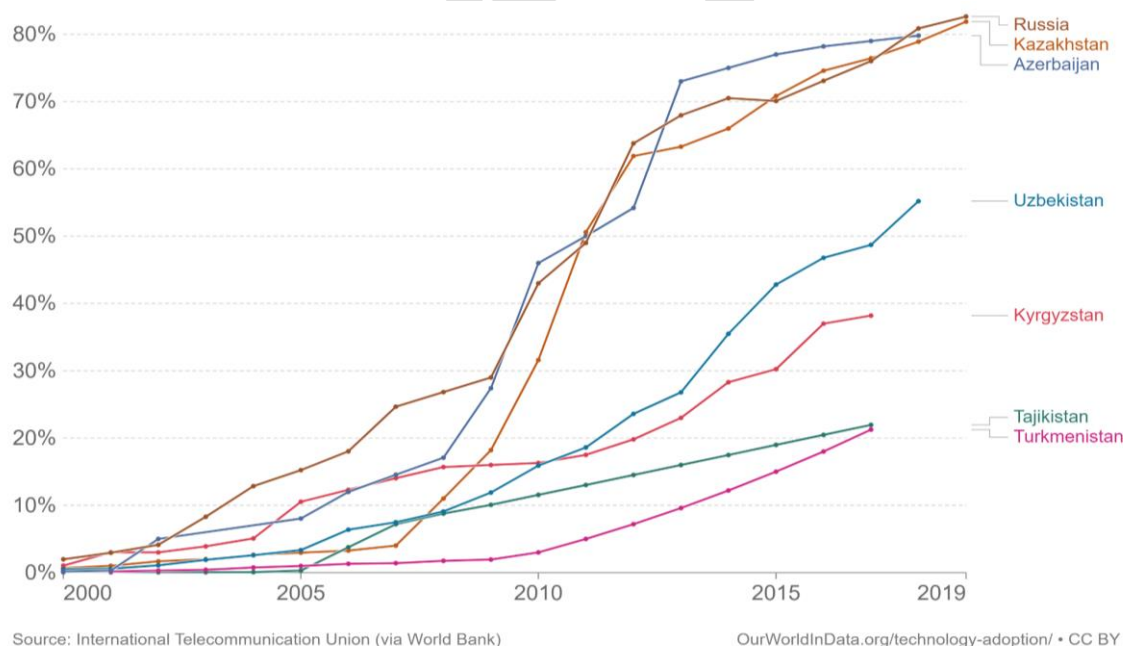
The impact of COVID-19 on the digital transformation and the speed at which the market for virtual connectivity services has realigned to allow companies, governments, educational institutions, and the public to move their processes online and continue their operations shouldn't be neglected or undervalued. This abrupt move toward virtualizing all operations has had a significant impact on the advancement of digital technology, network infrastructure, and digital literacy. The countries studied in this report were already showing a positive trend in internet access and broadband coverage before COVID-19. However, as can be seen from the Network Readiness Index (NRI) 2021 modeling results, the sub-region is still falling

behind in terms of general development and knowledge of ICT technologies. This modeling examines the trust, governance, inclusivity, and prospective influence of ICT technologies on the Sustainable Development Goals (SDGs) and country development. The NRI offers the chance to contrast current and previous values to see the change brought about by COVID-19, though it may be too soon to assess its full impact on digital innovations.

**Table 3: Network Readiness Index 2021**

	AZE	KAZ	KGZ	RUS	TJK	TKM	UZB
Score	47.56	52.17	42.22	57.74	34.55	-	-
Rank	76	61	92	43	111	-	-
Technology Pillar	45.93	43.11	28.60	53.71	23.43	-	-
People Pillar	45.19	51.54	39.76	58.80	26.48	-	-
Governance Pillar	47.24	57.25	45.76	59.97	35.05	-	-
Impact Pillar	51.90	56.79	54.75	58.49	53.25	-	-
<b>Source:</b> <a href="https://networkreadinessindex.org/">https://networkreadinessindex.org/</a>							

**Figure 1: Share of the population using the internet**



The United Nations developed the e-Government Development Index to assess the state of e-government development in UN member states. It assesses not only the development of websites in a country but also the analysis of digital infrastructure development, the level of education, and the population's capacity to use offered services. High scores in this ranking imply that each country has a developed and technologically competent infrastructure. However, it should be highlighted that the availability of infrastructure may not be able to give the necessary and substantial outcomes in the promotion of new methods and digital solutions in the absence of legislative and regulatory reforms. Nevertheless, without a strong foundation, it is impossible to bring about any change at all, and as shown in Table 4 below,

some Central Asian nations lag behind their neighbors by a margin, which can have an impact on regional cooperation and the efficiency of transit connections.

**Table 4: United Nations E-Government Development Index 2020**

	AZE	KAZ	KGZ	RUS	TJK	TKM	UZB
EGDI Score (0 to 1)	0.71000	0.8375	0.6749	0.8244	0.4649	0.4034	0.6665
EGDI Rank (out of 193)	70	29	83	36	133	158	87
Online Service Index	0.70590	0.92350	0.64710	0.81760	0.31760	0.17650	0.78240
Telecom Infrastructure Index	0.65280	0.70240	0.59020	0.77230	0.34960	0.35550	0.47360
Human Capital Index	0.77130	0.88660	0.78730	0.88330	0.72740	0.67830	0.74340
<p><b>Source:</b> United Nations e-Government Knowledge Base (UNeGovKB). <a href="https://publicadministration.un.org/egovkb/en-us/">https://publicadministration.un.org/egovkb/en-us/</a>  <b>Note:</b> The data utilized in the Database is derived from the United Nations Global E-Readiness Reports and the E-Government Surveys, which are produced by the Division for Public Administration and Development Management (DPADM) of the United Nations Department of Economic and Social Affairs (DESA).</p>							

The development and management of transportation infrastructure must take into account the climatic features of different nations as well as the effects of climate change on all facets of the transport sector and related services in order to increase connectivity and reduce risk. Most of the freight transit in landlocked developing nations (LLDCs) occurs on roads. The road network is the most susceptible to deterioration in this regard, necessitating greater resources and technological advancements for adoption measures. However, given the harsh winters in the Russian Federation and the intense heat waves in Turkmenistan in the summer, the effects of climate change on other forms of infrastructure, such as railways, airports, and rivers, shouldn't be ignored.

Against this backdrop, ESCAP launched the project "New technologies and digital transformation for more robust and competitive railway operations" earlier this year, with a focus on nations in North and Central Asia. Among inland modes of transportation, rail transit is the most ecologically friendly. It is also commonly utilized for freight transit in North and Central Asia. However, the Coordinating Council for Trans-Eurasian Transportation (CCTT) estimates that the time required for customs clearance and documentation-related formalities accounts for close to 39% of transit time. ESCAP's goal with this project is to eliminate inefficiencies that inhibit cross-border railway transport operations, aid in the implementation of modern rail and multimodal transport systems and increase the resilience of transportation networks and operations. The enhancement of electronic information interchange and the simplification of documentation and customs procedures will help achieve this. The project will also explore how rail services and rail-centered intermodal transport might support the notion of critical fast corridors (or green lanes, vital routes, etc.) that can continue to function in the event of substantial transport disruptions in the subregion.

Enabling integrated multimodal transportation systems that utilize different modes of transportation in accordance with their relative strengths is one method to make sustainable transportation a reality. Such arrangements promote complementary rather than competitive behavior. There is a need for proactive legislative actions to promote environmentally friendly and energy-efficient forms of transportation, such as railroads and multimodal transport networks, in order to advance toward such a system at the regional level. As overland transport is anticipated to rise quickly in the coming years, this would become even more crucial. Countries in the ESCAP region are adopting a number of national and regional measures to

improve the transportation infrastructure in order to accommodate rapidly increasing land transport, thus strengthening the connections between the nations.

This research is motivated by the dearth of previous comprehensive research on multimodal transport implementation and digitalization of the transport and freight sectors in the countries analyzed for this study. Existing studies do not give a complete assessment of the present situation, successful instances, drivers, and barriers to building dry ports and other multimodal transport facilities, as well as the digitalization of the transportation and freight industry. This study seeks to uncover the success factors, drivers, and constraints for digital transformation and the transition toward multimodal transport that may be applied to the transport sector of North and Central Asian countries.

DRAFT

# DIGITAL SOLUTIONS FOR RAILWAY AND MULTIMODAL TRANSPORT

One of ESCAP's overarching objectives is to see the creation of an international, integrated, multimodal logistics and transportation system for the region, with the Trans-Asian Railway and Asian Highway networks, as well as dry ports of international importance, as key components.

There are a variety of non-physical barriers that continue to pose substantial challenges for international rail transit in the Asian region. 2015's Resolution 71/7 on Adoption of the “Regional Cooperation Framework for the Facilitation of International Railway Transport” demonstrates ESCAP's commitment to the efficient and uninterrupted transportation of goods by rail across the region (UNESCAP, 2017). Member nations and their development partners can utilize the framework to unify international rail transport regulations throughout the region. ESCAP has also drafted the “Framework for enhancing efficiency of railway border crossings along the Trans-Asian Railway network and beyond”, a guiding document aimed to improve border crossing efficiency. Digitized information exchange between railways and control agencies might greatly boost the efficiency of the border crossing procedures, including transit formalities, along the Trans-Asian Railway Network and beyond (UNESCAP, 2018). Additionally, ESCAP also initiated the development of the “Regional Framework for the Development, Design, Planning, and Operation of Dry Ports of International Importance” that outlines the essential difficulties associated with designing and operating dry ports of international importance. It offers a corresponding set of targets to be set when developing or running these dry ports, as well as a framework for accomplishing each of these targets (UNESCAP, n.d.a).

There are many reasons to believe that digitization of railroads would improve international rail transport efficiency and allow railways to easily connect with other methods of transport in delivering sustainable freight services. Rail transport is recognized as critical to regional connectivity and the advancement of inclusive and sustainable economic and social development in the Regional Cooperation Framework for the Facilitation of International Railway Transport. In light of the increasing mobility of people and goods, the vast distances between departure and arrival points, and the low environmental impact of rail transportation, as well as the increased safety, carrying capacity, faster long-distance speeds, and lower cost of digital solutions, it is clear that digitalization of rail transportation is essential to further enhance subregional connectivity and multimodal transport networks.

## Railway transport

**Note:** This subsection is built on the information provided in the ESCAP “Smart Railway Solutions for Trans-Asian Railway Network in the Times of the COVID-19 Pandemic”.

Over the past decade, international rail transport has seen a dramatic shift, with more freight than ever before being transported. As a result of this growth, new train lines, infrastructure, and services are being built, and new rail alliances are being formed. Freight transport in the ESCAP area is facing changes in supply chains and the likely relocation of manufacturing as a result of the COVID-19 pandemic, which would alter the amount and frequency of freight along international transport routes. While other forms of transportation struggled to move products efficiently during the pandemic, rail service proved to be a dependable mode of transportation since it provided seamless and contactless solutions to freight transit. The railways should now embrace this situation to boost their competitiveness in the post-



pandemic climate by utilizing smart railway technologies. Smart railway solutions seek to increase railroads' awareness of the spectrum of choices available to deal with rising difficulties and capitalize on possibilities in the digital era. If effective, smart train technology might be easily replicated and scaled. For the region's railways, however, not all options would be of similar importance or relevance. The following modules are recommended for member states to consider when planning and designing improvements to their national railway systems (UNESCAP, n.d.b):

- **Smart railway operations:**

- a) *Automation of railway terminals:* Smart railway solutions based on automation could optimize processes at railway stations, terminals, shunting, and marshalling yards and could include: automation of loading and unloading, including stacking, storing, transporting cargo/containers at and between terminals, and facilitating container transshipment; use of intelligent gate systems; state-of-the-art IT solutions for terminal and yard administration, including automated wagon coupling. The scale, kind of railway operations, goods/wagons handled, location, number and type of stakeholders, and organizational choices for logistical activities define railway stations, terminals, shunting yards, and marshalling yards.

- b) *Advanced traffic management system solution:* Innovative railway traffic management systems can manage train control systems (such as signaling, automatic train protection, automatic braking, and speed control) by combining new and adaptable communication technologies (such as GSM-R, LTE/5G, WiFi, and SatComm) with innovative train positioning systems.

- **Smart railway maintenance:** Condition-based maintenance evaluates railroad components. Comparing real-time condition values of the observed parameter against the critical parameter threshold can characterize the railway component's current state and arrange any necessary repairs. Predictive maintenance includes condition-based monitoring. Advanced analytics may anticipate the future status of a railway component by integrating real-time, historical, and prospective usage data to identify failures and schedule maintenance (using artificial intelligence and machine learning).
- **Smart train driving:** The automatic of train operation, also known as ATO, is a solution used with automatic train protection (ATP) in train control systems. It automates starting, accelerating, braking, and stopping. ATO solutions work with the latest communication-based train control (CBTC) systems. These systems employ innovative train positioning technology, continuous on-board-to-trackside communication, and real-time interfaces to traffic control systems. ATO functions aren't related to safety, but they optimize driving allowing for fully automated train operations.
- **Smart railway border crossing solutions:** State of the art automated information systems aid in the effective management of rail transportation. They are composed of numerous applications and sub-systems that are used on a national and international scale. There are three main system solutions for electronic information exchange in international railway transport: 1) EU Telematics Applications for Freight - Technical Specification for Interoperability (TAFTSI). 2) OSJD SMGS and bilateral EDI agreement; 3) CIS Council for Railway Transport (CIS CRT). Harmonized customs formalities may help minimize transit time at border crossings. Single stop inspections at shared border crossings designate just one common border station between two neighboring nations as a shared border control checkpoint. All break-of-gauge



operations (such as the transshipment of containers and/or the changing of bogies) should be organized at the same joint border crossing station. Adopting such clever solutions increases cooperation between parties and may lead to the restructuring of border processes and controls.

- **Smart railway customer orientation:** India's Rail SUGAM is an Indian Railways app for freight customers. It's designed to meet the needs of potential and existing customers interested in Indian Railways' freight operations and performance. The app improves customer confidence by providing an easy-to-use interface for accessing relevant information. The application dashboards and data views provide information on multiple Indian Railways freight aspects, including performance, terminal handling details, contact details of concerned officers, and tracking the position of goods in transit over the Indian Railways network. JSC Kazakhstan Temir Zholy (KTZ) operates ASOUP, an automated transportation management system, since 1985. The system creates and maintains in real time a rail transportation information model (departure, wagon, train, container, locomotive road models) in which all the main business processes on the road are logically interconnected (registration of transportation, formation and passage of trains, management of traction resources, control of the location, technical condition of the rolling stock, maintenance of filing cabinets, maintenance of machine-to-machine information exchange of data with the national information systems of the railway department, the information database of the interstate level of the IDIL ICC RA, etc.). ASOUP systems organize, predict, and plan operational activities. ASOUP is the MCC's system-wide environment for implementing and creating automated railway technology.
- Smart railway investing:
  - a) Green bonds, sustainability bonds and green loans: These are means to borrow money and guarantee to pay it back. New or existing green initiatives must be financed by green financial instruments. Rail firms, municipalities, MDBs, and other organizations can issue green bonds with set rates and periods (e.g., 5 years, 10 years, or longer). Bond underwriters collaborate with issuers to determine bond pricing, oversee issuance, and sell bonds to investors. External reviewers can determine how effectively green bonds follow regulations, norms, certification, and verification. People, pension funds, and insurance companies can earn money with bonds. Development banks or commercial banks can grant green loans at one or more levels with a fixed or variable interest rate. Loans for green initiatives are given to lenders. As with green bonds, green loans might be evaluated and certified by a third party to ensure they meet requirements.
  - b) *Geographic Information Systems (GIS):* They allow to collect, organize, analyze, and display geo-referenced data. GIS's core characteristics highlight how it may be used to plan, manage operations, and make strategic choices. GIS integrates data to provide location information. Geodata is spatial, so it's easier to grasp than tabular, textual, and graphical data. GIS lets anybody map information. This is especially vital for worldwide collaboration or for many users. GIS uses a standard visual language to display links between different types of information. Geodata makes information easy to grasp, compare, and interpret.
  - c) *Railway transport modeling:* Transport modeling facilitates sensible transportation planning (for infrastructure, operation, technologies and other issues). It may also help test new routes, services, billing structures, and solutions and set

investment and development priorities. Changes in the railroad industry can be related to macroeconomic situations. All train network and performance parameters, as well as those of other transportation networks (if needed), are modeled digitally. The model adjusts formulae and mathematical principles using past data. Technology allows self-learning machine learning models. Self-learning algorithms need adequate processing power to improve.

The COVID-19 pandemic grew to quickly become a socio-economic challenge for all nations all around the world, and especially for ESCAP LLDCs. The transportation sector was one of the worst-hit by the pandemic, and hence gave an opportunity to rethink the way it has been developing over the past few decades. Transport and economic growth have usually gone hand in hand, which has led to increased negative environmental impact. While business-as-usual is no longer sustainable and favorable, the subregion now has to consider ways to increase the social and environmental sustainability of all aspects of socio-economic development, especially in the transport and logistics sector. Transport's rising emissions and impact on climate change are well-documented and require immediate action. Cleaner ways to get around can help cut down on transportation emissions, and smart solutions could make the region's railways more reliable, efficient, and green.

