Strengthening capacity for operationalizing sustainable transport connectivity along the China-Central Asia-West Asia Economic Corridor to achieve the 2030 Agenda

Study Report 2022

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UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

The Economic and Social Commission for Asia and the Pacific (ESCAP) serves as the United Nations regional hub promoting cooperation among countries to achieve inclusive and sustainable development. As the largest regional intergovernmental platform with 53 member States and 9 associate members, ESCAP has emerged as a strong regional think-tank, offering countries sound analytical products that shed insight into the evolving economic, social and environmental dynamics of the region. The Commission's strategic focus is to deliver on the 2030 Agenda for Sustainable Development by reinforcing and deepening regional cooperation and integration to advance connectivity, financial cooperation and market integration. The research and analysis of ESCAP coupled with its policy advisory services, capacity-building and technical assistance to governments aims to support countries' sustainable and inclusive development ambitions.

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2DS	–	2 degree scenario
ADB	–	Asian Development Bank
AEO	–	authorised economic operator
AFD	–	Agence Française de Développement
AH	–	Asian Highway
AI	–	Artificial intelligence
ALTID	–	Asian Land Transport Infrastructure Development
APTS	–	Advanced Public Transport Systems
ASEAN	–	Association of South East Asian Nations
ATIS	–	Advanced Traveler Information Systems
ATMS	–	Advanced Traffic Management Systems
BAU	–	business as usual
BCP	–	border crossing post/point
BRI	–	Belt and Road Initiative
CAR	–	Central Asia Road Links Programme
CAREC CPMM	–	CAREC Corridor Performance Measurement and Monitoring
CAREC	–	Central Asia Regional Economic Cooperation
CCTV	–	Closed-circuit television
CCWA	–	China - Central Asia - West Asia
CIS	–	Commonwealth of Independent States
COVID-19	–	novel coronavirus SARS-CoV-2
CVO	–	Commercial Vehicle Operations
DFID	–	Department for International Development, United Kingdom
DLCA	–	Digital Logistics Capacity Assessment
DSRC	–	dedicated short-range communications
EAEU	–	Eurasian Economic Union
EBRD	–	European Bank for Reconstruction and Development
ECA	–	(United Nations) Economic Commission for Africa
ECE	–	(United Nations) Economic and Social Commission for Europe
ECO	–	Economic Cooperation Organization
EIB	–	European Investment Bank
ESCAP	–	(United Nations) Economic and Social Commission for Asia and Pacific
ESG	–	Environmental, social and governance
ESIA	–	environmental (and social) impact assessments
EU	–	European Union
GIS	–	Geographic information system
GPS	–	the Global Positioning System
ICT	–	information and communication technologies
IFC	–	International Finance Corporation
INSTC	–	International North-South Transport Corridor

IRU	–	International Road Union
ITS	–	Intelligent Transport Systems
LLDC	–	Land-locked developing country
LPI	–	Logistics Performance Indicator
M2M	–	Machine to Machine
MOU	–	Memorandum of Understanding
OECD	–	Organisation for Economic Co-Operation and Development
OEZ	–	Odd-Even Zone
PPP	–	Public Private Partnership
RFID	–	Radio-frequency identification
RTZ	–	Restricted Traffic Zone
SCATS	–	Sydney Coordinated Adaptive Traffic System
SDGs	–	Sustainable Development Goals
SFT	–	(UNCTAD) Framework for Sustainable Freight Transport
SICI	–	Sustainable Infrastructure Connectivity Indicator
SOE	–	State-owned enterprise
TCDD	–	Turkish State Railways
UIC	–	International Union of Railways
UNCTAD	–	United Nations Conference on Trade and Development
V2I	–	Vehicle-to-Infrastructure
V2V	–	Vehicle-to-Vehicle
V2X	–	Vehicle-to-Everything
VMS	–	Variable Message Signs
WCO	–	World Customs Organization
WTO	–	World Trade Organization

UNITS

ft	–	foot
ha	–	hectare
km	–	kilometre
km/h	–	kilometre per hour
m	–	metre
TEU	–	twenty-foot equivalent unit
USD	–	United States dollar

Note: Where applicable names of railway nodes are spelled as in TAR agreement (edition 2017), road nodes as in AH agreement, dry ports names as in the Agreement on Dry Ports.

Introduction

With its missions to improving hard and soft connectivity between its member countries since its foundation in 1947, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) has increasingly looked at addressing sustainable transport challenges.[1] As the result of this work countries of Asia and Pacific has equipped themselves with regional instruments for promotion of regional road, railway networks and supporting infrastructure as well as operational environment for transport. These instruments include Intergovernmental Agreement on the Asian Highway Network (2003), Intergovernmental Agreement on the Trans-Asian Railway Network (2006), Intergovernmental Agreement on Dry Ports (2013), Regional Strategic Framework for the Facilitation of International Road Transport (2012), Regional Cooperation Framework for the Facilitation of International Railway Transport (2015).

Yet, while bottlenecks remain, increased integration of economies, new technologies and political developments provide new opportunities to close connectivity gaps. Accordingly, ESCAP continues to support its member countries by analyzing connectivity gaps and suggesting measures to close these.

Of particular relevance to understand and fill connectivity gaps are economic corridors. One of these economic corridors is the China – Central Asia – West Asia (CCWA) corridor (Figure 1). This corridor involves eight countries in a region with some of the most complex geopolitics.

CCWA Economic Corridor runs though China, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan, Islamic Republic of Iran and Turkey serving at full length or by its sections several critical inter- and intra-regional trade directions:

China – Europe	Central Asia – West Asia	Centra Asia – Caucasus
China – Central Asia	China – West Asia	China - Caucasus
Central Asia – Europe	China – South Asia	Central Asia – South Asia

Transport routes exist within the context of sources of materials and goods, points of their consumption and environment in terms of quality of transport infrastructure and legal operational arrangements. This environment determines which route among the variety of possible itineraries would be most used by business as the easiest, quickest and/or providing additional economic opportunities.

This means that any transport corridor is more than its rails, roads, loading facilities, etc. Nodes are not only important as places of logistics facilities and places where controls are implemented, they concentrate economic actors that can shape cargo structure between nodes, make some of the nodes more attractive for certain types of operations or freight and so on. Transport corridor is both shaped by the economy and legal environment of the territories it passes and reshaping them as they interact and become more and more interwoven with each other.

These complexity and interdependency are reflected in a notion of an economic corridor. Economic corridor is a space, a region: it "connects economic agents along a defined geography" and is "integral to the economic fabric and the economic actors surrounding it."[2] Therefore, while looking into the soft and hard infrastructure of the CCWA Economic Corridor, the chapters below describe the situation not only on the main China to Turkey route but on secondary networks and exits to other corridors.

Increased connectivity along the CCWA Economic Corridor would advance the region to the achieving goals under 2030 Agenda for Sustainable Development, specifically, sustainable development goal (SDG) 9.1: "Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all".

Better transport infrastructure and efficient transport would be instrumental to achieving the SDG's related to reducing negative impact on environment and increasing the energy efficiency of industries.[3]

[1] United Nations ESCAP, 'Review of Sustainable Transport Connectivity in Asia and the Pacific 2019: Addressing the Challenges for Freight Transport' (Bangkok: United Nations, 27 December 2019), https://www.unescap.org/sites/default/files/publications/Review2019_LowRes-17Feb2020.pdf.

[2] Hans-Peter Brunner, 'What Is Economic Corridor Development and What Can It Achieve in Asia's Subregions?', ADB Working Paper Series on Regional Economic Integration (Mandaluyong City, Philippines: Asian Development Bank, August 2013), 1.

[3] SDG 7.3: "By 2030, double the global rate of improvement in energy efficiency"; SDG 9.4: "By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities"; SDG 11.6: "By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management"; SDG 13.3: "Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning".

An analysis of the operationalisation of sustainable transport connectivity along the CCWA Economic Corridor has been carried out by ESCAP in 2020-2021. It covers issues relating to the status of soft and hard transport infrastructure, to green investments and the usage of smart transport technologies. The results are compiled in two reports. First, the report titled “Database of Agreements on International Road Transport and International Railway Transport in China-Central Asia-West Asia Economic Corridor” provides a detailed picture of the bilateral and multilateral agreements related to transport that CCWA countries are party to. The report is published separately and is expected to be supported by a corresponding database coming online in the near future. Second, the current report presents the existing condition of international transport across the countries of the CCWA Economic Corridor. Chapter I overviews transport corridor initiatives the countries are involved in, the logistics performance of the countries, the existing operational and physical bottlenecks with due consideration of the restrictions and opportunities related to COVID-19 and the impact of the pandemic on international transport and trade in the subregion. Chapter II elaborates on aspects of green infrastructure development, sustainable finance, suggestions for an index to measure sustainability of infrastructure, and recommendations on overcoming existing bottlenecks for transport. Chapter III discusses the deployment of existing and proposed smart transport systems including intelligent transport systems (ITS) within CCWA corridor member countries, together with policy recommendations and suggested action plans for inclusion in a corridor specific strategy through the survey among specialists from the respective CCWA member countries.

Chapter I China – Central Asia – West Asia Economic Corridor

I.1 Overview

The China – Central Asia – West Asia (CCWA) corridor is spanning eight countries: China, Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Turkey, and Uzbekistan. The countries of the CCWA without China are home to 925 million people (Table 1). The economies of the CCWA have grown their GDP on average by 5.1% over the last 5 years to reach a combined GDP of about 1.6 trillion USD.[1] Of the eight countries of the CCWA, five are considered land-locked developing countries (LLDC) with no access to a global ocean for transport connectivity. Among them, Uzbekistan is one the two countries of the World that are double landlocked – it is surrounded by landlocked countries and two international borders to be crossed to reach access to global maritime routes (Caspian sea is a lake by its nature).

Table 1 Economic data of the CCWA economies, 2018

	China	Kazakhstan	Uzbekistan	Tajikistan	Kyrgyzstan	Islamic Republic of Iran	Turkey	Turkmenistan
GDP per capita (current USD)	9,771	9,813	1,532	827	1,281	..	9,370	6,967
GDP (current, billion USD)	13,608.2	179.3	50.5	7.5	8.1		771.4	40.8
Population growth (annual %)	0.5	1.3	1.7	2.5	1.9	1.4	1.5	1.6
Population, total (million people)	1,392.7	18.3	33.0	9.1	6.3	81.8	82.3	5.9
Railways, goods transported (million ton-km)	2,238,435	206,258	22,940	165	935	30,299	12,058	13,327
Investment in transport with private participation (current, million USD)	25,965	740	..	..	..	..	6,924	..
Logistics performance index: Quality of trade and transport-related infrastructure (1=low to 5=high)	3.75	2.55	2.57	2.17	2.38	2.77	3.21	2.23
Transport services (% of service exports, balance of payments)	18.1	54.7	45.6	74.9	25.1	..	36.4	..

Note: ".." – data not available.
Source: World Bank, 'World Development Indicators', 2020

Transport networks of the eight countries provide various options for connections between China and partner countries in Central and West Asia, Mediterranean ports and EU space (Figure 1). For instance, train route through Kazakhstan, Uzbekistan and Turkmenistan is part of the Almaty-Bandar Abbas corridor entering Islamic Republic of Iran through the border point of Sarakhs and continuing to Turkey through the border crossing point Kapikoy. This route was opened in 2011 and has the potential to transport 2 million tons of freight annually.[2] The first train crossing the whole CCWA corridor from Western China to Islamic Republic of Iran arrived in 2016. It passed the 10,400 km journey starting in the Chinese city of Yiwu in 14 days, traversing through Kazakhstan, Uzbekistan, Turkmenistan, and managing elevations of up to 2,000 meters.[3]

The second railway route is bypassing Uzbekistan and is part of the East of Caspian Route, entering Islamic Republic of Iran through the Incheboroun border crossing. This route is a branch of the International North-South Transport Corridor, connecting Russian Federation to the Persian Gulf. The railway line was launched at the end of 2014 and foresees transporting some 15 million tons of cargo annually by 2022.[4]

[1] World Bank, 'World Development Indicators', 2020, https://databank.worldbank.org/source/world-development-indicators#.

[2] Majorie Leijen, 'A Tour through Iran as a Rail Freight Transit Country', RailFreight.Com, 17 July 2018, https://www.railfreight.com/corridors/2018/07/17/a-tour-through-iran-as-a-rail-freight-transit-country/.

[3] Marco Hernandez Arranz and Adolfo Marcelo Duhalde, 'Belt and Road Initiative', *South China Morning Post*, accessed 19 November 2019, http://multimedia.scmp.com/news/china/article/One-Belt-One-Road/khorgos.html.

[4] Majorie Leijen, 'New Railway Service Iran-China Launched, Connecting Inner Mongolia-Bam', RailFreight.Com, 9 September 2018, https://www.railfreight.com/beltandroad/2018/09/05/new-railway-service-iran-china-launched-connecting-inner-mongolia-bam/.

The third possible route between China and Turkey runs through Kyrgyzstan, Tajikistan, Turkmenistan and Islamic Republic of Iran. It is part of the Istanbul-Almaty corridor, which was established in 2002. However, the infrastructure in the east of the Islamic Republic of Iran requires upgrades to provide the required capacity.[1]

The CCWA Economic corridor can gain a lot from existing connection beyond the eight countries that provide alternatives for the purely CCWA routes. Since the completion of the Baku-Tbilisi-Kars railroad in 2017, a new 826 km railroad provides a reliable link between Asia and Europe. Trains starting traversing Aktau in Kazakhstan can cross by ferry to Baku in Azerbaijan, and continue by train to Kars in Turkey. Cargo between Turkmenistan and Turkey can also bypass the Islamic Republic of Iran by transloading to ferry between Turkmenbashi and Baku.

Also, a number of railway routes run through the subregions. For example, trains run from Kazakhstan to Uzbekistan via the border crossing points Oazis (Kazakhstan)/Karakalpakia (Uzbekistan), or from via the Northern section of the railway in Kyrgyzstan. Another possible route connects Kazakhstan and Turkmenistan and in April 2019, Uzbekistan joined this route with further upgrades, such as planned single tariff for containers.[2]

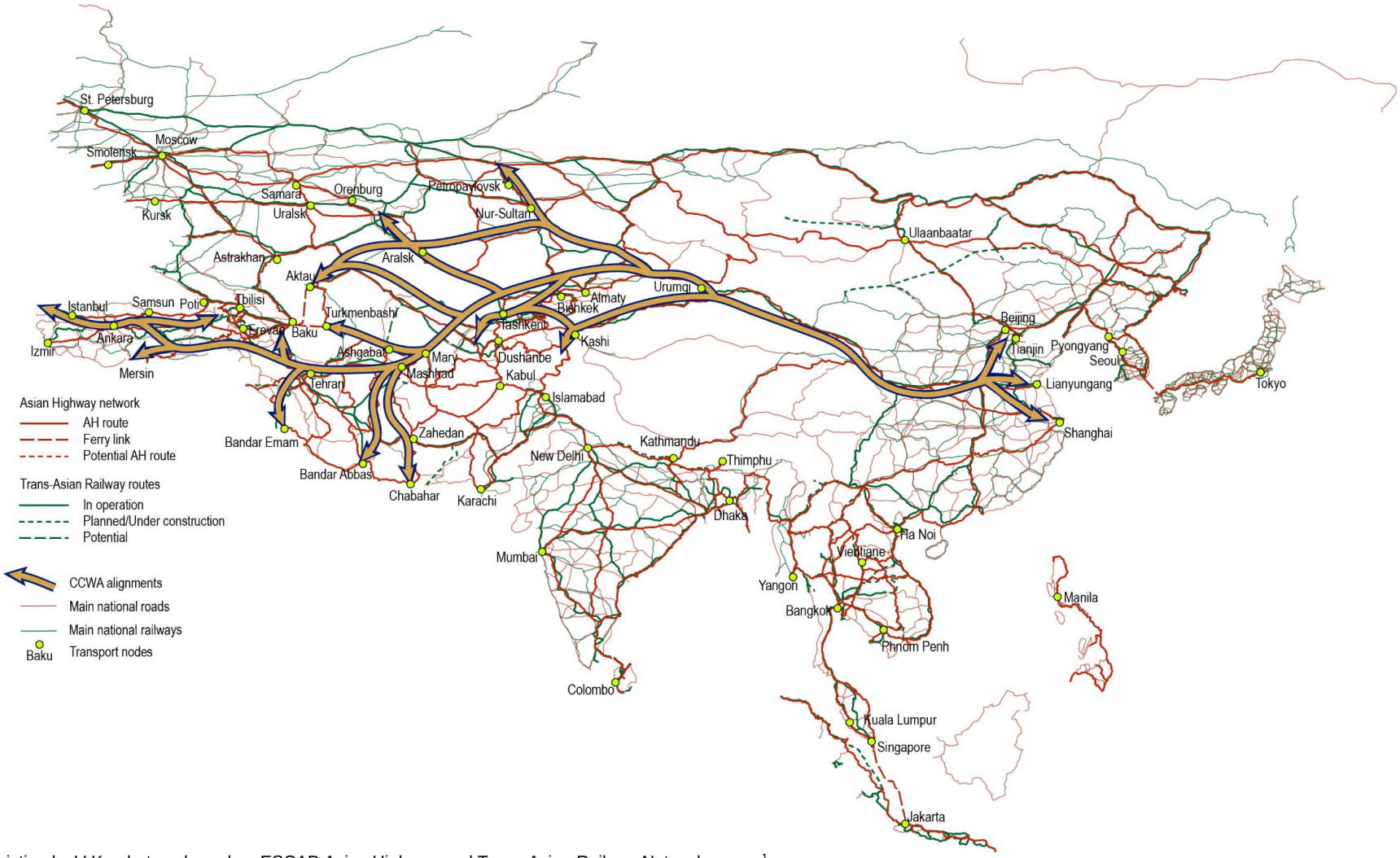
A further rail link between Uzbekistan and Tajikistan reopened at 2018 via Galaba and Amuzang on the north bank of the River Amu Darya.[3] The Trans-Caspian International Transport Route was established in 2013 initially as a coordinating mechanism between the national railway authorities of Azerbaijan, Georgia, and Kazakhstan and has since grown in members to play an important role in facilitating railway corridor connectivity between East Asia, the Caucasus, and Europe. In February 2018, the Turkish State Railways joined the TransCaspian International Transport Route mechanism. It was expected that by 2020, the route could reach 300,000 TEU between Europe and China.[4]

[1] Leijen, 'A Tour through Iran as a Rail Freight Transit Country'.

[2] Mykola Zasiadko, 'First Direct Rail Freight Link from Turkmenistan to China', RailFreight.Com, 11 July 2019, https://www.railfreight.com/beltandroad/2019/11/07/first-direct-rail-freight-link-from-turkmenistan-to-china/.

[3] Railway Gazette, 'Uzbekistan – Tajikistan Rail Link Reopens', *Railway Gazette*, 12 March 2018, https://www.railwaygazette.com/infrastructure/uzbekistan-tajikistan-rail-link-reopens/46106.article.

[4] Fuad Shahbazov, 'China to Europe By Way of Azerbaijan's Trans-Caspian Gateway: The Trans-Caspian International Transit Route Is Set to Reinvigorate Regional Economic Growth.', *The Diplomat*, 16 February 2018, https://thediplomat.com/2018/02/china-to-europe-by-way-of-azerbaijans-trans-caspian-gateway/.



Source: Depiction by V.Krechetova based on ESCAP Asian Highway and Trans-Asian Railway Networks maps[1].

Figure 1 China – Central Asia – West Asia (CCWA) Economic Corridor and ESCAP region's transport networks

[1] United Nations ESCAP, *Asian Highway Route Map*, 26 January 2021, 26 January 2021, https://www.unescap.org/resources/asian-highway-route-map; United Nations ESCAP, *Trans-Asian Railway Network*, 26 January 2021, 26 January 2021, https://www.unescap.org/resources/trans-asian-railway-network-map.

CORRIDORS OF THE CCWA COUNTRIES

Corridors have been widely adopted for making important interventions with respect to infrastructure development and maintenance, trade and transport facilitation, transport logistics monitoring, and capacity building for a variety of stakeholders. For the developing regions with large numbers of LLDCs, the United Nations regional agencies such as ECA and ESCAP underscored the importance of transport corridors.[1]

The CCWA corridor is an important corridor to improve economic exchanges, infrastructure connectivity and logistics efficiency between its member countries between China and Central and West Asia. The countries are not only part to the ancient Silk Road, but also formed a number of multilateral cooperation platform to promote connectivity and are one of the focus areas for Belt and Road Initiative. Some of CCWA Economic Corridor's transport links were subject of the ESCAP study *Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- and Inter-Regional Transport Connectivity* (2017) as Eurasian Central Corridor. The study thoroughly catalogued technical condition of the Asian Highway and Trans-Asian Railways sections along the Eurasian Central Corridor, legal arrangements for international transport, existing bottlenecks and suggested ways to mend the situation where needed.

Besides the CCWA, the corridor's countries are part of other adjacent corridors and coordinating initiatives. Among them are:

- CAREC – The Central Asia Regional Economic Cooperation – a subregional initiative that has a notable impact on the development of transport in the region, due to its structured financial donor support. The CAREC was initiated in 1996 to provide technical assistance for regional cooperation in Central Asia. It grew into a cooperation of 11 countries supported by 6 multilateral institutions, with the Asian Development Bank (ADB) serving as the organization's secretariat.2 Within CAREC Transport and Trade Facilitation Strategy 2014-2020, most important goals are:
    - development of the multimodal corridor network;
    - improvement of trade and border-crossing services;
    - improvement of operational and institutional effectiveness.
- INSTC – International North-South Transport Corridor established in 2000 3 and currently has membership of Azerbaijan, Armenia, Belarus, Bulgaria, India, Islamic Republic of Iran, Kyrgyzstan, Oman, Russian Federation, Tajikistan, Turkey, Syria, Ukraine. The goals of INSTC are:
    - Create non-discriminatory market access for transport service provider;
    - Harmonize transport regulations along the corridor;
    - Increase efficiency of transport linkages.
- TRACECA – Transport Corridor Europe-Caucasus-Asia was initiated in 1993. Its member countries are Armenia, Azerbaijan, Bulgaria, Georgia, Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Republic of Moldova, Romania, Tajikistan, Turkey, Ukraine and Uzbekistan. Its goals for the 2016-2026 period are to continue developing the following factors:
    - Institutional – legal barriers to transport and international trade;
    - Motorways of the sea, train ferries and sea routes;
    - Railway sector;
    - Road sector;
    - Inland waterways;
    - Connections to the hinterland, multimodal and logistic opportunities.
- ECO – The Economic Cooperation Organization, which is a subregional cooperation mechanism with the 10 member countries Afghanistan, Azerbaijan, Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkey, Turkmenistan, and Uzbekistan. Its goals are:
    - double intra-regional trade;
    - maximize connectivity, mobility and accessibility;
    - enhance energy sustainability and security;
    - achieve sustainable and high economic growth;
    - and improve general quality of life.

[1] UN-OHRLLS and Gilberg Mbae Maeti, 'Report on Best Practices for Effective Transit Transport Corridor Development and Management (Draft Version)' (Ulaanbaatar: UN-OHRLLS, 2019).

[2] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017', 2017, http://www.unescap.org/sites/default/files/Study%20Report%20Eurasian%20Corridors-Final.pdf.

[3] Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017 (ESCAP, 2017), p. 25.

Table 2 Corridors relevant for CCWA countries

Corridor Initiative \ Countries	China	Islamic Republic of Iran	Kazakhstan	Kyrgyzstan	Tajikistan	Turkey	Turkmenistan	Uzbekistan
CCWA	X	X	X	X	X	X	X	X
CAREC	X		X	X	X		X	X
Central-Asia Road Link				X	X			
Asian Highway Network	X	X	X	X	X	X	X	X
East-West Economic Corridor	X							
Kazakhstan – Turkmenistan - Iran Transnational Railway		X	X				X	
International North-South Transport Corridor (INSTC)		X	X	X	X	X		
National Road Rehabilitation (Osh-Batken-Isfana)				X				
Nurly Zhol			X					
Regional Improvement of Border Services				X	X			
Transport Corridor Europe-Caucasus-Asia (TRACECA)		X	X	X	X	X		X
Turkmenistan – Afghanistan - Tajikistan Railway					X		X	
China-Kyrgyzstan - Tajikistan-Afghanistan-Iran railway corridor; also Five Nations Railway Corridor (FNRC)	X	X		X	X			
Trans-Asian Railway (TAR)	X	X	X		X	X	X	X
Economic Cooperation Organization (ECO)			X		X	X		X
Trans-Caspian East-West Middle Corridor (Trans-Caspian Corridor)	X		X	X		X	X	

Source: Compiled by Dr. Christoph Nedopil.

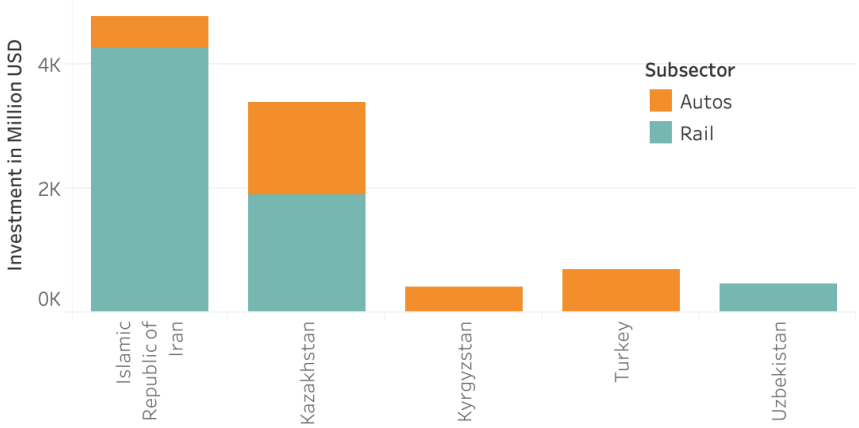
Table 2 gives an overview of the most relevant initiatives impacting infrastructure connectivity for CCWA countries. As can be seen, CCWA countries are part to quite a number of such initiatives showing their dedication to improving connectivity. The numerosity of initiatives, however, may require extensive coordination.