## Multimodal transport and dry ports

Over the last decade, transformational changes in cost, usability, and availability of new technologies, software, and hardware have enabled the introduction of new ICT solutions for warehouse management and thereby laid the foundation for the digitalization of the transport and logistics sector, allowing for more inclusive multimodal transport solutions, including increasing the popularity of dry ports among freight transporters (UNESCAP, 2020a). These solutions change the business-as-usual model by increasing the effectiveness and efficiency of multimodal transport in the following areas:

- **Freight transportation and handling:** The exchange of data between smart sensors, control systems, and platforms is increasing in volume year by year. This is partly due to the spread of broadband and high-speed Internet (4G and 5G) networks, which has been made possible by the development of information and communication technologies. Cargo forecasting and scheduling systems currently use both ground data from sensors and Global Positioning System (GPS) information to model optimal timeframes for cargo handling.
- **Maintenance:** Connecting all elements of the warehouse to the risk and error control system can allow warehouse operators to spot problems before they become critical. This means shorter downtime for machinery and a reduction in repair costs.
- **Smart sensors and the Internet-of-Things:** Sensors are a key element of the digital infrastructure of modern transportation solutions. Due to their relatively low cost and given their increasing service lifecycle, such sensors can be implemented both on moving objects and in transport infrastructure networks. They provide additional information for analysis, forecasting, and monitoring of the efficiency of the transport and logistics sector.
- **Autonomous vehicles:** Trucks, cranes, stackers, and other mechanized vehicles are now becoming more and more "independent" and can be controlled remotely either by an operator or by a computer system. If the pace of development of control and risk

analysis systems continues, connected autonomous units will be able to perform an increasing number of tasks without human intervention.

- **Warehouse robots:** Mobile warehouse robots are becoming increasingly popular as they can operate around the clock without the need for lighting (which is, in some cases, the largest consumer of electricity) and require minimal space for maneuvering. Mobile robots are also becoming smarter, allowing them to automate not only the process of moving cargo from Point A to Point B but also enter the relevant data into the warehouse management system and initiate the next sequence of operations.
- **Artificial intelligence:** Artificial intelligence (AI) can plan for more efficient use of the resources of warehouse terminals and connect service consumers and service providers, reducing the time needed for forming transport routes and loading and unloading algorithms. However, these systems are not yet able to operate beyond operator-defined parameters and thus replace human operators.

The use of ICT technologies will help to increase the efficiency of transport networks and reduce logistics costs; develop international transit and strengthen international trade links; and integrate intermodality into the transport and logistics network. In this context, the development of logistics hubs and dry ports with the introduction of the latest digital technology is of great importance for the region's progress as a transit and logistics hub.

# **OVERVIEW OF TRANSPORT SECTOR DEVELOPMENT AND DIGITALIZATION IN SELECT COUNTRIES OF NORTH AND CENTRAL ASIA**

It is important for the countries of Central Asia, the Russian Federation and Azerbaijan to find the right approach to realizing their transit potential, which is impossible without infrastructure, digital transformation, and the introduction of new technologies to achieve the set national socio-economic development goals. In the long term, the use of innovative and multimodal transport methods for the development of the transport and logistics sector, the introduction of automated e-commerce, the transition to paperless document management, the use of ICT solutions, the introduction of "green corridors" and electronic queues at checkpoints will accelerate the transition to a digital economy and erase existing barriers. If the transport and logistics systems processes of the CA countries, the Russian Federation, and Azerbaijan work properly, these solutions can accelerate the delivery of goods, reduce time, including the ability to track cargo and vehicles, and most importantly, increase the competitiveness of the transport and logistics industry, which will have a positive impact on the development of non-carbon sectors of the economy. It is worth emphasizing that trade facilitation is no less important than the creation of the infrastructure itself, as it does not require large investments and time. Trade facilitation is predominantly related to politics, so it is a matter of interaction and cooperation between countries.

Given that a well-developed and well-aligned transport and logistics infrastructure is an integral element of the mobility of people and goods, economic growth, and the promotion of innovative solutions, namely the development of the consumer market, all aspects of socio-economic growth are linked to it. The global commodity chain, especially in a regional context, generates a large flow of goods and services between countries. International transport is served by the transport systems of individual countries, which use national rolling stock carriers as well as transport networks to link Europe and Asia. In the development of international and regional cooperation, the leading role is played by the formation of a network of international transport corridors with a special regulatory and procedural status, allowing the facilitation of goods transit processes.

This section evaluates the present state as well as the progress that has been made in terms of the digitalization of the transport and logistics sector at the national level in the subregion of the selected North and Central Asian countries, with a specific emphasis on railway transport as well as multimodal transport and digitalization through ongoing or planned national development strategies, policies, and programs. Specifically, this section looks at how digitalization is being implemented through national development strategies, policies, and programs. It paves the way for further analysis of successful policy tools, best practices, and lessons learned regarding digital transformation and the application of new technologies. This section seeks to improve understanding of the digitalization potential and degree of digitization, its drivers and barriers for the sector and the country; examines already implemented or planned national strategies for transport and logistics sector-specific transformation in terms of information and communications technology (ICT), road freight, and digitization trends.

## Azerbaijan

The transport sector in Azerbaijan is regulated by the Ministry of Digital Development and Transport of the Republic of Azerbaijan<sup>4</sup> which is a central executive body implementing state policy and regulation in the areas of telecommunications, TV and radio broadcasting, Information Technologies, Road Transport, Maritime Transport, and Civil Aviation. Additionally, the Azerbaijan International Road Carriers Association (ABADA) is responsible for T1 documents or TIR Carnets, and the State Customs Committee of the Republic of Azerbaijan<sup>5</sup> is responsible for authorizations for international road transport, documents on veterinary and phytosanitary control, as well as export and import operations (IRU, 2022a).

After the Global Financial Crisis of 2008, the economy's vulnerability to fluctuating oil prices forced Azerbaijan to look into the development of the non-oil sector. As a result of the reforms, the transport sector was selected as part of the non-oil sector development target areas and was included in Azerbaijan's five-year socio-economic development state program. Roadmaps have been developed for 11 different sectors of the economy, consisting of 12 documents with corresponding targets, divided into three phases - short-term (from 2016 to 2020), medium-term (until 2025), and long-term (from 2025) (JICA, 2019). Among other things, these documents prioritize infrastructure and ICT development and improvement of the legislative and customs norms as a sustainable and inclusive way of socio-economic development and utilization of the transit potential of the country.

This is further supported by the “Strategic Roadmap for Development of Logistics and Trade in the Republic of Azerbaijan” adopted in December 2016, which states that “Azerbaijan in long-term aspires to become a regional logistics hub through its efficiently operating logistics centers with strong connectivity to other countries,” further highlighting the importance of developing modern and efficient transit facilities, including through digitalization (GoRA, 2016b). It sets the short, medium, and long-term perspective for the economic development in logistics and trade in Azerbaijan until 2025. Additionally, two Decrees of the President of the Republic of Azerbaijan promote transport and logistics sector development: 1) “On additional measures to continue reforms in the customs system” No. 1853 dated 4 March 2016; and 2) “On obtaining, suspension, termination, and restoration of the rights of foreign trade participants on permanent use of the “Green Corridor” customs clearance system” No. 427 dated 21 December 2018 (MDDTRA, n.d.).

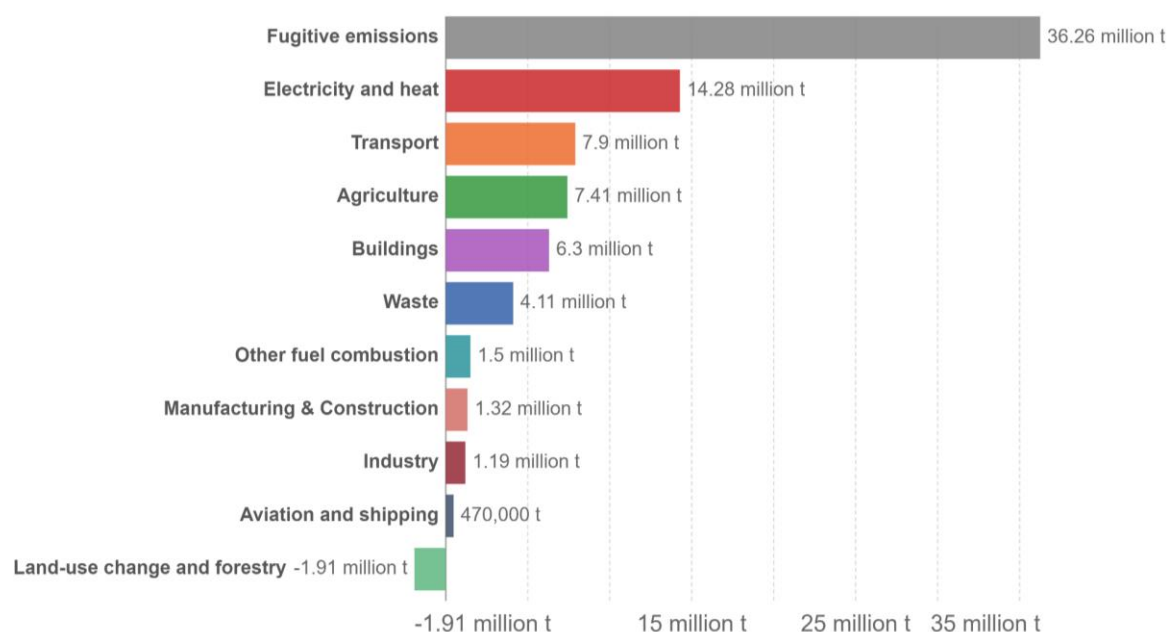
According to the information submitted to the United Nations Framework Convention on Climate Change (UNFCCC) on the Intended Nationally Determined Contribution (INDC) of the Republic of Azerbaijan in 2017: “By 2030, the Republic of Azerbaijan targets a 35% reduction in the level of greenhouse gas emissions compared to 1990/base year as its contribution to the global climate change efforts.” According to the Climate Watch 2018 data, the transport sector of Azerbaijan is the 3rd largest emitter in the country, as shown in Figure 2 below (UNFCCC, n.d.).

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<sup>4</sup> <https://mincom.gov.az/en/>

<sup>5</sup> <https://customs.gov.az/en>

**Figure 2: Greenhouse gas emissions by sector in Azerbaijan in 2018**



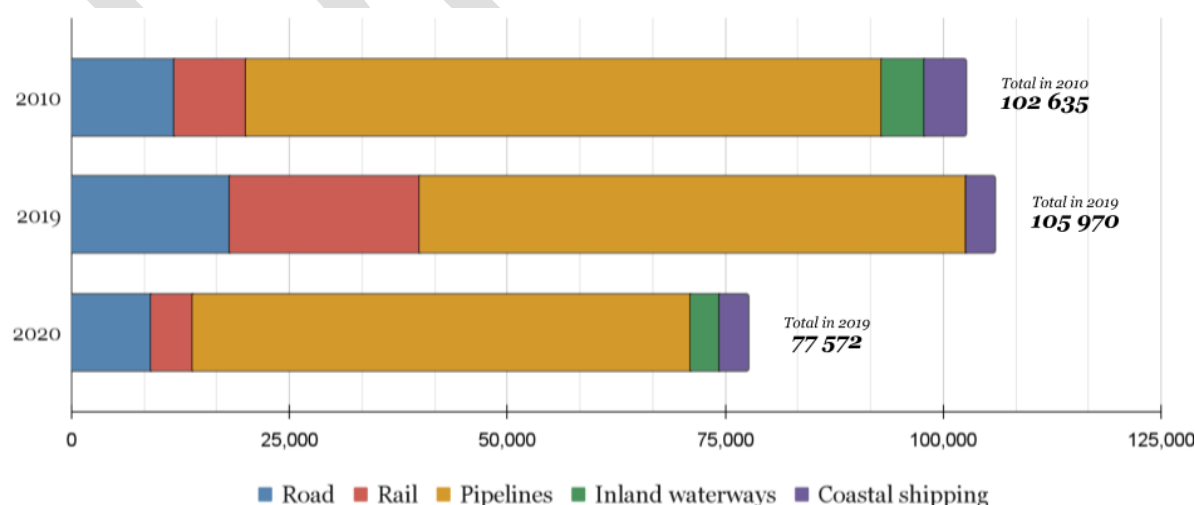
Source: CAIT Climate Data Explorer via Climate Watch

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Note: Greenhouse gases are weighted by their global warming potential value (GWP100). GWP100 measures the relative warming impact of one molecule of a greenhouse gas, relative to carbon dioxide, over 100 years.

According to the ITF Transport Statistics for the Republic of Azerbaijan, 105 970 million tonnes-kilometers of goods were transported in 2010 and 77 572 million tonnes-kilometers in 2020, showing a significant decrease in the rail freight transport volume. Whilst pipeline transport is the main mode of freight transport, road and rail also hold a significant share of the freight transported. All in all, a decrease in the volume of freight transported by pipeline during 2020 could be linked to COVID-19-related uncertainties and increased restrictions at the border since there was almost no change in the volume of freight transported by pipeline (ITF, 2020).

**Figure 3: Goods transported in Azerbaijan in 2010, 2019, and 2020 (t-km, millions)**



Source: ITF Transport Statistics

## **Policies, Strategies, and Programmes on the Digitalization of Transport:**

- ***National Strategy for the Development of the Information Society in the Republic of Azerbaijan for 2014-2020:*** Digital transformation is a priority of the National Strategy for the Development of the Information Society in the Republic of Azerbaijan for 2014-2020. Digital technologies are largely regarded as an important strategic vector in the national policy to diversify the economy. This strategy envisages measures to develop the scientific and technological potential of Azerbaijan, increase digital capacity, improve cybersecurity and e-commerce. Although this strategy does not define the priorities and ways of digitalization of transport and logistics, many aspects of ICT development and e-government are contributing factors in the digital transformation (UNESCAP, 2020b), (AzerTac, 2014).
- ***Strategic Roadmap for Development of Telecommunications and Information Technologies in the Azerbaijan Republic:*** In 2016, Azerbaijan adopted the Strategic Roadmap for the Development of Telecommunications and Information Technology to support the development of the ICT sector, increase the productivity and efficiency of enterprises through the introduction of advanced digital tools, and improve the quality of public services. This Strategy serves as a guideline for achieving the goals defined in the Order of the President of the Republic of Azerbaijan approving the "Main directions of the strategic roadmap for the development of the national economy and its key sectors and subsequent issues," dated March 16, 2016, No. 1987. Some of the identified priority areas, namely the expansion of digital payments, the improvement of electronic services of state bodies, and the improvement of information systems of state organizations, indirectly support the digitalization of the transport and logistics sectors, as they introduce the digitalization of government processes, which also includes the transport sector (GoRA, 2016).
- ***Strategic Roadmap for the Development of Logistics and Trade in the Republic of Azerbaijan:*** The Strategic Roadmap sets short, medium, and long-term policy directions for economic development in logistics and trade in Azerbaijan for the periods of 2020, 2025, and post 2025. It not only stipulates the development objectives and targets but also defines a series of strategic priorities and actions to achieve those objectives and targets, covering development prospects for the period by 2020, and a detailed action plan specifying the main and other responsible persons, period of execution, and indicators is developed therein. In order to achieve its objectives in the logistics and trade sector, Azerbaijan will greatly install and utilize advanced technological infrastructure in managing its logistical operations in the long term. It will collect and integrate data from various sources on the specifics of commodities and transportation routes and feed it into its central database. Through an intelligent system built upon this database, Azerbaijan will quantify, analyze, and better manage different operations of freight effectively and cost-efficiently. This increased digitalization trend will also promote less than-truckload (LTL) logistics in Azerbaijan further, as well as multi-user storage and shared distribution. This way, it will ensure that different logistics counterparts coordinate to jointly optimize their warehousing and transportation operations (GoRA, 2016b).
- ***Alat Free Economic Zone:*** As part of the emerging trade and logistics hub in the Alat settlement on the Caspian Sea coast, it was established by the decree signed by the President of the Republic of Azerbaijan on May 22, 2020. The decree orders documentation of the lands located in the administrative territory of Garadagh district, 65 kilometers south of Baku, which Alat settlement is part of, as the territory of the newly

created free economic zone. The Baku International Sea Trade Port, the largest Caspian port in the settlement of Alat, is ordered to include the land allocated for its utilization in the territory of the Alat Free Economic Zone. The law defines a special tax and customs regime to be applied to the companies operating within the free economic zone. No value-added tax will be imposed on the goods, works and services imported to the zone, while they will also be exempted from customs fees, according to the document. While there is no direct mention of the digitalization of the Alat Free Economic Zone, it should be noted that Baku International Sea Trade Port is one of the largest and most advanced container management facilities connecting Asia and Europe (ERAIr, 2021).

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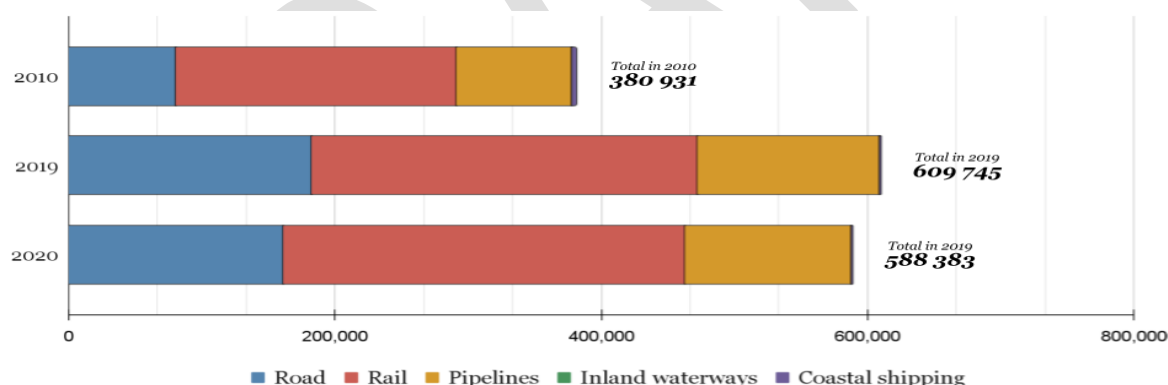
## Kazakhstan

The Ministry of Industry and Infrastructural Development of the Republic of Kazakhstan<sup>6</sup> is the central executive body of the Republic of Kazakhstan responsible for the management and inter-sectoral coordination of the development and implementation of state policy in the fields of transport and communications. The Ministry was established following Decree No. 875 of the President of the Republic of Kazakhstan dated August 6, 2014 and replaced by the Ministry of Transport and Communications.

The ACS BS automated control system at border crossings has been operational since 2009. The technology automates operational labor (station, departmental) and improves operational transportation management. ACS BS is a series of interconnected operations based on a single regulatory reference and variable information. In 2012, a new version of the station-node automated control system was created. In 2017, the stations installed the automated control system "Contractual and Commercial Activities" as part of the Company's digitization of cargo and commercial activities (ACS CCA).

Over the years, and especially in the past decade, Kazakhstan has made active efforts to build and restore transport infrastructure and enable multimodal transport. At the end of 2018, all modes of transport carried almost 10 million tons of cargo, while in 2020, this number amounted to 22.67 million tons, of which 20.6 million were for rail transport and 2.07 million tons for road transport. It is worth noting that the share of rail transport, compared with road transport, is steadily increasing.

**Figure 4: Goods transported in Kazakhstan in 2010, 2019, and 2020 (t-km, millions)**



Source: ITF Transport Statistics

This is partly because Kazakhstan is actively modernizing road and rail infrastructure, including corridors, BCPs, cargo terminals, temporary storage facilities, airports, and constructing missing links. Yet another reason is Kazakhstan's alignment of infrastructure development priorities with its neighbors and other partner countries under the Nurly Zhol State Infrastructure Development Program. One of the best examples of such synergy is the construction of the Khorgos-Eastern Gateway, Central Asia's largest dry port. This infrastructural project contributes to the alignment of Kazakhstan's "Nurly Zhol" program with China's Belt and Road Initiative (BRI). At the port, the narrow-gauge railroad from China meets the broad-gauge railroad adopted by the CIS. At the moment, this facility allows for the processing of 5-6 container trains per day, but it is planned to increase the capacity to 10 container trains per day (MSSI, 2020).

<sup>6</sup> <http://www.miid.gov.kz/>

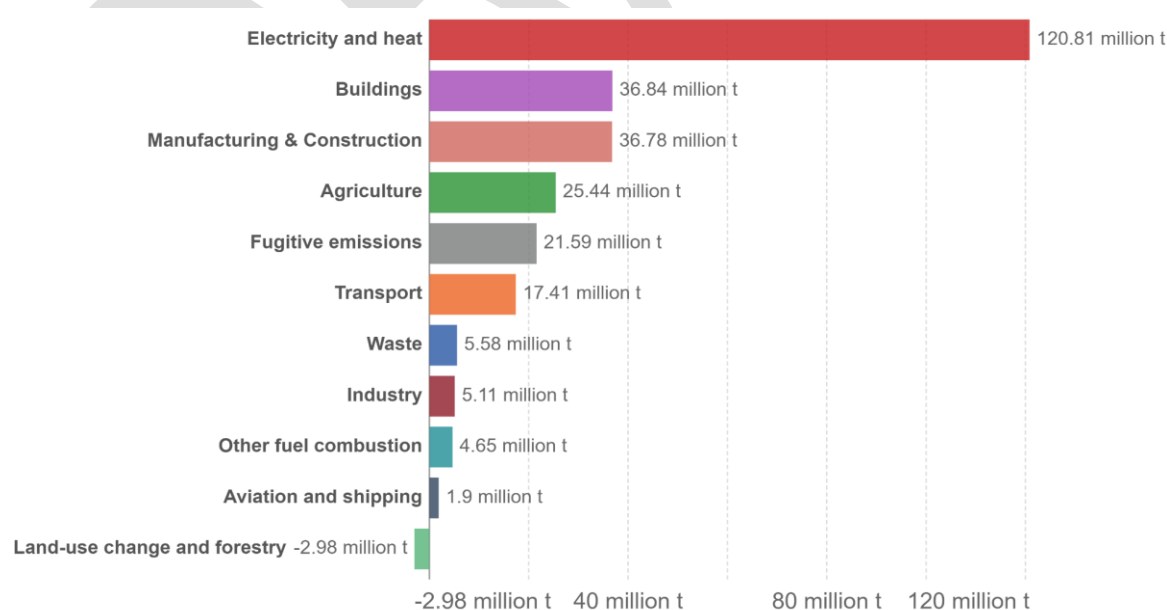
In his address to the participants of the World Economic Forum, President Kassym-Jomart Tokayev noted that the development of the transport and logistics complex remains an important task, despite the successful implementation of the First Phase of the "Nurly Zhol" State Infrastructure Development Program. *"Our efforts enabled us to connect the capital with the regions through the creation of modern and sustainable infrastructure and high-quality roads. "Currently, a new infrastructure priority of the transport system has been formed, the country's integration into global transport corridors has been ensured, and the historical status of Kazakhstan as a link between Asia and Europe is restored,"* he said.

Kazakhstan is a party to the Intergovernmental Agreement on the Asian Highway Network and the Intergovernmental Agreement on the Trans-Asian Railway Network. The Asian Highway network in Kazakhstan includes 12,828 km of non-Primary roads, 557 km of class I roads, 5,407 km of class II roads, and 6,389 km of class III roads. The length of Kazakhstan's railways is 21 thousand km. The operational length of the mainline railway network is 16.1 thousand km (UNESCAP, 2022b).

In the freight transportation sector in recent years, and especially during the pandemic of COVID-19, Kazakhstan has made the transition to paperless processing of documents through the Automated System of Contractual and Commercial Work. This has made it possible to eliminate direct customer contact during service provision and to speed up document flow, and thus the volume and speed of services provided.

As per their Intended Nationally Determined Contributions, Kazakhstan has signaled its commitment to reduce greenhouse gas emissions by up to 25% by 2030 when compared to 1990. "Greening" of the economy and energy sector is identified as the main direction of socio-economic development, which shall allow Kazakhstan to meet its goal. While the transport sector is not the main GHG emitter, the development and modernization of transport infrastructure as part of socio-economic development can lead to a shift of transport modes from GHG intensive to "greener" modes of transport.

**Figure 5: Greenhouse gas emissions by sector in Kazakhstan in 2018**



Source: CAIT Climate Data Explorer via Climate Watch

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Note: Greenhouse gases are weighted by their global warming potential value (GWP100). GWP100 measures the relative warming impact of one molecule of a greenhouse gas, relative to carbon dioxide, over 100 years.

## **Policies, Strategies, and Programmes on the Digitalization of Transport:**

- ***The Strategy Kazakhstan-2050:*** Adapted in 2012, the Strategy aims to guide the diversification of the economy of the Republic of Kazakhstan by focusing on the available internal resources and adapting to the changing world, hence forcing the government authorities to plan strategically ahead and become among the 30 most developed states by 2050. One of the areas of focus is the development of the transport and communication infrastructure that would allow Kazakhstan to realize its transit potential and be attractive as a transit hub between Asia and Europe and the Middle East. It also calls for regional integration and the development of joint logistic centers and hubs with neighboring countries. Transfer of new technologies and best practices is something that is being referred to constantly (GoRK, n.d.a).
- ***State program "Digital Kazakhstan" for 2018-2022:*** It is expected that the reduction of transit time will significantly increase the volume of transit freight traffic in the railway sector in all directions from China through Kazakhstan - to Europe, Turkey, and Iran. The main effect will be obtained both through the transition to electronic document management, including in the field of air transportation, and through the introduction of an intelligent transport system, which will increase the volume of road freight transportation by providing high-quality and safe road infrastructure between the regions of Kazakhstan and international traffic. The intelligent transport system will combine the functions of video surveillance, traffic control, weather alerts for drivers and electronic payment for transport services. For the system integration of vehicles, infrastructure, users and information technology, an ITS will be developed consisting of sub-components with their gradual implementation, including a set of technical means for automating the collection of funds for road use; a system of non-stop dynamic weighing of vehicles installed on the main road transport corridors, a traffic control system. All this makes it possible to inform drivers about the situation on the roads, create systems for analyzing and forecasting climatic conditions, use video monitoring systems and detect traffic violations, including ensuring unimpeded transit through the territory of Kazakhstan. The program also includes a number of measures to improve the efficiency of road operations, increase the efficiency of rail transport, and improve forecasting of passenger and freight traffic (Adilet, n.d.b).
- ***State program of infrastructural development "Nurly Zhol" for 2020 - 2025:*** The purpose of the program is to promote economic growth and improve the living standards of the population of the country through the creation of an efficient and competitive transport infrastructure, the development of transit and transport services, and the improvement of the technological and institutional environment of the transport and infrastructure complex. The process of containerization of cargo transportation is important for balancing the transit and export transportation of Kazakhstan. Assurance of container technology; the ability to provide quality service at production facilities, terminals, and dry ports; increasing the speed of handling and preservation of goods; support for customs and logistics operations; loading and unloading at the infrastructure of enterprises; access roads, terminals, and warehouses are also objectives of the program. Improvement of the regulatory and technical base of the road sector will be focused on integration with the best practices of the Eurasian Economic Union (EAEU) and OECD countries, as well as the elimination of technical gaps and discrepancies with the transition from a parametric to a regulatory technical regulation system as part of a complete digitization of all regulatory and technical documentation. One of the areas of

implementation of this initiative will be the introduction of modern information and communication technologies (ICT) in the field of transport and transport infrastructure. It will provide for the introduction of intelligent control systems for traffic flows, as well as the creation of a unified information environment for multimodal interaction between different types of transport, cargo owners, customs and supervisory state bodies, which will increase the efficiency of the transport system, eliminate non-physical barriers in the transport process, significantly speed up cargo handling and have an overall positive effect on the competitiveness of the transport industry (Adilet, n.d.a).

- ***National Development Plan of the Republic of Kazakhstan until 2025:*** The government of Kazakhstan in 2021 unveiled its National Development Plan 2025, which complements the government's main goal of becoming one of the 30 most developed countries in the world by 2050 and which replaces the previous Plan 2020. Overall, the plan is a continuation of the current strategy to diversify the economy, which includes significant investments in technology, increased exports of manufactured goods and the development of "new" industries such as transport and logistics, aerospace services, engineering, information and communications technology (ICT) and tourism, but takes into account the main challenges that Kazakhstan faced during COVID-19. One of the nationwide priorities is "Building a Diversified and Innovative Economy," which relates to the introduction of new technologies, e-government, and ICT solutions to the business vision, including in the trade and logistics sector (GoRK, n.d.b).
- ***Plan of the Nation - 100 Steps to Implement Five Institutional Reforms:*** Among the 5 presidential reforms in the third "Industrialization and Economic Growth", Steps 58: Attracting strategic (anchor) investors to create a single operator for the maintenance and development of road transport infrastructure; 65: Integration of Kazakhstan into international transport and connectivity. The launch of a project to create a multimodal transport corridor - "Eurasian Transcontinental Corridor", which will allow the unhindered transit of goods from Asia to Europe; 66: Creation of an international aviation hub; and 68: Improving the efficiency of state regulation of air transportation to make air transit through Kazakhstan more attractive; are provided for the development of transport and logistics (GoRK, n.d.c).

## Kyrgyzstan

The Ministry of Transport and Roads of Kyrgyzstan is in charge of the transportation sector. In 2016, the Ministry of Transport and Communications changed its name to reflect its new functions. In 1998, Law No. 89 (of July 8) "On Transport" was adopted, covering all modes of transport in the Kyrgyz Republic. Law No. 121 of July 18, 2016 "On Railway Transport" and the Air Code of the Kyrgyz Republic No. 281 of August 6, 2015, were adopted separately (OECD, 2019).

In recent years, Kyrgyzstan has become more active in improving its transit potential, despite its geographic location and large differences in altitude, as well as its remoteness from major transit sea and land corridors. However, the lack of a unified national rail network (the rail network is represented by fragmented, unconnected lines, geographically separated into two sections) and the poor quality of road and rail infrastructure stand in the way of this development. Coupled with the problem of financing, this task remains difficult to achieve. At the same time, Kyrgyzstan is actively cooperating with its neighbors and the international community on the development of the transport and logistics sector (UNECE, 2020a).

It is worth noting that major improvements in the transport and logistics sector, and infrastructure development took place due to the adoption of Kyrgyzstan's National Development Strategy for 2018-2040 states that Kyrgyzstan should become a transit country by 2040 for the transit of passengers and freight. The main focus here is on repairing and maintaining the current condition of the country's main transportation routes, while the transport and logistics sector requires major technological transformation. One such change could be Kyrgyzstan's participation in international agreements, as Kyrgyzstan, for example, is not a party to the Intergovernmental Agreement on Dry Ports, which makes it even more difficult for Kyrgyzstan to utilize its transport potential by improving supply chain and logistics, reducing transport costs, and ensuring the modal shift to a more efficient and sustainable mode of transport when transiting goods from China to Europe and the Middle East (OWPKR, n.d.). In 2021, Kyrgyzstan's National Trade Facilitation Roadmap for 2021-2025 was adopted. It presents several comprehensive national reforms to facilitate trade and develop cooperation with neighboring states (MJKR, n.d.).

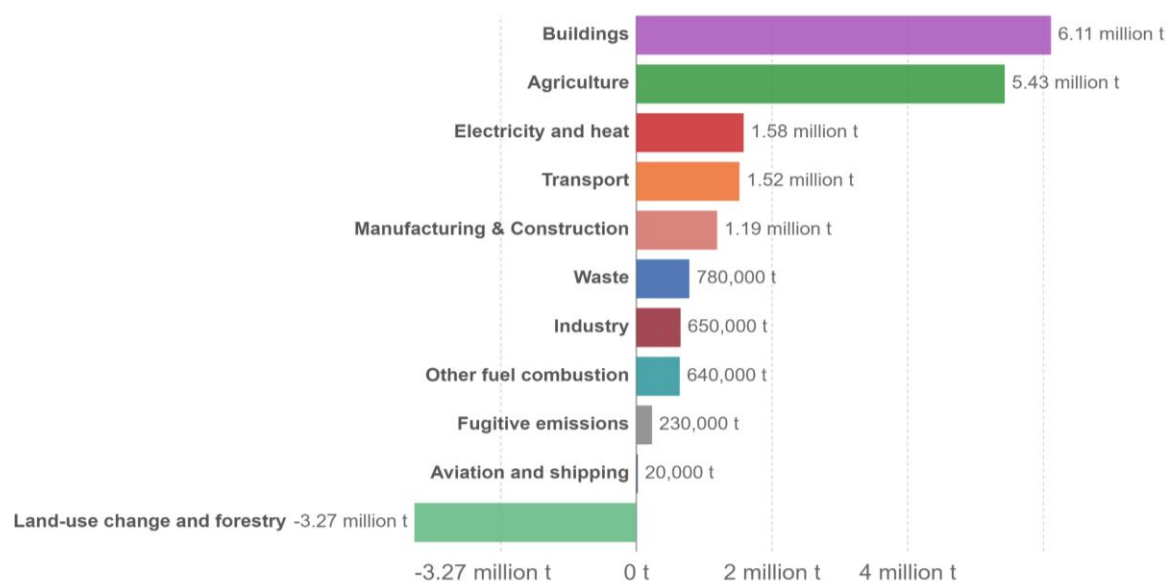
Besides being one of the members of the Eurasian Economic Union (EAEU), which allows partners to use the "green corridor" for the transit of essential goods like medicines, medical products, and foodstuffs, Kyrgyzstan also cooperates with China within the framework of the Cross-Border Cooperation Program for 2015-2020. The Programme has established green lanes at certain BCPs on the Kyrgyzstan-China state border for seamless and fast transport of agricultural products since 2015 (UNECE, 2021).

According to the National Statistical Committee of Kyrgyzstan, in 2019, 34.2 million tons of freight were transported in Kyrgyzstan by all types of transport, which is 3.6% more than in 2018. However, in 2020 more than 26 million tons of freight were transported by all modes of transport, which is less than 7.4 million tons, or 21.6 percent when compared to the 2019 amount (Tazabek, 2020).