TRANSPORT INFRASTRUCTURE INVESTMENTS IN THE CCWA COUNTRIES

One responsibility of corridor initiatives is coordination of investment in transport connectivity to increase efficiency and lower total costs.

In the CCWA, continuous efforts and investments have been made to improve the transport connectivity. However, connectivity problems and gaps still exist, like the discontinuity of the highway and railroad, mismatch of the cargoes and wagons, and different construction standard of different countries. Therefore, more investments are needed in infrastructure construction.

In order to finance these infrastructure investments, traditional sources, such as the Asian Development Bank (ADB), the World Bank, the European Bank for Reconstruction and Development (EBRD) and national development banks play an important role. Over the past years, Chinese financial institutions and enterprises have also been increasing their infrastructure investments, particularly through its Belt and Road Initiative (BRI). All CCWA countries have signed Memorandums of Understanding with China to join the BRI. Accordingly, from 2013, the initial year of the BRI, to December 2019, Chinese investors have contributed almost 10 billion USD (see Figure 2) of road and rail infrastructure, particularly in Islamic Republic of Iran and Kazakhstan.



Source: by Dr. Christoph Nedopil based on data from American Enterprise Institute[1].

Figure 2 Accumulated Chinese transport investments in CCWA countries 2013-2019 in million USD

Compared to direct Chinese investments in the CCWA, infrastructure investment from other countries usually come through multilateral development banks. The German KfW,[2] and the French AFD,[3] for example, lists no infrastructure projects in the CCWA countries.

LOGISTICS PERFORMANCE IN THE CCWA

Despite investments to strengthen transport infrastructure over the past years in the CCWA, challenges and bottlenecks remain. An indicator that measures the quality of transport and logistics is the Logistics Performance Index (LPI) Tracker provided by the World Bank. For CCWA countries the overall 2018 LPI score ranges from 3.6 in China to 2.3 Tajikistan (the highest score for the LPI in 2018 is 4.2 for Germany). Accordingly, while China ranks 26 globally on the LPI, Turkmenistan ranks 126th and Tajikistan ranks 134th.[4]

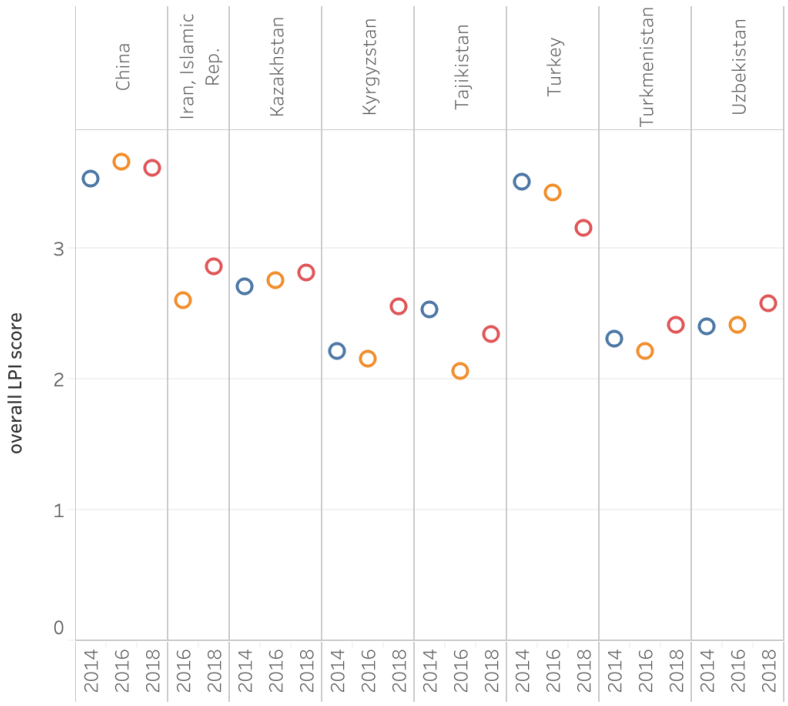
While some countries of the CCWA have progressed and improved on the LPI over the past years (notably Kyrgyzstan and Kazakhstan), other countries have stalled or worsened (notably Turkey, due to decreasing performance in efficiency of the clearance process at customs, competence and quality of logistics services, and ability to track and trace consignments), see Figure 3.

[1] Derek Scissors, *China Global Investment Tracker* (Washington: American Enterprise Institute, 2019), http://www.aei.org/china-global-investment-tracker/.

[2] 'KfW Development Finance. "KfW Entwicklungsfinanzierung | Weltweites Engagement."', KfW, 2020, https://www.kfw.de/microsites/Microsite/transparenz.kfw.de/#/country/TUR.

[3] Agence Francaise de Developpement (AFD), 'More Sustainable Transport to Support Istanbul's Growth', 2013, https://www.afd.fr/en/carte-des-projets/more-sustainable-transport-support-istanbuls-growth.

[4] Jean-François Arvis et al., 'Connecting to Compete 2018 - Trade Logistics in the Global Economy. The Logistics Performance Index and Its Indicators.' (Washington: The World Bank, 2018), https://openknowledge.worldbank.org/bitstream/handle/10986/29971/LPI2018.pdf.



Source: by Dr. Christoph Nedopil based on data from Jean-François Arvis and others, Connecting to Compete 2018 - Trade Logistics in the Global Economy.[1]

Figure 3 CCWA LPI performance 2014-2018

Looking at specific indicators, the LPI scores quality of customs, infrastructure, international shipments, logistics quality, timeliness, and tracking and tracing. Table 3 shows that most CCWA countries except China rank below 3 at least at some dimensions (with the highest score attainable being 5) – indicating a performance gap and need for investments.

Table 3 Logistics Performance Index (LPI) 2018 for CCWA countries

Country	Customs 2018	Infrastructure score 2018	International shipments score 2018	Logistics quality score 2018	Timeliness score 2018	Tracking and tracing score 2018	overall LPI score 2018
China	3.286	3.753	3.536	3.595	3.840	3.648	3.605
Iran, Islamic Rep.	2.625	2.767	2.757	2.838	3.356	2.767	2.853
Kazakhstan	2.664	2.546	2.734	2.577	3.525	2.777	2.810
Kyrgyzstan	2.750	2.375	2.215	2.358	2.941	2.644	2.546
Tajikistan	1.923	2.166	2.313	2.333	2.949	2.333	2.340
Turkey	2.713	3.210	3.061	3.047	3.628	3.233	3.146
Turkmenistan	2.350	2.229	2.288	2.308	2.719	2.558	2.410
Uzbekistan	2.103	2.570	2.423	2.588	3.090	2.709	2.577

Source: World Bank, "World Bank Development Indicators."[2]

SUSTAINABLE DEVELOPMENT THROUGH TRANSPORT CORRIDORS

In order to further improve transport connectivity and accelerate economic development and prosperity through better infrastructure connectivity, better regional and trans-continental rail and road connectivity, supported by dry ports, efficient border crossings and operational parameters with a focus on sustainability is important.

To that end, the United Nation's ESCAP has provided relevant frameworks and championed international agreements to promote infrastructure connectivity, such as the *Intergovernmental Agreement on the Asian Highway Network* (enforced since 2005),[3] the *Intergovernmental Agreement on the Trans-Asian Railway*

[1] Arvis et al.

[2] World Bank, 'World Development Indicators'.

[3] 'Intergovernmental Agreement on the Asian Highway Network' (Bangkok, 18 November 2003), http://www.unescap.org/sites/default/files/AH%20Agreement%20with%20Amended%20Annex%20I-%202016_En.pdf.

Network (enforced since 2009),[1] and the *Intergovernmental Agreement on Dry Ports* (enforced since 2016).[2] ESCAP has also provided recommendations of best practices of transport facilitation to promote soft infrastructure connectivity like the *Regional Strategic Framework on the Facilitation of International Road Transport* (2013)[3] and *the Regional Cooperation Framework for the Facilitation of International Railway Transport* (2017). [4]

Transport connectivity within the CCWA is also an important requirement to reach the 2030 Agenda and the United Nation Sustainable Development Goals (SDGs). The SDGs directly aim at enhancing the resilience and sustainability of various kinds of infrastructure, including transport infrastructure. SDG 7, for example, proposes to "increase substantially the share of renewable energy in the global energy mix" by 2030, while SDG 9 endeavours to "develop quality, reliable, sustainable and resilient infrastructure[…] to support economic development and human well-being, with a focus on affordable and equitable access for all".[5] Economic corridors additionally support SDG 17 – Partnership for the Goals – through better coordination and integration of different economies, cultures and institutions. Furthermore, transport infrastructure directly impacts SDG 13 by contributing to climate action through possible emissions from transport and SDG 15 – Life on Land through the construction of linear infrastructure that impacts biodiversity. Therefore, the selection and prioritization of infrastructure projects in line with the sustainable development goals will require not only enhancing financing for such infrastructure connectivity, but must incorporating sustainability consideration as well.

I.2 CCWA Economic Corridor: existing operational challenges and non-physical barriers

I.2.1 Railway operational challenges and non-physical barriers

RAILWAY LEGAL REGIMES AND AGREEMENTS

Most part of the China - Central Asia - West Asia Economic Corridor is governed by the Agreement on International Goods Transport by Rail SMGS with exception of Turkey the countries' railways are members of Organisation for Co-Operation between Railways[6]. Islamic Republic of Iran and Turkey are members of Intergovernmental Organisation for International Carriage by Rail and parties to the Convention Concerning International Carriage by Rail (COTIF). The two legal regimes developed and actively use CIM/SMGS consignment note for cargos moving between them, the note can be used in both paper and electronic form, does not require additional documentation when goods change the legal space saving time and reducing costs[7]. Since Islamic Republic of Iran is a member to both organizations and agreements there is more room for streamlining corridor operations.

It is noteworthy, that family of agreements under OSJD umbrella includes also specific agreements on exchange of wagons, tariffs, accounting rules and operations in combined transportation, and not all of them are signed by all of the countries of CCWA corridor (Annex III). Development of through railway transport for the whole corridor might benefit from countries considering the joining or convincing their partners to join the agreements to facilitate cross-border railway operations. For instance, CAREC corridor performance management and monitoring observed that costs of movement of a 40-ft container via Turkmenistan railway sections in 2018 were about 60% higher than in neighbouring Uzbekistan, making the route less attractive[8].

Countries do fill the vacuum by different means: to facilitate the railway transport through their borders, Islamic Republic of Iran and Turkmenistan signed MOU allowing Iranian wagons to be operated on the Turkmenistan

[1] 'Intergovernmental Agreement on the Trans-Asian Railway Network' (Busan, Republic of Korea, 10 November 2006), http://www.unescap.org/sites/default/files/TAR%20Agreement-Consolidated-24Nov2015-En.pdf.

[2] 'Intergovernmental Agreement on Dry Ports' (Bangkok, Thailand, 7 November 2013), https://treaties.un.org/doc/Treaties/2013/11/20131107%2012-02%20PM/XI-E-3.pdf.

[3] United Nations ESCAP, 'Regional Strategic Framework for the Facilitation of International Road Transport', 12 March 2012, http://www.unescap.org/sites/default/files/Booklet_A_Strategic_Framework.pdf.

[4] 'Regional Cooperation Framework for the Facilitation of International Railway Transport' (Bangkok, Thailand, 29 May 2015), http://www.un.org/ga/search/view_doc.asp?symbol=E/ESCAP/RES/71/7.

[5] United Nations DESA, '#Envision2030: 17 Goals to Transform the World for Persons with Disabilities', n.d., https://www.un.org/development/desa/disabilities/envision2030.html.

[6] OSJD, 'Report on The Activities of the Organisation for Co-Operation between Railways for 2018', 27 August 2019, https://en.osjd.org/dbmm/download?vp=68&load=y&col_id=121&id=443.

[7] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[8] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2018* (Mandaluyong City, Philippines: Asian Development Bank, 2019), https://www.adb.org/sites/default/files/publication/536721/carec-cpmm-annual-report-2018.pdf.

railways, Islamic Republic of Iran offers discounts for transit cargos and facilitating container trains to China.[1] Moreover, Islamic Republic of Iran and Turkmenistan singed MOU on exchange of electronic documentations between the Customs of the two countries in 2018.[2]

OTHER ISSUES

Overall, railway operations in Central Asia require further shift towards intermodality as already pushed by development of container block train services. Existing wagon-centred operation model for railways when a wagon is loaded at origin and then moved to marshalling yard to join a freight train and might change several trains via several marshalling yards before reaching destination leads to increase of railways costs and transit time.[3]

Domestic issues with wagons and platforms could affect international railway transit as well. Untimely movement of empty wagons, inefficient managements of unused wagons can make masses of wagons impeding railway traffic as it is observed in Kazakhstan. Fleet management issues enhanced by big number of parties involved and unclear definitions of their legal obligations increase costs and complexity of railway shipping in Kazakhstan. Situation is by-product of the railway reform of 2004 and by 2018 the need for improvements became urgent as for instance, lack wagons main contributor to the delays at Dostyk and Altynkol border crossings. [4]

Both sign of existing inefficiencies in shipping by railways and contributing factor to them is price discrimination for international freight forwarders: in 2018, Chinese freight forwarders spent at Kazakhstan's side of Alashankou (China) – Dostyk (Kazakhstan) and Khorgos (China) – Altynkol (Kazakhstan) railway border crossings 3-4 times more per 40-foot container than Kazakhstan ones.[5]

I.2.2 Road operational challenges and non-physical barriers

CCWA Economic corridor has double potential: not only it provides shorter land connections for trans-Eurasian cargos between China and Europe it also provides connections to the sea ports and cheaper maritime routes for the five landlocked countries of the eight countries in question. One, Uzbekistan, is double landlocked: cargo/passenger have to cross at least two other countries to reach a seaport by land.

The countries fully appreciate this double potential and work actively to employ the range of instruments to realize it. In the area of road transport, all countries committed to bringing main international roads to common standards by joining AH Agreements and since China acceded to TIR convention in 2016, carriage under TIR carnet is possible across all eight countries. Most of the countries joined International Convention on the Harmonisation of Frontier Controls of Goods (1982), Customs convention on containers (1972), Agreement on Dry Ports and Conventions on road traffic, signs and signals (1968) (see Annex III).

At bilateral level countries are consistently closing gaps in road agreements with partners even if separated by number of borders. China under Belt and Road Initiative concluded road transport agreements with Turkey and Uzbekistan in 2017. Tajikistan and Uzbekistan - in 2018 opening over 40 routes for international transit and extending allowed time for it to 15 days[6].

The growth in number of agreements has not yet eliminated various challenges to road transport operations:

- need to transship cargos at border due to political decisions or lack or agreements;
- differences between treatment by the two parties to a bilateral roads transport agreement, such as different level of openness of countries to trucks of reach other, documentation for temporary importation of vehicle, acceptance of national driving license;
- difficult procedures;
- differences in standards on weights and dimensions for freight road vehicles, seasonal decrease in permissible axle loads;

[1] Kordbacheh Mozhgan, 'Islamic Republic of Iran's Presentation at the Sixth Meeting of the Working Group on the Trans-Asian Railway' (Sixth Meeting of the Working Group on the Trans-Asian Railway, United Nations Convention Center, Bangkok, Thailand, 10 December 2019), https://www.unescap.org/sites/default/files/Item5_Iran_0.pdf.

[2] Islamic Republic New Agency, 'Тегеран и Ашхабад подписали 13 соглашений о расширении сотрудничества (=Tehran and Ashgabat signed 13 agreements to expand partnership)', 2018 <https://ru.irna.ir/news/3604161/> [accessed 3 May 2020].

[3] 'Enhancing Connectivity and Freight in Central Asia: Case-Specific Policy Analysis' (OECD/The International Transport Forum, 2019), 82, https://www.itf-oecd.org/sites/default/files/docs/connectivity-freight-central-asia.pdf.

[4] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2018*.

[5] Asian Development Bank.

[6] 'Uzbekistan and Tajikistan signed Agreement on Strategic Partnership', *TASS Russian News Agency* (blog), 17 August 2018, https://tass.ru/mezhdunarodnaya-panorama/5466253; Iskandar Firuz and Barot Yusufi, 'Uzbekistan facilitated freight transit via its territory', *Radio Ozodi* (blog), 21 December 2018, https://rus.ozodi.org/a/29668614.html.

- unofficial payments occurring while in transit and during controls[1], and others.

Examples of difficulties in procedures are requirement of Islamic Republic of Iran to translate documents on the international road operation into Farsi and involvement of an Iranian agent, stricter requirements in China for temporary importation of vehicles than in its partners; there are differences whether national driving licences to be translated in national language of partner country or English.[2]

It might be that difficult procedures and political decisions impede usage of Turkmenistan territory for transit: CAREC CPMM report 2018 noted that the carriers of the partner countries put complexity in visas and permit procedures as well as periodic restrictions on railway and road traffic as the reasons to use alternatives via Georgia, Azerbaijan and Kazakhstan for their shipments. Situation could not be verified since there were no shipments via Turkmenistan in the observations and the country did not participate in the monitoring campaign.[3]

TRANSHIPMENT AT BORDERS AND SPORADIC CLOSURE OF BORDERS

Transshipment at border might be required when country does not give traffic rights to partners either due to absence of a road agreement or due to political issues. There are positive changes in this area along CCWA Economic Corridor: for instance, while ESCAP's Eurasian corridors study (2017) noted need for transshipment at border at Tursunzade (Tajikistan) – Sariosiyo (Uzbekistan) it is no longer the case as confirmed by CAREC CPMM 2018.

There might be different reasons for transhipment of cargos between trucks of different countries at border. For instance, despite the bilateral road transport agreement, due to difficulties in entry by trucks into each other territories and cabotage sensitivities, the practice existed between Kazakhstan and China at Khorgos/Horgos in 2018 and notably contributed to border crossing delays for shipments[4] and was a discussion point for the countries[5].

Political tensions likewise can cause borders closures for road transport and transit. There are reports of closures of Turkmenistan borders for road transit to/from Tajikistan in 2018 and 2019 for months.[6]

Other way to restrict and redistribute road transit is decision whether a border crossing is open to third-countries. This way, the Karamyk (Kyrgyzstan) – Karamyk (Tajikistan) border crossing located at a promisingly short route from China to West Asia is closed for international transit impeding development of this route as transcontinental transit route.[7]

WEIGHTS AND DIMENSIONS ISSUES

Differences in limits on gross vehicle weight, axle loads have direct impact on efficiency of road transport operations. The operators from countries with higher limits might need to underload its trucks or keep separate fleet for transit via particular countries or to carry out transport operations on selected directions. Seasonal reductions in axle loads (might be applied for movement during daylight hours or for a period on weeks/months) due to hot weather or snow melting complicate scheduling of operations and might lead to additional time in transit for cargos.

Meanwhile, limits on gross vehicle weight and axle loads normally are dictated by state of roads. On-going improvement of road infrastructure along the CCWA Economic corridor and their participation in AH Agreement open opportunity for harmonization of standards: the Agreement explicitly promotes agreed road design standards meaning similar freight road vehicles might be accommodated across the whole AH network.

[1] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2018*.

[2] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[3] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2018*.

[4] Asian Development Bank.

[5] 'Translogistica Kazhakhstan', 28 September 2018, https://translogistica.kz/ru/media-tsentr/otraslevye-novosti/novosti-blog/571-na-avtoperevozki-mezhdu-kazakhstanom-i-kitaem-utverzhdeny-kvoty-razreshenij.

[6] Alisher Zarifi, '10 Месяцев Запрета На Транзит Через Туркменистан. Когда Решится Проблема? (="10 Months of Restrictions on Transit via Turkmenistan. When Might the Situation Be Resolved?")', *Radio Ozodi* (blog), 6 November 2019, https://rus.ozodi.org/a/30255903.html.

[7] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

Table 4 Limits on dimensions, weight and axle load of a freight road vehicle in the countries along CCWA

	Maximum Width, mm	Maximum Height, mm	Maximum Length, mm		Maximum Gross Weight, ton		Maximum Single Axle Load, ton
			Rigid truck	Articulated Vehicle/Road Train	Rigid Vehicle	Articulated Vehicle/ Road Train	
China	2,550	4,000	12,000	20,000	31	49	11.50[ii]
Islamic Republic of Iran	2,600	4,500	12,000	20,750	34	44	13
Kazakhstan	2,550[i]	4,000	12,000	20,000	25	44	10
Kyrgyzstan	2,550[i]	4,000	12,000	20,000	32	44	11.5
Tajikistan	2,500[i]	4,000	12,000	20,000	..	40	10
Turkey	2,550[i]	4,000	12,000	22,000	32	44	11.5
Turkmenistan	2,500	4,000	..	24,000	..	36	10
Uzbekistan	2,550[i]	4,000	12,000	20,000	32	44	11.5

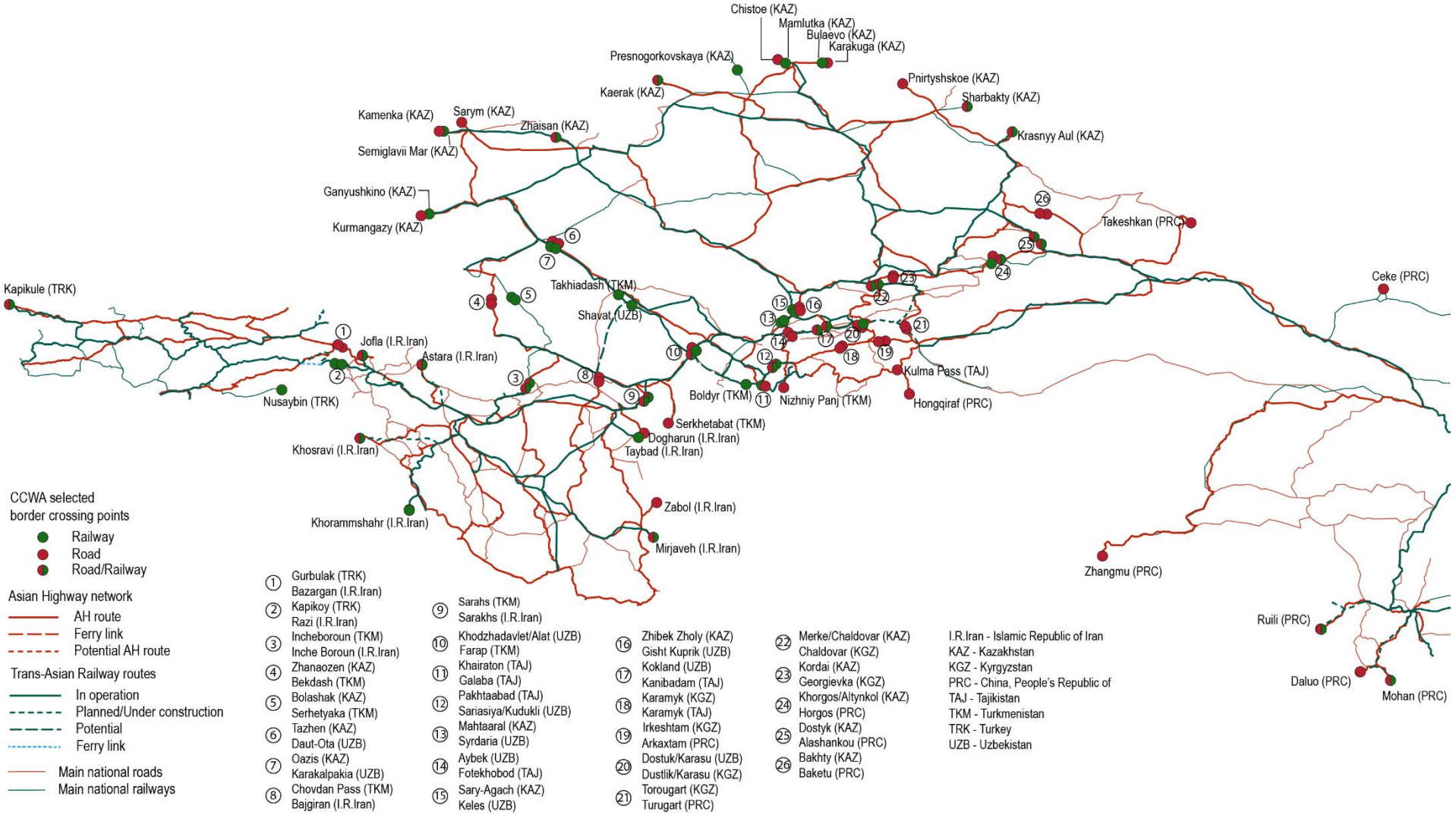
i 2,600 mm for truck with isothermal or refrigerator body
ii For powered axle
.. data are not available or are not reported separately

Source: Annex I to "Strengthening the Capacity of ESCAP Member States to Harmonize Standards on Weights, Dimensions and Emissions of Road Vehicles for Facilitation of Transport along the Asian Highway Network" (Bangkok, Thailand: ESCAP, 27 November 2019).

Countries along the CCWA Economic corridor do vary on restrictions on sizes and weights of freight road vehicles/commercial vehicles (Table 4) with China allowing the heaviest articulated vehicles and Turkmenistan setting the strictest limit followed by Tajikistan. In other words, it means that hypothetically a transit from China to Turkey and EU might opt for routes avoiding these two countries as loss in efficiency would be bigger comparing to routes in other CCWA countries.

The situation is further complicated as Kazakhstan and Tajikistan reduce limit on axle loads to 8 tons/axle (6 on some roads) in spring and summer respectively.[1] While time for such limitations is quite stable year to year and known in advance, allowing for additional variables does not simplify the transport operations. For summer time this restriction is applied for daylight hours and increases fuel usage for wating out daytime hours, increases time for transit. Spring restrictions might require additions to fleet, underloading of existing trucks.

[1] 'Strengthening the Capacity of ESCAP Member States to Harmonize Standards on Weights, Dimensions and Emissions of Road Vehicles for Facilitation of Transport along the Asian Highway Network' (Bangkok, Thailand: ESCAP, 27 November 2019), https://www.unescap.org/resources/strengthening-capacity-escap-member-states-harmonize-standards-weights-dimensions-and.



Source: Depiction by V.Krechetova.

Figure 4 Points of border crossing along CCWA Economic Corridor

I.2.3 Border crossings

Railway and road networks of the countries in Central Asia are connected in multiple points. Taking only TAR and AH routes into the account, CCWA Economic corridor deals with the almost 50 road, railway or both modes border crossings across eight countries (Figure 4). Adding smaller border crossing posts (BCP) and counting in border crossing posts between the CCWA countries and their neighbours, CCWA Economic corridor has to deal with several times of the number.

These border crossings are target for the state programs and multilateral efforts to reduce delays and costs they introduce to international transit and bilateral transport. There are two directions for such efforts:

- Improvements and innovations to Customs, border crossing, sanitary and other related procedures at country level and legislation applied at all places where such checks are carried out: inland logistics terminals, border crossings, airports and ports, etc.;
- Physical changes at border crossings and inland terminals to accommodate bigger traffic, to install scanning, communication, data processing and other equipment.

To ensure reasonable usage of resources, the countries prioritize the second type of efforts by concentrating on transit corridors, such as CAREC or BRI corridors. Meanwhile, usage of tools and procedures reducing time and costs of checks should be pushed to all border crossings. This way, a part of traffic, especially bilateral, might chose other points than the corridors border crossings freeing capacity for international transit.

Main problems connected to border crossings at the CCWA Economic Corridor are: quality of facilities, delays, costs.

QUALITY OF BORDER CROSSING FACILITIES

Despite progresses made over the years in Islamic Republic of Iran and Central Asian countries on the border infrastructure, there is still need for improvements in layouts, installation of equipment and implementation of recent technologies, renovation and expansion of amenities for drivers, passengers and staff, especially in Tajikistan, Turkmenistan, and Uzbekistan and bordering BCPs.[1]

DELAYS

Border crossings across CCWA Economic Corridor routes are known for delays: for CAREC sections, average time spent at a border crossing for road transport is half day (12.2 hours in 2019) and for railway transport almost day (20.6 hours in 2019). For the time the corridors are monitored (2009-2019) the average time spent on road border crossings is increasing and the time spent of railway border crossings was increasing in 2010-2014 (maximum 32.6 hours) and is decreasing since.[2] There are notable differences between individual BCPs and directions of traffic: while average of 1-2 hours were required for truck at Karamyk (Kyrgyzstan – Tajikistan) depending on direction, at Horgos (China) – Khorgos (Kazakhstan) the times were 6.8-20.4 hours.[3]

Since 2018, at China's BCPs Customs and quarantine controls are carried out simultaneously saving approximately 2 hours per shipment[4]. Additional costs savings were introduced by improved electronic data interchange with China Customs that allows now border crossing posts in Alashankou and Khorgos have the Customs declarations data submitted in Urumqi[5].

The worst performing road BCPs in terms of time spent to cross a border are Horgos (China) – Khorgos (Kazakhstan), Tazhen (Kazakhstan) – Daut-Ota (Uzbekistan), Pakhtaabad (Tajikistan) – Sariasiya (Uzbekistan), Alat (Uzbekistan) – Farap (Turkmenistan), Sarahs (Turkmenistan) – Sarakhs (Islamic Republic of Iran): on average, trucks spent 6.8 hours and over at each side.[6] The last information available for Bazargan (Islamic Republic of Iran) – Gurbulak (Turkey) road BCP suggested a truck could spend 17 hours total to pass both sides[7].

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[1] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[2] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2019* (Mandaluyong City, Philippines: Asian Development Bank, 2020), https://www.carecprogram.org/uploads/carec-cpmm-annual-report-2019.pdf.

[3] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2018*.

[4] Asian Development Bank.

[5] Asian Development Bank.

[6] Asian Development Bank.

[7] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

For railway BCPs the longest delays are associated with break-of-gauge operations (see section I.3 for details). The other reasons for delays at railway BCPs might be inefficient organization of trains exchange (Khodzhadavlet (Uzbekistan) – Farap (Turkmenistan) railway BCP).

Mitigation of delays require:

- Management of queuing;
- Improvement of fleet exchange processes;
- Optimization of inspection process, including moving some of them out of BCPs towards inland Customs terminals. Sometimes only one of the controls require improvements.
- Elimination of manual documents processing;
- Implementation of appropriate ESCAP models: the efficient cross border transport models, the model on integrated controls at the border crossing, the secure cross border transport model.

COSTS

Costs occurring at border crossings vary greatly depending on main mode, traffic volume, way of carrying out controls, status of shipment (export, import, transit) and agreements between countries involved. Figures for CAREC corridors 1-3 in years 2014-2018 show slight decrease in border crossing costs, except for road BCPs of the corridor 3.[1]

Railway BCPs require more costs than road ones if changes of gauges, changes of wagons, platforms required. This means, that Alashankou (China) – Dostyk (Kazakhstan) and Horgos (China) - Altynkol (Kazakhstan) are the most notable bottlenecks at the CCWA corridor (see section I.3 for more details on railway BCPs).

Among road BCPs for which the data available, highest average spending in 2018 was at both sides of Horgos (China) – Khorgos (Kazakhstan), Sarakhs and Farap (Turkmenistan). Most expenses occur at Customs check, visa and immigration, loading and unloading.[2]

CAREC CPMM 2018 reconfirmed existence of unofficial payments at the transport corridors in Central Asian countries during various steps of inspections and controls, queuing and vehicle registration.[3] Such payments on one hand increase costs of transit and cross-border operations, on the other hand, reflect existence of procedural inefficiencies that make the payments acceptable option for both sides.

[1] Asian Development Bank, CAREC Corridor Performance Measurement And Monitoring Annual Reports 2014, 2016, 2018.

[2] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2018*.

[3] Asian Development Bank.

I.3 CCWA Economic Corridor: transport assets of countries

I.3.1 Railways

Source: Depiction by V.Krechetova.

Figure 5 Railway gauges in countries along the CCWA Economic Corridor

GAUGES AND BREAK-OF-GAUGES

Railway transport along the CCWA Economic corridor has to adapt to the two gauges used: 1,520 mm and 1,435 mm (Figure 5). In case the cargos to exit the corridor to Pakistan, India or Indochina, there are two more gauges to face: 1,676 mm and 1,000 mm.

Currently, four break-of-gauge railway border crossing points are in operation directly along the corridor. With realization of long-time ideas of China (Kashi) – Central Asia railways there might be two more. Eight other break-of-gauge points are relevant to the corridor at its existing or under construction connections with Azerbaijan (Astara – Rasht railway), Georgia, Russian Federation, Mongolia.

Among the four existing break-of-gauge railway border crossing points two are at the border between Islamic Republic of Iran and Turkmenistan (Incheboroun – Etrek; Sarakhs – Sarakhs) and two at the China – Kazakhstan border (Alashankou – Dostyk; Khorgos – Altynkol). At all four, the break-of-gauge is dealt with by bogies change. These operations are costly and contributes most to the overall costs and time of crossing a border. Other important components to the costs at the railway border crossing are movements of wagons, Customs, quarantine and related inspections. For instance, in 2018 the border crossing costs of railway shipments in Dostyk (Kazakhstan – China border, break-of-gauge point) were 549 USD while the same in Saryagash (Kazakhstan – Uzbekistan border, 1,520 mm space) were 122 USD or 4.5 times lower. Difference in time for the same border crossing was 6.7 times (61 hrs Dostyk and 9.1 hrs Saryagash). While Dostyk seems to be an extreme example, case of Altynkol looks similar: twice as expensive as in Saryagash (251 USD against 122 USD) and four times as long (39.6 hrs against 9.1 hrs)[1].

The bogies changes are possible at the both side of the railway border crossing at Sarakhs (Islamic Republic of Iran) – Sarakhs (Turkmenistan), meaning that both 1,520 mm and 1,435 mm tracks spans across border between the stations. Islamic Republic of Iran also constructing repairing and bogies storage facilities. The capacity of this round-the-clock border crossing is changing bogies for 400 wagons/24 hrs (Iranian side) and exchanging up to 600 wagons/day between sides[2].

At the Etrek – Garmsar railway, the bogie change facilities are operating at Etrek (Turkmenistan). In the Incheboroun at the Islamic Republic of Iran's side the construction of the 1,520 mm tracks is on-going and the development plans include dry port with multimodal facilities, bogies change tracks, iron ore yard and other[3].

It is planned to lay second track from Jinghe to Alashankou at the China's side of the Alashankou (China) – Dostyk (Kazakhstan) border crossing[4]. Both sides of the border crossing introduce long delays into the transit:

[1] Asian Development Bank.

[2] Mozhgan, 'Islamic Republic of Iran's Presentation at the Sixth Meeting of the Working Group on the Trans-Asian Railway'.

[3] Mozhgan.

[4] 国家铁路局规划与标准研究院, '中国泛亚铁路网项目实施进展情况报告(=China's progress report on projects along TAR network)' (Sixth Meeting of the Working Group on the Trans-Asian Railway, United Nations Convention Center, Bangkok, Thailand, 10 December 2019), https://www.unescap.org/sites/default/files/Item5_China_0.pdf.

in Alashankou (21.9 hrs in 2018) the main contributor were restrictions on entry for the trains to the station and in Dostyk (61 hrs) the main reason was wagon's shortage[1].

ELECTRIFICATION AND TRACKS

Except for Kyrgyzstan, CCWA Economic countries are parties to the Intergovernmental Agreement on the Trans-Asian Railway (TAR) Network[2] thus are committed to bring the prioritized sections of their railway networks to the mutually agreed standards. Indeed, quality of the sections that are part to the TAR section is to different extent higher than the average for the respective countries: for instance, over 35 per cent of TAR sections in Kazakhstan are electrified (27 per cent for the whole network), in Turkey electrification rate for TAR sections is about 50 per cent (37 per cent for the network), in China the rate is slightly higher. Same true for double and multitrack sections (in countries that have them): in Kazakhstan, 31 per cent of the network is this category, but for TAR sections the share is well over 35 per cent[3] (Figure 6).

As 2018, continuously growing railway network of China reached 131.7 thousand km with 70 per cent electrification rate.[4] The sections crucial for CCWA Economic corridor railway connectivity are mostly double tracked and electrified at their east ends: Lianyungang – Xian – Urumqi – Jinghe, Shanghai – Xuzhou, Tianjin – Xuzhou[5]. Moreover, the eastern part of the country disposes of network of double-tracked electrified conventional railways allowing to diversify use of ports in China and access to different manufacturing locations. Even the conventional lines in the central and eastern provinces capacity of which was not addressed directly so far might gain release of capacity due to growth of the high-speed railway network. High-speed rail lines are often laid in proximity between the same origin-destinations pairs as conventional lines and passenger traffic diverts to them freeing conventional lines for freight.

Connections to Central Asia on the other hand require second tracks and electrification to increase capacity. Respective plans to the Jinghe – Alashankou section mentioned above. Need of the same to the Luntai – Kashi is interlinked with progress of China – Kyrgyzstan railway ideas.

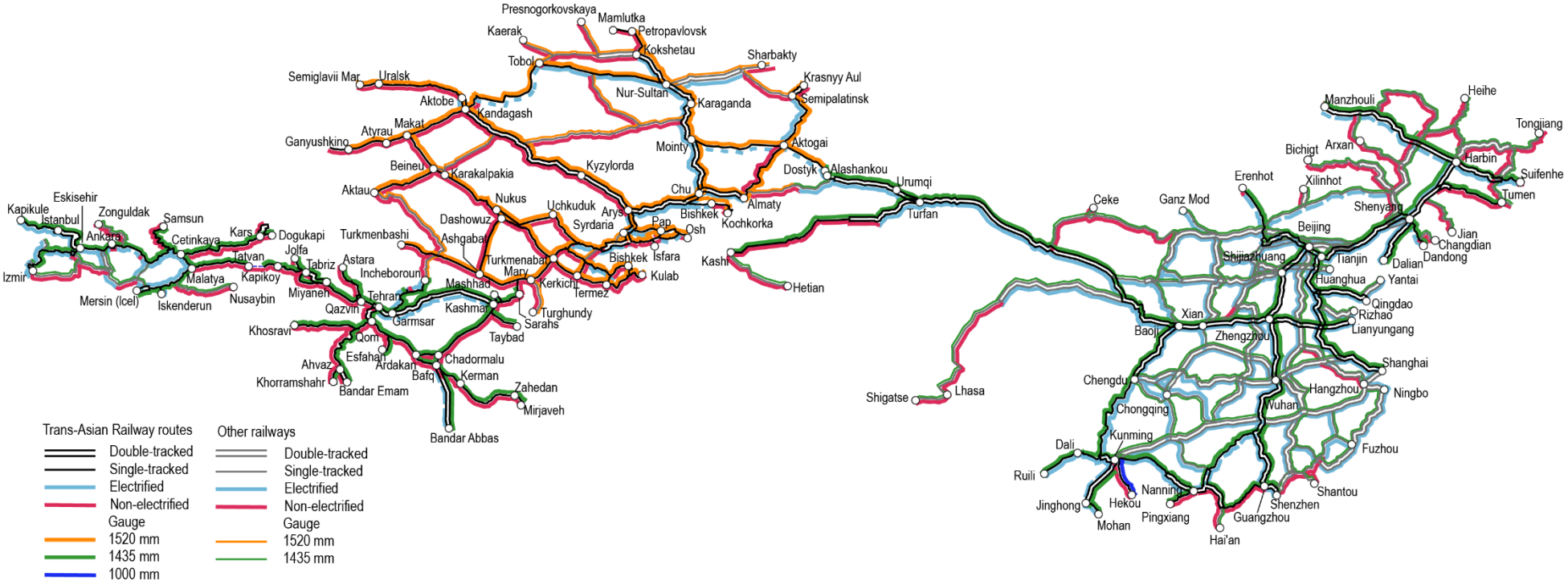
[1] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2018*.

[2] United Nations Treaty Collection <https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XI-C-5&chapter=11&clang=_en>

[3] Author estimates for TAR sections, for the networks the sources are stated below under description of the countries situation.

[4] National Bureau of Statistics, *China Statistical Yearbook 2019* (China Statistics Press, 2019), http://www.stats.gov.cn/tjsj/ndsj/2019/indexch.htm.

[5] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'; *China Railway Atlas (Chinese)* (Beijing: China Railway Press, 2012).



Source: Depiction by V.Krechetova.

Figure 6 Electrification and tracks along the conventional railways in CCWA countries

As of 2019, Islamic Republic of Iran has 11.5 thousand km of railway lines and 6.5 thousand km were under construction[1]. Sections Mashhad – Kashmar – Garmsar – Tehran – Karaj, Tehran – Qom, Qazvin – Loshan, Ahvaz – Bandar-Emam are double tracked. The country is implementing large scale electrification program, with works planned or under way at Mashhad – Kashmar – Garmsar – Tehran[2], Bafq – Bandar Abbas[3], Garmsar –Gorgan – Incheboroun sections[4].

As 2018, 27 per cent of the railways in Kazakhstan were electrified and 31 per cent has two or more tracks[5]. While almost whole length of electrified railways is double-tracked, about one fourth of double-tracked railways is non-electrified.

Situation is better along the sections that are part to the Trans-Asian Railway network: sections Almaty – Chu – Kokshetav, Chu – Arys – Sary-Agach are both double-tracked and electrified. Electrification and construction of second track at some parts are planned along Dostyk – Mointy section[6] that is crucial to the international railway transit at CCWA Economic Corridor. TAR connections to the ports Aktau and Kuryk would benefit from either second track or electrification, or both. So far, electrification of single tracked Tobol to Nikeltau section is at planning stage[7]. Rest of the network, being single tracked and nonelectrified provides limited alternatives to these routes in terms support to the Economic Corridor.

Kazakhstan has diverse railway fleet: 47 per cent of freight wagons and over 33 per cent of locomotives were between 5 and 10 years old as 2018. Overall, locomotive fleet would benefit from renewal: over 78 per cent of electric locomotives and over 58 per cent of diesel locomotives were over 25 years old as 2018[8].

Kyrgyzstan's railway network is split in two parts with main railway line in the north of the country. Both Kochkor – Bishkek – Alamedin (north, 323 km[9]) and Osh – Karasu (center, 101 km[10]) are single tracked non-electrified. Electrification is planned for Bishkek – Alamedin section[11]. Connection between the two parts and connecting them to the railway network of China would make the Kyrgyzstan railways important part of the CCWA economic corridors. Plans and possible itineraries for such connections are under discussions between the country and donors, its neighbours both bilaterally and under the CAREC and TAR frameworks.

Aged rolling stock is the other important issue for the Kyrgyzstan railways addressed by the country's Railways Development Strategy[12].

Tajikistan has 978 km of railways[13] that are single tacked and non-electrified. Initially built to be connected via territory of Uzbekistan, the Tajikistan railways were reconnected in 2016 by Yavan – Yangi Bazar line[14]. When ideas to connect Tajikistan with China via Kyrgyzstan by railway became reality, importance of the country to the CCWA Economic Corridor will grow.

Tajikistan's railway fleet includes 2 thousand freight wagons and 42 locomotives[15].

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[1] Mozhgan, 'Islamic Republic of Iran's Presentation at the Sixth Meeting of the Working Group on the Trans-Asian Railway'.

[2] The World Bank, *Belt and Road Economics: Opportunities and Risks of Transport Corridors* (Washington, D.C.: The World Bank, 2019).

[3] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[4] RIA Novosti, 'РЖД Начали Электрификацию Железнодорожной Линии в Иране (=Russian Railways Started Electrification of a Rail Line in Iran)', 2 July 2018, https://ria.ru/20180702/1523796208.html.

[5] As share of total length excluding sections in border countries or sections of the foreign countries within Kazakhstan.

[6] 'Государственная Программа Инфраструктурного Развития «Нұрлы Жол» На 2020 - 2025 Годы Утверждена Постановлением Правительства Республики Казахстан От 31 Декабря 2019 Года № 1055 (= State Program of the Infrastructure Development "Nurly Zhol" 2020-2025 Approved by the Decision of the Government of the Republic of Kazakhstan N1055 31 December 2019)', accessed 25 April 2020, https://primeminister.kz/assets/media/plan-na-rus.pdf.

[7] 'Государственная Программа Инфраструктурного Развития «Нұрлы Жол» На 2020 - 2025 Годы Утверждена Постановлением Правительства Республики Казахстан От 31 Декабря 2019 Года № 1055 (= State Program of the Infrastructure Development "Nurly Zhol" 2020-2025 Approved by the Decision of the Government of the Republic of Kazakhstan N1055 31 December 2019)'.

[8] Ministry of National Economy, Republic of Kazakhstan, *Транспорт в Республике Казахстан 2014-2018: Статистический сборник (=Transport in Republic of Kazakhstan 2014-2018: Statistical Yearbook)* (Nur-Sultan, 2019), www.stat.gov.kz.

[9] 'Развитие Транспортного Потенциала в Кыргызской Республике' (SPECA Workshop on Connectivity and Inland Transport Competitiveness, Astana, Kazakhstan, 26 November 2018), https://unece.org/DAM/trans/doc/2018/speca/S2_NM_KYR.pdf.

[10] 'Развитие Транспортного Потенциала в Кыргызской Республике'

[11] Asian Development Bank, *Unlocking the Potential of Railways: A Railway Strategy for CAREC, 2017–2030.* (Mandaluyong City, Philippines: Asian Development Bank, 2017), http://dx.doi.org/10.22617/RPT178656-2.

[12] 'Постановление Правительства Кыргызской Республики от 30 сентября 2014 года № 558 Об утверждении Основных направлений развития железнодорожного транспорта Кыргызской Республики на 2014-2020 годы (=Decree of the Government of the Kyrgyz Republic N588 30 September 2014 on aproval os the Main Directions of the Development of the Railway Transport of Kyrgyz Republic for 2014-2020)', *Kyrgyz Temir Zholu* (blog), accessed 9 May 2020, http://kjd.kg/ru/about/strategiya-razvitiya-zeleznyh-dorog/.

[13] 'Presentation of the Ministry of Transport of the Republic of Tajikistan' (Sixth meeting of the working group on the Trans-Asian Railway Network, Bangkok, Thailand, 9 December 2019), https://www.unescap.org/sites/default/files/Item5_Tajikistan_0.pdf.

[14] Tajikistan Railways, 'История железных дорог в Республике Таджикистане (= History of Railways in Tajikistan)', *State entreprise 'Rohi Ohani Tojikiston'* (blog), accessed 25 April 2020, https://www.railway.tj/ru/about/history-railway.

[15] 'Presentation of the Ministry of Transport of the Republic of Tajikistan'.

As 2018, Turkey has 11.5 thousand km of conventional railways 37 per cent (4.2 thousand km) of which are electrified and 39 per cent (4.5 thousand km) has signalling, about 3 thousand km of lines are double or multiple tracked.[1]. Turkey plans to electrify entire network by 2023 and currently works are ongoing on multiple sections, including Cetinkaya – Kalin (Figure 6) [2]. There are 1.2 thousand km of high-speed railways (Konya – Ankara, Ankara – Gebze).[3]

Ferry over lake Van in Turkey was long-time bottleneck for the railway connection Turkey – Islamic Republic of Iran. As the 2 new ferry vessels with capacity 32 wagons/4,000 ton each replaced the old low capacity vessels in 2018, the number of wagons crossed the lake nearly doubled (19.8 thousand of wagons in 2018 against 11.2 thousands in 2017) with the number of the round trips reduced by 23% from 628 to 509.[4] Time to cross the lake fell from 5 to 3.5 hours.[5] Replacement of the ferry vessels reversed the downward trend in railway traffic by the route observed since 2014.

Turkmenistan has 5,1 thousand km of railways[6], the network is single tracked non-electrified. The section Turkmenabat – Mary – Ashgabat – Turkmenbashi, part of the TAR network and crucial section to the CCWA Economic Corridor, is poor state causing safety hazards and low speeds (36.7 km/h).[7] The situation is addressed by modernization project under CAREC framework with ADB assistance.

Uzbekistan has 4.7 thousand km of railways with 54 per cent (2.5 thousand km) of them electrified[8]: electrification works on sections Angren – Pap, Pap – Kokand – Andijon, Samarkand – Bukhara were finalised in 2016; on section Karshi – Termez in 2018. Electrification of Pap – Namangan – Andijon is on the way with 1st stage completed in 2019[9]. Section Sary-Agach – Khavast – Samarkand is double-tracked.

Rolling stock at Uzbekistan railways require renewal, the problem that is being addressed by ADB project on railway efficiency in the country. Diesel locomotives makes 75 per cent of the country's locomotives (rest are electric) and most of locomotives are over 30 years old[10].

RAILWAY INFRASTRUCTURE RELATED ISSUES: SUMMARY

- Main bottlenecks are the connections between railway networks of the countries. Border crossings are not the only impediment: border regions have lower network density and the last stretches to the border are not always at the same quality and capacity as main sections of the countries' networks.
- Attention should be paid to handling capacities and/or efficiency of operations at border crossings with bogies changes: already extra-long waits at the Alashankou (China), Altynkol and Dostyk (Kazakhstan) might become even longer with further increase of number and frequency of container trains between China and Europe.
- While the issue is not that urgent presently, capacity of border crossing appear to be filled in sporadically between countries with the same gauge (for instance, Turkmenistan (Farap) – Uzbekistan (Khodzhadavlet)).
- CCWA Economic Corridor countries put a lot of emphasis on electrification and signalling of their railways with the relevant programs being implemented in China, Islamic Republic of Iran, Kazakhstan, and Turkey, projects on the way under the CAREC framework. These efforts should be continued as, presently, among all the alternatives for a railway run from China to Turkey across these countries, there is no single one fully or mostly electrified.

[1] General Directorate of Turkish State Railways, *2014-2018 İstatistik Yilliği Annual Statistics*, accessed 26 April 2020, http://www.tcdd.gov.tr/files/istatistik//20142018yillik.pdf.

[2] RailwayPRO, 'Turkey to Electrify the Entire Conventional Network by 2023', 11 January 2018, https://www.railwaypro.com/wp/turkey-electrify-entire-conventional-network-2023/.

[3] General Directorate of Turkish State Railways, *2014-2018 İstatistik Yilliği Annual Statistics*.

[4] General Directorate of Turkish State Railways.

[5] Onur Uysal, 'Van Lake Unlocked', *Rail Turkey* (blog), 26 July 2018, https://railturkey.org/2018/07/26/van-lake-unlocked/.

[6] 'Туркменистан - важнейший транспортно-транзитный перекресток континента (=Turkmenistan is the crucial transport and transit crossroad of the continent)', *Embassy Of Turkmenistan to Peoples Republic Of China - Beijing* (blog), accessed 10 May 2020, https://china.tmembassy.gov.tm/tk/news/3619.

[7] Asian Development Bank, 'Project Number: 51360-002 Transaction Technical Assistance Facility (F-TRTA) Turkmenistan: Preparing the Central Asia Regional Economic Cooperation Corridors 2, 3 and 6 (Turkmenabat–Mary–Ashgabat–Turkmenbashi) Railway Modernization Projects', April 2018, https://www.adb.org/sites/default/files/project-documents/51360/51360-002-tar-en.pdf.

[8] 'Report and Recommendation of the President to the Board of Directors: Project Number: 51052-002 Proposed Loan Republic of Uzbekistan: Railway Efficiency Improvement Project' (Asian Development Bank, April 2019), https://www.adb.org/sites/default/files/project-documents/51052/51052-002-rrp-en.pdf.