The updated Nationally Determined Contribution (NDC) of the Kyrgyz Republic submitted in 2021 states that "the overall mitigation goal of the Kyrgyz Republic is to unconditionally reduce GHG emissions by 16.63% by 2025 and by 15.97% by 2030, under the business-as-usual scenario." Should international support be provided, GHG emissions will be reduced by 2025 by 36.61% and by 2030 by 43.62%, under the business-as-usual scenario (UNFCCC,

n.d.).” According to Climate Watch 2018 data, GHG emissions from buildings and agriculture amount to almost 60% of the total emissions. The transport sector still takes 4th place.

**Figure 6: Greenhouse gas emissions by sector in Kyrgyzstan in 2018**



Source: CAIT Climate Data Explorer via Climate Watch

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Note: Greenhouse gases are weighted by their global warming potential value (GWP100). GWP100 measures the relative warming impact of one molecule of a greenhouse gas, relative to carbon dioxide, over 100 years.

### **Policies, Strategies, and Programmes on the Digitalization of Transport:**

- **National Development Strategy of the Kyrgyz Republic until 2018-2040:** In 2018, Kyrgyzstan approved the National Development Strategy of the Kyrgyz Republic for 2018-2040, one of the strategic foundations of which was the National Program of Digital Transformation "Taza Koom". The current national strategy focuses on the introduction of modern technologies, particularly in the state customs service, education, and banking. The "Taza Koom" program is considered a key component of the national strategy for sustainable development until 2040 and provides for the development of public services, smart cities and villages, infrastructure, and human capital. Under this strategy, the transport infrastructure will ensure the freedom of movement of the population and take the country out of the transport deadlock. Kyrgyzstan should become a transit country with safe and in-demand corridors for the transit of passengers, goods, and cargo. A transit railway network and a railway branch line connecting the north and south of the country will be created. A vision of the future implies unambiguous digitalization in the integrated development of the entire economy and the functioning of the transport complex of the Kyrgyz Republic, which directly stems from the advanced development of the country's digital infrastructure within the framework of global trends (NSCKR, 2020), (GoKR, 2018a).
- **National Development Program of the Kyrgyz Republic until 2026:** As stated in the program, the National Development Program of the Kyrgyz Republic until 2026, aimed at improving the well-being of citizens, has been developed within the framework of the National Development Strategy of the Kyrgyz Republic until 2040, while maintaining the succession principle based on long-term strategic goals of the country with a human-centered approach and an emphasis on the fundamental commitment to "leave no one behind" the Sustainable Development Goals. One of the important priorities of the Programme is aimed at transport and logistics integration and solving the problem



of transport isolation of the country. Support for transport highways and international corridors will be a state policy priority. The state will create conditions (including the allocation of land) for the formation of a modernly equipped multimodal cargo hub, combining air, rail and road transport. In the development of transport and logistics infrastructure modern digital technologies will be introduced, providing seamless transit corridors (GoKR, 2021).

- **Road transport development concept of the Kyrgyz Republic for 2020 - 2024:** In the conditions of high mountains and due to the inaccessibility of the country's regions, road transport is the main mode of transport in the Kyrgyz Republic. Thus, 95% of freight and passenger transportation is carried out by road, which constitutes the main part of the transport sector. The concept addresses the need for digitalization and the introduction of information technology in road and urban transport to improve mobility, reduce the time of delivery of goods, as well as to ensure the safety of road users. There are plans to switch to an electronic format for obtaining certificates when issuing a license for passenger and freight transportation. Creating an information and communication system for calling emergency services in case of accidents in cars in accordance with the technical regulations of the EAEC "On the safety of wheeled vehicles" and creating opportunities for the development of CAREC transport corridors (GoKR, 2018b).
- **The Ministry of Digital Development:** The Ministry of Digital Development was established by Presidential Decree No. 114 of May 5, 2021 "On the Cabinet of Ministers of the Kyrgyz Republic" as a result of the merger of the State Service for Digital Development under the Government of the Kyrgyz Republic and the State Registration Service under the Ministry of Justice of the Kyrgyz Republic. The Ministry was created to develop and implement policies in the fields of digitalization and e-government. It also implements state policies in the use of electronic signatures, state and municipal electronic services, identification systems, ensuring equal access to digital technology, electrical and postal communications, including radio and television broadcasting, population registration, motor vehicles and trailers, special technological machines, driving, civil status records, archives, and cybersecurity.<sup>7</sup>
- **Digital Kyrgyzstan 2019-2023:** complements and expands the National Development Strategy of the Kyrgyz Republic for 2018-2040 and the program of digital transformation, which forms the basis of the process of digitization of the country. The concept addresses the construction of modern and adaptive state institutions, investment in human capital, the creation of flexible mechanisms for the development and updating of the regulatory framework, the promotion of research activities and innovation in business, and the consolidation of the business environment will be the engines of economic growth. The issue of Internet coverage of the entire territory of the Kyrgyz Republic is also being considered. The next step is considered the creation of an infrastructure for data collection, processing, storage, and analysis. As noted in the document, digitalization of both industry and other sectors will be incomplete without updating the logistics and transport industries. Digital transformation will solve many optimization tasks, which, in turn, will increase the efficiency, volume, and quantity of freight transportation (GoKR, n.d.a).

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<sup>7</sup> <https://digital.gov.kg/about/>

## Russian Federation

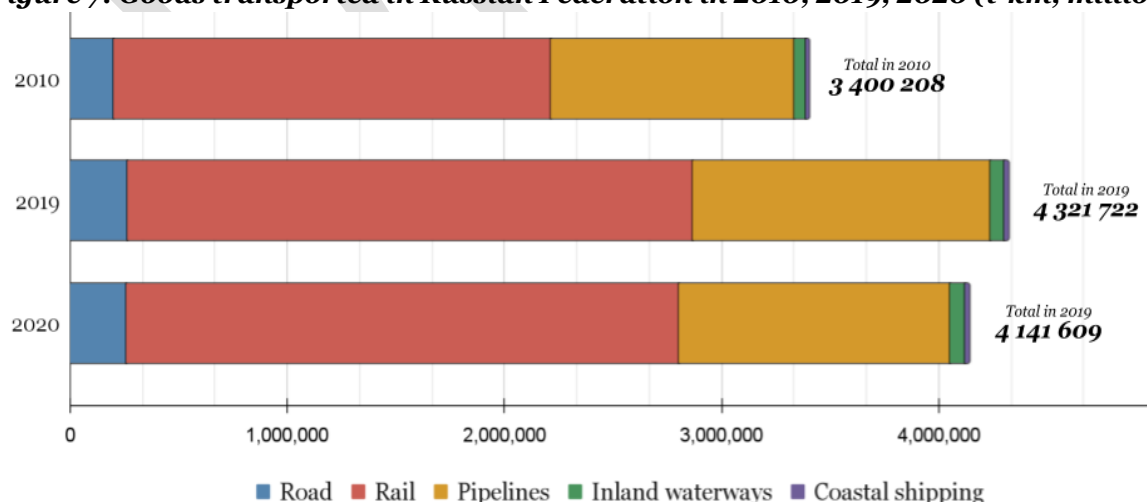
The Ministry of Transport of the Russian Federation is the federal executive authority responsible for the development of state policy and legal regulation in the field of civil aviation, the use of airspace of the Russian Federation, aerospace search and rescue, maritime, domestic water, railway, automobile, urban electric and industrial transport, operation of navigable hydraulic structures, and ensuring transport safety.

The following are additional notable governmental laws, rules, and decrees that affect the digitalization of the transport and logistics industry in the Russian Federation:

- Presidential Decree No. 474 of July 21, 2020 "On the National Development Goals of the Russian Federation for the period until 2030".
- Strategy for the Development of Information Society in the Russian Federation for 2017 - 2030.
- Program "Digital Economy of the Russian Federation", approved by the Decree of the Government of the Russian Federation No. 1632-r of July 28, 2017.
- Transport Strategy of the Russian Federation until 2030 with a forecast for the period until 2035, approved by Order of the Government of the Russian Federation No. 3363-r of November 27, 2021.
- Strategic direction in the digital transformation of the transport sector of the Russian Federation until 2030, approved by Decree of the Government of the Russian Federation No. 3744-r of 21 December 2021.

The transport system of the Russian Federation is characterized by a developed transport network, one of the most extensive in the world, including 87,000 km of railroads, over 745,000 km of paved roads, over 600,000 km of overhead lines, 70,000 km of the main oil and product pipelines, over 140,000 km of gas pipelines, over 115,000 km of river navigation routes, and many sea routes. The vastness of the territory and the harsh climate give rail and pipeline dominance over other modes of transport when transporting goods. The role of road transport in the total freight turnover is also insignificant due to the extremely short average distance of transportation, despite the fact that more than half of the cargo is transported by road (Verigina, 2021).

**Figure 7: Goods transported in Russian Federation in 2010, 2019, 2020 (t-km, millions)**



Source: ITF Transport Statistics



According to the ITF Transport Statistics for the Russian Federation, in 2019, a total of 4 321 722 million tonnes-kilometers of goods were transported by all modes of transport. It is almost 25% higher than the 2010 amounts. Despite COVID-19 taking a toll on the economy in 2020, the decrease in freight turnover was not significant and came mainly from the decrease in goods transported by pipeline (ITF, 2020).

The Russian Federation's trade and transport facilitation policy is based on the country's membership in the Eurasian Economic Union (EAEU). Customs regulations (export, import, transit, temporary storage, customs declaration, payment of relevant fees, duties and taxes, etc.) in the Russian Federation is mainly regulated by the Customs Code of the Eurasian Economic Union; issues not included in the Code are regulated by national legislation (Krechetova, 2021).

In 2020, following the mission of transforming priority sectors of the economy and the social sphere established by Presidential Decree No. 204 of 07.05.2018 "On National Goals and Strategic Development Objectives of the Russian Federation for the period until 2024," and as part of the implementation of the Digital Economy national program to promote the digital transformation of priority industries, the Russian Ministry of Communications, with the participation of the Digital Transformation Department of the Russian Ministry of Transport, key industry associations, and expert organizations for the study, is to assess the level of readiness of industries, determine the best solutions and practices in this area, and identify the segments of industries and companies that have the greatest potential to become drivers of successful digital transformation of the economy.

The study also focuses on the selection of key state corporations in transport and logistics, on whose KPIs for digital transformation will be tested and their digital readiness will be assessed. The Russian Ministry of Communications, with the assistance of the Digital Transformation Department of the Russian Ministry of Transport, initiated a survey of a wide range of core companies on their readiness for digital transformation, and as of May 6, 2020, it included the leading market players that form about 50% of the industry output: companies in the areas of passenger and freight transportation, postal and courier services, and logistics companies were covered.

Digital technologies will contribute to the transformation of established methods in the industry and the implementation of structural and technological shifts. Digitalization of the road transport complex is already an objective process that largely determines the development and competitiveness of the industry itself and the related spheres that cooperate with it. Individual blocks and short chains of connections have already been created and are beneficial for the participants of the road transport complex, but it is necessary to continue to take systematic measures to further develop roadside services of all kinds.

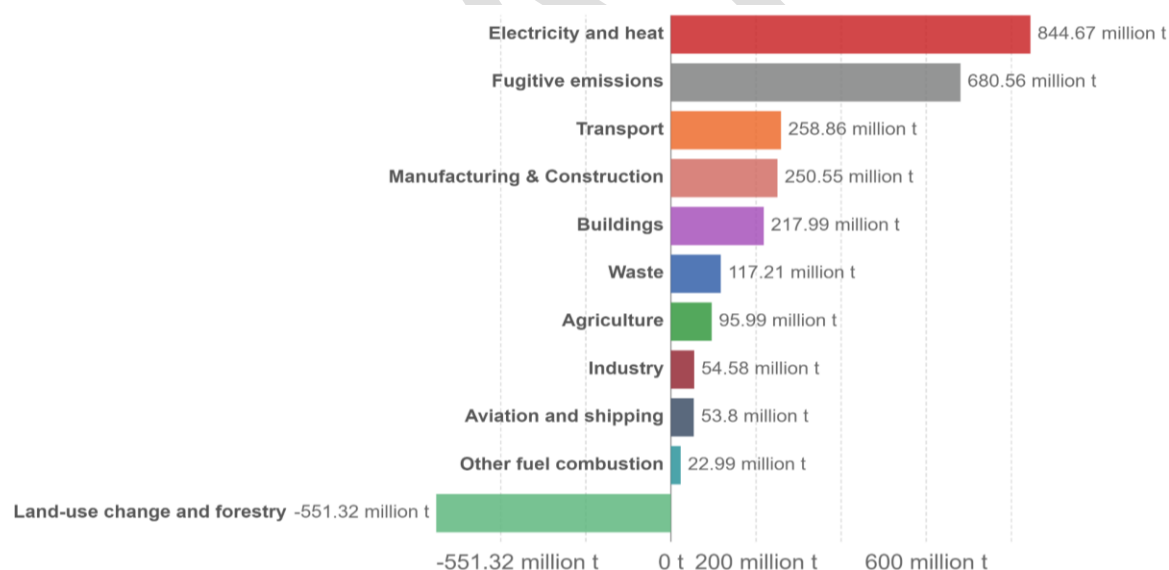
An important step is the organization of multimodal passenger and freight transport, including not only across Central Asia but also to distant foreign countries, using different types of transport, providing the opportunity to get to the endpoint of the trip by the optimal route with a guaranteed level of comfort and safety. It is necessary to introduce special computer software packages to perform, support, and monitor processes in the online mode, with the content of all information bases in the form of accessible electronic databases, as well as to conduct appropriate training of employees.

According to Presidential Decree No. 290 of June 24, 2019, "On Amendments to Certain Decrees of the President of the Russian Federation," transit through the territory of the Russian Federation of sanctioned goods during international road and rail shipments to third

countries is permitted. Such transportation is possible with the use of electronic navigation seals, as well as with the availability of registration cards for the drivers of vehicles engaged in such road transportation. The list of checkpoints across the state border of the Russian Federation, stationary and mobile checkpoints or checkpoints located at railway stations, requirements for electronic navigation seals, and the procedure for issuing record coupons to drivers of vehicles were approved by Decree No. 1877 of the Government of the Russian Federation dated December 27, 2019 "On Measures to Implement Decree No. 290 of the President of the Russian Federation of June 24, 2019". The requirements for seal operators and the procedure for applying electronic seals are defined by Order of the Ministry of Transport of Russia No. 13 of January 14, 2020 "On the implementation of transit international road transport and transit international rail transport through the territory of the Russian Federation to third countries while ensuring their traceability using a control system that provides for the use of identification means (seals) that function based on global navigation satellite system GLONASS technology"(MTRF, n.d.a).

The Intended Nationally Determined Contribution (INDC) of the Russian Federation submitted to the United Nations Framework Convention on Climate Change (UNFCCC) stipulates a GHG emissions reduction by 25-30% by 2030 under the business-as-usual scenario. Based on the World in Data information, the transportation sector of the Russian Federation accounts for 258 million tons of CO<sub>2</sub> equivalent emissions, which is at the same level as manufacturing and construction and buildings.

**Figure 8: Greenhouse gas emissions by sector in the Russian Federation in 2018**



Source: CAIT Climate Data Explorer via Climate Watch

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Note: Greenhouse gases are weighted by their global warming potential value (GWP100). GWP100 measures the relative warming impact of one molecule of a greenhouse gas, relative to carbon dioxide, over 100 years.

### **Policies, Strategies, and Programmes on the Digitalization of Transport:**

- **National goals and strategic objectives for the development of the Russian Federation until 2024 (GoRF, n.d.):** The Decree of the President of the Russian Federation declares that the Government of the Russian Federation should:
  - in developing a national project aimed at creating safe and high quality roads should consider integration of new technical requirements and standards for road

improvements, including those based on digital technology, aimed at eliminating places of concentration of road accidents by 2024;

- Integrate multisectoral coordination mechanisms and ensure a sustainable and secure information and telecommunications infrastructure for high-speed transmission, processing and storage of large volumes of data, accessible to all organizations and households when developing the national program "Digital Economy of the Russian Federation" by 2024;
  - Create a system of legal regulation of the digital economy, based on a flexible approach in each sphere, and the implementation of civil turnover based on digital technologies; the creation of a global competitive infrastructure for data transmission, processing and storage primarily based on domestic developments;
  - should be transformed into priority sectors of the economy and the social sphere, including health, education, industry, agriculture, construction, urban economy, transport and energy infrastructure, and financial services, through the introduction of digital technologies and platform solutions; and the development and implementation of a national mechanism for implementing a coordinated policy of the Eurasian Economic Union member states when implementing plans for the development of the digital economy.
- **National Program "Digital Economy of the Russian Federation" for 2018-2024:** As part of the implementation of Presidential Decree No. 204 of May 7, 2018, the National Program "Digital Economy of the Russian Federation" for 2018-2024 was formed. The goal of the program is to create favorable conditions for the development of the digital economy and the growth of digital innovation in all industries. The program aims to support the industrial application of all the latest advances in digital technology, but primarily the development of digital solutions based on big data, artificial intelligence, neurotechnology, blockchain, quantum computing, the Industrial Internet of Things, robotics, virtual and augmented reality (UNECE, 2020b).
- **Transport Strategy of the Russian Federation until 2030, with a forecast for the period up to 2035:** As part of the strategy of digital transformation of the transport industry, virtual and augmented reality, artificial intelligence, big data processing and information modeling, blockchain and other technologies will be introduced (GoRF, 2021). Among other things, the following technologies will be applied: a) when analyzing road traffic, creating digital models of the traffic conditions and the optimal design of vehicle routes; b) when creating a system of end-to-end exchange of electronic transport documents, creating a national digital logistics framework of the Eurasian Economic Union digital transport corridors; a unified transport complex management center, including solutions for collecting citizens' appeals; digital twins of existing and new transport infrastructure facilities using advanced visualization technologies (virtual and augmented reality); c) a transport flow modeling system; d) in creation and operation of information system of accounting and planning of works (costs) for design, construction, repair and maintenance of transport infrastructure facilities (including predictive analytics of maintenance and repair of transport infrastructure facilities); and e) implementation of smart contracts using distributed registry systems for cargo tracking and exchange of legally significant data between industry participants and the state.

To achieve Goal 4, "Digital and Low-Carbon Transformation of the Industry and Accelerated Implementation of New Technologies," the following tasks have been defined:

- Task 11 "Digitalization of passenger transportation";
  - Task 12 "Digitalization of freight transport";
  - Task 13 "Digitalization of the infrastructure and transport vehicles life cycle";
  - Task 14 "Digitalization of the management of the transport complex";
  - Task 15 "Improvement of the level of technological development and decarbonization of the transport complex".
- **6 main digital transformation projects of the Russian regions:** In 2021, the Ministry of Transport of the Russian Federation has identified six projects of digital transformation of the transport industry in the regions. Namely (TADVISER, 2021):
- **Passenger and Cargo Unmanned Vehicles:** It is proposed to create a smart secure infrastructure for unmanned vehicles on all modes of transportation throughout the country, ensuring that they are used for commercial and personal transportation.
  - **"The Green Digital Passenger Corridor":** The Ministry of Transport believes that the implementation of such an innovation should allow for any trip without paper documents and without cash, taking into account benefits and real traffic.
  - **Seamless freight logistics:** The initiative suggests realizing the transit potential of Russia, which will have the effect of speeding up transportation, reducing its cost, increasing the income of the Russian budget and transport companies.
  - **Digital management of the transport system of the Russian Federation:** This project is intended to improve the efficiency and safety of the transport complex. The tools to achieve the task - Situational Information Center of the Ministry of Transport; online monitoring of vehicles, including drones; online monitoring of transport infrastructure facilities; integration with the national data management system.
  - **Digitalization of transport security:** The goal is to increase the information security of the transport complex. This will ensure control and prevention of leaks of personal and biometric data of passengers through the analysis of data flows; control and analysis of the state of security of the transport complex in online mode.
  - **Digital twins of transport infrastructure objects:** The task of the initiative is to monitor the state of the objects of the transport infrastructure. For this purpose, it is necessary to create 3D models of all objects of transport infrastructure; move to a system of planning the construction and maintenance of transport infrastructure using BIM-technology.
- **Strategy for the Development of the Information Society in the Russian Federation for 2017-2030:** In order to further develop high-tech industries in Russia, the "Strategy for the Development of the Information Society in the Russian Federation for 2017-2030" in 2017 adopted the program "Digital Economy of the Russian Federation", aimed at the comprehensive and systematic development and implementation of digital technologies in all areas of life. Five main directions for the period until 2024 are highlighted: regulatory regulation, human resources and education, the formation of research competencies and technical reserves, information infrastructure, and information security. The implementation of the program will strengthen the role of Russia's digital economy by 2025. The roadmaps (first and second stages) for the development and amendment of normative legal and other acts to organize the interaction of participants in foreign economic activities and subjects of international trade with

public authorities, including supervisory authorities and other organizations in electronic form on the basis of the digital platform of the Russian Export Center JSC "One Window" were approved. Regulatory legal acts were developed and adopted, providing the possibility of electronic interaction of the Russian Export Center JSC with public authorities and organizations using the infrastructure of the electronic government. Though this strategy lays down a base for developing a digitally literate and capable society and government, that should support easy and fast transition to digital economy, it lacks direct guiding instructions for the transport and logistics sectors of the economy (GoRF, 2017).

- **Russian Railways Strategy for Digital Transformation until 2025:** Updates are being made to the Russian Railways Digital Transformation Strategy, which was adopted by the Russian Railways Board of Directors on 25 October 2019. Priority areas for actualization include the dissemination of acquired expertise in digital transformation, import replacement of foreign software, and information security. Globally, these include digital services for passengers and shippers, electronic logistics platforms, electronic (paperless) legally significant document management, customer relationship management (CRM) and remote service systems, distributed registries, Big Data, artificial intelligence, digital modeling in construction, the Internet of Things, traceability systems based on RFID and other marking technologies, and satellite navigation systems.

## Tajikistan

The transport sector is managed by the Ministry of Transport of the Republic of Tajikistan. The State Unitary Enterprise "Rohi Ohani Tojikiston" is the only carrier in Tajikistan.<sup>8</sup>

Despite the efforts of the Government of Tajikistan to improve the country's transport infrastructure and transit potential, Tajikistan's transport sector today remains one of the least developed among Central Asian countries. Transit traffic through the territory of Tajikistan is practically absent, and the development of the sector itself mainly suffers from the geopolitical and geographical location of the country (ADB, 2021).

Approximately 90% of freight and passenger transportation within Tajikistan is conducted by road, especially in the high-mountain and remote territories bordering neighboring countries. The high dependence of rail connectivity on the political situation between neighboring countries and the affordability of road transport reduces the incentive to use the railway infrastructure, which is sufficient to carry only about 40% of Tajikistan's exported and imported cargo.

One of the main problems of Tajikistan's railway network is the lack of a coherent and well-functioning system of multimodal transport solutions to ensure uninterrupted transportation. The digitization of the transport and logistics sector is very slow and, in some cases, does not provide even basic data on the movement of cargo within the country until it arrives at major BCPs.

Rail transport continues to be competitive only for bulk or liquid cargoes, such as cement, grain, cotton, and petroleum products. These cargoes are difficult to transport by road, especially hazardous cargoes and through areas located in inaccessible mountain ranges.

More than 23 state-funded investment projects amounting to almost 3.2 billion simonis have been implemented across the country. As a result, 1,650 kilometers of roads were built and repaired, and 109 bridges and 27 kilometers of tunnels were built and put into operation. The Government of Tajikistan pays special attention to the sphere of international cooperation in the transport sector: 39 agreements with nine CIS countries and seven countries from Central Asia and Europe, as well as 27 agreements with seven international organizations, have been signed (ERTUKGBNI, n.d.).

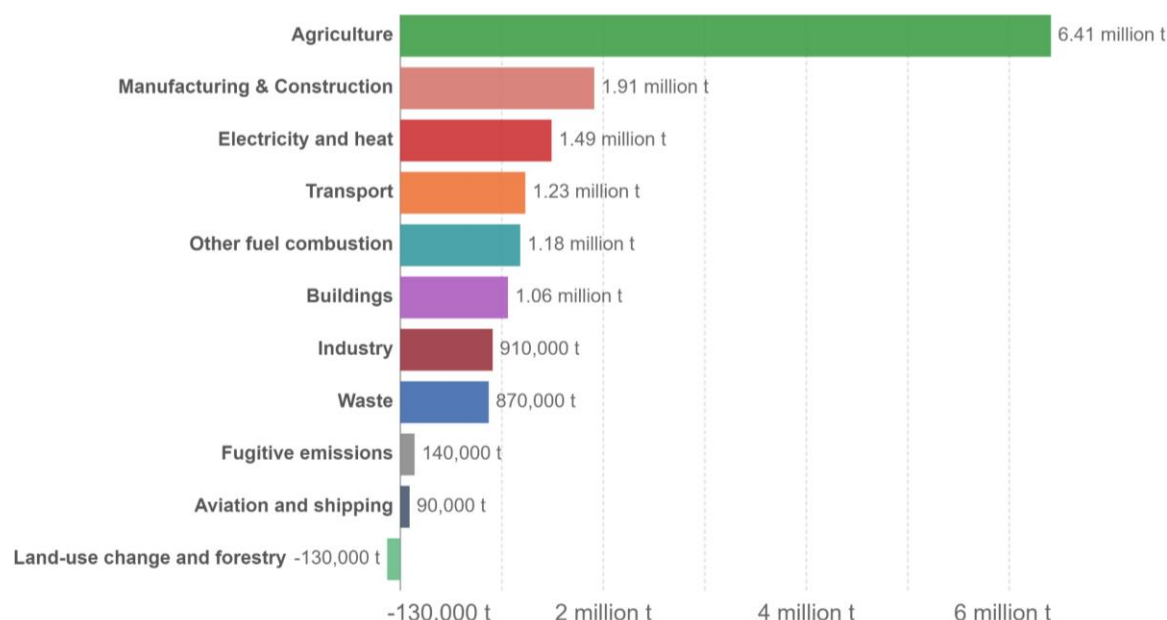
The Updated Nationally Determined Contributions (NDC) of the Republic of Tajikistan identifies ways for sustainable and efficient development, taking into consideration climate change and environmental and socio-economic challenges, including an unconditional and conditional greenhouse gas (GHG) emissions reduction goal for 2030. It indicates that the Industrial Development Strategy of the Republic of Tajikistan for the period until 2030 provides for the introduction of new technologies related to the reduction of emissions of harmful substances into the atmosphere, saving raw materials and energy resources as measures for mitigation and adaptation to climate change. According to the State Target Program on Development of Transport Complex of the Republic of Tajikistan until 2025, the life cycle of transport infrastructure will be increased, which will make it more resilient to climate change. The main goal of this measure is to bring the transport infrastructure in line with international environmental standards. Specific measures include improving road surfaces, increasing traffic capacity, building bypass roads in populated areas, using anti-corrosive paints, plastic, and metal, and creating roadside protection strips. These measures

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<sup>8</sup> <https://www.mintrans.tj/>

are integrated into numerous road construction and reconstruction projects being implemented and planned in the country. The unconditional goal is to reduce greenhouse gas emissions and their impact on the climate system without significant new international funding to not exceed 60-70% of 1990 emissions levels by 2030.

**Figure 9: Greenhouse gas emissions by sector in Tajikistan in 2018**



Source: CAIT Climate Data Explorer via Climate Watch

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Note: Greenhouse gases are weighted by their global warming potential value (GWP100). GWP100 measures the relative warming impact of one molecule of a greenhouse gas, relative to carbon dioxide, over 100 years.

## Policies, Strategies, and Programmes on the Digitalization of Transport:

- **Digital Economy in Tajikistan:** The concept of the digital economy in the Republic of Tajikistan is based on the message of the President of the Republic of Tajikistan, the Leader of the Nation, the respected Emomali Rakhmon, "On the directions of domestic and foreign policy of the Republic of Tajikistan," dated December 26, 2018 and in accordance with the decree of the Republic of Tajikistan of January 31, 2019, No.39, "On the results of the socio-economic development of the Republic of Tajikistan in 2018 and the challenges for 2019." The main challenge to the digitization of the transport and logistics sector is increasing transit traffic. In the initial stages, the main effect will be achieved through the transition to electronic paperwork and furthered through the introduction of an intelligent transport system, which will increase the volume of trucking by providing quality and safe road infrastructure between the regions of the republic and in international communication (GoRT, 2020a).
- **National Development Strategy of Tajikistan until 2030:** The policy priorities and measures for the digital transformation of Tajikistan's economy and society are outlined in the country's National Development Strategy until 2030. Tajikistan is developing a roadmap for the country's digital transformation by introducing data-driven innovation and creating demand for digital solutions through e-government and one-stop-shop solutions. Between 2026 and 2030, Tajikistan will continue to improve the national ICT infrastructure by increasing stable broadband coverage and establishing data centers across the country. In the long term, Tajikistan intends to promote a high level of digitalization in priority industrial sectors: agriculture, energy production,

telecommunications, transport, trade, manufacturing, education, and health, which should improve social welfare and contribute to long-term sustainable development (UNECE, 2020b).

- ***State target development program of the transport complex of the Republic of Tajikistan till 2025:*** The main goal of the program is to create a reliable, efficient, and economically integrated transport infrastructure capable of transforming Tajikistan into a transit state with access to international transport corridors as well as adapting the transport system to meet current market conditions. The program calls for the implementation of projects aimed at the development of road, rail, air transport, and multimodal transportation. In addition, ensuring environmental safety of transport and computerization of the transport sector (GoRT, 2011).
- ***The second phase of the Central Asia Road Links Program:*** The second phase of the Central Asia Road Links Program (CARs-2), initiated by the Government of Tajikistan, aims to improve the country's connectivity with the Kyrgyz Republic and Uzbekistan along priority cross-border road links and to support improvements in road operations and asset management practices. Inadequate transport links in poor rural areas such as Sugd oblast -the country's entry and exit points for trade and travel to Uzbekistan and the Kyrgyz Republic -which account for 40 percent of Tajikistan's overall freight turnover, exacerbated people's social and economic isolation. About 650,000 people, or 27.6 percent of the total population of the country's bottom 40, are from Sugd. In 2014, the Republic of Tajikistan was only ranked 188 out of 189 countries on the Doing Business "Trading across borders" indicator and 114th out of 160 countries on the Logistics Performance Index. Data from the World Bank/IFC Enterprise Surveys show that customs clearing times for both imports and exports in Tajikistan in 2013 were about 50 percent higher than in Eastern Europe and Central Asia as a region (imports: 8.8 vs. 5.9; exports: 6.8 vs. 4.4 days). The same survey showed the percentage of firms identifying transportation as a major constraint to be higher in Tajikistan (12.4 percent) than in Eastern Europe & Central Asia (10.4 percent) (WB, 2021).
- ***Program for Implementation of the Road Asset Management System in the Republic of Tajikistan for the period 2021-2024:*** This program was developed in order to achieve the goals envisaged by the concept of digital economy in the Republic of Tajikistan with the use of information and communication technologies and the implementation of an intelligent road asset management system. The main advantages of implementing the road asset management system are the availability of a legal and regulatory framework for the development and implementation of modern information and communication technologies in the road and transport sector, as well as the implementation of components of the system in the framework of effective cooperation with development partners (GoRT, 2020b).



## Turkmenistan

In 2021, the Agency of Transport and Communication<sup>9</sup> was established under the Cabinet of Ministers of the country with a view to radically transform the sphere of transport and communication, which is responsible for creating opportunities for self-governance and further improving the quality of activities and level of services provided and expansion of national and international transport networks. Thus, it included the agencies “Türkmen demirýollary” (Turkmen Railways), “Türkmen aragatnaşyk” (Turkmen communications), “Türkmen awtoulaglary” (Turkmen automobile service), “Türkmen howaýollary” (Turkmen Airlines), and “Türkmen deňiz derýaýollary” (Turkmen State Service of Maritime and River Transportation).

Along with Kazakhstan, Turkmenistan plays a key role in maritime transport from Asia to Europe via the Caspian Sea. Maritime transport is under the coordination of the Agency “Türkmen deňiz derýaýollary”, which is the central executive authority in the field of water transport and conducts the state policy in the field of water transport on the territory of Turkmenistan. The importance of this agency became even more significant after the opening of the new international seaport of Turkmenbashi in 2018. The total throughput capacity of the port averages about 17 million tons of cargo per year, excluding oil products. Negotiations are being carried out to link this port with existing or form new international transport corridors (NCA, 2022a). It should be noted that Turkmenistan is not a member of the World Trade Organization nor of the Eurasian Economic Union.

The agency “Türkmen demiriollary” is responsible for the operation of Turkmenistan's railroads. The total length of Turkmenistan's railway networks is more than 5,000 kilometers. The Kerki-Imamnazar-Akina railway line, commissioned in the fall of 2016, is the first link in the Asian International Transport and Transit Corridor and can be seen as an innovative transportation project to create multimodal connections (NCA, 2022b).

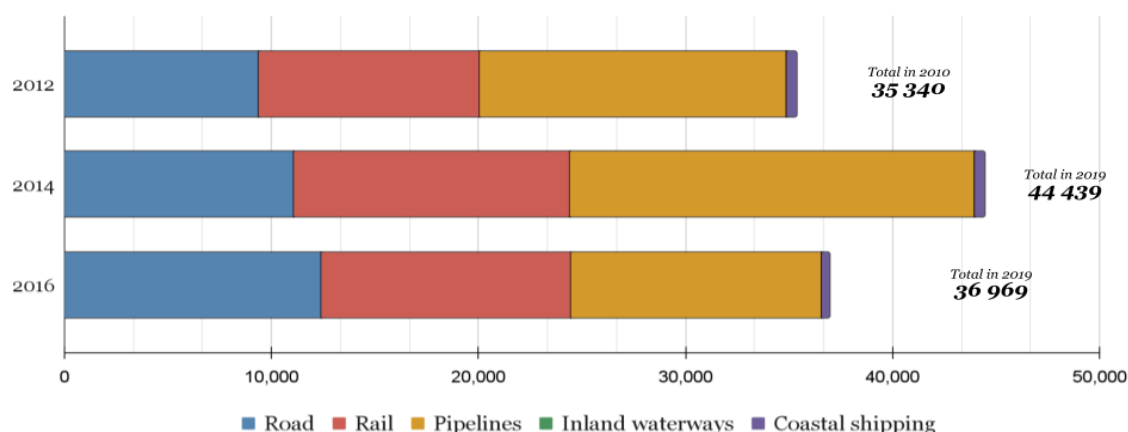
In order to meet the needs of the population of Turkmenistan in road transport, ensuring a high quality of passenger transportation as well as serving the population by road transport, the relevant departments and divisions of the Agency “Türkmen awtoulaglar” carry out passenger transportation on 607 routes, of which 168 are urban, 336 are suburban, and 103 are intercity (NCA, 2022c).