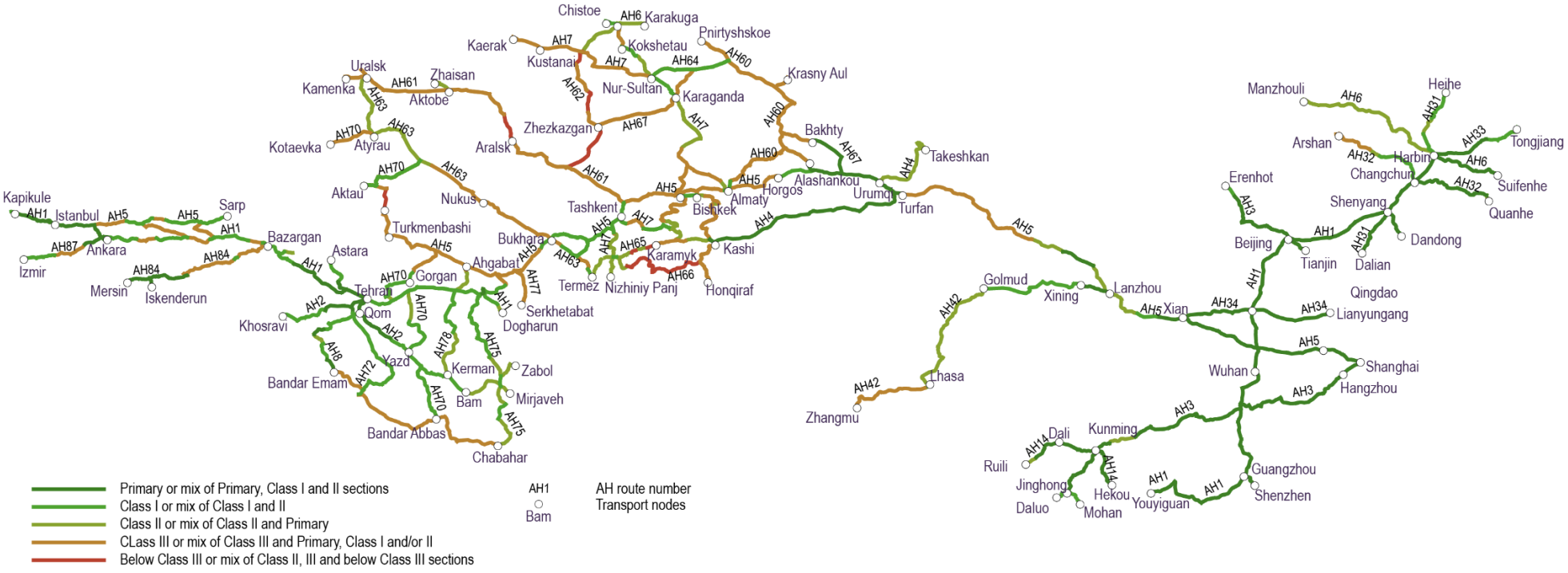
[9] I. Rizametova, '25 лет стального созидания: славная история, весомый потенциал, уникальные возможности (=25 years of steel creation: pround history, considerable capabilities, unique possibilities)', *TEMIRYO'LCHI.UZ http://www.railway.uz/*, 7 November 2019, Special Edition edition.

[10] 'Report and Recommendation of the President to the Board of Directors: Project Number: 51052-002 Proposed Loan Republic of Uzbekistan: Railway Efficiency Improvement Project'.

- Same true for double-tracked lines: no option for railway run across all of the CCWA countries is fully double-tracked.
- There are missing links within the corridor: China – Kyrgyzstan – Uzbekistan, Kyrgyzstan – Tajikistan. Linking these areas by railway would strengthen the regional network, make it more sustainable and provide more economic opportunities to landlocked Kyrgyzstan, Tajikistan, and Uzbekistan.
- Aging railway fleet is the issue no less important than the tracks and electrification: it limits speeds, creates wagon shortage causing delays, it is safety hazard. This issue has more urgency in Kyrgyzstan, Uzbekistan. Kazakhstan is addressing the issue, but more has to be done. More information is required to assess situation in Islamic Republic of Iran, Turkmenistan.

Source: Depiction by V.Krechetova.

Figure 7 Asian Highways and main roads in countries along CCWA Economic Corridor



Source: Depiction by V.Krechetova.

Figure 8 Road quality along Asian Highways in countries along CCWA Economic Corridor

I.3.2 Roads

CCWA Economic Corridor road routes provide a number of options to transport goods from China to counties of Central Asia and Europe (Figure 7). The main of them are included into the Asian Highway (AH) agreement to be brought to the agreed technical standards. It is desirable for AH network to be of, at least, Class II: two lanes with asphalt/cement concrete pavement, minimum structure loading HS20-44[1]. The data provided to the ESCAP Asian Highway database[2] by countries show that so far there is no option fully meeting this desirable goal (Figure 8). The sections that would serve serious limitation are the ones falling below Class III. There are such sections along AH61, AH62, AH70 in Kazakhstan and AH65, AH66 in Tajikistan.

Road infrastructure in CCWA countries is improving by national development programs, such as Nurly Zhol in Kazakhstan, by multilateral efforts under Central Asia Regional Economic Cooperation, TRACECA, Belt and Road Initiative and others. The progress, among other indicators, manifests in speed of travel on the CAREC road corridors measured by the Corridor Performance Measurement and Monitoring: average speed without delay (excluding time for stops) for all road corridors rose from 41 km per hour in 2010 (37.8 km per hours in 2013)[3] to 46.3 km per hour in 2018[4]. Though CAREC corridors only partially overlap with CCWA, they do so where most of investments needed, so the 14% increase in speeds is an important boost for the whole corridor.

Speed without delays in the countries along the CCWA Economic corridor except for Tajikistan was above CAREC average in 2018 and in all of them it grew in 2016-2018 (Table 5). It is noteworthy though, that not for all of the road sections there were shipments to carried for them found for monitoring and this optimistic picture might not fully reflect actual situation. For instance, monitoring data for Kazakhstan does not include section of AH62 Zhezkazgan – Kyzylorda part of which is below Class III as reported in the AH database and speed on this section might be lower.

Table 5 Speed without delay (km/h) at the CAREC corridors within CCWA Economic Corridor countries

	2016	2017	2018
China (Xinjiang Uighur Autonomous Region)	47.0	54.7	53.7
Kazakhstan	52.0	53.9	56.3
Kyrgyzstan	39.0	49.1	50.9
Tajikistan	32.1	39.6	39.5
Turkmenistan	51.5	51.7	53.9
Uzbekistan	47.6	46.8	50.8

Source: Asian Development Bank, CAREC Corridor Performance Measurement and Monitoring Annual Report 2018

Total length of roads in China 48,486.5 thousand km, high speed highways account for 142.6 thousand km or 3 per cent of total network.[5] Length of AH routes in China increased to over 26 thousand km of roads after sections with status “potential” were included into the main AH network. For the roads that are part to the AH network (Figure 8), China reported only about 4.5 km in Yunnan province to be below Class III as of 2015. AH sections key to the CCWA Economic corridor from Shanghai, Lianyungang, Tianjin up to Jiayuguan are Class II and above. Prior to 2013, some sections of Class III were reported in Xinjiang Uighur Autonomous Region and Gansu province along the Jiayuguan to Turfan section, Kashi – Torougart and Kashi – Honqiraf sections.[6] The road was converted into the whole length to high speed road “Lianyungang – Horgos” in 2013[7], but no updated information is available in Asian Highway database as Zhengzhou – Urumqi section had status of “potential” route till end of 2019. More detailed information, available for only part of Asian Highway sections in China (10.8 thousand km), shows that most of AH sections have 4 and more lanes (about 80 per cent), are with asphalt or cement concrete surface (97 per cent) and are tolled (over 79 per cent). [8]

[1] See Annex II to the Intergovernmental Agreement On The Asian Highway Network, 2004.

[2] ESCAP Asian Highway Database < https://www.unescap.org/resources/asian-highway-database >.

[3] Asian Development Bank, ‘CAREC Corridor Performance Measurement & Monitoring Annual Report 2013’ (Mandaluyong City, Philippines, n.d.), C:\Users\user\Dropbox\Library\Transport\Transport Corridors Studies by RCI and IO\CAREC\CPMM, http://www.carecprogram.org/uploads/docs/CAREC-Publications/2013/2013-CAREC-CPMM-Annual-Report.pdf.

[4] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2018*.

[5] National Bureau of Statistics, *China Statistical Yearbook 2019*.

[6] ESCAP Asian Highway Database < https://www.unescap.org/resources/asian-highway-database >.

[7] Xinhua, ‘江苏连云港至新疆霍尔果斯高速即将全线高速化 (=Jiangsu Lianyungang to Xinjiang Horgos Highway is about to be high speed road at full length)’, *The Central People’s Government of the People’s Republic of China* (blog), 11 March 2013, http://www.gov.cn/jrzg/2013-03/11/content_2351805.htm.

[8] ESCAP Asian Highway Database < https://www.unescap.org/resources/asian-highway-database >.

Islamic Republic of Iran has total 210 thousand km of roads with over 81 thousand km of national roads[1]. AH routes make over 11.1 thousand km fully Class II and above with asphalt concrete surface, 45 percent have 4 or 6 lanes (2017); 90 per cent is toll-free.[2] In 2019, one more route, Chabahar – Mahshahr 1,7 thousand km, was added to the list of AH routes as AH88. The road is in process of being upgraded to Class II at full length.[3]

Total length of roads in Kazakhstan is 96.2 thousand km and 86.5 per cent of them are with hard surface (2018)[4]. Asian Highways makes 12.8 thousand km of the Kazakhstan road network. There are sections along AH61, AH62 and AH70 that includes road below Class III standards and, so far, there is no border to border stretch of AH routes fully Class II or above (Figure 8).[5] As of May 2019, over 30 per cent of local roads and about 20 per cent of the total length of republican roads were in unsatisfactory technical condition.[6]

The country works on improvement to the AH sections: the Aktobe – Martuk – Zhaisan section (AH 61) was upgraded to Class II[7] in 2013[8], section Astana – Shiderty – Ekibaztuz section of AH64 was brought to Class I in 2019[9], works to upgrade Ucharal – Dostyk to Class II are on-going.[10] Reconstruction is on-going on various sections of AH 7 and AH 5 along Karaganda – Balkhash – Burubaital – Kapshagai.[11]

Kyrgyzstan operates 34 thousand km of roads 18 thousand km of which are public roads[12]. Roads with asphalt surface make 34 per cent of public roads the rest are rubble, gravel (over 48 per cent) or dirt roads[13].

Length of AH routes within Kyrgyzstan is 1.76 thousand km. In 2013, over 75% was Class III with the rest being Class II or below Class III (2013).[14] The sections falling below Class III were located along AH61 between Naryn and Torougart and were gradually upgraded to Class III and Class II[15] through series of road projects for CAREC Corridor 1 (Bishkek – Torougart Road)[16]. Works are under way to improve road structures at AH5 (Kara Balta – Bishkek) [17] and AH7 from Dzhalal Abad to Madaniyat (Bishkek-Osh Road Improvement Project[18]).

[1] Alireza Afkham, 'I.R. Iran Transportatian Report' (Expert Group Meeting on Strengthening the capacity of ESCAP member States to harmonize standards on weights, dimensions and emissions of road vehicles for facilitation of transport along the Asian Highway network, Tbilisi, Georgia, 23 January 2019), https://www.unescap.org/sites/default/files/Iran%2C%20Islamic%20Republic%20of.pdf.

[2] ESCAP Asian Highway Database: "Status of the Asian Highway Network in Member States (25 September 2017)" <https://www.unescap.org/resources/asian-highway-database >.

[3] Hossein Motevalli Habibi, 'Presentation of the Road Maintenance Transport Organization of Islamic Republic of Iran' (Eighth Meeting of the Working Group on the Asian Highway, United Nations Conference Centre, Bangkok, Thailand, 18 September 2019), https://www.unescap.org/sites/default/files/Islamic%20Republic%20of%20Iran_Country%20presentation.pdf.

[4] Ministry of National Economy, Republic of Kazakhstan, *Транспорт в Республике Казахстан 2014-2018: Статистический сборник (=Transport in Republic of Kazakhstan 2014-2018: Statistical Yearbook)*.

[5] ESCAP Asian Highway Database < https://www.unescap.org/resources/asian-highway-database >. No further details are given in this report as at the time of drafting the most recent information in the AH database is of 2010.

[6] United Nations ESCAP, 'National Land Transport Infrastructure Kazakhstan, Kyrgyzstan, Mongolia', July 2019.

[7] 'Reconstruction of the Road Section "Aktobe-Martuk-Border of Russian Federation" of Transit Corridor "Western Europe-Western China" Is in Progress in Accordance with Time Schedule, without Backlogs.', *Western Europe - Western Chine International Transit Corridor* (blog), 16 November 2011, https://europe-china.kz/en/news/4673.

[8] 'Завершена Реконструкция Ещё Одного Участка Автодороги «Актобе – Мартук – Граница РФ (На Оренбург)» Км 0-102 в Актюбинской Области в Рамках Международного Проекта «Западная Европа - Западный Китай»', *Western Europe - Western Chine International Transit Corridor* (blog), 7 October 2013, https://europe-china.kz/news/6035.

[9] JSC "National Company "Kazautozhol" <http://kazautozhol.kz/oldweb/texts/dorogy/rekonstruktsiya/realizuemye-proekty.html>.

[10] JSC "National Company "Kazautozhol" <http://kazautozhol.kz/oldweb/texts/dorogy/rekonstruktsiya/realizuemye-proekty.html>.

[11] United Nations ECE, 'Logistics and Transport Competitiveness in Kazakhstan' (Geneva: United Nations, 2019), https://www.unece.org/fileadmin/DAM/trans/publications/Report_-_Kazakhstan_as_a_transport_logistics_centre_Europe-Asia.pdf.

[12] Ministry of Transport and Roads of the Kyrgyz Republic, 'Информация о проделанной работе по организации и обеспечению безопасности дорожного движения на автодорогах общего пользования за 9 месяцев 2017 года (=Information on activities performed to ensure safety on the public roads in nine months of 2017)' (SPECA Workshop on Transport related Sustainable Development Goals (SDGs) 2017, Astana, Kazakhstan, 2 November 2017), https://www.unece.org/fileadmin/DAM/trans/doc/2017/speca/workshop/Kyrgyzstan.pdf.

[13] Ministry of Transport and Roads of the Kyrgyz Republic, 'Presentation Kyrgyzstan' (Expert Group Meeting on Strengthening the capacity of ESCAP member States to harmonize standards on weights, dimensions and emissions of road vehicles for facilitation of transport along the Asian Highway network, Tbilisi, Georgia, 23 January 2019), https://www.unescap.org/sites/default/files/Kyrgyzstan_10.pdf.

[14] ESCAP Asian Highway Database: "Status of the Asian Highway Network in Member States (25 September 2017)" <https://www.unescap.org/resources/asian-highway-database >. No further details are given as at the time of drafting the most recent information in the AH database is of 2010.

[15] ADB project completion reports for Kyrgyz Republic: CAREC Transport Corridor 1 (Bishkek – Torugart Road) Project, Project 2 and Project 3 <https://www.adb.org/sites/default/files/project-document/77263/39674-022-kgz-pcr.pdf>; <https://www.adb.org/sites/default/files/project-document/173727/42399-013-pcr.pdf>; <https://www.adb.org/sites/default/files/project-documents/42399/42399-023-pcr-en.pdf>.

[16] Ministry of Transport and Roads, Kyrgyzstan, 'Infrastructure Priorities of Landlocked Developing Countries by Kyrgyzstan' (Enhancing regional integration of landlocked developing countries in North and Central Asia through infrastructure connectivity, Issyk-Kul, Kyrgyzstan, 6 September 2017), https://www.unescap.org/sites/default/files/Kyrgyzstan_8.pdf.

[17] Ministry of Transport and Roads, Kyrgyzstan.

[18] Asian Development Bank, 'Kyrgyz Republic: CAREC Corridor 3 (Bishkek–Osh Road) Improvement Project, Phase 4', accessed 5 March 2020, https://www.adb.org/projects/45169-003/main#project-pds.

Road network of Tajikistan accounts to over 26 thousand km.[1] Among them 1.9 thousand km are part to the AH network and about 48 per cent of those (914 km) fall below Class III (as of 2015).[2] The rest is mostly Class II with short sections of Class I (Figure 8). About 47 per cent of AH routes in Tajikistan have 1 lane, 55 per cent have 2 lanes, all of them have asphalt concrete surface and 85 per cent are toll-free. [3] Quality of infrastructure and terrain limit the speeds on Tajikistan roads and the country shows the lowest ones among the CAREC corridors monitored in 2016-2018 (Table 5). To empower the road transit along CCWA corridor the situation requires amends.

Turkey's road network accounts to almost 247.5 thousand km, 68 thousand km of which are provincial roads, state highways and motorways[4]. Over 5.2 thousand km are part to the AH network with 85 per cent are of Class II and above;[5] as of 2018, 97 per cent of AH routes in Turkey have 4 and more lanes, 86 per cent have asphalt concrete surface and 79 per cent is toll-free.[6]

Total length of roads in Turkmenistan is 13.7 thousand km with 2.28 thousand km of international importance.[7] About 2.2 thousand km of roads are AH routes and over 95% of them are Class III (2008). [8] Over 20 km on the AH70 at the border with Kazakhstan fall below Class III (Figure 8).

Uzbekistan has total of about 184 thousand km of roads with over 42 thousand km of public roads[9]. Over 80 per cent of roads have hard surface.[10] About 3 thousand of the country's roads are part to the AH network with 77 per cent falling under Class I and Class II; rest are Class III roads (Figure 8).[11]

Main recognized problem on Uzbekistan roads is need for roads rehabilitation and maintenance. It is estimated that over 70 per cent of the public roads require rehabilitation and current speed of maintenance and upgrades is not enough to catch up with aging of road surfaces and related road structures.[12] Among the roads targeted for priority rehabilitation and maintenance are the country's sections of AH5, AH7.[13]

ROAD INFRASTRUCTURE RELATED ISSUES: SUMMARY

- Capacity of road network is undermined by low quality sections, especially those below AH Class III; to ensure viable speed and stability of road operations along the corridor routes, it is desirable that they comply with AH Class II and higher.
- In accordance with the most recent data submitted to the AH database, there are sections with roads below AH Class III standard at AH 61, AH 62, AH 70 in Kazakhstan and AH65, AH66 in Tajikistan.
- Quality, efficiency and speed of road maintenance and rehabilitation are not at the same level across the countries and require attention at Central Asian segments, especially in Tajikistan and Uzbekistan.

[1] 'Государственная целевая программа развития транспортного комплекса Республики Таджикистан до 2025 года (=The State Target Program for the Development of the Transport Complex of the Republic of Tajikistan until 2025)' (Ministry of Transport of the Republic of Tajikistan, 1 April 2011), https://www.mintrans.tj/sites/default/files/2017/gosudarstvennaya_celevaya_programma_razvitiya.pdf.

[2] ESCAP Asian Highway Database: "Status of the Asian Highway Network in Member States (25 September 2017)" <https://www.unescap.org/resources/asian-highway-database >.

[3] ESCAP Asian Highway Database < https://www.unescap.org/resources/asian-highway-database >.

[4] Turkish Statistical Institute, *Turkey in Statistics 2018* (Ankara, Turkey, 2019).

[5] ESCAP Asian Highway Database: "Status of the Asian Highway Network in Member States (05 February 2016)".

[6] ESCAP Asian Highway Database < https://www.unescap.org/resources/asian-highway-database >.

[7] 'Туркменистан - Важнейший Транспортно-Транзитный Перекресток Континента (=Turkmenistan Is the Crucial Transport and Transit Crossroad of the Continent)', Embassy Of Turkmenistan to Peoples Republic Of China - Beijing <https://china.tmembassy.gov.tm/tk/news/3619> [accessed 10 May 2020].

[8] ESCAP Asian Highway Database: "Status of the Asian Highway Network in Member States (25 September 2017)" <https://www.unescap.org/resources/asian-highway-database >. No further details are given in this report as at the time of drafting the most recent information in the AH database is of 2008.

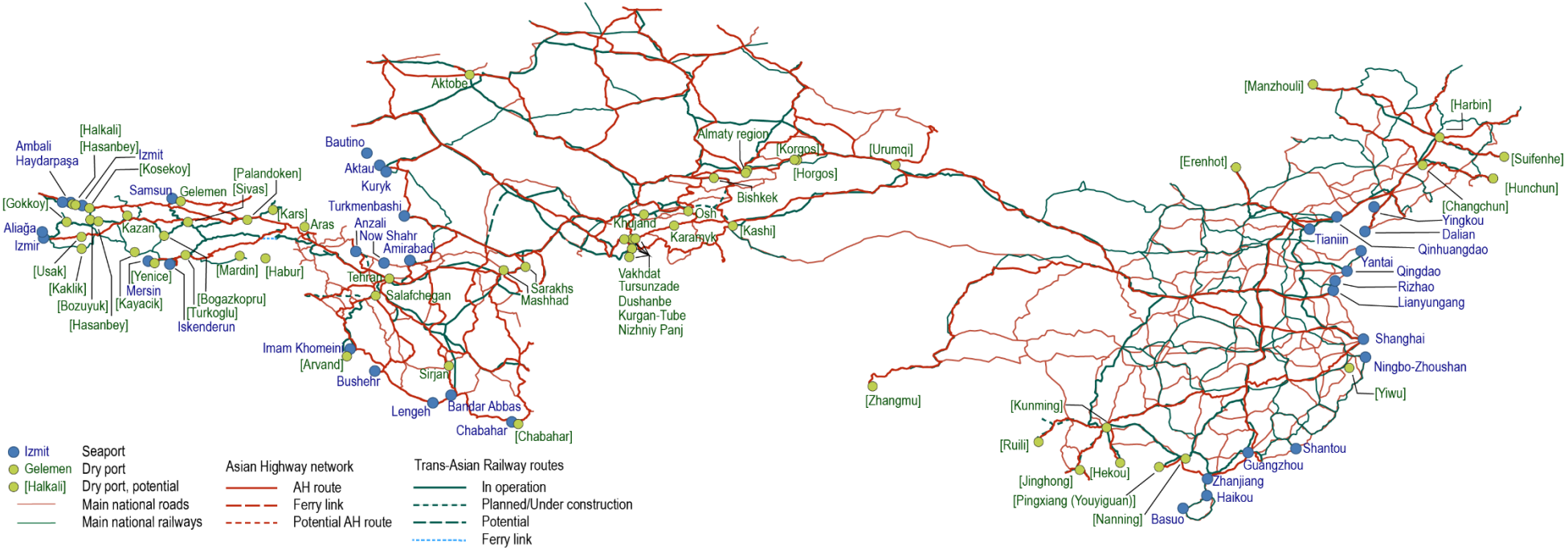
[9] The state committee of the Republic of Uzbekistan for roads <http://www.uzavtoyul.uz/ru/post/matbuot-anjumani-haqida-20-02-2019.html> [accessed 31 May 2020]

[10] 'Draft Resolution of the President of the Republic of Uzbekistan on Approval of Development Strategy of the Transport System of the Republic of Uzbekistan up to 2035', Pub. L. No. ID-3867 (2019), https://regulation.gov.uz/ru/document/3867.

[11] ESCAP Asian Highway Database: "Status of the Asian Highway Network in Member States (25 September 2017)" <https://www.unescap.org/resources/asian-highway-database >. No further details are given in this report as at the time of drafting the most recent information in the AH database is of 2008.

[12] Draft Resolution of the President of the Republic of Uzbekistan on Approval of Development Strategy of the Transport System of the Republic of Uzbekistan up to 2035.

[13] Gazeta.uz, 'Автодороги «абсолютно не отвечают» требованиям — президент (=President: Roads "absolutely do not meet" standards)', *Gazeta.uz* (blog), 4 October 2019, https://www.gazeta.uz/ru/2019/10/04/roads/.



Source: Depiction by V.Krechetova.

Figure 9 Dry ports of international importance and seaports relevant to the CCWA Economic Corridor

I.3.3 Key nodes

SEAPORTS

There are two sets of seaports on the CCWA Economic Corridor (Figure 9). One set are the Caspian ports of Kazakhstan, Islamic Republic of Iran and Turkmenistan that serve as connection points to the land routes in Caucasus and Russian Federation and can be used as alternatives to land sections between the countries of the corridor itself.

The second set are the seaports of Turkey, seaports of Islamic Republic of Iran in Persian Gulf and Gulf of Oman, east China seaports. They serve as exit points to the maritime connections for goods that either transit the CCWA countries, originate/destined for locations along the CCWA Economic Corridor.

Caspian seaports are dwarfed by the seaports of the second set in turns of both total and container turnover (Table 6) and they serve railway and road ferries, containers, grain, oil, and other liquid and dry bulk cargos.

Kazakhstan's seaports make CCWA Economic Corridor's connections to Azerbaijan, Islamic Republic of Iran and, Russian Federation and Turkmenistan: Aktau, Kuryk, and Bautino. Joining transport cooperation under TRACECA, CAREC, United Nations ECE and ESCAP framework, Trans-Caspian International Transport Route, the county realized that possibilities provided by trans-Caspian ferry connections could not be captured with facilities as of 2000-2010. After expansion of port Aktau to 21.5 million ton[1] and building of the new port in Kuryk, the capacity grew to 27 million ton.[2] Fright turnover has not catch up so far, in 2019 total turnover was 5 million tons[3].

Aktau as a year-round ice-free port with 11 berths, including ferry terminal, oil berths, grain and cargo terminals with both open storage (2,000 square m) and sheltered warehouses (80,000 square m)[4]. Bautino ("Cargo area Bautino") is a 200 thousand ton capacity subsidiary of Aktau port 150 km to the north[5]. Seaport Kuryk, operating since 2016, has capacity 6 million ton[6], serve road and railway ferries and is planned to serve as shipbuilding and repair base. Currently the two ports serve ferry route to seaport Alat (Azerbaijan).

Turkmenbashi in Turkmenistan is one of the main nodes for multiple regional transport initiatives. The new seaport Turkmenbashi, commissioned in 2018, has multipurpose ferry terminal, general cargo, bulk cargo, container and polypropylene terminals, licensed to serve as bonded warehouse, and plans to shipbuilding and repairing facilities. Depths at port are 6-7 m, current capacity 17 million tons, warehouses and premises of 146.9 thousand square m[7].

Table 6 CCWA Economic Corridor seaports

Country	Seaport	Turnover, million ton		Container turnover, thousand TEU
		2018	2019	2018
Caspian seaports				
Iran (Islamic Republic of)	Amirabad	3.63	4.12	1.66
	Anzali	1.49	1.03	3.47
	Now Shahr	0.58	0.77	0.04
Kazakhstan	Aktau	3.60	3.50	2.49
	Bautino	0.10	0.30	not available
	Kuryk	1.57	1.36	not available
Turkmenistan	Turkemenbashi	not available	not available	not available

[1] United Nations ECE, 'Logistics and Transport Competitiveness in Kazakhstan'.

[2] Ministry of Industry and Infrastructure Development, Republic of Kazakhstan, 'Водный транспорт (=Water Transport)', accessed 13 June 2020, https://www.gov.kz/memleket/entities/miid/activities/2395?lang=ru&parentId=253.

[3] Strategy2050, 'Более 5 млн тонн составил грузооборот в морских портах Казахстана (=Freight Turnover in Kzakhstan's Seaport Reached 5 million ton)', 5 February 2020, https://strategy2050.kz/ru/news/bolee-5-mln-tonn-sostavil-gruzooborot-v-morskikh-portakh-kazakhstana/.

[4] Seaport Aktau <http://www.portaktau.kz/>

[5] Cargo area Bautino <http://www.portaktau.kz/ru/infrastructure/gruzovoj-rajon-bautino>

[6] Seaport Kuryk <https://portkuryk.kz/>

[7] International seaport Turkmenbashi <http://turkmenbashiseaport.tm/>

Country	Seaport	Turnover, million ton		Container turnover, thousand TEU
		2018	2019	2018
Other seaports				
China	Lianyungang	214.43	not available	4,745.00
	Ningbo - Zhoushan	1084.39	not available	26,351.00
	Rizhao	437.63	not available	4,040.00
	Shanghai	683.92	not available	42,010.20
Iran (Islamic Republic of)	Bandar Abbas (Shahid Bahonar and Shahid Rajaee)	79.58	81.82	2,138.89
	Bushehr	2.79	3.03	96.68
	Chabahar	1.96	3.06	50.41
	Imam Khomeini	43.06	44.08	88.87
	Lengeh	1.33	1.20	3.59
Turkey	Izmit	72.43	not available	1,598.00
	Botas	60.73	not available	not available
	Iskenderun, Hatay	57.47	not available	not available
	Aliaga	53.27	not available	not available
	Ambarli	33.65	not available	3,170.00
	Mersin	32.22	not available	1,662.00
	Tekirdag	25.56	not available	not available

Source: Lloyd's List Maritime Intelligence[1]; National Bureau of Statistics, China; Ports & Maritime Organization, Islamic Republic of Iran[2]; General Directorate of Turkish State Railways[3]; PortNews IAA[4].

China's east seaports dominate the landscape with number and size of its ports (Figure 9 shows only 15 biggest ports in China by total turnover and Table 6 only the most relevant ports to CCWA Economic corridor by location). Seven of Chinese ports are within top 10 World container ports (Shanghai was the busiest in 2018)[5].

To attract part of these cargos, routes of CCWA should provide benefits of time savings, reliability and stability of performance, flexibility in access to inland origin/destination points.

The seaports in Islamic Republic of Iran and Turkey, on the other hand are the points at which the goods from across CCWA Economic Corridor can be loaded on ships to go to Europe or other regions by sea.

Among over 50 seaports of Turkey, the biggest container seaports are Ambarli, Mersin and Izmit, the first two are within World top 100[6]. In terms of total turnover, the biggest are Izmit, Botas, Iskenderun, Aliaga (as of 2018).[7] Botas handles mainly liquid bulk (92 per cent), Iskederum – dry bulk (76 per cent), Izmit and Aliaga are fairly diversified[8]. Seaports Haydarpaşa and Izmir are managed by the Turkish State Railways and others are privatized.

[1] 'Lloyd's List Maritime Intelligence: One Hundred Ports 2019', accessed 13 June 2020, https://lloydslist.maritimeintelligence.informa.com/one-hundred-container-ports-2019.

[2] 'Ports and Maritime Organization of the Islamic Republic of Iran (System Operations Statistics). Reporting Interval 2019/01/01 to 2019/12/31' (Ministry of Roads and Urban Development, Islamic Republic of Iran, 10 January 2020), https://www.pmo.ir/en/statistics/annualreport; 'Ports and Maritime Organization of the Islamic Republic of Iran (System Operations Statistics). Reporting Interval 2018/01/01 to 2018/12/31' (Ministry of Roads and Urban Development, Islamic Republic of Iran, 6 January 2019), https://www.pmo.ir/en/statistics/annualreport.

[3] General Directorate of Turkish State Railways, *2014-2018 İstatistik Yilliği Annual Statistics*.

[4] 'Грузооборот Порта Курык (Казахстан) в 2019 Году Снизился На 15,2% - До 1,36 Млн Тонн (=Freight Turnover of the Kuryk Port (Kazakhstan) Decreased in 2019 15.2% to 1.36 Million Ton)', *PortNews IAA* (blog), 25 February 2020, https://portnews.ru/news/291939/; 'Грузооборот ВВП Казахстана За 5 Месяцев 2019 Года Вырос в 2 Раза - До 1,3 Млн Тонно-Км (=Freight Turnover of Domestic Water Transport in Kazakhstan Grew 2 Times in 5 Months 2019 - to 1.3 Million Ton-Kilometre)', *PortNews IAA* (blog), 26 June 2020, https://portnews.ru/news/279197/.

[5] 'Lloyd's List Maritime Intelligence: One Hundred Ports 2019'.

[6] 'Lloyd's List Maritime Intelligence: One Hundred Ports 2019'.

[7] Eurostat: Gross weight of goods transported to/from main ports – Turkey; extracted on 15.06.20;

[8] Eurostat, 'Maritime Ports Freight and Passenger Statistics: Statistics Explained', March 2020, https://ec.europa.eu/eurostat/statistics-explained/pdfscache/6652.pdf.

Busiest seaports in Islamic Republic of Iran are Bandar Abbas and Imam Khomeini, both connected to AH (AH 8, AH 70) and TAR networks. Bandar Abbas is among the World top 100 busiest ports by total and container turnovers[1].

DRY PORTS

Dry ports are important redistribution points at a land corridor or an intersection of land corridors that serve to transfer cargos between modes, directions, vehicles/wagons and have handling facilities and equipment of needed types and capacity, storages and warehouses, presence of authorities to implement Customs, quarantine and other types of controls. CCWA Economic Corridor goes by land via multiple borders and countries and requires network of dry ports sufficient in number, geographical coverage and capacity to ensure cargos join/leave transit routes from/to production and consumption centres in their hinterlands.

Developed and signed under auspices of ESCAP to promote dry ports in the region, the Intergovernmental Agreement on Dry Ports defines a dry port "an inland location as a logistics centre connected to one or more modes of transport for the handling, storage and regulatory inspection of goods moving in international trade and the execution of applicable customs control and formalities"[2], suggests principles to design, construct and operate them as locations of existing or potential dry ports.

Among the countries of CCWA Economic Corridor, only Kyrgyzstan and Uzbekistan have not joined the agreement as of 2020. Other countries added over 50 locations to the list of potential and existing dry ports in the Agreement's Annex. Among them over 40 are relevant to the land routes of the CCWA (Figure 9).

Development of dry ports in the countries is not limited to locations and entities listed as part of international network in ESCAP region. CCWA countries aim at development of domestic networks logistics terminals with functions and facilities that close to the definition above.

China has over 100 dry ports that either serve transport flows from seaports or land border crossings[3]; 17 of them are included into the Dry Ports agreement. Dry ports in China often relay on existing railway container distribution centres.[4] For CCWA critical dry ports deep within China's territory are Chongqing, Chengdu, Urumqi that are used by transcontinental container block-trains and the last two are developed with railways participation. Intergovernmental Agreement of Dry Ports lists dry ports of international importance relevant to the CCWA Economic corridor in Horgos, Urumqi, Kashi. Overall, dry ports in China are affected by big number of actors in planning and constructing them: central government, including both Customs and Ministry of Transport, provincial governments that may have additional development plans, private sector and state companies. As a result, there are overcapacity at some cases, not all of the logistics terminals/centres identified as dry port provide the dry port variety and level of services[5].

Islamic Republic of Iran requires for a logistics centre recognized as a dry port to be multimodal and provide Customs services. In total there are layers of logistics centres: dry ports, logistics parks and freight terminals with dry ports the highest level in terms of capacity, importance to international transport, diversity of service; dry ports are linked by high capacity railways and roads[6]. Among nine dry ports included in the Dry port agreement, five are special economic zones[7]. For CCWA the most important dry ports in Islamic Republic of Iran are Sarakhs Special Economic Zone, Motahari Rail Station (Mashhad), Sahlan Special Economic Zone (Tabriz).

Kazakhstan actively competes for transit cargos and is developing the network of transport and logistics centres to provide needed services and infrastructure. Focus is on creation of "one stop" points to get

[1] 'Lloyd's List Maritime Intelligence: One Hundred Ports 2019'; American Association of Port Authorities.

[2] 'Intergovernmental Agreement on Dry Ports'.

[3] 'Development of International Dry Port in China' (Expert Group Meeting on the Draft Regional Framework for the Development of Dry Ports of International Importance, Bangkok, 6 June 2017), https://www.unescap.org/sites/default/files/China_EGM%20Dry%20Ports_2017.pdf.

[4] 'The Status Quo and Future Development of the Chinese International Inland Port' (2nd Meeting of the Working Group on Dry Ports, Bangkok, 14 November 2017), https://www.unescap.org/sites/default/files/China_Presentation%20WGDP%282%29_14-15%20November%202017_0.pdf.

[5] 'Development of International Dry Port in China'.

[6] Mehdi Safari Moghadam, 'Iran Dry Ports' (2nd Meeting of the Working Group on Dry Ports, Bangkok, 14 November 2017), https://www.unescap.org/sites/default/files/Iran_Presentation%20WGDP%282%29_14-15%20November%202017_1_0.pdf.

[7] 'Intergovernmental Agreement on Dry Ports'.

warehouse's, container terminal's, Customs' and transport services[1]. Among the about 20 locations of existing, planned or under construction transport and logistics centres[2] "KTZE Khorgos Gateway" and the ones located in Shymkent, Almaty, Dostyk and Nur-Sultan are key for CCWA Economic Corridor.

Kyrgyzstan is not a party to Dry port agreement as of June 2020, however, the annex lists two dry ports of international importance in the country: Alamedin (Bishkek) and Osh[3]. Logistics centre at Osh was included in the list of nodes for CAREC Corridor 3 in the CAREC Trade and Transport Facilitation Strategy 2020 and Transport Strategy 2030.[4] Based on reporting, there is a network of trade and logistics terminals for processing and distribution of agricultural products that is not fully operational and its terminals do not fit the definition of a dry port.

Tajikistan established a network of border and inland logistics terminal to consolidate services (Customs, loading-unloading, inspections, Customs procedures, etc.) for international road operators, their cargos, drivers and vehicles[5]. Among the seven locations included in the list of dry ports of international importance in the Dry port agreement, Dushanbe, Khujand, Vakhdat and Kurgan-Tube and inland and the Nizhniy Panj, Tursunzade and Karamyk are border ones. Due to limited role of railways in Tajikistan, the terminals do not fit the bill for movement the cargos between modes. Facilities and equipment of the terminals are often insufficient, outdated or even missing (loading-unloading machinery, for example).[6]

Turkey is developing the network of 21 intermodal freight terminals as dry ports/logistics centres enabled to implement railway – road transfer of cargos, providing inland container depots and Customs-bonded services.[7] Where possible, dry ports are planned in locations of organized industrial zones or logistics centres of TCDD. As of 2019, nine are operational.[8] Among 19 potential and existing dry ports in Turkey included into the Dry Ports agreement, most important for CCWA might be Palandoken (Erzurum), Sivas, Kazan (Ankara), Bogazkopru (Kayseri), Hasanbey (Eskisehir), Gokkoy (Balikesir), Kosekoy (Izmit), Halkali, Yesilbayir (Istanbul), Usak, Turkoglu (Kahramanmaras), Yenice (Mersin)[9]. As of 2020, except for Kazan, they are potential dry ports.

Turkmenistan is a party to the Dry port agreement since 2016 and in 2017 the country suggested adding to the list of dry ports in international importance facilities in Akbugdaý, Sarakhs, Ymamnazar, Ashgabat, Turkemenbashi, Mary, Turkmenabat, Dashoguz, Razyezd N 161, Talimarjan, Farap, Tahiatash, Serhetabat, Ak-Yayla, Artyk, Serhetyaka[10]. Information for these proposed locations is scarce and available descriptions suggest that further development in terms of variety of facilities is required. Dry ports Ashgabat, Sarakhs, and Farap are in operation, Ymamnazar is under construction. The ports serve road transport with focus handling containers, advance electronic declaration is available; Ymamnazar dry port has both road and railway access[11].

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[1] 'Development of the Transport-Logistics Infrastructure of the Republic of Kazakhstan' (Bangkok, 13 November 141AD), https://www.unescap.org/sites/default/files/4.%20Kazakhstan_0.pdf.

[2] Kazlogistics Integrated Portal for Logistics in Kazakhstan <http://portal.kazlogistics.kz/terminal/map/>.

[3] 'Intergovernmental Agreement on Dry Ports'.

[4] 'CAREC Transport and Trade Facilitation Strategy 2020' (Astana, Kazakhstan, 23 October 2013), http://www.carecprogram.org/uploads/docs/CAREC-Publications/CAREC-Transport-TradeFacilitation-Strategy.pdf; 'CAREC Transport Strategy 2030 for Endorsement by the 18th Ministerial Conference', accessed 19 June 2020, https://www.carecprogram.org/uploads/CAREC-Transport-Strategy-2030-MC-Draft.pdf.

[5] Farrukh Nematzoda, 'Ministry of Transport, Republic of Tajikistan (presentation in Russian for Expert Group Meeting on the Draft Regional Framework for the Development of Dry Ports of International Importance)' (Expert Group Meeting on the Draft Regional Framework for the Development of Dry Ports of International Importance, Bangkok, 6 June 2017), https://www.unescap.org/sites/default/files/Tajikistan_EGM%20Dry%20Ports_2017.pdf.

[6] 'Association of International Road Carriers of Republic of Tajikistan "ABBAT": Terminals', accessed 19 June 2020, http://www.abbat.tj/.

[7] Bülent Süloğlu, 'Dry Ports Structuring in Turkey' (2nd Meeting of the Working Group on Dry Ports, Bangkok, 14 November 2017), https://www.unescap.org/sites/default/files/Turkey_Presentation%20WGDP%282%29_14-15%20November%202017.pdf.

[8] BARIŞ ŞIMŞEK, 'Turkey Continues to Build Logistics Centers to Boost Trade Flow', *Daily Sabah* (blog), 10 July 2019, https://www.dailysabah.com/business/2019/07/10/turkey-continues-to-build-logistics-centers-to-boost-trade-flow.

[9] 'Intergovernmental Agreement on Dry Ports'.

[10] United Nations ESCAP, 'Proposals for Amending the Intergovernmental Agreement on Dry Ports: Note by the Secretariat. Working Group on Dry Ports, 2nd Meeting, Bangkok, 14 and 15 November 2017 (E/ESCAP/DP/WG(2)/2)', 18 September 2017, https://www.unescap.org/sites/default/files/E_DPWG2_2E.pdf.

[11] 'Economical Management Direction, State Customs Service of Turkmenistan', 2019, http://www.terminal.gov.tm/.

Uzbekistan is not party to Dry port agreement as of June 2020 and no dry port included to the Agreement's Annex. Main logistics terminals of the country are located in Angren, Navoi, and Tashkent. International Logistics Center "Angren" operating since 2009 is part to the free economic zone with the same name, has both railway and road access, provides the range of Customs related, warehousing and containers/cargos handling services[1] in line with a dry port definition. Same true for multimodal transport and logistics hub "Navoi" located in the Navoi Free Economic Zone and operating since 2008[2] and «Tashkent» International Logistics Center commissioned in 2017.[3]

I.4 Impact of COVID-19 pandemic

I.4.1 COVID-19 pandemic situation

COVID-19 is an infectious disease caused by a novel coronavirus (SARS-CoV-2) first encountered by humans, probably, in December 2019. By March 11, 2020, when World Health Organization declared pandemic, there were cases reported across all continents (118,319 globally, 4,292 deaths).[4] At the end of 2020, the number of accumulated confirmed cases globally approached 79.2 million and number of deaths exceeded 1.7 million[5] and due to the new virus variants coupled with troubled vaccine roll-out the pandemic rages on in 2021. The scale of this pandemic exceeded outbreaks of Severe acute respiratory syndrome (SARS) in 2002-2003 (over 8 thousand probable cases, 774 deaths in 26 countries); pandemic of Influenza A(H1N1) in 2009-2010 (over 490 thousand confirmed cases, almost 18.5 thousand deaths in 214 countries); Middle East Respiratory syndrome coronavirus (MERS-CoV) that peaked in 2014-2015 (about 2.5 thousands of cases, 851 deaths in 27 countries to date) (Table 7).[6] With the virus circulating globally, before the efficient treatment or vaccine are available countries regardless of infection levels among their population implement prevention, containment and protection measures.

Table 7 Selected Recent Infections Outbreaks in Asia

Infection	Dates	Total confirmed cases till end of 2020	Deaths reported till end of December 2020	Number of countries reported cases
Severe acute respiratory syndrome (SARS)	2002-2003	8,096	774	26
Influenza A(H1N1)	2009-2010	491,382	18,449	214
Middle East Respiratory syndrome coronavirus (MERS-CoV)	2012- on-going (peaked in 2014-2015)	2,566	882	27
COVID-19 (SARS-CoV-2)	2019- ongoing	79,231,893	1,754,574	Globally

Source: WHO, 2020.

China was the first country to face the novel coronavirus and experienced the peak of infections in January - March 2020.[7] As of July 2020, China successfully managed smaller outbreaks happening in different parts country and restores economic activities showing year-on-year GDP growth in second quarter 2020 in

[1] FEZ Angren, 'International Logistics Center "Angren"', accessed 19 June 2020, http://www.fez.uz/page/mtsl-angren.

[2] Directorate of FEZ 'Navoi', 'Advantages of Multimodal Transport-and-Logistics Hub of Navoi', accessed 19 June 2020, https://www.feznavoi.uz/.

[3] United Cargo Centre OOO 'Interlogistics', '«Tashkent» International Logistics Center', accessed 19 June 2020, http://ucc.uz/uk.

[4] 'Coronavirus Disease 2019 (COVID-19) Situation Report – 51' (WHO, 11 March 2020), https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200311-sitrep-51-covid-19.pdf?sfvrsn=1ba62e57_10.

[5] WHO, 'Weekly Epidemiological Update - 29 December 2020', 29 December 2020, https://www.who.int/publications/m/item/weekly-epidemiological-update---29-december-2020.

[12] WHO, 'Summary of Probable SARS Cases with Onset of Illness from 1 November 2002 to 31 July 2003', accessed 25 July 2020, https://www.who.int/csr/sars/country/table2004_04_21/en/; WHO, 'Weekly Virological Update on 05 August 2010', accessed 25 July 2020, https://www.who.int/csr/disease/swineflu/laboratory06_08_2010/en/; WHO, 'MERS Situation Update, December 2020', n.d., https://applications.emro.who.int/docs/WHOEMCSR326E-eng.pdf?ua=1.

[7] Zunyou Wu, 'China's Response to COVID-19' (Webinar: Managing COVID-19 Pandemic - Experiences & Best Practices of China, Japan and the Republic of Korea, Incheon, Republic of Korea, 2 July 2020), https://www.unescap.org/sites/default/files/1.%20China_0.pdf.

3.2 per cent after 6.8 per cent plunge in the first quarter.[1] Among the countries along the CCWA economic corridor, Islamic Republic of Iran was next to discover cases in mid-February 2020, at the end of July 2020, the total number of officially registered cases continues to grow steadily.[2] Kazakhstan, Kyrgyzstan, and Uzbekistan registered first cases in mid-March and after periods of low numbers of officially confirmed cases their grows accelerated in July 2020. Tajikistan reported first cases in end of April and official daily numbers of cases peaked in May 2020. First officially confirmed cases were reported in Turkey in mid-March and daily number of cases peaked in April 2020. No cases are reported in Turkmenistan (Table 8).

After the initial version of this section was completed in the first half of 2020, the virus spread took different paths in CCWA countries. While new cases are continued to be low in China, new peaks in cases happened in the second half of 2020 and in spring of 2021 in Islamic Republic of Iran, Kyrgyzstan, Turkey and Uzbekistan.[3]

Table 8 Officially reported cases of coronavirus disease (COVID-19) in countries along the CCWA economic corridor as of 02 May 2021

Country	Total cases to date	Cases cumulative total per 100,000 population	Total deaths to date
China	103,649	7.04	4,858
Iran (Islamic Republic of)	2,516,157	2,995.68	72,090
Kazakhstan	375,637	2,000.55	4,345
Kyrgyzstan	96,060	1,472.37	1,619
Tajikistan	13,714	143.79	91
Turkey	4,849,408	5,749.9	40,504
Turkmenistan	0	0	0
Uzbekistan	91,643	273.81	652

Source: WHO Coronavirus Disease (COVID-19) Dashboard < https://covid19.who.int/table> Downloadable data, version May 2nd 2021, 3:09pm CEST..

Among the actions the countries employ to contain virus spread (testing, quarantine and treatment, contact tracing, social distancing, prevention), there are two families of actions that directly and indirectly affect supply chains and transport of goods and passengers: local containment and prevention of imported cases/spread of cases across a country.

Domestic containment measures that affect transport are restrictions on people's movements to prevent virus spreading via crowding and mingling:

- Quarantines, lockdown or "stay-at-home" orders, declaration of states of emergency, curfews to prevent commuting, mingling, crowding. These measures include closures of public places, malls and non-essential shops/stores/market places, schools, offices, non-essential businesses and production lines, dining places, entertainment and sporting events.
- Switching schools, business and governmental services to remote mode by via electronic platforms.
- After the rise in cases is under control, these measures are encouraging social distancing, limiting of gatherings and modes of in-person services in opened businesses (only take-aways/deliveries or only out-door dining for restaurants, as an example).

These measures cause disruption of the supply chains and abruptly changing demand. The most obvious effect is shortages of sanitizers and other disinfectants, masks and other personal protective equipment directly used by hospitals. Next is shortage of fever, cold and cough medications disappearing from pharmacies due to hoarding and manufactures with limited capacities that cannot be expanded in short term[4]. Suppliers of raw food to restaurants and fast-food chains faced problems with their produces as their

[1] National Bureau of Statistics of China, 'Preliminary Accounting Results of GDP for the Second Quarter and the First Half Year of 2020', *Press Release* (blog), 17 July 2020, http://www.stats.gov.cn/english/PressRelease/202007/t20200717_1776596.html.

[2] Here and further in this paragraph the information is from 'WHO Coronavirus Disease (COVID-19) Dashboard' <https://covid19.who.int/table> version 2020/7/24, 6:34pm CEST.

[3] WHO Coronavirus Disease (COVID-19) Dashboard < https://covid19.who.int/table> Downloadable data, version May 2nd 2021, 3:09pm CEST.

[4] 'В Казахстане Объяснили Дефицит Лекарств (=Shortage of Medicines in Kazakhstan Explained)', *TASS, Russian News Agency* (blog), 5 July 2020, https://tass.ru/obschestvo/8889489.

clients reduced demand and they have to find other buyers and reorganize deliveries if they can. Disruptions of different scales might happen even when due to closure of offices and schools people demand for certain goods (office and schools supplies, food products) shifts from cities' business centres to residential areas. In short run, this reshuffling can cause oversupply in one parts and shortages in other parts of an administrative area and need for rearranging logistics without actually changing total of said good consumed by the area.[1]

Due to prolonged pandemic period supply chains, delivery and last mile logistics processes settled into in a temporary equilibrium, therefore, new period of shifts and rebalancing disruptions might be expected when the pandemic restrictions to be lifted and the need for supplies for virus prevention falls.

Prevention of imported cases or of spread of cases across regions/cities of a country focuses on stoppage of long-distance people movement:

- Ban of commercial passenger air flights, passenger trains and bus lines, car trips.
- Restrictions and bans of changes in crews of vessels, trains, freight road vehicles.

Effect on air transport is profound: in March 2020, total passenger-kilometres of air industry fell almost 53 per cent on year-on-year basis (in May the fall exceeded 90 per cent), with plunge in Asia-Pacific region was almost 60 per cent and in China domestic market over 65 per cent.[2] Airlines were seeking solutions, including adopting social distancing, requiring passengers adhering safety guidelines and using passenger planes for transporting cargos, especially the ones needed for fight with COVID-19.[3]

In their initial impact analysis, International Union of Railways (UIC) estimated that cancellations of trains led to drop of passenger traffic on railways up to 80 per cent for domestic travel and up to 100 per cent for international services.[4] China reported -55.6 per cent change (drop) in number of passengers carried by railways in the first 5 months 2020.[5]

Maritime transport experienced different issue that the industry called "humanitarian crisis": travel restrictions, stoppage of passenger air flights, disembarking restrictions, slow and uncoordinated bureaucratic response to accommodate the needs of the industry prevented changes of crews for months, leaving the vessels with exhausted due to extended times at sea or understaffed crews threatening safety of navigation[6].

Freight road and railway transport operates during pandemic and faces less drastic measures and losses (see next subsection).

[1] Jean-Paul Rodrigue and Thomas Luke, 'Transportation and Pandemics', *The Geography of Transport Systems* (blog), accessed 22 June 2020, https://transportgeography.org/?page_id=8869.

[2] IATA, 'Press Release No: 36: Passenger Demand Plunges in March as Travel Restrictions Take Hold', 29 April 2020, https://www.iata.org/en/pressroom/pr/2020-04-29-01/; IATA, 'Air Passenger Market Analysis May 2020', 1 July 2020, https://www.iata.org/en/iata-repository/publications/economic-reports/air-passenger-monthly-analysis---may-2020/.

[3] Jackie Wattles and Chris Isidore, 'Grounded Passenger Jets Are Causing an Unexpected Bottleneck', *CNN Business* (blog), 16 May 2020, https://www.cnn.com/2020/05/14/business/airline-cargo-freight-covid-19/index.html; Air Cargo News, 'Airlines Fill Passenger Seats with Cargo to Meet Demand', 25 March 2020, https://www.aircargonews.net/airlines/airlines-fill-passenger-seats-with-cargo-to-meet-demand/.