In addition, in order to increase cargo transportation through the territory of Turkmenistan in 2018, the Open Joint Stock Company “Transport and Logistics Center of Turkmenistan” was also established. The Transport and Logistics Center of Turkmenistan JSC carries out cargo transportation by various modes of transport, including multimodal transportation that combines road, rail, air, sea, and container transport, by shipping goods from the place of cargo loading to the place of its unloading, as well as warehouse work, loading and unloading of goods, and customs clearance (NCA, 2022d). As shown in Figure 10 below, goods transported in Turkmenistan by road are constantly increasing, and pipeline amounts are volatile and are dependent on the oil and gas sector supply volumes. In recent years, Turkmenistan has advanced its activity in bilateral and multilateral trade and logistics sector development, attracting more investment and opening “green corridors” for goods transport. However, COVID-19 has restricted this trend, especially related to the transport of passengers.

**Figure 10: Goods transported in Turkmenistan in 2012, 2014, and 2016 (t-km, millions)**

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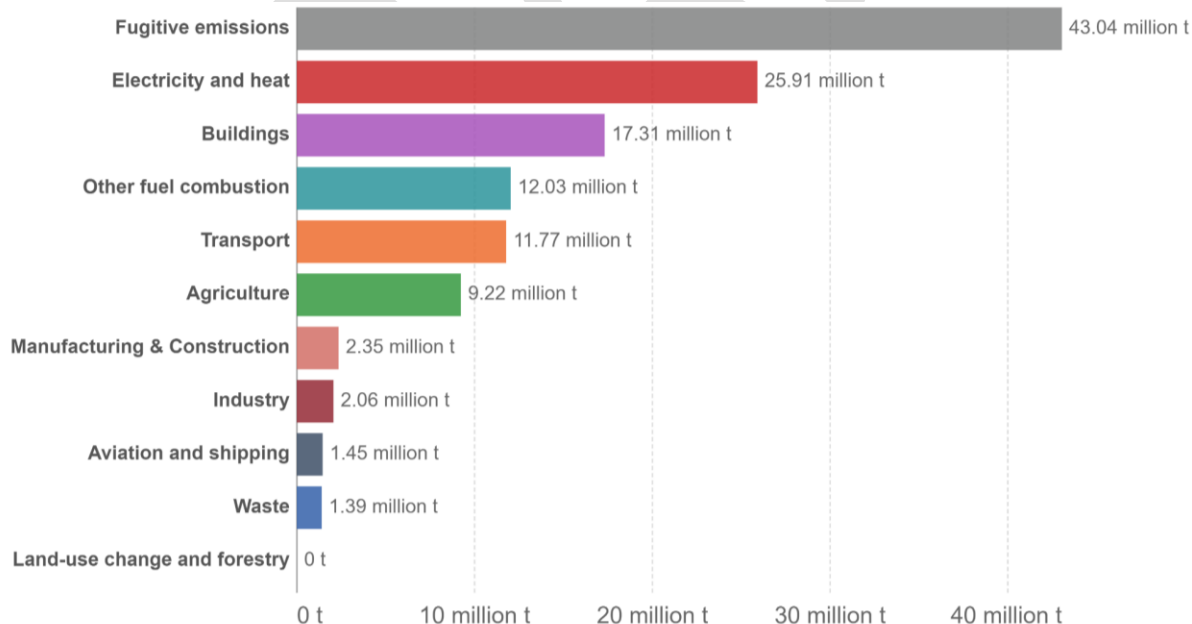
<sup>9</sup> <https://tla.tm/archives/2100>



Source: CAREC, Railway Sector Assessment for Turkmenistan, 2021

According to the NDC submitted to the UNFCCC by Turkmenistan, the baseline scenario of economic development provides for sustainable average annual economic growth for the period 2015 - 2030, and the growth rate of GHG emissions will significantly lag behind the GDP growth rate, while the intensity of GHG emissions will be reduced. This means that Turkmenistan's GHG emissions will not grow. However, it is also noted that with financial and technical support from international donors and development partners, Turkmenistan can achieve zero emissions growth and even reduce them by 2030 (UNFCCC, n.d.). From the World in Data information, in 2018, transport sector CO<sub>2</sub> emissions were slightly higher than agricultural sector emissions, but were much lower than buildings and electricity & heating.

**Figure 11: Greenhouse gas emissions by sector in Turkmenistan in 2018**



Source: CAIT Climate Data Explorer via Climate Watch

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Note: Greenhouse gases are weighted by their global warming potential value (GWP100). GWP100 measures the relative warming impact of one molecule of a greenhouse gas, relative to carbon dioxide, over 100 years.

## Policies, Strategies, and Programmes on the Digitalization of Transport:

- ***Digital Economy Development Concept of Turkmenistan for 2019-2025:*** In 2018, Turkmenistan adopted a Digital Economy Development Concept for 2019-2025 to support the digital transformation of all industries and public administration. The concept is complemented by a technological roadmap, which aims to create a knowledge economy and increase the productivity of the economy. Turkmenistan has taken a comprehensive approach to solving the problem of transition to the digital economy. Improving the legislative framework, creating the necessary infrastructure and favorable conditions for the development of IT companies, solving the issues of providing human resources, and much more will undoubtedly accelerate the achievement of the goals set. One of the priority tasks is the widespread transition to e-government and document management. In February 2020, the leader of the nation signed a decree "On the creation and introduction of an electronic document circulation system and web-sites in Turkmenistan". The consistent implementation of the provisions of the concept of the development of the digital economy in Turkmenistan for 2019 - 2025, approved by President Gurbanguly Berdimukhamedov, contributes to the further progress of the fatherland, business and investment activity, and the introduction of advanced management methods. It should be noted that the digitalization of the transport and logistics sector is not mentioned here directly, but is an indirect beneficiary (GoT, 2021).
- ***National Program of Socio-Economic Development of Turkmenistan 2030:*** With regard to the "National Program of Socio-Economic Development of Turkmenistan until 2030", it should be noted that it defines the guidelines for the recommended growth rates of freight and passenger transportation, as well as freight and passenger turnover by all modes of transport operating in the country, including road transport. In particular, this program for the period up to 2030 provides for an annual increase in freight and passenger transportation by road at an average of 3-4%. The main objective of state transport policy in the long-term perspective is the formation of a highly effective national transport system designed to ensure satisfaction of demand for cargo and passenger transportation, increase its safety, creation of conditions for financial recovery of transport enterprises through investment activity, and increase the competitiveness of domestic carriers in the domestic and foreign transport work and service markets. Thus, development of the transport sphere will correspond to the growing trade relations of Turkmenistan with foreign countries and to the purpose of the creation of profitable, reliable and accessible direct transit routes (GoT, 2022).
- ***The Concept of Digital Economy Development for 2019-2025:*** In 2018, Turkmenistan adopted the Digital Economy Development Concept for 2019-2025 to support the digital transformation of all industries and public administration. The concept is complemented by a technological roadmap, which aims to create a knowledge economy and increase the productivity of the economy. In 2019, new laws and amendments to existing legislation were adopted, such as the laws "On Communications," "On Cybersecurity," and "On Legal Regulation of the Development of the Internet and Internet Services in Turkmenistan." Turkmenistan is currently working on the creation of a system of interagency digital exchange to ensure more effective communication between the authorities. Turkmenistan has created the e.gov.tm public services portal to improve the quality of public services and better meet the needs of rural communities. To accelerate the digital transformation, the government created an interagency working group and the agency Turkmen Aragatnashyk. Development of the transport and logistics sector is also identified as a contributing factor of socio-economic development and its digitalization is

noted as a trend of the current century to achieve effective and attractive transport and logistic systems. Yet, there are no direct actions identified in this regard, but transport and logistics are mentioned as indirect players (GoT, 2018).

- ***Single Window for Export and Import Transactions" Project:*** In December 2020, UNDP, UNCTAD and the State Customs Service of Turkmenistan signed the Project Document "Single Window for Export and Import Transactions" in Turkmenistan for 2021-2023. This goal is also stipulated by the "Concept of Development of the Digital Economy in Turkmenistan for 2019-2025. The "Single Window" system provides for the transition of paperwork for export, import, and transit procedures from paper to electronic format. Users will only have to sign in to the system to receive services electronically through the portal. Thus, the process of passing through customs procedures will be accelerated and time costs will be reduced (UNDPTKM, n.d.).

## Uzbekistan

The Ministry of Transport of the Republic of Uzbekistan was established in 2019 and is defined as a state body for the development and implementation of a unified state policy in the development of road, rail, air, river transport, subway, as well as road facilities.<sup>10</sup> The Strategy for the Development of the Transport System of the Republic of Uzbekistan until 2035 serves to plan and develop the transport system of the country, the legislative and regulatory framework, and regulations for the development of the transport sector of the country, as well as the formation of transport connectivity and development of cargo transportation in accordance with international standards. In addition, in 2021, the Law "On Transport" was also adopted, providing the legal, economic, and organizational framework for the functioning and synergies of road, air, river, rail, and urban transport in Uzbekistan (GoRU, 2021).

Sever other noteworthy national policies, regulations, and decrees that have a direct or indirect impact on the digitization of the Uzbek transport and logistics sector are as follows:

- Decree of the President of the Republic of Uzbekistan No. PP-1989 dated 27.06.2013 "On Measures for Further Development of the National Information and Communication System of the Republic of Uzbekistan";
- Decree of the President of the Republic of Uzbekistan No. PP-2042 dated 20.09.2013 "On measures to further enhance incentives for domestic software developers";
- Resolution No. 355 of the Cabinet of Ministers of the Republic of Uzbekistan dated 31.12.2013 "On Measures for Implementing the System of Assessment of the Status of Development of Information and Communication Technologies in the Republic of Uzbekistan";
- Decree of the President of the Republic of Uzbekistan No. PP-2569 dated 01.08.2016 "On measures for further development and implementation of information and communication technologies in the real sector of the economy for 2016-2018";
- Decree of the President of the Republic of Uzbekistan No. PP-4699 of 28.04.2020 "On Measures for Widespread Implementation of Digital Economy and e-Government";
- Decree of the President of the Republic of Uzbekistan No. PP-6079 dated 05.10.2020 "On approval of the "Digital Uzbekistan-2030" Strategy and measures for its effective implementation";
- The Decree of the President of the Republic of Uzbekistan from 17.02.2021 № PP-4996 "On measures to create conditions for the accelerated introduction of artificial intelligence technologies".

Uzbekistan seeks to become a transport and logistics hub in Central Asia. Efforts are being made to develop the railway industry, restore rolling stock, rehabilitate and modernize railway lines, and increase the level of electrification of railway lines. Finances are being invested in railway infrastructure to overcome geographical limitations, create new transport corridors, and establish cooperation with neighboring countries to increase transit links.

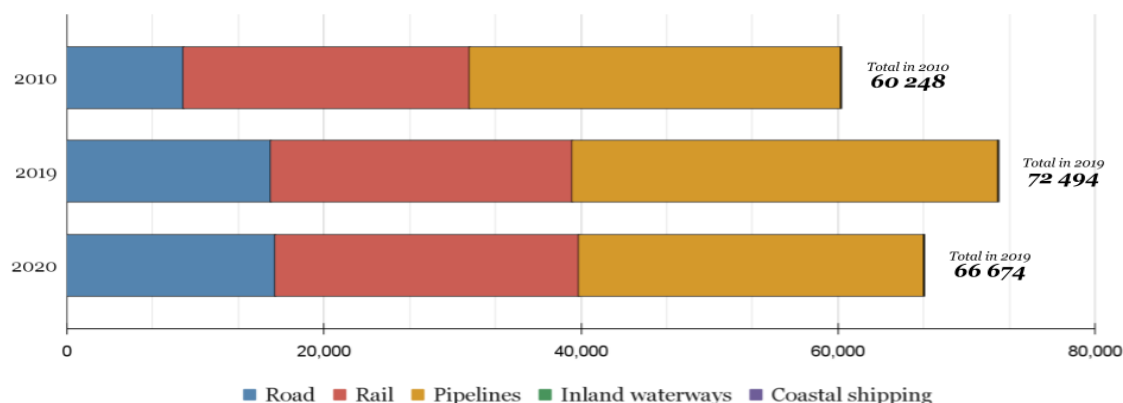
In Uzbekistan, 98% of all cargo and 88% of passengers are transported by road. All settlements in the republic have a stable automobile connection, which provides access to neighboring districts, regions, and neighboring countries. There are 99 routes through the territory of Uzbekistan for transit traffic of foreign carriers in the territory of the Republic of Uzbekistan. A network of logistics centers created in Uzbekistan consists of seven logistics centers (LC)

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<sup>10</sup> <http://mintrans.uz>.

and 29 commodity transport bases. The total annual cargo handling capacity of all logistics and warehouse facilities is 3.092 million tons (GoRU, 2019).

**Figure 12: Goods transported in Uzbekistan in 2010, 2019, and 2020 (t-km, millions)**

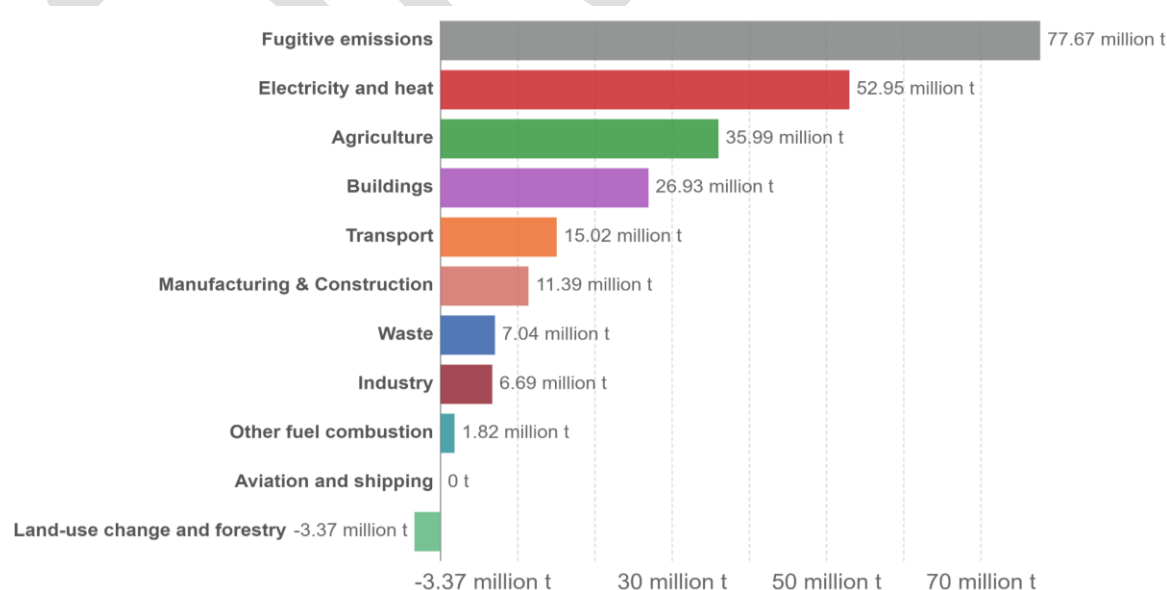


Source: ITF Transport Statistics

In April 2004, Uzbekistan became a party to the Intergovernmental Agreement on the Asian Highway Network, and in July 2009, the Intergovernmental Agreement on the Trans-Asian Railway Network. Within the framework of these agreements, measures are being taken to bring international highways and railway networks into compliance with modern requirements and improve their technical properties. It is worth noting that Uzbekistan's national railway network is already suitable for the movement of freight trains at a speed of 100 km/h, and some sections of lines allow speeds of up to 160 km/h (DSCRU, 2019).

The updated NDC of the Republic of Uzbekistan submitted to the UNFCCC in 2021 has indicated an updated commitment to unconditionally reduce specific greenhouse gas emissions per unit of GDP by 35% by 2030 from the 2010 level. It should be noted that, based on the data collected by the World in Data, Uzbekistan's transport sector contributes only half of the emissions of the agricultural sector.

**Figure 13: Greenhouse gas emissions by sector in Uzbekistan in 2018**



Source: CAIT Climate Data Explorer via Climate Watch

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Note: Greenhouse gases are weighted by their global warming potential value (GWP100). GWP100 measures the relative warming impact of one molecule of a greenhouse gas, relative to carbon dioxide, over 100 years.

## **Policies, Strategies, and Programmes on the Digitalization of Transport:**

- ***Strategy of Actions on Five Priority Areas of Development of the Republic of Uzbekistan for 2017-2021:*** The Strategy of Actions on Five Priority Areas of Development of the Republic of Uzbekistan for 2017-2021 to strengthen the development of transport and logistics infrastructure, carry out modernization, technical and technological upgrades, implement transport and communications infrastructure projects, strengthen the development of the railway industry, increase the transport and transit potential of the country, and ensure safety and improve the comfort and reliability of train traffic, as well as increase investment. Uzbekistan continues to actively implement and improve many of the objectives and priorities set out in this strategy. However, on the way to implementing this strategy, the country, like the rest of the world, has encountered development difficulties related to COVID-19. Being a country without direct access to the sea, the issue of the country's transit became very serious, but thanks to the active and coordinated actions of the government and the President, the economic risks have been minimized and the country is on a corrective course (GoRU, n.d.).
- ***Strategy for the Development of the Transport System of the Republic of Uzbekistan until 2035:*** The Strategy for the Development of the Transport System of the Republic of Uzbekistan until 2035 has been prepared in accordance with the Decree of the President of the Republic of Uzbekistan dated 01.02.2019. No. UP-5647 "On measures to radically improve the state management system in the field of transport", the Decree of the President of the Republic of Uzbekistan from 05.02.2019 No. PP-4160 "On additional measures to improve the rating of the Republic of Uzbekistan in the annual report of the World Bank and International Finance Corporation "Doing Business" (item 42 of the Road Map), the Decree of the President of the Republic of Uzbekistan from 01.02.2019 No. PP-4143 "On organization of the Ministry of Transport of the Republic of Uzbekistan". The goals and objectives of this strategy are derived from the goals of the fundamental Action Strategy for the period 2017-2021 and are aimed at forming an integrated unified transport system of Uzbekistan, providing conditions for sustainable economic growth and meeting public demand for quality transport services. The issue of digitalization and the introduction of ICT solutions in the transport sector occupy a central place in the implementation of Task 4 of this Strategy, "Creating a competitive market for integrated transport and logistics services (GoRU, 2019).
- ***The "Digital Uzbekistan-2030" Strategy:*** Within the framework of this strategy, it is expected to (GoRU, 2020):
  - increase from 78 to 95 percent the level of connection of settlements to the Internet, including by increasing to 2.5 million ports of broadband access, laying 20 thousand kilometers of fiber-optic communication lines and developing mobile communication networks;
  - Introduction of more than 400 information systems, electronic services and other software products in various spheres of socio-economic development of the regions
  - Organization of training 587 thousand people in the basics of computer programming, including the involvement of 500 thousand young people as part of the One Million Programmers project
  - Introduction of more than 280 information systems and software products for automation of management processes, production, and logistics in the enterprises of the real sector of the economy

- the consolidation of relevant higher educational institutions in the regions will improve the digital literacy and skills of khokims, employees of state bodies and organizations, by training them in information technologies and information security and by training some 12 thousand of their employees in information technologies.

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# TRANSPORT DIGITALIZATION IN SELECTED NORTH AND CENTRAL ASIAN COUNTRIES

## Good Practices and Tools

### Azerbaijan:

- The Azerbaijan Services and Assessment Network (ASAN), a single administrative service, is a mechanism designed to integrate both national and regional transportation services aimed at the general public, and is unique in the extent to which it removes barriers between individual administrative organizations. Other plans include comprehensive management of traffic information systems to minimize congestion, bus modernization, implementation of electronic tolling and other measures (JICA, 2019).
- Digitization and automation are two of the Port of Baku's strategic objectives. In accordance with this objective, the port is establishing an electronic platform, PMiS, to connect the various systems operated by the diverse organizations that comprise the seaport community. PMiS is shared in that it is set up, organized, and utilized by businesses in the same industry. It enables the exchange of information between customers and national customs agencies and other authorities. The implementation of the PMiS adheres to the Single-Window paradigm. The fundamental principle is that data is only entered into the system once. A Port Community System connects transport and logistics chains by optimizing, managing, and automating logistics-efficient processes through a single data submission (WPSP, 2020).

### Kazakhstan:

- Information system "Satti Sapar" ([sattisapar.gov.kz](http://sattisapar.gov.kz)) was introduced. It is intended for preliminary notification by the carrier about transit travel through Kazakhstan. The system will allow the carriers to increase the speed of the vehicle, reduce the delivery time of goods in transit traffic, by eliminating checks along the route. This removes administrative barriers and creates favorable conditions for carriers (UNESCAP, 2022b).
- Agreements on electronic data exchange were signed with the railway administrations of Kyrgyzstan, Azerbaijan, and China. Since the beginning of July 2019, a paperless exchange of shipping documents in export and import communications with the Russian Federation has been carried out in several stages. Both countries are also engaged in the processes related to transport and transit development of the EAEU region (UNESCAP, 2022b).
- Kazakhstan Temir Zholy (KTZ) has deployed digital route diagnostics, a traffic management center, and digital services at 17 stations. The initiatives involve freight, passenger, and multimodal rail transit and business operations. The Digital Railway plan involves digitizing the company's business models and introducing new technology in freight and passenger transportation, infrastructure, and transport logistics. Introducing and running cargo information systems increases transportation efficiency. The automated systems handle operational transportation, plan and anticipate train routes, and control diesel fuel and electric power (AT, 2018).
- The "Personal Cabinet" project on the corporate website of KTZ Express JSC, with the functionality to apply for a rate calculation/contracting/organization of transportation, loading and issuance of instructions for filling out the waybill, dislocation of

railcars/containers, has been launched in Kazakhstan. In 2020, 80% of all requests for transportation were submitted through the "Personal Office".

- An intelligent transportation system (ITS) is being established as part of the digitization of transport and logistics. Special automated measuring devices (AIMS) deployed on important road transport corridors offer contactless weighing of moving vehicles, monitoring and accounting of intensity, excluding inappropriate stops. Ten ITSs were scheduled to be launched in 2017 and about 46 by 2020. From 2018 to 2022, ITS will also include traffic management systems, climate analysis and forecasts, video monitoring, and traffic infraction detection. As part of railway digitization, the "Automation of Predictive Train Timetable" project is implemented to increase train schedule accuracy and planning depth from 45 days to 3 hours. Digital track diagnostics and multimodal transportation management projects are also planned for 2018-2020. (Zakon.kz, 2017).
- The ACS BS is a border crossing automated control system that has been in operation since 2009. The system's objectives include improving transportation process management and automating operational work technical operations. The ACS BS is a network that shares a common regulatory reference and variables, as well as being technically and data-linked. To that purpose, a redesigned version of the station-node automated control system was developed in 2012; this system is in charge of automating the operation of a railway junction. The stations deployed the automated control system "Contractual and Commercial Activities" in 2017 as part of the Company's digitalization of its cargo and commercial operations (ACS CCA). More than 42,000 people have joined up for the service, and the firm employs over 2,570 people in the system. Procedures are made more open, clear, and efficient using this strategy. As a consequence, local shipment planning was reduced from 11 hours to 5 minutes, international shipment planning was reduced from two days to one hour, forwarding was reduced from two days to one hour, and invoice processing was reduced from thirty minutes to five minutes.
- ASU-DKR, a new automated information management system for transportation, is now being implemented to guarantee a more complete and effective international freight transportation service across Kazakhstan's railway network (KTZ, n.d.).

#### **Kyrgyzstan:**

- The Safe-TIR and TIR-EPD applications were successfully implemented in 2013 and 2014, respectively. Work on the introduction of an automated information system "Electronic Transport Control" (AIS ETC) is continuing. There are 27 points of transport control (PTC), including weight control. 14 PTCs out of 27 have already been installed in AIS ETC which minimizes human involvement and also makes it possible to monitor the PTCs through the central service established in the Ministry of Transport and Roads (UNECE, 2020c).
- Kyrgyzstan introduced the Single Window Information System (SWIS), dubbed Tulpar, in 2016 to issue licenses for international business operations. The Single Window Centre for Foreign Trade (SWC) and the State Enterprise Centre for Electronic Interaction under the State Service for Digital Development under the Government of Kyrgyzstan signed an agreement to ensure inter-agency interaction and data exchange through the Tunduk electronic interoperability system (operator of the Tunduk system). This allows for the transferring of data (electronic permits) through the Tunduk system to the Unified Automated Information System of the SCS (UAIS) for customs operations (UNESCAP, 2022b).

- Tyndyk is a service for the exchange of legally electronic documents via the Internet, created to ensure secure data exchange between government agencies, local authorities and commercial organizations (GoKR, n.d.b).
- There are two automated information systems in the field of intelligent transport systems in the Kyrgyz Republic: The Automated Information System "Electronic Transport Control" (hereinafter AIS ETC), which is a centralized information system that provides activities of the Agency of Road, Water Transport, and Weight and Dimension Control under the Ministry of Transport and Roads of the Kyrgyz Republic, and the dynamic system of weight and dimension control of vehicles. There are currently five operational systems functioning on the main international corridors on the territory of the Kyrgyz Republic (EEC, 2020).

### **Russian Federation:**

- A large number of pilot projects for the introduction of digital services in transportation are currently being implemented. The following pilot projects can be singled out among them (MTRF, n.d.b):
  - pilot operation of highly automated vehicles on public highways, including the organization of the movement of unmanned and highly automated vehicles on the M-11 Neva federal public highway;
  - implementation of autonomous navigation technologies;
  - implementation of transport unmanned aviation systems and services for delivery of cargo by unmanned air transport;
  - digitization of document flow, including conversion of transportation documents into electronic form;
  - real-time monitoring of the state of transport infrastructure;
  - introduction of intelligent transport systems in urban agglomerations;
  - digital transformation of the provision of public services in the transport industry;
  - introduction of a system for tracking freight traffic using electronic navigation seals.
- Rosstandart approved a series of preliminary national standards in the areas of the Internet of Things (IoT), Sensor Networks, and the Industrial Internet of Things (IIoT). The documents for these were developed by the Cyberphysical Systems Technical Committee on the basis of RVC with the support of the Russian Ministry of Industry and Trade. Experts from 100 public and private companies took part in the development of the regulations (TLA, n.d.).

### **Tajikistan:**

- Online reports to the Tax Committee and license applications to the Ministry of Industry and New Technologies are becoming prevalent. In 2019, the Trade Portal of Tajikistan was formally inaugurated, and in 2021 the Single Window for export, import, and transit activities, Dushanbe's "City Card" electronic payment system, etc. were implemented. In Tajikistan, individuals utilize multipurpose platforms from "Alifbank", "Eskhata," and "Amonatbank," etc. These platforms transfer money, pay for products and services. In accordance with the Concept of Digital Economy, it is intended to develop a single national site of open data "Ma'lumoti kushod" on the basis of e-government (AIA, 2021).

### **Turkmenistan:**

- Turkmenistan will work with UNCTAD and the UN Development Programme (UNDP) to set up a single window system for trade in the nation. A single window would allow importers and exporters to electronically submit all regulatory documents in one portal, saving them time and reducing the cost of transactions (UNCTAD, 2020).
- To accelerate the digital transformation, the government created an interagency working group and the Turkmen Aragatnashyk Agency. The agency provides ICT and There are cybersecurity training opportunities for specialists at all levels from both the public and private sectors.
- JSC Demirýollary ("Railways") together with the business company Asman Oky have developed and implemented an automated system of online services for the registration of international cargo shipments (TRL, n.d.).

#### **Uzbekistan:**

- Uzbekistan was the first country in the region to digitize the TIR system and establish digital routes to neighboring countries. The TIR and CMR systems are based on the UN Conventions and are undergoing an important transformation right now. Paper data carriers are being replaced by digital copies, allowing for comprehensive data circulation. Both of these systems are particularly important for international road and multimodal transport and logistics (IRU, 2022b).
- Digitalization of passenger and freight transportation services, sale of electronic tickets, online application for submission of freight cars. Application of electronic transportation documents on the basis of the UN EDIFACT standard.<sup>11</sup>

#### **Bilateral/International:**

- Logistics hub: It is planned to create the International Centre for Trade and Economic Cooperation (ICTEC) "Central Asia", which will be located in the area of BCP "Zhibek Zholy" (Kazakhstan) and "Gisht Kuprik" (Uzbekistan). The throughput capacity is 35 thousand people and 5 thousand trucks per day in both directions. The center is intended to become a large industrial, trade, and logistics hub for the implementation of joint investment projects between Kazakhstan and Uzbekistan (UzDaily, 2021).
- Asycuda World (Automated System for customs data) - an information system developed by UNCTAD (United Nations Conference on Trade and Development - a body of the UN General Assembly) - simplifies the verification of documents at customs. The system allows up to 14 times to reduce the time that is usually spent on cargo clearance. Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan are users of this system (ASYCUDA, n.d.).
- The UN Convention on the Contract for the International Carriage of Goods by Road, or CMR, governs international trucking rules. Most European governments, as well as a handful of other nations, have accepted this pact. The CMR consignment note, which includes details on the products being transported, the shipping businesses, and the consignee parties, is used by shippers, drivers, and consignees of commodities. The CMR Consignment Notes were only available in paper form until recently, but the IRU is currently pushing for their transfer to electronic format. In February 2008, a protocol was added to the Convention on the Contract for the International Carriage of Goods by Road

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<sup>11</sup> <https://doi.org/10.1063/5.0091195> Организация электронного взаимодействия между всеми участниками перевозочного процесса

that suggested the electronic management of the CMR through e-CMR. The date of this protocol's implementation is June 5, 2011. In January 2017, the eCMR was introduced in a formal manner. Paper CMR bills of lading provide several benefits, including the unification of road freight transportation contract conditions and the facilitation of the whole freight transit procedure. All of these advantages are provided by the worldwide e-CMR solution, which also modernizes the system by removing expenses associated with paperwork and handling (IRU, n.d.).

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## Transport Sector Advancement in Crisis Response and Increased Efficiency

The SARS-CoV2 coronavirus, also referred to as COVID-19, started to spread around the globe in December 2019 and has had a devastating impact on many facets of everyday life and many nations. Given that a well-built and efficient transportation infrastructure is strongly related to global connectivity, COVID-19 has disproportionately had a negative impact on the transportation and logistics sectors more than other sectors in both developed and developing countries. As a result, many nations have had to delay or amend their plans for new growth as a result of the economic crisis, and financial institutions have stopped funding new projects. The unavailability of raw materials, transportation, skilled personnel, and the rising cost of projects are further factors limiting the development of transportation infrastructure. This demonstrates how the existing model of socioeconomic growth is inadequate to deal with cataclysms, particularly at the global level.

According to the research of Robert Earley and Peter Newman, the COVID-19 outbreak, more than any other event since the conclusion of World War II, has had a dramatic impact on the whole world. They predicted that global trade in goods would decline by 9.2 percent in 2020 compared to 2019 and by 4.5 percent in Asia (Earley and Newman, 2021).

Countries have closed their internal and external borders, placed limits on people's freedom of movement, and taken decisions to ensure basic necessities for their citizens. These actions have had an influence on international freight. The efficacy of cross-border trade is threatened by the delay of border crossings. Although waiting at the border results in resource loss, fuel consumption from idle trucks, and other significant inefficiencies since drivers must wait for permits to cross the border, advancements in border-crossing tracking technology give the chance to open borders over the long run. Cross-border transportation for all kinds of products, but especially food, can result in more seamless supply chains thanks to tracking and control systems integrated between the private sector and governments.

Governments, border authorities, logistics providers, and merchants have been looking for methods to leverage current trade and transport facilitation measures to transfer products across borders quickly since the COVID-19 outbreak. The crisis has also sped up the adoption of trade and transportation facilitation policies globally, encouraging world-wide best practices for streamlining customs clearance processes and building document bases that are acceptable to all parties—consignor, transit, and recipient nations. This presents a chance to improve regional connectivity, encourage paperless trade, and create a better system as well as a contemporary transport and logistics industry. According to the ESCAP issue note, in response to COVID-19, trade facilitation measures may be categorized into five areas (UNESCAP and ADB, 2020):

- 1) Transparency and institutional coordination:** Almost all countries in the subregion have introduced similar COVID-19 response measures, posted them on official websites, and have established a governing body to develop and coordinate response measures to COVID-19. More than 60 percent of border agencies in the region have established coordination mechanisms in terms of both domestic and cross-border cooperation for certain trade procedures, such as expedited clearance of essential goods and establishment of green corridors. However, few countries have established National Trade Facilitation Committees (NTFCs) or their equivalents, and in many countries they have not participated in the COVID-19 crisis response planning and often lack the competence to

implement effective trade facilitation measures. COVID-19 demonstrated the importance of NTFCs or equivalent agencies in coordinating trade facilitation in a crisis response.