[4] UIC COVID-19 Task Force, *Management of COVID-19: First Estimation of the Global Economic Impact of Covid-19 on Rail Transport* (Paris, 2020), https://uic.org/IMG/pdf/economic_impact.pdf.

[5] National Railway Administration, '2020 年 5 月份全国铁路主要指标完成情况 (=Status of Major Indicators of Railways Nationally in May 2020)', *Ministry of Transport of the People's Republic of China* (blog), 19 June 2020, http://www.mot.gov.cn/tongjishuju/tielu/202007/t20200708_3428731.html.

[6] Richard Meade, 'Shipping Struggles to Overcome Political Inertia as Crew Change Crisis Starts to Bite', *Maritime Intelligence/Lloyd's List Intelligence* (blog), 10 June 2020, https://lloydslist.maritimeintelligence.informa.com/LL1132639/Shipping-struggles-to-overcome-political-inertia-as-crew-change-crisis-starts-to-bite; Greg Miller, 'Crew Crisis Is Triggering Ship Detentions and Diversions', *American Shipper/FreightWaves* (blog), 2 July 2020, https://www.freightwaves.com/news/crew-crisis-to-trigger-ship-detentions-and-diversions.

I.4.2 COVID-19 pandemic related measures for freight transport at the borders along the CCWA Economic corridor

While people movements across borders are undesirable during the period with active spread of pathogen and no vaccine or effective treatment available, movement of goods becomes crucial in containing and fighting the impact of disease and securing needs of people.

During COVID-19 pandemic international freight transport is operating, majority of the Asian Highway countries keeping most of their borders open for it and implemented some measures to facilitate trade and transport for essential goods and pandemic response supplies. The situation along the CCWA Economic Corridor is the same with the exception of the closed borders of Turkmenistan.

First months of 2020 were most volatile in terms of change in policies as the situation was new, hard to predict, changed daily and countries had to refine their policy decisions on-the-go while getting knowledge of the situation, having to reconcile public health, economic needs, regional and domestic responses. After six months with better understanding of the pathogen, its medical, economic, political impact, situation became easier to navigate, however, fluidity and uncertainty still persist.

Main responses in international freight transport in countries along the CCWA were (see also Table 9 and country sections below):

1. Temporary closures of main corridor border crossings (times of closure differ).
    a. *China – Kyrgyzstan (Arkaxtam – Irkeshtam; Turgat - Turougart)* [1]
    b. *China – Tajikistan (Karasu – Kulma Pass)*
    c. *Islamic Republic of Iran – Turkey (Bazargan – Gurbulak)*[2]
2. Limiting number of border crossings open for international freight *(all countries except Turkmenistan with fully closed borders).*
3. Introduction of sanitary and prevention measures at the border crossings, logistics terminals, railway stations, etc.: requirements to drivers use masks, gloves, organising COVID-19 testing, vehicles disinfecting and other.
4. Barring foreign drivers from driving vehicles deep into the partner country territory with two options of implementation:
    a. *Option 1 (Turkey for a limited period, Turkmenistan)*

– Foreign trucks allowed till border or facility/buffer zone to unload/load cargo or disengage/pick up trailers. Time to exit country limited: same day (ex., China) – 72 hrs.

– Places of stay, parking areas, routes to follow are restricted

– Cargo/trailer are carried further by domestic truck and driver

    b. *Option 2 (China – Kazakhstan border for a limited period)*

– Foreign driver or domestic driver who visited countries of a determined high-risk list is changed by another domestic driver

5. Pushing forward electronic procedures in international trade, Customs, transport operations, waiving/reducing number of steps requiring in person contact for paper documents submission.
6. Setting priority channels for essential goods, foodstuff, medical supplies.

[1] 阿拉山口市政, '新疆口岸通关提示 （=Information of Operation of Xinjiang Border Crossings)', 6 February 2020, http://www.alsk.gov.cn/info/1024/28590.htm; '4 月 14 日，中吉边境伊尔克什坦口岸恢复开通货物运输 (= China - Kyrgyzstan Border Crossings Restored Freight Operations on April 14)', 15 April 2020, http://www.mofcom.gov.cn/article/i/jyjl/e/202004/20200402955404.shtml.

[2] 'Turkey Reopens Border Gates With Iran', *Financial Tribune Daily* (blog), 5 June 2020, https://financialtribune.com/articles/domestic-economy/103671/turkey-reopens-border-gates-with-iran.

7. Waiving, cancelling or cutting fees, charges, such as demurrage, storage, railway tariffs.
8. In some cases, physical inspections were replaced by contactless options, such as video-conferencing, or foregone.

The situation was not easy with queuing and congestions at border crossing that remained open, different measures at the two sides of a border causing confusion, especially since due fluidity of the situation and number of agencies involved in the relief process: public health, transport, Customs, border crossing agencies both domestic and of the partner countries'. In the flood of information to monitor some documents might become outdated before their addressee could adjust. ESCAP, ECE and IRU set monitoring web-pages allowing countries to check partners' measures that proves to be of crucial importance in solving these issues. Meanwhile, countries' associations of transport operators keep working with authorities on clarifying the issues and making sure the clarifications are made available to the industry actors.

Noteworthy is the change in trade policies that is quite restrictive. While import of food and essential goods, medical and pandemic relief supplies is facilitated in all countries, at least in some of the way (cancelled or reduced duties, speeded up clearance, green channels), export of the same categories or selected codes under them is not permitted or limited in most countries except China and Turkey.

Table 9 Overview of policy responses in management of international freight transport in countries along the CCWA Economic Corridor as of July 2020

	China	Iran (Islamic Republic of)	Kazakhstan	Kyrgyzstan	Tajikistan	Turkey	Turkmenistan	Uzbekistan
Border crossings open for freight transport	Partially	Partially	Partially	Partially	Partially	Partially	No	Partially
Implementing of social distancing, sanitary measures at ports of entry, personal protection equipment requirements/supplies for both personnel and users	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facilitation in customs and border-crossing procedures	Yes	N/A	N/A	Yes	N/A	N/A	N/A	Yes
Acceptance of electronic Customs/transport documents	Yes	Yes	Yes	N/A	N/A		N/A	Yes
Fact-track and/or round-the-clock clearance/green lines for Personal Protective Equipment and anti-epidemic supplies at the Customs and border control points	Yes	Yes	N/A	Yes	N/A	Yes	N/A	N/A
Disinfection of vehicles, wagons and locomotives	Yes	N/A	N/A	Yes	Yes	Yes	N/A	Yes
New health checks: self-declaration of countries visited, visual check for symptoms, temperature checks, oxygen level test, Covid-19 negative status certificate, quarantine or self-isolation	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes
Drivers testing at border (with or without requirement to have negative test results at hands prior to entry)	Yes	N/A	Yes	Yes	Yes	N/A	Yes	Yes
Requirements on personal protective equipment for drivers	Yes	N/A	Yes	Yes	N/A	Yes	N/A	Yes
Restrictions on time spent in destination country	Yes	N/A	Yes	N/A	Yes	Yes	N/A	Yes
Lifting charges or penalties for storing the cargo	N/A	N/A	Yes	Yes	N/A	N/A	N/A	
Railway charges/fees/penalties relief	N/A	N/A	Yes	Yes	N/A	N/A	N/A	Yes
Reduction/cancellation of some import duties and taxes	Yes	Yes	N/A	N/A	N/A	Yes	N/A	Yes
Additional regulations and restrictions/suspension for export of selected goods	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes

Note: N/A – data not available.
Source: ESCAP Policy Responses to COVID-19 in Asia and the Pacific database; IRU Flash Info Page; UNECE Observatory on Border Crossings Status due to COVID-19.

CHINA

In China, land border crossings were closed only partially, opening of seasonal border crossings was delayed. On CCWA Economic corridor, BCPs with Kyrgyzstan (Turougart, Irkeshtam) were closed February 6-April 14, 2020, by initiative of Kyrgyzstan.[1] With the July 2020's COVID-19 outbreak in Xinjiang, China and Kazakhstan closed Khorgos border crossing for both passenger and freight transport starting 20 July 2020.[2]

Freight road transport vehicles are to be unloaded/loaded at the border crossing, the driver to leave within 24 hours and refrain from contacts with personnel at the BCP. Drivers should follow the anti-epidemic measures set for the BCP, that might include health declaration, symptoms monitoring, testing if needed, and other. Drivers who refuse to comply with the epidemic prevention regulations and control procedures to be blacklisted.[3]

Operations of block trains continues through pandemic and number of trains grows comparing 2019 (+6 per cent in January-February 2020 year-on-year basis). To minimize risk of spread of COVID-19 a number of measures are taken, they might vary by railway of origin, but include regular trains disinfection, setting crews operation in a way to limit them going out of the train, such as separate places for meals, provision of disinfectants and disposable materials. Procedures and modes for Customs clearance are facilitated to reduce the costs.[4]

To alleviate economic pressure on transport operators during the pandemic period, Chinese government removed all road tolls for all vehicles and provides financial support to companies involved in transport and affected by the pandemic.[5] Import duties are temporarily decreased for selected goods and import source countries, control and regulation increased in export of supplies needed for pandemic relief[6] with the goal to ensure the quality of these goods and that they come from trusted manufactures. Comprehensive package of measures are in place to facilitate export/import oriented business and foreign trade operations: promoting usage of remote state services (single window via "Customs+Internet" portal), extension of functionality of the single window; speeding up release of goods, relaxing some procedures for instance allowing advance submission of electronic copies for documents later required in paper form, off-site audit by video conference, reduction of costs by lowering some fees, number of application, etc.[7]

ISLAMIC REPUBLIC OF IRAN

In March – June 2020, most of border crossings of Islamic Republic of Iran with Turkmenistan and Turkey were closed. Goods to Turkmenistan have to be unloaded at the border. At the border with Turkey, Razi border crossing was the only operating through initial months of the pandemic. Bazargan border crossing

[1] 阿拉山口市政, '新疆口岸通关提示 （=Information of Operation of Xinjiang Border Crossings)'; '4 月 14 日，中吉边境伊尔克什坦口岸恢复开通货物运输 (= China - Kyrgyzstan Border Crossings Restored Freight Operations on April 14)'.

[2] Kazavto, 'Уведомление о Временном Закрытии Автомобильного Сообщения Из РК в КНР с 20 Июля 2020 Года. (=Notice on Temporary Closure of Road Transport between Republic of Kazakhstan and China Starting July 20, 2020)', 22 July 2020, https://www.kazato.kz/posts/uvedomlenie-o-vremennom-zakrytii-avtomobil-nogo-soobsheniya-iz-rk-v-knr-s-20-iyulya-2020-goda.

[3] United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: China', 27 April 2020, https://www.unescap.org/sites/default/files/China-monitoring-response-to-COVID-19.pdf.

[4] '中欧班列复工率已达 90%以上 (=Over 90% of China - Europe Trains Returned to Work)', *State Council, People's Republic Of China* (blog), 22 March 2020, http://www.gov.cn/xinwen/2020-03/22/content_5494084.htm.

[5] United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: China'.

[6] United Nations ESCAP, 'Policy Responses to COVID-19 in Asia and the Pacific', accessed 25 June 2020, https://www.unescap.org/covid19/policy-responses.

[7] Pamela Ugaz and Sijia Sun, 'Case Study: China's Trade Facilitation Responses to the COVID-19 Pandemic', *UNCTAD Transport and Trade Facilitation Newsletter, Special COVID-19 Edition*, no. 52 (22 May 2020), https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=2328.

reopened in May 2020 with some restrictions, fully on June 4, 2020, and operated by the health protocols agreed by the two countries; 60 trucks per day were allowed[1].

For the operating Customs offices and border crossings working hours were extended and priority in clearance was given to pandemic relief supplies. To ensure social distancing, Customs clearance documents are accepted via e-mail; licenses of the international transport companies, temporarily export and import licenses expiring in the pandemic period are renews automatically[2]. Import duties and taxes for a list of equipment and supplies for pandemic relief were set at minimum 5 per cent of Customs value.[3]

KAZAKHSTAN

During 2020, state of emergency in Kazakhstan was enforced from March 16 till May 11, clusters of new cases dictated that the lockdown measures remained in some areas and on July 5, some of restrictions measures were reimposed (for 14 days initially) at the country level.[4]

To better control people's movement associated with international transport Kazakhstan temporary closed selected road border crossings. At the borders with the CCWA Economic Corridor countries, some border crossings were closed at the border with China, Kyrgyzstan, Turkmenistan, Uzbekistan, including major road crossing Khorgos since July 20, 2020.[5]

Initial state of emergency envisaged that drivers in international road transport could carry on if quarantine and anti-epidemic measures were observed[6], driver carried along passport and for freight road vehicles coming from or via a set of countries that included China and Islamic Republic of Iran either a driver or a truck to be replaced by domestic one.[7] In July, the last condition was cancelled, all drivers were allowed to enter/exit and Chinese drivers were allowed 24 hours visa-free interval to reach logistics centres located at the border crossings at Kazakhstan's side.[8] In March – May 2020, Kazakhstan allowed visa-free entry, transit and exit for all foreign drivers working in international freight transport.[9]

Usage of electronic documentation was reaffirmed by abolishing of requirement to carriers to carry paper permits as applications for related were approved prior to the transport operation. All procedures and payments related to freight transport by railway were also fully moved to remote mode. [10]

[1] 'Turkey Reopens Border Gates With Iran'; Tasnim News Agency, 'Iran, Turkey Reopen Key Border Crossing to Help Boost Trade', 4 June 2020, https://www.tasnimnews.com/en/news/2020/06/04/2279414/iran-turkey-reopen-key-border-crossing-to-help-boost-trade.

[2] 'Best Practices to Prevent and Fight the Spread of COVID-19 (Source: Islamic Republic of Iran's Customs Administration and Iran`s Ministry of Health)' (UNECE), accessed 25 June 2020, https://wiki.unece.org/download/attachments/101548447/Best%20practices%20to%20prevent%20and%20fight%20the%20spread%20of%20COVID-19%3B%20Iran.pdf?version=1&modificationDate=1586847485408&api=v2.

[3] United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: Islamic Republic of Iran', 27 April 2020, https://www.unescap.org/sites/default/files/Islamic-Republic-of-Iran-monitoring-response-to-COVID-19.pdf.

[4] Александр Гусаров, 'В Казахстане Продлят Карантин До 2 Августа (=Quarantine in Kazakhstan Extended till August 2)', *Rossiyskaya Gazeta* (blog), 14 July 2020, https://rg.ru/2020/07/14/v-kazahstane-prodliat-karantin-do-2-avgusta.html.

[5] Kazavto, 'Уведомление о Временном Закрытии Автомобильного Сообщения Из РК в КНР с 20 Июля 2020 Года. (=Notice on Temporary Closure of Road Transport between Republic of Kazakhstan and China Starting July 20, 2020)'; Kazavto, 'О Временном Закрытии Автомобильных Пунктов Пропуска На Отдельных Участках Государственной Границы Республики Казахстан (=On Temporary Closure of the Road Border Crossings on Selected Sections of the State Border of the Republic of Kazakhstan)', 2 April 2020, https://www.kazato.kz/posts/o-vremennom-zakrytii-avtomobil-nyh-punktov-propuska-na-otdel-nyh-uchastkah-gosudarstvennoj-granicy-respubliki-kazahstan.

[6] The quarantine and sanitary measures for border crossings personnel and users are outlined in the regularly updated orders of the Chief State Sanitary and Medical Officer on prevention of coronavirus infection available at <https://online.zakon.kz>.

[7] Kazavto, 'Чрезвычайное Положение: В ПС КНБ Сделали Заявление (=State of Emergency: Border Service Made an Announcement)', March 2020, https://www.kazato.kz/posts/chrezvychajnoe-polozhenie-v-ps-knb-sdelali-zayavlenie.

[8] Border Service of National Security Committee of the Republic of Kazakhstan, 'Порядок Пересечения Государственной Границы Республики Казахстан На Период Карантинных Ограничений (= Procedures for Crossing State Border of the Republic of Kazakhstan during the Quarantine Period)', 17 July 2020, https://www.gov.kz/memleket/entities/shekaraknb/press/news/details/poryadok-peresecheniya-gosudarstvennoy-granicy-respubliki-kazahstan-na-period-karantinnyh-ogranicheniy?lang=ru.

[9] 'Protocol of the Meeting of the State Commission on Insuring the State of Emergency under the President of the Republic of Kazakhstan' (IRU, 24 April 2020), https://www.iru.org/apps/cms-filesystem-action?file=/flashinfo/kazakhstan.pdf.

[10] United Nations ESCAP, 'Policy Responses to COVID-19 in Asia and the Pacific'.

Kazakhstan banned export of face masks as well as restricted export of some agricultural, construction commodities.[1]

To provide stimulus for railway industry recovery, Kazakhstan cancelled storage and demurrage charges, fines for failure to meet monthly loading plans.[2] Railway freight rates between Kazakhstan and Uzbekistan were decreased by 50 per cent.[3]

KYRGYZSTAN

During pandemic period, Kyrgyzstan banned export of selected essential goods and food staff, medicines and medical equipment. Selected borders crossings with Kazakhstan (a short-term closure took place in March 2020), Tajikistan and Uzbekistan were open for freight traffic in both directions as of end of July 2020.[4] Border crossings with China were closed February 6-April 14, 2020.[5] Upon reopening the traffic was limited to freight only; trucks and drivers are not allowed to enter partner country and swap of trailers happens at the buffer (neutral) zone. Drivers are required to use personal protective equipment (masks, gloves, disinfectants) while swapping trailers, before entering neutral zone drivers have their temperature checked, on the way back - express test and answer a questionnaire. Goods and vehicles are disinfected.[6]

To facilitate the international road transport, special permits were cancelled, green channels were set for trucks carrying essential and medical goods. Border crossing process was amended to prevent spread of COVID-19 and includes drivers testing, filling itinerary questionnaire, installation of mobile application needed for anti-pandemic measures, drivers using masks and gloves while going through border crossing procedures.[7]

To alleviate the situation of transport operators, Kyrgyz Temir Zholu reduced coal railway tariff by 30 per cent, cancelled storage and demurrage charges.

TAJIKISTAN

Border crossings with Kyrgyzstan and Uzbekistan remained open for freight transport, with Afghanistan closed since March,16, 2020, and China (Kulma Pass - Karasu) was closed in January – April 2020.[8] Upon reopening, the Kulma Pass – Karasu border crossing implements contactless control, Tajikistan's drivers were not allowed to leave the vehicles. Tajikistan has banned export of selected food products. [9]

Entry of foreign freight vehicles was made possible till border terminal where either the goods are reloaded onto domestic truck or a trailer disengaged. Return of the vehicles and trailers is monitored by Customs till border crossing. Since June 2020, foreign drivers with vehicles were allowed to stay in Tajikistan up to five days to deliver the cargo till final destination in case their COVID-19 test was negative, test might be done

[1] United Nations ESCAP.

[2] Transport Committee, Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan, 'В Стране с Начала Года Железнодорожным Транспортом Перевезено 137 Млн. Тонн Грузов (= Since the Beginning of the Year Railway Transport in the Country Carried 137 Million Ton of Cargos)', 15 July 2020, https://www.gov.kz/memleket/entities/transport/press/news/details/v-strane-s-nachala-goda-zheleznodorozhnym-transportom-perevezeno-137-mln-tonn-gruzov?lang=ru.

[3] United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: Kazakhstan', 12 June 2020, https://www.unescap.org/sites/default/files/Kazakhstan-monitoring-response-to-COVID-19.pdf.

[4] United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: Kyrgyzstan', 12 June 2020, https://www.unescap.org/sites/default/files/Kyrgyzstan-monitoring-response-to-COVID-19.pdf.

[5] 阿拉山口市政, '新疆口岸通关提示 （=Information of Operation of Xinjiang Border Crossings)'; '4 月 14 日，中吉边境伊尔克什坦口岸恢复开通货物运输 (= China - Kyrgyzstan Border Crossings Restored Freight Operations on April 14)'.

[6] United Nations ECE, 'Observatory on Border Crossings Status Due to COVID-19', accessed 25 June 2020, https://wiki.unece.org/display/CTRBSBC/Observatory+on+Border+Crossings+Status+due+to+COVID-19+Home.

[7] United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: Kyrgyzstan'.

[8] United Nations ECE, 'Observatory on Border Crossings Status Due to COVID-19'; United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: Tajikistan', 12 June 2020, https://www.unescap.org/sites/default/files/Tajikistan-monitoring-response-to-COVID-19.pdf.

[9] United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: Tajikistan'.

prior to the crossing border or at the border. While awaiting the test results drivers were to be quarantined, vehicles had to be disinfected before entering country.[1]

TURKEY

In the early stage of pandemic, most of border crossings were closed, including the ones with Islamic Republic of Iran at the CCWA Economic Corridor. Kapikoy BCP was not closed during and worked round the clock, Gurbulak BCP was closed March – early June 2020.[2]

At the border crossings that remained opened, "contact-free foreign trade" mode was enforced. At road border crossings, after disinfection of the trailers, vehicles, cargos were transhipped onto the Turkish vehicles with domestic drivers; direct contact avoided. At the Kapikoy (Turkey) – Razi (Islamic Republic of Iran) railway BCP due to lack of buffer zone, it was decided to use push and pull by locomotives at the different sides, cargo documents transferred within the wagons.[3]

All drivers are checked for symptoms, in case of symptoms in place, foreign drivers are denied entry, domestic drivers are quarantined. Initially, foreign drivers were obliged to leave Turkey within 24 or 72 hours, since May 2020 this requirement was replaced the signed letter of commitment to leave as soon as possible to avoid 14 days quarantine.[4]

Updated rules in June allowed international transit via Turkey requiring disinfection of the vehicle while entering, drivers to follow routes set by Customs, drivers to wear face masks any time they have to come in contact with people, keep sufficient supply of masks, disinfectant and food for the journey. A system to track vehicles is in place to ensure the fastest exit from the country. Domestic drivers are to be quarantined at home 14 days after arrival unless they have to undertake another international haulage trip in which case this term does not need to be completed.[5]

For border crossing, the number of vehicles per day might be limited (60 trucks/day at Gurbulak, for instance), so priority in entry is given to vehicles carrying medicines, medical supplies and food. [6] Import tariffs waived for ethyl alcohol, disposable masks and medical ventilators, export of masks and personal protection equipment, lemons is regulated.[7]

TURKMENISTAN

Turkmenistan closed its borders for entry of the foreign trucks: goods, trailers are moved to domestic carriers at the border. Goods, trailers, semi-trailers arriving to Turkmenbashi port were not allowed to have tractors, drivers or crews with them. People arrivals are allowed though seriously restricted and require to present proof (less than 72 hours old) of negative results of a Covid-19 test. One more test to be administered upon arrival.[8]

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[1] 'Временный Порядок Регулирования Международных Грузовых Автомобильных Перевозок На Территории Республики Таджикистан с Целью Профилактики Коронавирусной Инфекции "COVID -19" (=Temporary Regulations of the International Road Freight Transport within Territory of the Republic of Tajikistan to Prevent Coronavirus "COVID-19")' (ABBAT, April 2020), http://www.abbat.tj/news/972; 'Изменения и Дополнения к Временному Порядку Регулирования Международных Перевозок Грузовых Автомобилей На Территории Республики Таджикистан По Профилактике Коронавирусной Инфекции «COVID-19» (=Amendments to the Temporary Rules on Internaitonal Freight Road Transport within Territory of the Republic of Tajikistan to Prevent Coronavirus Infection COVID-19"' (IRU, 10 June 2020), https://www.iru.org/apps/cms-filesystem-action?file=/flashinfo/NEW-%20ru-1.pdf.

[2] 'Update on Iran's Border Crossings Amid Coronavirus Outbreak', *Financial Tribune Daily* (blog), 3 May 2020, https://financialtribune.com/articles/domestic-economy/103162/update-on-irans-border-crossings-amid-coronavirus-outbreak.

[3] 'Statement By Mr. Osman Nuri Beyhan, Deputy Director General For International Agreements And EU Affairs Of The Ministry Of Trade Of The Republic Of Turkey' (UNECE Informal Multidisciplinary Advisory Group Meeting On Transport Responses To The COVID-19 Crisis, Geneva, 9 June 2020), https://www.unece.org/fileadmin/DAM/trans/doc/2020/wp5/4c_Mr_Osman_Nuri_Beyhan_COVID_meeting_9_June_2020.pdf.

[4] United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: Uzbekistan', 14 June 2020, https://www.unescap.org/sites/default/files/Uzbekistan-TF.pdf.

[5] United Nations ECE, 'Observatory on Border Crossings Status Due to COVID-19'.

[6] United Nations ECE.

[7] United Nations ESCAP, 'Policy Responses to COVID-19 in Asia and the Pacific'.

[8] United Nations ECE, 'Observatory on Border Crossings Status Due to COVID-19'.

UZBEKISTAN

Border crossing continued to be opened for international freight with a number of additional protection measures, such as disinfection of vehicles, replacement of trucks if necessary, dedication of the areas in proximity of the border crossings for COVID-19 testing of drivers, requirements to drivers to wear disposable masks, gloves, protective suits. Drivers could remain in the country for 10 days of the delivery the goods or pick up return load for which they are to stay at the designated areas. In case a driver was tested positive to the COVID-19 they and co-divers if any were to be quarantined at the designated facilities.[1] Upon arrival at the border crossing driver was given a map of routes and technical stops.[2]

Uzbekistan temporary restricted transit of Iranian trucks via its territory in March – April 2020, as of July 2020 the restrictions were lifted.[3]

To ensure smooth international road transport and Customs clearance of the cargos, Uzbekistan set a command centre. Procedures for foods import were streamlined, related permits were to be issued prior arrival to the borders.[4] Usage of single window services for foreign trade via dedicated internet platform of the Customs Committee is encouraged, in addition, Uzbekistan Temir Yollari JSC opened its interface for preliminary Customs information.