- 2) **Simplification of customs procedures and expedited clearance:** Although in the early stages of the pandemic, the primary protective measures concentrated on border crossings, which resulted in trade restrictions, as the epidemic proceeded, most governments tried to streamline trade procedures and accelerate cargo clearance. Tariff, VAT, and customs duty reductions were the most widely employed methods, as were priority clearance of vital goods used to combat COVID-19 and reduced processes for registration and approval of applicable technical rules. Moreover, during the pandemic, various nations signed Mutual Recognition Agreements (MRAs) for their own Authorized Economic Operators (AEOs). In the post-pandemic future, the development of AEO projects is likely to increase since that would allow for direct and faster operations between customs agencies and freight operators.
- 3) **Digital trade and transport facilitation:** A major driver of increased trade digitization is the vital role that digital trade facilitation plays in reducing some of the impacts of the COVID19 pandemic. The obvious need for increased usage of paperless trading methods, backed by suitable information technology, was made evident by the epidemic. In sectors where the adoption of other paperless trade measures lags, such as the electronic exchange of data and papers, the epidemic has given a push to update digital infrastructure and speed up digital transformation. On the basis of current international initiatives, Tajikistan has established a national single window, while Uzbekistan is adopting electronic sanitary and phytosanitary (SPS) certifications. The Central Asia Regional Economic Cooperation (CAREC) Program participants concur that improving customs services and bringing domestic legislation in line with global e-commerce norms are essential. To maintain the constant flow of international freight in the transportation industry, several steps have been taken to improve connectivity through increased use of digital technology (especially along the Asian Highway and Trans-Asian Railway networks). It is important to keep in mind, however, that the implementation of digital trade and transport is contingent upon the availability of suitable capacity, digital infrastructure, and technology. A top focus is developing capabilities to enhance the facilitation of digital trade and transportation.
- 4) **Transport and transit facilitation:** Facilitating the transit of critical goods, decreasing trade costs, and increasing supply chain connectedness are all goals of trade facilitation. Additional checks, shorter hours of operation, road closures, border restrictions, and other hurdles caused by the COVID-19 epidemic dramatically raised transportation and travel expenses. It also highlighted the fundamental constraints of present freight operations and revealed the exposure of large parts of the Asia-Pacific transportation industry to risk. As a result of the spread of COVID-19, the regional economies have taken extensive measures to guarantee the smooth passage of all foreign cargo via the border crossings. Among these were the coordination of border policies to facilitate the passage of commercial vehicles and other vehicles with substantial needs, the introduction of "green lanes" for the expedited transport and transit of large goods, the simplification of border crossing procedures, the modification of requirements for drivers and incoming trucks, and other measures. Note that Asian Highway Network countries have maintained most or all of their land borders open to truck traffic. Rail is an important link for the transfer of essential products and medical supplies since two-thirds of them have adopted specific trade and transport facilitation measures to assure freight flow on the Trans-Asian Railway Network

with minimum disruptions. Trans-Asian Railway Network lines have seen increased international freight movement in recent years, including during the COVID-19 epidemic.

- 5) Business facilitation and trade finance:** The majority of countries in the subregion have initiated economic stimulus measures to help the commerce and transportation sectors. These policies include tax cuts on income, financial exemption packages, and reductions in associated fees. These measures are intended to encourage economic growth. COVID-19 also demonstrated the precarious nature of paper-based trade financing, which necessitates the employment of a sizeable number of "back-office" personnel. Trade finance institutions in the People's Republic of China, Japan, and the Republic of Korea have already started investing in digitization, and technologies such as artificial intelligence and blockchain which are being utilized in the development of digital trade finance.

Throughout the COVID-19 pandemic, the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) has been concentrating its research efforts on recovery and reestablishing more effective freight policy in particular. According to the findings of the "Economic and Social Survey of Asia and the Pacific 2021: Towards Post-COVID-19 Resilient Economies" carried out by the organization (UNESCAP, 2021), the following priorities are the focus of countries in their efforts to building back from pandemic and lessons learned:

- Protect transport workers.
- Adapt to changes in transport market behavior.
- Strengthen cross-border connectivity.
- Support economic growth, including job creation.
- Increase the resilience of freight transport.
- Improve digitalization of transport services.
- Integrate decarbonization and sustainable transport.

These priorities should help countries realize their potential, guide the recovery from the economic downturn caused by COVID-19, and move the subregion toward improved connectivity by: 1) Digitalizing the trade and transport industry by introducing smart infrastructure, paperless trade, and intelligent transport/logistics solutions; 2) Building Resilience by taking advantage of transport multimodality, operational connectivity, and transport facilitation at borders; and 3) Enhancing Connectivity by leveraging transport multimodality, operational connectivity, and transportation facilitation at borders.

The COVID-19 pandemic has shown how digitization and progress are intertwined. Because of the pandemic, new digital solutions and digital collaboration have been implemented to help people deal with their daily lives and take advantage of emerging chances for social and economic growth. Meanwhile, the epidemic has deepened digital disparities, which have endangered development gaps across nations. As a result of this need, in May 2022, ESCAP members and associate members passed resolution 78/1, pledging to increase digital cooperation at all levels, including the ministerial level, with the goals of reducing digital divides, bolstering digital connectivity, fostering digital skills, addressing digital trust and security, and promoting a digital economy and society that is accessible to all. The Asia-Pacific Information Superhighway was identified as a potential regional platform for fostering digital collaboration by ESCAP members and associate members.

Adverse effects of the COVID-19 pandemic brought about an opportunity for regional governments to boost their socio-economic development agendas, and ensure health and social protection measures for everybody. The virus affects everyone, regardless of financial



class or boundaries. The existing crisis may be a chance to expand regional collaboration to confront this cross-border epidemic and build a stronger, more resilient Asia-Pacific based on inclusion, solidarity, equality, and respect. The UNESCAP will continue to encourage tolerance, optimism, and collaboration across Asia and the Pacific (UNESCAP, n.d.c).

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## Lessons Learned

A conducted literature review suggests that the advancement of the transport and logistics sector's digital transformation in North and Central Asian countries is being affected by the following six obstacles and challenges:

- **Technological disconnect:** Azerbaijan, Kazakhstan, and the Russian Federation are among the nations evaluated for this study that perform highest in terms of Network Readiness Index, E-Government Development Index, and Amount of Goods and Services Exported. This is in part due to the higher technological maturity of these countries as well as the availability of resources. Less technologically advanced nations frequently concentrate on the introduction of the technology itself rather than on a clear strategy to integrate existing technologies and policies under one unified vision that incorporates both national needs and regional cooperation benefits. However, it should be noted that no single digital solution currently unites all of the states covered by this study, and an increasing number of businesses are providing specialized high-tech solutions that are tailored to the country's needs and industry to enhance data exchange or optimize transportation operations. Additionally, when it comes to digital transformation in any sector, initial investment costs are quite significant since existing infrastructure is frequently out-of-date or lacks critical integration capabilities.
- **Lack of digitally competent human capital:** Digital transportation in the transport and logistics sectors suffers from a shortage of digitally competent and qualified personnel, an issue that is projected to worsen in the future as the emergence of new technologies necessitates the development of new skill sets and technological expertise. Adequate human resources must be ensured through collaboration between academia and the private sector for future technological development and implementation as the world transitions to a digital economy. This is unachievable without a well-structured, all-encompassing vision for socio-economic growth that is both flexible enough to respond to global trends and robust enough to withstand economic shocks. Human capital shortages can only be addressed by cultivating a digitalized workforce at all levels of the economy, particularly in nations with a strong potential for development but a shortage of skilled professionals.
- **Cybersecurity:** The transition to "connected" technology carries with it the danger of diminished cyber security and resilience. Since data protection and national security are of the utmost importance when it comes to bilateral and multilateral data exchange between sovereign states, countries in North and Central Asia may be hesitant to use certain information systems or document exchange platforms due to data security concerns. Moreover, each online system requires both proactive and reactive protection as well as real-time threat monitoring to assure both the reliability of linked systems and data security. Greater dependence on digital infrastructures and services increases the need for cybersecurity. Modern technologies and linked devices necessitate the replacement or updating of old digital infrastructure and services, as they may be increasingly vulnerable to cyberthreats. This relates to the necessity for investment to upgrade or introduce new technologies and educate personnel about these technologies.
- **Regional collaboration and need for harmonized standards:** Since their independence, North and Central Asian countries have actively worked to update and revise their national policies and laws related to road safety, transportation and logistics, customs, and data collection and reporting guided by the international framework agreements. Though they are defined by the same frameworks, national transportation

standards and regulations vary widely, which further complicates the development of the unified information exchange system for digital data and document exchange. Since updating and harmonizing standards and regulations of all countries in the subregion will take a considerable amount of time and effort, countries in North and Central Asia are currently actively collaborating within the framework of international freight transportation routes and regional cooperation agreements.

- **The future is not here yet:** Despite the enormous progress made in hardware and software over the past decade and the increasing use of "smart" technologies in our daily lives, the technology that could completely eliminate human error, guarantee optimal resource utilization, and reduce resource losses is still lagging behind. Massive investments are needed to design and implement autonomous robotics and intelligent transportation systems that could function with little to no human intervention (both from a control as well as programming standpoint). To provide quick and dependable data transfer, such systems frequently need extra investments in auxiliary technologies and infrastructures, including cloud-based computing and ultra-rapid 5G/6G connectivity. Large amounts of digitally accessible data are necessary for artificial intelligence to operate within the constraints set by the operator while utilizing machine learning. Task planning and execution may be improved by the IoT technology, which links sensors and systems and is aided by AI. However, at the end of the day, it is all tied to each country's overall infrastructural and socioeconomic growth. Despite significant advancements in mobile and cellular network coverage, distance from cities significantly reduces network speed and dependability. Increased distances from urban centers have a negative impact on road conditions as well, and deteriorating pavement makes it difficult for fully autonomous vehicles to use state highways without human supervision. This is not to suggest that we should cease technological advancement; rather, we should consider the transport and logistics sector digitization as a driver of economic growth and sustainable development.
- **Lack of evidence base:** One of the main forces behind the digital transformation of the transport and logistics sector is cost reduction, which is linked to improved resource utilization efficiency and shorter processing times at the border. The countries of North and Central Asia, the majority of which are also Least Developed Countries, require substantial evidence-based for a shift from a monomodal paradigm of business as usual to a multimodal digitalization scenario to happen faster. There are not enough thorough studies that can fully summarize the associated direct and indirect costs and benefits of multimodal transport development and its digitalization, despite the fact that there may be a general consensus that it is more effective and efficient as well as environmentally friendly. This is a concern since, in the next decades, the expansion of multimodal transport and its digitization are anticipated to have a substantial influence on the world economy. Process simplification has a substantial impact on customs procedures and what may be required for processing large amounts of data. It also increases stakeholder collaboration and data transparency and attracts investments. Predicting how things will go down is really important. Policymakers and governments will urge the private sector to actively participate in the development of the transport and logistics sector if there is demonstrable proof, backed by statistics, that doing so would help achieve socio-economic development goals and use fewer resources.

## CONCLUSION

The majority of the nations in North and Central Asia are landlocked, which increases the cost of freight transportation. For socio-economic growth to be competitive in global markets, the transportation and logistics sector must be easily accessible, well structured, and highly efficient. Additionally, the timely delivery of freight and connectivity affect the sustainability of food supply, which has an impact on societal stability and food security. The effectiveness of global supply chains has greatly benefited from factors including considerable reductions in transit time and costs, better access to information needed to manage inventory and timely delivery, and reduced tariffs and border restrictions. Increased digitization initiatives have the potential to enhance each of these aspects, and North and Central Asian nations are making strong efforts in this regard, especially post-COVID-19.

National strategies and initiatives in North and Central Asia promoting the digitalization of important sectors of the economy, including transportation and logistics, are often sectoral in nature and lack a coherent master plan that ties all ends together. On the other hand, short-term national programs and initiatives, which are part of the long-term socioeconomic development plans, are narrowly focused and can target specific tasks, but not all of them are implemented, which leads to problems in achieving the goals set.

When it comes to the digitalization of the transport and logistics industry, countries mainly focus on digitizing document flow, speeding up customs procedures through new and innovative solutions, standardizing regulations and procedures, and mutual recognition of consignment notes. Thus, in North and Central Asian countries, the development of ICT infrastructure, both within countries and along their borders, has received much attention over the years, since without a reliable and fast Internet connection, it is impossible to receive, process, or send data. ICT infrastructure, e-resilience, and its role in societal resilience are crucial, especially along international transport corridors and customs checkpoints.

ICT infrastructure also serves as a catalyst for the development of remote settlements, allowing populations to develop small and medium-sized businesses around storage or cargo management centers. However, the varying degrees of ICT penetration and development in each individual North and Central Asian country makes it difficult to create a regional transport and logistics corridor, thereby forcing countries to focus more on national development than on integration into a single supply chain. Since national strategies rarely examine the regional component of transportation digitization, International Framework Agreements might serve as a motivating force for such regional integration and further promote ICT infrastructure, digitalization, and multimodal transport solutions, which have a positive impact on all sectors of the economy and society. It is also important to note that the implementation of digital solutions in the supply chain for transportation and logistics encourages the development of publicly accessible and advanced payment systems, which in turn drives the development of other sectors of the economy.

Given the geographic isolation of the majority of the countries examined in this report from the sea, the development of digital technologies and the digitalization of North and Central Asian economies contribute to a positive structural transformation of development trends, particularly in the transport and logistics sector. This facilitates the efficient management of available resources and human capital. In addition to having a positive effect on the speed at which goods are moved and the enhancement of land-based multimodal transport services, the adoption of digital technologies and land-based and dynamic data driven approaches in the transport and logistics sector also helps to develop small and medium-sized businesses

and create jobs. Increased freight turnover and quicker processing times result in a wider range of goods and products being carried, which helps to ensure long-term national food security and enhances quality of life.

Given that global transportation and logistics systems were one of the areas most severely impacted by the COVID-19 pandemic, particularly air and passenger transport and, to a lesser extent, pipelines and rail transport, the issue of developing seamless and contactless transportation corridors through the use of innovative digital technologies ought to be the basis for disaster resilience in North and Central Asia. The governments of North and Central Asia may capitalize on the chance given by the post-pandemic environment to improve digitalization and urge economies to step up their digitization efforts by making use of the potential presented by the post-pandemic environment. Therefore, in order for nations to get past the difficulties that currently exist and get back on track toward socio-economic development, they need to transform their operations and move toward digitalization of the transport and logistics sector, as well as regional trade and transit facilitation.

## RECOMMENDATIONS

Given the high interest of the countries studied in this report in optimizing and improving transport and logistics infrastructure, both through changes to national policies and through the creation of innovative multimodal transport hubs, and taking into account the difficulties faced by the transport and logistics sector due to COVID-19, the following is recommended:

- It is necessary to ensure compliance with and enforcement of relevant UN transport conventions and legal agreements related to the transport sector and border crossing facilitation. This will promote the integration of the subregion's road network into existing and planned transport corridors, which in turn will increase traffic flow, ensure faster delivery of goods, and increase the reliability of freight.
- As the effectiveness of dry ports and multimodal logistics hubs has been proven both regionally and globally, the development of inland dry ports and logistics hubs in the subregion should be accelerated to reduce logistics costs and optimize cargo flows, thereby creating a favorable framework for the introduction of digital technologies and the Internet of Things needed to drive the digitalization of the transport and logistics sector.
- One of the main factors promoting digital technologies and smart solutions in areas remote from megacities is strategically located dry ports and logistics hubs, as well as the systematic development of roadside infrastructure along the routes of international transport corridors. Thus, countries are encouraged to work not only at the national level but also within the framework of UNESCAP-promoted intergovernmental agreements to formalize the integration of regional rail, road, and dry port networks into a unified subregional network.
- During the planning and construction of dry ports along international transport corridors, it is important not to forget about intra-country transport connectivity and the need to provide remote areas with quality transport services and infrastructure.
- Alignment of regulatory transport and logistics documents, customs freight, and tariff requirements.
- A regional roadmap for the development of priority transport corridors, simplification, and harmonization of standards, documents, and procedures at border crossings should be developed in order to harmonize standards and documents and promote best practices. The creation of such a mechanism will reduce the cost of implementing new ICT solutions, as compatibility and interoperability issues will be resolved.
- Implement an electronic document management system for the transportation of goods, both internationally and nationally, with the elaboration of interstate recognition of phytosanitary certificates and norms.
- A methodological toolkit should be developed to analyze the costs and benefits of introducing new ICT technologies as part of the overall digitalization of the transport and logistics sector, with a special focus on small and medium-sized enterprises. The toolkit should promote the use of more environmentally friendly modes of transport, especially in cities and along busy transport corridors, and facilitate the transition to "green" business models.
- Strengthen interagency cooperation and coordination of activities related to trade management, both within countries and in transit, to simplify and improve freight inspection and expedite the passage of goods through border crossing points.
- Improve and modernize transit corridors and build missing links in places where they are lacking to achieve an international, integrated, intermodal transport and logistics system.
- In areas of large flows of goods, strengthen the work and outfit the border stations.

- Address the further financing of digitalization projects.
- Develop a regional system for freight transit in cases of emergencies with simplified transportation documents procedures.
- The problems and losses of the transport sector because of the COVID-19 pandemic due to idle freight at border crossings have prompted governments to adapt to realities, change the way things are, and begin the transition to digitizing transport documents. To make the transport and logistics sector more efficient, the platform for digitizing documentation and customs procedures should be further developed, and work should continue implementing smart technologies and sensors.
- ESCAP promotes the development of the Asian Highway and Trans-Asian Railway networks, as well as dry ports of international importance, as part of a shared vision of internationally integrated intermodal transport and logistics systems for the region. These networks have become the backbone of land transport infrastructure in the Asia-Pacific region and support the development of transport links within countries, subregions, and between Asia and Europe, as well as improving transport connectivity for landlocked developing countries. Therefore, countries should strive to promote cooperation within this “common vision” and enforce integration of these initiatives into national strategic documents.

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