Railway tariffs were cut 50-70 per cent, Kazakhstan and the Russian Federation provided discounts for railway tariffs at their side, wagon services fees are waived, grace periods for wagons loading are introduced.[5]

To ensure sufficient stock of pandemic relief supplies, Uzbekistan eliminated import duties or taxes on certain medicines, medical equipment and essential goods, foods and banned export of some personal protective equipment.[6]

I.4.3 COVID-19 impact on transport volumes and foreign trade in the countries along the CCWA Economic corridor

Impact of the pandemic situation on economies, international trade and transport is profound and multi-faceted. Delivery times, cargo volumes and values, structures – all are affected. In June 2020, IRU estimated freight turnover in Eurasia to shrink by 18 per cent in 2020[7]; International Transport Forum expects over half reduction in ton-kilometres in inter-urban freight (both domestic and international) in China, Central Asia and the Russian Federation in 2020.

Since the year 2000, international trade in countries along CCWA Economic corridor suffered twice (Annex 1 Table I-2):

- In 2009 most countries lost from one sixth to one third of value of total trade, export and import as consequence of Global Financial Crisis 2007-2008;
- In 2015-2016 the fall was caused by turbulence at emerging markets due to combination of measures taken in China to fight credit bubbles and in USA to tighten monetary policy and interdependencies in global economy. In 2015 countries lost from 8 to 36.6 per cent of total trade.

[1] United Nations ECE.

[2] United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: Uzbekistan'.

[3] 'Update on Iran's Border Crossings Amid Coronavirus Outbreak'.

[4] 'Указ Президента Республики Узбекистан «О Первоочередных Мерах По Смягчению Негативного Воздействия На Отрасли Экономики Коронавирусной Пандемии и Глобальных Кризисных Явлений» (President Order "on Priority Measures on Mitigation of Adverse Impact of Coronavirus Pandemic and Global Crisis on Economy")', *Uzbekistan Social and Democrat Party Adolat* (blog), 20 March 2020, https://www.adolat.uz/ru/uzbekiston/ukaz-prezidenta-respubliki-uzbekistan-o-pervoocherednyh-merah-po-smyagcheniyu-negativnogo-vozdejstviya-na-otrasli-ekonomiki-koronavirusnoj-pandemii-i-globalnyh-krizisnyh-yavlenij.

[5] United Nations ESCAP, 'Monitoring Response To Covid-19 Along The Regional Transport Network. Country Profile: Uzbekistan'.

[6] United Nations ECE, 'Observatory on Border Crossings Status Due to COVID-19'.

[7] Jens Hügel, 'Virtual Expert Group Meeting on Safe and Seamless Transport Connectivity along the Asian Highway Network during and after the COVID-19 Pandemic: IRU's Presentation' (Virtual Expert Group Meeting on Safe and Seamless Transport Connectivity along the Asian Highway Network during and after the COVID-19 Pandemic, Bangkok, Thailand, 25 June 2020), https://www.unescap.org/sites/default/files/IRU.pdf.

More time needed for recovery and while there drop year-on-year was less in 2016 than in 2015, growth rates returned to positivity only in 2017.

In 2020 impact on external trade of the CCWA countries was uneven. While Chinese foreign trade grew 1.5 per cent year to year, it contracted in other countries for which the data are available. Turkey experienced the smallest contraction, Kyrgyzstan – the largest. In Kazakhstan, Kyrgyzstan the fall is comparable to one of 2015-2016, in Uzbekistan – exceeded it (Annex I Table I-2). Further contraction is in view as monthly data (Annex I Tables I-3, I-4), available so far for China, Kazakhstan, Kyrgyzstan and Turkey, show that while in China growth rates (year-on-year) were restoring and got positive in June, in the other three countries import, export or both accelerated their fall by May 2020.

Trade between countries along the corridor suffered due to COVID-19 pandemic restrictions. Despite visible exceptions of flows that did grow (because of being small and volatile or due to fall in prior years), most of the flows by directions seriously contracted in March – June 2020.

China's transport was hit most in the beginning of the year 2020 when accumulated road tonnage fell by over 27 per cent in January – February, but with restoration of economic activities the road traffic volume grew and for January – June accumulated tonnage was less than in 2019 by 9 per cent.[1] Railway traffic experienced less contraction, in January and April tonnage was less than in 2019 (by almost one and by 2.6 per cent), otherwise the tonnage grew slowly with accumulated railway tonnage January-May 2020 being by 0.8 per cent higher the same period of 2019. Railway freight turnover was below 2019 levels in March-May. In June, the railway traffic started recovering with both tonnage and ton-kilometres increased by 6.9 per cent and 5.5 per cent.[2]

Data of General Administration of Customs shows that in international transport, road traffic was hit more than railways: while number of inspected trains in first half of the year was 2.2 per cent (February) – 11 percent (March) lower than in respective months of 2019, number of inspected trucks dropped by 45 per cent (January – February) to by 69.6 per cent (June).[3]

Export and import of China in value terms were contracting more in the beginning of the year 2020. Export fell -17.2 per cent year-on-year basis in January – February, -13.3 per cent in March and returned to growth in June (0.5 per cent). Import value contracted less with most in May -8.2 per cent year-on-year and also reversed to grows in June (2.7 per cent).[4] In physical terms (tonnage), except for January-February when export was lower than in 2019, import and export were higher than in 2019 (2.4 to 8.1 per cent) and in June the growth was 29.1 per cent for import and 11 per cent to export year-on-year.[5]

Export to partner countries along the CCWA corridor in March-June 2020 was dropping sharply year-on-year basis by up to -60 per cent depending on country and month, except to Islamic Republic of Iran and Turkey trade value with which maintained growth. Value of import fluctuated by months and countries masking possible trends. In June 2020, reduction of export slowed down and for two countries export grew comparing with 2019.[6]

Growth of transport, storage and communication's industry in Islamic Republic of Iran calculated in constant prices 2011 slowed down since fourth quarter of 2018 till first quarter of 2020 and the import and export in

[1] Ministry of Transport, People's Republic of China, '2020 年 1 月,2 月,3 月,4 月,5 月,6 月公路货物运输量 (=Road Transport Volumes in January, February, March, April, May, June 2020)', 2020, http://www.mot.gov.cn/tongjishuju/gonglu/.

[2] National Railway Administration, '2020 年 1 月份,2 月份,3 月份,4 月份,5,月份 6 月份全国铁路主要指标完成情况 (=Status of Major Indicators of Railways Nationally in January, February, March, April, May, June 2020)', *Ministry of Transport of the People's Republic of China* (blog), 19 June 2020, http://www.mot.gov.cn/tongjishuju/tielu/.

[3] General Administration of Customs, People's Republic of China, '2020 年 2 月,3 月,4 月,5 月,6 月货运监管业务统计快报表', 2020, http://www.customs.gov.cn/customs/302249/302274/302275/9f806879-1.html.

[4] General Administration of Customs, People's Republic of China, '2020 年 1 至 2 月,3 月,4 月,5 月,6 月全国进出口总值表（美元值）'<http://www.customs.gov.cn/ > [accessed 25 July 2020].

[5] General Administration of Customs, People's Republic of China, '2020 年 2 月,3 月,4 月,5 月,6 月货运监管业务统计快报表'.

[6] General Administration of Customs, People's Republic of China, Monthly Statistics 2020 <http://www.customs.gov.cn/customs/302249/302274/302277/index.html>

constant prices 2011 are falling since first quarter 2019, so the analysis of impact of COVID-19 pandemic requires wating for later data[1].

In January - June 2020, Kazakhstan's transport and warehousing sector reduced almost 15 per cent in volume[2]. Total freight tonnage shows negative growth since February: -2 per cent to -17.4 per cent year-on-year basis; freight turnover fell less, by less than one per cent to by 5.5 per cent in March – June 2020.[3]

Foreign trade in January – May 2020 in monetary terms fell almost 7 per cent year-on-year basis; export shows negative growth in April – May 2020 by over 14 per cent to by almost 22 per cent and import reducing by 7 to by almost 22 per cent on year-on-year basis in March – May 2020.[4]

In January-May 2020, Kyrgyzstan's foreign trade value fell 22.7 per cent comparing to 2019 on the account of import contraction (31.8 per cent) while export fluctuating between exceeding and falling below last years' figures during these months overall grew 1.2 per cent. Trade value with CCWA Economic Corridor partner countries decreased except for Turkmenistan: trade with China plummeted to 36.1 per cent of the same in 2019, with other countries one third to almost one half was lost. Notably, trade with Turkmenistan, the smallest in its size (0.3 per cent in total foreign trade), doubled comparing with 2019 and while total trade with Islamic Republic of Iran and Tajikistan fell, imports grew 30.4 per cent and 10.4 per cent respectively.[5]

Road transport, main freight carrier in Kyrgyzstan (over 90 per cent of cargos), lost 30 per cent of volume (ton) in January-May 2020 compared with 2019 and almost 42 per cent in June 2020. Railways (about 6 per cent) lost only 4 per cent.[6]

Turkey's foreign trade started to slow down in February and reached reduction by over 30 per cent in total value year-on-year basis in April and March. Export (-41.5 per cent and -40.9 per cent in value) fell more than imports (-25.0 per cent, -27.8 per cent) over the same months.[7] In January – May 2020, the export from Turkey to every country along the CCWA Economic Corridor fell from -39 per cent (Turkmenistan) to -70 per cent (Islamic Republic of Iran); import from the countries dropped from -37 per cent (China) to -89 per cent (Islamic Republic of Iran).[8]

In Turkey, railway transport carries about one per cent of export or import in value terms and seems to be less affected by the pandemic so far. Import and export carried by railway continued to grow in value terms in January – March, there was reduction in railway export in May and in import in April. Road transport in 2020 carried about one sixth of Turkey's import and one third of export. Export by road started falling in March (-22 per cent in value terms year-on-year) and in April-May fell by 38 per cent each month. Import by road continues to grow in January-March, but started dropping in April (-28 per cent in value terms year-on-year) and May (-34 per cent). [9]

[1] Statistical Center of Iran, 'Quarterly National Accounts (1390-1398)', 22 June 2020, https://www.amar.org.ir/Portals/1/releases/sna/7.quarterly-national-accounts_1390-1398.xlsx.

[2]Ministry of National Economy of the Republic of Kazakhstan, Committee of Statistics. Growth Rate Of Sectors Of The National Economy (Volume Index, %) <https://stat.gov.kz/>[accessed 28 July 2020].

[3] Ministry of National Economy of the Republic of Kazakhstan, Committee of Statistics, 'Socio-Economic Development Of The Republic Of Kazakhstan, Monthly, February -June 2020', Various dates, https://stat.gov.kz/edition/publication/month.

[4] Ministry of National Economy of the Republic of Kazakhstan, Committee of Statistics.

[5] National Statistical Committee of the Kyrgyz Republic, 'Социально-экономическое положение Кыргызской Республики: январь-июнь 2020 (=Social economic situation of the Kyrgyz Republic: January - June 2020)' (Bishkek, 23 July 2020), http://www.stat.kg/media/publicationarchive/f3a60ffe-7ce2-4ddf-9c6f-7455948c26fd.doc.

[6] National Statistical Committee of the Kyrgyz Republic.

[7] Turkish Statistical Institute, 'Foreign Trade by Months, 2013-2020 (General Trade System)', 2020, http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=2884.

[8] Calculated based on data on export and import by countries from Turkish Statistical Institute < http://www.turkstat.gov.tr> as downloaded on 26 July 2020.

[9] Calculated based on data on export and import by mode of transport from Turkish Statistical Institute < http://www.turkstat.gov.tr> as downloaded on 26 July 2020.

Chapter II Improving connectivity in the CCWA and beyond

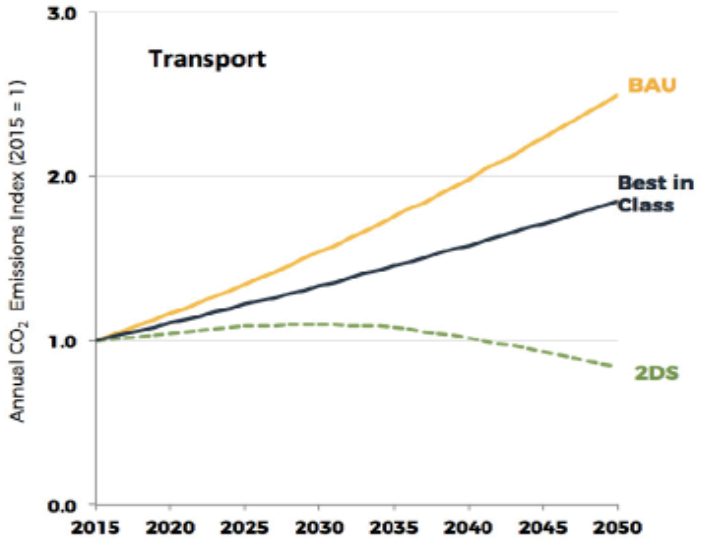
While infrastructure connectivity within the CCWA has made progress over the last years, more investments, coordination and cooperation are needed to accelerate infrastructure development. In order to achieve sustainable infrastructure connectivity in line with the United Nations SDGs, the challenges of green infrastructure development and the opportunities of green infrastructure finance will be described.

II.1 Green infrastructure development

Infrastructure development for freight transport has potential positive impacts on a number of sustainable development goals (SDGs), as mentioned above. However, with growing awareness regarding the risks of climate change and loss of biodiversity, it is important to take sustainability and green perspectives into consideration when investing in freight transport infrastructure. Particularly affected by infrastructure investment and freight transportation are SDG 13 (climate action), SDG 14 (life below water) and SDG 15 (life on land).

Risks on climate change are caused by an increase of emissions from improved transport connectivity and thus more freight transport. According to a recent study that looks at emission impacts of transport in the countries of the BRI (of which all CCWA countries are members), transport-related emissions are set to increase by 150 per cent in the business as usual (BAU) scenario within the next 35 years.[1] That means with current investment trends in transportation infrastructure, it will be impossible to meet the Paris climate accords. Even investing in best-in-class transport infrastructure technologies is set to increase emissions by 80 per cent by 2050 compared to 2015, while a 2 degree scenario (2DS) would require an emission reduction of at least 20 per cent (see Figure 10).

[1] Ma Jun and Simon Zadek, 'Decarbonizing the Belt and Road Initiative: A Green Finance Roadmap' (Beijing: Tsinghua University, September 2019), https://www.vivideconomics.com/wp-content/uploads/2019/09/Decarbonizing-the-Belt-and-Road-%E2%80%93Final-Report-English.pdf.



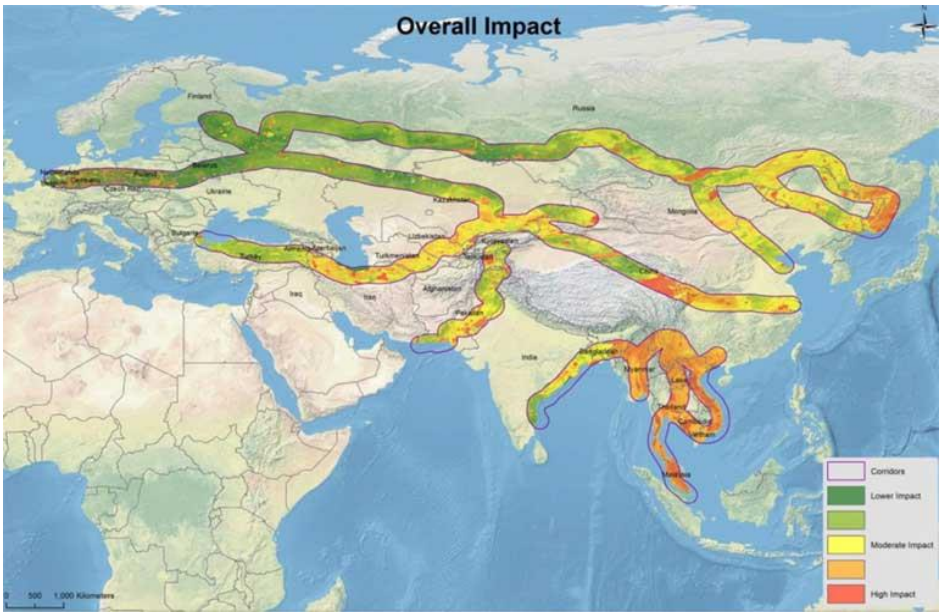
Note: 2DS - 2 degree scenario, BAU - business as usual.
Source: Ma and Zadek, "Decarbonizing the Belt and Road - a Green Finance Roadmap," 2019[1]

Figure 10 Impacts of transport investments in the BRI on CO2-emissions

Similarly worrying are transport infrastructure investments in regards to the protection of biodiversity. Transport corridors connecting China with Europe via the Russian Federation, Mongolia and Central and West Asian countries overlap with 265 threatened species including saiga antelopes, tigers and giant pandas, as well as 1,739 Important Bird Areas (IBA) or Key Biodiversity Areas (KBA) and 46 biodiversity hotspots or Global 200 Ecoregions.[2] As can be seen in Figure 11, infrastructure development along the CCWA has moderate to high risks of impacting biodiversity.

[1] Jun and Zadek.

[2] Nana Li and Evgeny Shvwarts, 'The Belt and Road Initiative - WWF Recommendations and Spatial Analysis', WWF Briefing Paper (Hong Kong: WWF, May 2017), http://awsassets.panda.org/downloads/the_belt_and_road_initiative___wwf_recommendations_and_spatial_analysis___may_2017.pdf.



Source: WWF, 2017.[1]

Figure 11 Risk of loss of biodiversity along major corridors.

Planning transport infrastructure should therefore minimize both climate and biodiversity risks through mitigation measures. At the same time, infrastructure needs also be planned with adaptation measures to cope with climate change, e.g. more extreme weathers such as storms, draughts, heat waves, which shows that road and rail infrastructure leads to a risk of deforestation, flooding, pollution and invasion of species (see Table 10).

[1] Li and Shvwarts.

Table 10 Impact of infrastructure on biodiversity loss

Industrial cause of impact (examples)	Direct risks	Indirect risks
– Linear infrastructure (e.g., roads, power lines) – Non-linear infrastructure (e.g., mining, hydrodams)	Deforestation	Ease of access to new hunting grounds Ease of trading of illegal goods Landslides Floods
– Hydrodams – Sealing of surfaces (e.g., through roads, rail)	Flooding	Landslides
– Power generation (e.g., through cooling)	River temperature increase	Increased evaporation Change in rain patterns
– Mining and use of raw materials for construction (e.g., karst)	Loss of natural resources	
– Mining – Emissions from transport – Emissions from energy generation	Pollution (air, water)	
Transport industry (that carries animals/plants by accident or as cargo) Ease of travel for invasive species through de-forestation and linear infrastructure	Invasion of species	

Source: by Dr. Christoph Nedopil.

Planning transport infrastructure should therefore minimize both climate and biodiversity risks through mitigation measures. At the same time, infrastructure needs also be planned with adaptation measures to cope with climate change, e.g. more extreme weathers such as storms, draughts, heat waves).[1]

In order to improve sustainability and minimize environmental impacts of present and particular future infrastructure construction, a number of steps need to be taken. These steps are both relevant to safeguard minimum standards and ideally improve outcomes to even higher levels. Particularly multilateral development banks, such as the IFC or World Bank, have issued detailed guidelines on ensuring sustainable infrastructure development along the project lifecycle in different industries (e.g. ESG Resources for Companies)[2] and engage investors (e.g. through the Equator Principles).[3] Generally, the steps for insuring sustainable infrastructure development include:

1. Plan infrastructure investments in an integrative manner, including integrated planning between modes of transport such as road, rail, shipping (which are often the responsibility of different ministries or departments, as well as different levels of administration, such as national, provincial or even local). This will increase the overall efficiency and reduce cost.
2. Conduct and publish environmental (and social) impact assessments (ESIA). This should be required by either planning authorities, financial institutions, insurers etc. to be conducted by the project owners, such as private constructors, investors, public private partnerships (PPP) and state-owned enterprises (SOEs). This will both improve quality, reduce cost and increase public participation and cooperation.

[1] United Nations ESCAP, 'Review of Sustainable Transport Connectivity in Asia and the Pacific 2019: Addressing the Challenges for Freight Transport'.

[2] International Finance Corporation (IFC), 'ESG Resources for Companies - Sustainable Infrastructure', 2020, https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Company-Resources/Sustainable-Infra/Sustainable-Infrastructure.

[3] Equator Principles Association and International Finance Corporation (IFC), 'Equator Principles July 2020', July 2020, www.equator-principles.com.

3. Coordinate and engage with local stakeholder groups to maximize cooperation and support from local communities to minimize public resistance against the project.
4. Coordinate with international organizations (e.g. Central Asia Regional Economic Cooperation (CAREC), ESCAP, the United Nations ECE) to increase connectivity within the corridors.
5. Apply highest standards of multilateral development banks for conducting project appraisal (e.g. IFC Performance Standards, e.g. Performance Standard 6 on Biodiversity[1]) to ensure that project is able to be electable for a broad range of funders and to minimize environmental harm.
6. Require a safeguard management mechanism to monitor proper environmental conduct and ensure compensation for environmental (and social) damages done.
7. Engage multilateral development banks (e.g. Asian Development Bank (ADB), European Investment Bank (EIB), International Finance Corporation (IFC), Asian Infrastructure Investment Bank (AIIB)) and national development agencies (e.g. KfW, Agence Française Development (AFD), Department for International Development, United Kingdom, (DFID), China Eximbank) to improve funding.
8. Monitor project implementation according to local laws and international standards, as well as the project-specific environmental impact mitigation measures through independent and accredited sources.

II.2 Sustainable infrastructure finance

Financing sustainable transport infrastructure continues to be a challenge, with financing gaps being said to be to be about USD 8.4 trillion in Asia and the Pacific[2] (including urban transport). A number of challenges to financing sustainable infrastructure are highlighted across the literature, particularly in emerging economies.[3] Amongst the most frequently raised issues is the lack of transparency in the development of infrastructure project pipelines due to a lack of project structuring and financing capabilities. Furthermore, project development costs and the role of public support at the early stage of the project cycle is insufficient, especially in developing countries with less mature financial markets. Additionally, the lack of comparable historical performance data of sustainable infrastructure projects presents a challenge to investors who today find it difficult to accurately estimate risk of sustainable versus un-sustainable projects. Finally, capacity and availability of both public and private investors willing to invest in sustainable infrastructure is often lacking, also due to the risks perceived in investing in these countries.

In order to tackle these challenges and accelerate sustainable infrastructure investments that contributes to the SDGs and the Paris agreement on limiting climate change, five financing strategies should be considered:

1. Multilateral and bilateral development banks play a critical role in de-risking infrastructure investments. On the one hand they can finance the identification of bankable projects through feasibility studies and green infrastructure facilities. On the other hand, they can support capacity building to increase efficient allocation of available funds (e.g., infrastructure planning and oversight capacity). Finally, these development finance institutions can provide policy support and capacity building to countries in order to improve national (green) finance systems that attract more international private investors.

[1] International Finance Corporation (IFC), 'Performance Standards on Environmental and Social Sustainability' (World Bank Group, January 2012), https://www.ifc.org/wps/wcm/connect/24e6bfc3-5de3-444d-be9b-226188c95454/PS_English_2012_Full-Document.pdf?MOD=AJPERES&CVID=jkV-X6h.

[2] Asian Development Bank, 'Experts Discuss Bridging Funding Gap for Asia's $8.4 Trillion Transport Needs', 12 September 2018, https://www.adb.org/news/experts-discuss-bridging-funding-gap-asias-84-trillion-transport-needs.

[3] Asian Development Bank, Asian Financial Development Report on Infrastructure Finance (Manila, 2019); World Bank Group, Infrastructure Connectivity. Japan G20 Development Working Group, January 2019 <https://www.oecd.org/g20/summits/osaka/G20-DWG-Background-Paper-Infrastructure-Connectivity.pdf>;
A-M Bor, G Duke, and J Kisielewicz, Positive Impact Finance for Business & Biodiversity (Brussels: European Union, 2018) <http://ec.europa.eu/environment/biodiversity/business/assets/pdf/Positive_Impact_Finance-EU_Business_Biodiversity_Platform_2018.pdf>.

2. Blended finance instruments should be used to further de-risk projects and mobilize private participation. Blended finance instruments combine concessionary finance (e.g., from development banks, governments, donors) with non-concessionary finance (e.g., investors, banks) that allows for an overall lower economic return of a project.
3. Green financial instruments should be used to improve participation of local and private investors. Among them, green bonds are a promising instrument as they are the most mature green finance instrument in regard to investor interest and global standards (other green finance instruments include, for example, green loans, green credit. These are, however, less developed). While the greatest green investment potential into green bonds is located in global capital markets, the challenges of accessing these capital markets for emerging market players can be overcome in different ways, e.g., through participation of anchor investors (including sovereign investors, development banks) and a further opening-up of financial markets.
4. United Nations ESCAP, CAREC, the BRI and other organizations and initiatives working to promote connectivity in the region can support coordination of investments, as well as standard setting to lower infrastructure development costs. Each of them, however, is likely to attract different kinds of investors. CAREC, with the ADB as its secretariat, can more easily accelerate global investment, while the BRI, for example, is so far mostly a bilateral investment stream between China and the recipient country.
5. Shared and transnational standards can define and guide how to implement sustainable infrastructure projects, which further attracts global investors. This can be done practice by utilizing environmental and social safeguards for infrastructure projects, and by (clarifying the sustainability "best practice" by industry sector, geography, and/or organization type. In setting up such standards, intergovernmental organizations can play a key role based on their authority, mandate, and convening capabilities.

UNCTAD has provided a sustainable freight transport infrastructure and financing toolkit, which also highlights specific aspects from public-private partnerships for infrastructure finance, and improving environmental performance.[1]

II.3 An indicator set to measure sustainable infrastructure connectivity in the CCWA and beyond

Infrastructure connectivity matters for seamless and efficient global value chains to function. It is a foundation of the modern economy that is characterized by global trade, division of labor and fragmentation of production.

EXISTING FRAMEWORKS TO MEASURE INFRASTRUCTURE CONNECTIVITY

Measuring international infrastructure connectivity is difficult. A number of models exist that aim to provide measures to compare infrastructure connectivity and encourage stakeholders to collect, share and publish a specific set of data. Some of those infrastructure connectivity frameworks are listed in Table 11:

Table 11 Selected infrastructure connectivity frameworks

Name	Content
UNCTAD Framework for Sustainable Freight Transport (SFT)[2]	Provides a modular step-by-step process that details how to plan, design, develop and implement tailored sustainable freight transport strategies. With its key performance indicators (KPIs), more than 250 indicators related to sustainable freight transport

[1] UNCTAD, 'UNCTAD Sustainable Freight Transport and Finance Training Toolkit – UNCTAD SFT Portal', 2016, https://unctadsftportal.org/sftftoolkit/.

[2] UNCTAD, 'UNCTAD Framework for Sustainable Freight Transport (SFT Framework)' (New York and Geneva: UNCTAD, 2017), https://www.sft-framework.org/UNCTAD-SFT-Framework.pdf.

Name	Content
	are listed. The KPIs are brought together from a variety of sources.
Connectivity Utility Model[1]	Assesses the connectivity of an airport, a train station, a city or a region in multi-modal transport networks involving multiple quality dimensions of transport services. This new connectivity measure considers both direct connections, and single- and multi-modal indirect connections.
World Bank Logistics Performance Index[2]	Measures the performance of trade logistics across a number of qualitative and quantitative factors collected through surveys of operators.
ADB Economic Corridor Development[3]	Practical analysis of corridors and characteristics.
European Union Transport and Environment Reporting Mechanism (TERM)[4]	Published since 2000, this indicator provides an overview of transport demand and pressures from the sector on the environment, as well as selected related impacts and policy responses, particularly within EU countries. Focuses on air pollution, greenhouse gas emissions, freight volumes and modal split, size and age of fleets etc.
European Union Scoreboard[5]	Compares and evaluates EU countries' transport infrastructure within four main indicators (internal market, investment and infrastructure, energy union & innovation, as well as people), using publicly available data (e.g. World Economic Forum Global Competitiveness Report).
Bangkok 2020 Declaration for Environmentally Sustainable Transport (EST)[6]	Consisting of 20 goals with 105 indicators along avoid-shift-improve for transport with voluntary reporting.
ASEAN sustainable transport indicators[7]	Set of 33 quantitative variables for sustainable transport, covering both freight and passenger transport with details on measurement.
OECD/ITF Transport Benchmarking Indicators[8]	Set of quantitative indicators to be collected for measurement and comparison of sustainable transport, spanning seven topics (transport infrastructure, transport equipment, transport measurement, traffic, economic and social, safety, energy and environment).
Green Corridor Portal[9]	A set of 12 green transport corridor indicators to measure general performance.
US Federal Highway Administration Improvements in the Movement of Highway and Intermodal Freight Indicators[10]	An quantitative indicator set spanning mostly reliability, speed and safety measures.

Source: by Dr. Christoph Nedopil.

In addition, other institutions and authors have identified a number of specific benchmarks to measure or contribute to measurement of infrastructure connectivity, such as the Intermodal Freight Transport

[1] Zhenran Zhu, Anming Zhang, and Yahua Zhang, 'Measuring Multi-Modal Connections and Connectivity Radiations of Transport Infrastructure in China', *Transportmetrica A: Transport Science* 15, no. 2 (29 November 2019): 1762–90, https://doi.org/10.1016/j.ijtst.2018.11.004.

[2] World Bank, 'About | Logistics Performance Index', 2018, https://lpi.worldbank.org/about.

[3] Brunner, 'What Is Economic Corridor Development and What Can It Achieve in Asia's Subregions?'

[4] European Environment Agency, Evaluating 15 Years of Transport and Environmental Policy Integration: TERM 2015: Transport Indicators Tracking Progress towards Environmental Targets in Europe (Luxembourg: Publications Office, 2015) <http://bookshop.europa.eu/uri?target=EUB:NOTICE:THAL15007:EN:HTML>.

[5] Mobility and Transport - European Commission, 'EU Transport Scoreboard' (European Union, 24 October 2016), https://ec.europa.eu/transport/facts-fundings/scoreboard_en.

[6] ASEAN and GIZ, *Sustainable Land Transport Indicators on Energy Efficiency and Greenhouse Gas Emissions in ASEAN* (Jakarta: ASEAN Secretariat, 2019), https://asean.org/storage/2019/03/Sustainable-Transport-Indicators-ASEAN-Final.pdf.

[7] ASEAN and GIZ.

[8] Rachele Poggi, *Transport Benchmarking Indicators* (Paris: OECD, 2016), https://www.itf-oecd.org/sites/default/files/docs/item_6.4_transport_indicators.pdf.

[9] Green Corridor Portal, 'Benchmarking of the Core Network Corridors | Green Corridor Portal', 2016, https://greencorridorportal.org/key-performance-indicators/benchmarking-of-the-core-network-corridors/.

[10] Federal Highway Administration and Hagler Bailly Services, 'Measuring Improvements in the Movement of Highway and Intermodal Freight - FHWA Freight Management and Operations', 2000, https://ops.fhwa.dot.gov/freight/freight_analysis/measure_rpt.htm.

benchmark by OECD,[1] or for OECD's measure for intermodal corridors.[2] Also, ESCAP has provided connectivity indicators[3] based on the APEC model for transport connectivity,[4] as well as a more detailed indicator measuring corridor connectivity.[5] Finally, CAREC monitors and assesses the efficiency of the six CAREC transport corridors that link the 11 CAREC country members—Afghanistan, Azerbaijan, the People's Republic of China, Georgia, Kazakhstan, the Kyrgyzstan, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan.[6]

These models offer guidance and practical tools to stakeholders from both the public and the private sector across all modes of transport to provide the basis to evaluate the status quo, promote sustainable freight transport systems and track progress.

A NEW INDICATOR TO SIMPLIFY MEASUREMENT

It is suggested to develop an indicator that measures how infrastructure supports ***sufficient, interoperable, fast, easy, safe, cheap, green, reliable, resilient and social*** international freight transportation and how well countries cooperate to achieve infrastructure connectivity.

Existing infrastructure connectivity frameworks typically have two shortcomings that make the development of a new indicator relevant:

- First, there is currently no indicator measuring the overall performance in regards to sustainable, international, multimodal transport connectivity, a new indicator becomes necessary.[7]
- Second, many of the measures and frameworks struggle with data availability. For example, the World Bank's LPI is lacking data for some of the most current data for the CCWA economies, while the EU TERM also struggles with data completeness in more developed countries.[8] Particularly, very specific indicators are often too hard to report due to weaker local capacities (e.g. the Framework for Sustainable Freight Transport Key Performance Indicator "percent of bridges that meet good and poor structural condition targets" is one such example where data is hard to get by).

Therefore, the new indicator needs to integrate and build on existing indicators to make use of available measures and data. It also must overcome the challenge of lacking data to express the state of development. The indicator should also support the measurement of infrastructure connectivity not by its weakest knot, but by the sum of its strengths and weaknesses. This will help to improve network quality through identification of and enhancement of weak connections.[9]

Accordingly, an assessment methodology that has been informed by different assessment tool and has been enriched with sustainable infrastructure performance indicators is being proposed. In order to overcome the issue of data availability and quality, the indicators are only asking binary (yes/no) question. This makes both the application of the indicators easier and the identification of weaknesses of the system more transparent. At the same time, this makes it possible to build a differentiated picture of the state of sustainable infrastructure connectivity along the different variable sets.

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[1] OECD, *Benchmarking Intermodal Freight Transport* (Paris: OECD, 2002).

[2] Carlos Martner and Gabriela Carcia, 'Performance Measurement for Intermodal Corridors: A Methodological Approach.' (Roundtable on Logistics Development Strategies and their Performance Measurement, Mexico: OECD, n.d.), https://www.itf-oecd.org/sites/default/files/docs/martner.pdf.

[3] United Nations ESCAP, 'Review of Sustainable Transport Connectivity in Asia and the Pacific 2019: Addressing the Challenges for Freight Transport'.

[4] APEC, 'The Economic Impact of Enhanced Multimodal Connectivity in the APEC Region', 2010, https://www.apec.org/Publications/2010/06/The-Economic-Impact-of-Enhanced-Multimodal-Connectivity-in-the-APEC-Region.

[5] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[6] Asian Development Bank, CAREC Corridor Performance Measurement And Monitoring Annual Report 2018 (Mandaluyong City, Philippines: Asian Development Bank, 2019), <https://www.adb.org/sites/default/files/publication/536721/carec-cpmm-annual-report-2018.pdf> [accessed 3 May 2020].

[7] World Bank Group, 'Infrastructure Connectivity. Japan G20 Development Working Group'.

[8] European Environment Agency, *Evaluating 15 Years of Transport and Environmental Policy Integration: TERM 2015 : Transport Indicators Tracking Progress towards Environmental Targets in Europe*.

[9] MTI Global Practice et al., *Connectivity Along Overland Corridors of the Belt and Road Initiative. Discussion Paper* (Washington: World Bank, 2018), http://documents.worldbank.org/curated/en/264651538637972468/pdf/130490-MTI-Discussion-Paper-6-Final.pdf.

SUSTAINABLE INFRASTRUCTURE CONNECTIVITY INDICATOR (SICI)

The following Table 12 gives an overview of the different indicators of the sustainable infrastructure connectivity indicator along the 11 dimensions. The indicator is calculated first independently for rail and road transport by filling in "1" for a positive answer and "0" for a negative answer in the open fields. Each category is then added up for a total value of each category and for the overall sum. In the category "sufficient", for example, road transport can have a maximum value of 4, rail can have a maximum value of 6, making the maximum value for the "sufficient infrastructure connectivity" 10.

Table 12 Sustainable Infrastructure Connectivity Indicator (SICI)

Target	Key Performance Indicator	Road	Rail	Sources
Sufficient	Is the carrying capacity of road sufficient to transport the current and expected goods on the road?			SFT, Network and infrastructure related performance measures/indicators
	Is the carrying capacity of rail sufficient to transport the current and expected goods on the rail?			SFT, Network and infrastructure related performance measures/indicators
	Is the rolling stock of the rail network (engines, vehicles) sufficient to transport current and expected goods?			SFT, Network and infrastructure related performance measures/indicators
	Is the capacity of intermodal facilities sufficient to handle current and expected goods?			SFT, Network and infrastructure related performance measures/indicators
	Are intermodal facilities infrastructure conditions and equipment adequate for current and expected freight transport?			SFT, Network and infrastructure related performance measures/indicators
	Is the capacity of the border crossing sufficient to handle current and expected goods within less than 4 hours (e.g., regards to availability of space, personnel)?			SFT, Network and infrastructure related performance measures/indicators
	Is the railroad consistently sufficient to carry railcars of gross weight 130 metric ton and more.			SFT, Network and infrastructure related performance measures/indicators
	Total value sufficiency	**x/4**	**x/6**	**Sum of total sufficiency: x/10**
Interoperable	Are the standards for freight trucks (dimension) identical or interoperable between the two countries in question?			ESCAP, CAREC
	Can freight trucks operate seamlessly in the two countries in question?			ESCAP, CAREC
	Are the standards for rail (e.g., gauge, container sizes) identical or interoperable between the two countries?			ESCAP, CAREC
	Can freight train wagons operate seamlessly in the two countries in question?			ESCAP, CAREC
	Can freight train engines operate seamlessly in the two countries in question?			ESCAP, CAREC
	Is the rail corridor in question electrified?			ESCAP, CAREC
	Total value interoperability	**x/2**	**x/4**	**Sum of total interoperability: x/6**
Easy	Are bill of laden documents accepted by the countries in question?			ESCAP, CAREC
	Is there one freight insurance that is sufficient to insure freight across the countries in question?			ESCAP, CAREC
	Are the documents for vehicles to operate in two countries standardized?			ESCAP, CAREC
	Are the documents for the driver standardized and transferrable between two countries?			ESCAP, CAREC
	Total value easiness	**x/4**	**x/3**	**Sum of total easiness: x/7**
Safe	Is less than 0.01% of the freight on average lost or damaged?			OECD
	Are there sufficient truck rest areas for current and predicted traffic?			SFT, Network and infrastructure related performance measures/indicators
	Is the ISO 9001 for dangerous goods properly implemented?			EU TERM

Target	Key Performance Indicator	Road	Rail	Sources
	Is the truck crash rate lower than 500 per billion km travelled?			SFT, Network and infrastructure related performance measures/indicators, Canadian Vehicle Safety best practice[1]
	Total value safety	**x/4**	**x/2**	**Sum of total safety: x/6**
Reliable	Are there at least 1 alternative routes to cope with unforeseen events?			Connectivity Utility Model
	Are incidents (e.g., accidents, mudslides, spills) cleared within reasonable time?			SFT, Network and infrastructure related performance measures/indicators
	Are irregular payments happening, e.g., at border crossing, safety checks, …?			CAREC
	Are more than 85% of roads on the corridor at least in good condition (e.g., bridges, potholes, marking, signage)?			SFT, Network and infrastructure related performance measures/indicators, CAREC
	Are more than 85% of rails on the corridor at least in good condition (e.g., bridges).			SFT, Network and infrastructure related performance measures/indicators, CAREC
	Total value reliability	**x/4**	**x/4**	**Sum of total reliability: x/8**
Fast	Are more than 80% of the corridor length meeting the speed targets?			SFT, Network and infrastructure related performance measures/indicators
	Is the average road speed with delays (SWD) higher than 26 km/h?			CAREC (in 2019 SWD is 22.6 km/h, without delays 43.6 km/h[2])
	Are less than 10% of the rail network operating at lower than 40 km/h?			EU TERM, CAREC
	Is the average speed with delays (SWD) higher than 22 km/h?			CAREC (in 2019 SWD is 22.6 km/h[3])
	Are services/arrival times of rail services per day sufficient for current and estimated freight volumes?			Rong Zhang et al., 'Reliability Analysis on Railway Transport Chain' [4]
	Are weighing stations operating efficiently?			U.S. Federal Highway Administration[5]
	Are transfer time between transport modes less than X hours?			
	Is the average waiting time at toll plazas less than X hours?			U.S. Federal Highway Administration
	Are delays adding more than 10% of target times?			U.S. Federal Highway Administration
	Is the clearing time at border crossing points less than 4 hours (road) and 13 hours (rail)?			CAREC top 25% in the region
	Is the time for border compliance for export less than 12 hours?			World Bank top 25% in the region
	Is the time for document compliance for export less than 8 hours?			World Bank top 25% in the region
	Total value speed	**x/9**	**x/8**	**Sum of total speed: x/17**
Cheap	Is the cost per 500 km and 20-ton cargo lower than 700 USD?			CAREC median cost is USD 762 (2019)[6]
	Is the cost per 500 km and 20-ton cargo lower than 700 USD?			CAREC median cost is USD 646 (2019) [7]
	Is one freight insurance sufficient to insure freight across the countries in question?			ESCAP
	Is one driver insurance sufficient to insure freight across the countries in question?			ESCAP

[1] *Canadian Motor Vehicle Traffic Collision Statistics: 2017* (Government of Canada, Transport Canada, 2019), https://www.tc.gc.ca/eng/motorvehiclesafety/canadian-motor-vehicle-traffic-collision-statistics-2017.html.

[2] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2019*.

[3] Asian Development Bank.

[4] Rong Zhang, Lu Li, and Wenliang Jian, 'Reliability Analysis on Railway Transport Chain', *International Journal of Transportation Science and Technology* 8, no. 2 (June 2019): 192–201, https://doi.org/10.1016/j.ijtst.2018.11.004.

[5] Federal Highway Administration and Hagler Bailly Services, 'Measuring Improvements in the Movement of Highway and Intermodal Freight - FHWA Freight Management and Operations'.

[6] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2019*.

[7] Asian Development Bank.

Target	Key Performance Indicator	Road	Rail	Sources
	Is one vehicle insurance sufficient to insure freight across the countries in question?			ESCAP
	Is the cost of border compliance less than 250 USD			World Bank top 25% in the region
	Total value price	**x/5**	**x/3**	**Sum of total price: x/8**
Green	Do the transport modes rail or ship have more than 30% of the mode split along the corridor?			EU TERM
	Are nodes and links located less than 10km from the corridor to optimize supply chain structure?			Rong Zhang et al., 'Reliability Analysis on Railway Transport Chain'[1]
	Are emission standards Euro V or higher?			
	Are noise emissions caused by freight transport in urban areas less than 50-55 db(A)?			BEST[2]
	Are fuel quality standards higher Euro 4?			
	Are sufficient alternative fuelling stations available to significantly increase alternative fuel use?			SFT
	Are measures to prevent water pollution resulting from freight transport activity (e.g., oil or chemical spills) sufficient to avoid environmental harm?			IFC Standard
	Is biodiversity protected to the establishment of buffer zones and no violation of key biodiversity areas through land use (e.g., roads, facilities)?			IFC Standard
	Is the emission factor of the railway below 0,14 kg/unit CO2, 0,008 g/unit CH4, 0,003 g/unit N2O?			U.S. Environmental Protection Agency standard[3]
	Are empty runs below 20%?			EU Average is 12.3%[4]
	Are environmental laws enforced through regular checks and controls?			
	Total value greenness	**x/10**	**x/8**	**Sum of total greenness: x/18**
Resilient	Have adverse event scenarios been developed?			Rong Zhang et al., 'Reliability Analysis on Railway Transport Chain'[5]
	Is the system ready to cope with adverse events by providing alternatives?			Leviäkangas Pekka and Aki Aapaoja, 'Resilience of Transport Infrastructure Systems'[6]
	Total value resilience	**x/2**	**x/2**	**Sum of total resilience: x/4**
Social	Has an efficient disease control been established at the border?			ESCAP
	Are working conditions according to ILO standards?			
	Are working conditions according to ILO standards?			
	Total value social	**x/3**	**x/3**	**Sum of total social: x/6**
Cooperative	Does a cluster development agent exist for the countries in question?			ESCAP
	Does a framework for cluster development exist for the countries in question?			ESCAP
	Does a corridor agreement exist for the countries in question?			ESCAP
	Does a corridor secretariat exist for the countries in question?			ESCAP
	Does a corridor management institute exist for the countries in question?			ESCAP
	Do the countries in question share an economic corridor?			ESCAP

[1] Zhang, Li, and Jian, 'Reliability Analysis on Railway Transport Chain'.

[2] Jarl Schoemaker et al., 'Quantification of Urban Freight Transport Effects I', *Best Urban Freight Solutions*, October 2006, http://www.bestufs.net/download/BESTUFS_II/key_issuesII/BESTUF_Quantification_of_effects.pdf.

[3] US Environmental Protection Agency, *Emission Factors for Greenhouse Gas Inventories*, n.d.

[4] EUROSTAT, 'Road Freight Transport by Journey Characteristics - Statistics Explained', December 2019, https://ec.europa.eu/eurostat/statistics-explained/index.php/Road_freight_transport_by_journey_characteristics.

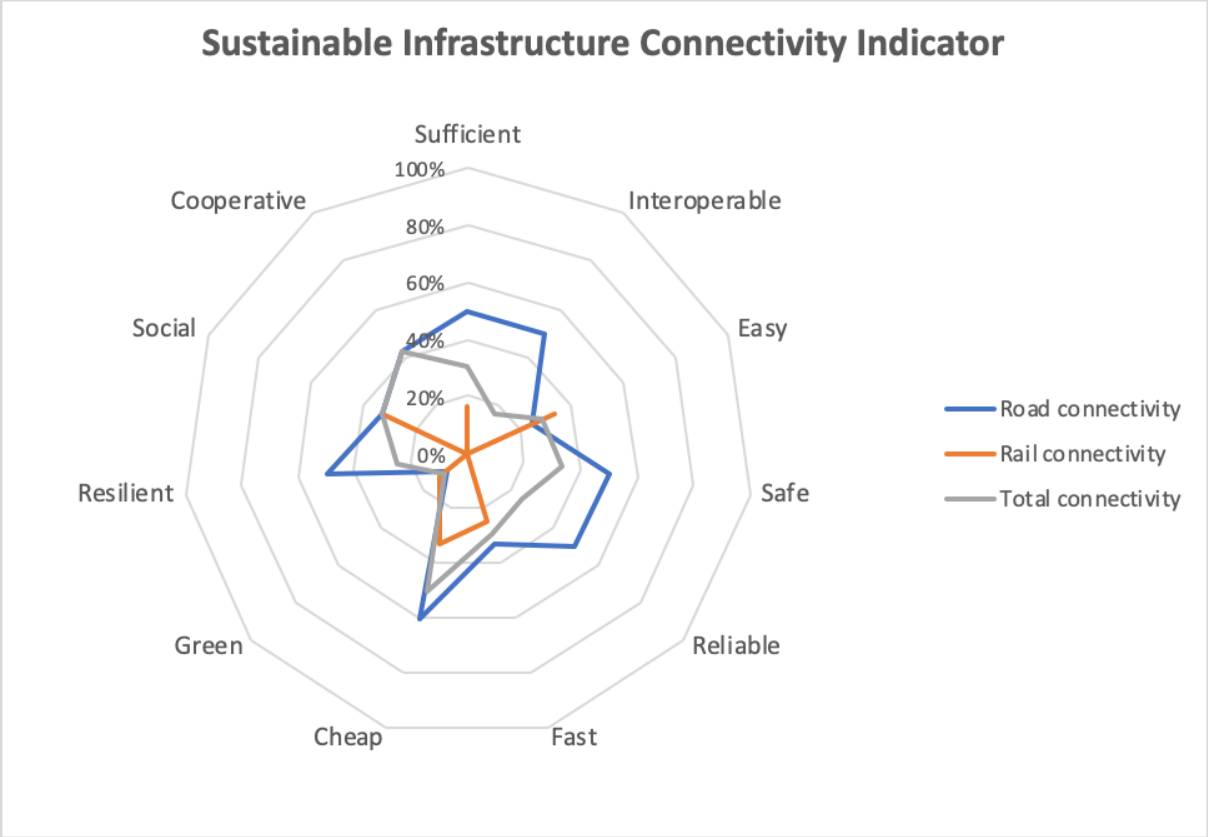
[5] Zhang, Li, and Jian, 'Reliability Analysis on Railway Transport Chain'.

[6] Leviäkangas Pekka and Aki Aapaoja, 'Resilience of Transport Infrastructure Systems', *CSID Journal of Infrastructure Development* 1, no. 1 (1 October 2018): 80, https://doi.org/10.32783/csid-jid.v1i1.11.

Target	Key Performance Indicator	Road	Rail	Sources
	Are data, e.g., customs, shared between the countries (e.g., WCO Globally Networked Customs, ASYCUDA)?			ESCAP
	Total value cooperation	**x/7**		**Sum of total cooperation: x/7**
	Total value indicator			**Sum of total: x/97**

Source: by Dr. Christoph Nedopil.

The application of the SICI is partly relying on external data (e.g., cost of different services) that should be more easily available due to existing data providers and queries, and partly on self-evaluation (e.g., many sufficiency indicators). The resulting net-diagram is shown in Figure 12.



Source: Dr. Christoph Nedopil.

Figure 12 Example net diagram of the Sustainable Infrastructure Connectivity Indicator

The SICI should serve as a tool for constant improvement. It is therefore not to be understood as a static measure, but requires regular application and evaluation.

II.4 Policy recommendations for sustainable connectivity along the CCWA Economic Corridor

Of the eight CCWA countries, five are landlocked countries, making coordination of the countries' investments and operations of soft and hard connectivity paramount.

In order to achieve inclusive and sustainable transport development in accordance with United Nations' General Assembly resolution of 2014[1] and to accelerate the progress of the CCWA corridor into economic corridor [2] with a focus on green infrastructure, a number of recommendations are derived from the research in three dimensions:

- Hard infrastructure connectivity

  Hard infrastructure for transport in the CCWA countries and between the CCWA countries, such as roads and railways, border crossings need upgrading and improvement. For example, facilitating break-of-gauge operations between China and the Central Asian countries by technological solutions, closing railway missing links such as the one between China and Tajikistan. Other countries' railways require various improvements from track maintenance, electrification, double tracking, to rolling stock and dry ports construction.

- Operational connectivity

  Operations connectivity or soft infrastructure also needs upgrading. Inefficient border procedures that some time differ at the two sides of a border, inadequate equipment or insufficient facilities cause significant delays and increased costs for border crossing at some borders. CCWA Economic corridor might benefit from wider adoption of solutions for seamless transit, of information exchange between Customs to minimize the border checks, and other digital solutions for transport and trade mushrooming recent years.

- Corridor managements and coordination

  Coordination of policies and development plans for between the CCWA countries is not a fully institutionalized. Rather, the CCWA countries are members of multiple corridors, bilateral, regional and international initiatives and agreements. This lack of a common institution in the CCWA makes coordination and agreement more difficult for the CCWA corridor.

HARD INFRASTRUCTURE CONNECTIVITY

In order to upgrade hard infrastructure connectivity in and between the CCWA countries, hard infrastructure investments in all dimensions are required – from road to rail, from dry ports to border crossings. The focus for further investments should be on existing gaps or weak links, which are particularly salient in the CCWA.[3]

Thus, efforts should be first concentrated on increasing efficiency of existing infrastructure and on planning and operational capacity of decision makers (e.g. the Khorgos border crossing is already well established, but needs further upgrades in its capacity). This also includes investment in transport assets, particularly rail wagons, to overcome shortages of rail wagons, e.g. at Khorgos, Dostyk, Altynkol (Kazakhstan-China border).[4]

In regard to rail infrastructure, CCWA countries should upgrade the single-tracked and non-electrified tracks. Investments should be accelerated to electrify and provide double-tracks for existing lines to increase rail capacity. In some countries of the CCWA, construction of new rail infrastructure would be beneficial, such as to connect the Northern and Southern railway lines in Kyrgyzstan or connect Tajikistan's and Kyrgyzstan's railway to China. Special consideration should be given to optimal way to organize the rail gauge break operations between China and its neighbouring countries.

Also, upgrading linear road infrastructure is important for the further development of the CCWA connectivity. Roads in many of the central Asian countries tend to be in poor conditions and due to the geological, alpine challenges, planning and maintenance of roads requires advanced capacities.

[1] United Nations General Assembly, 'Role of Transport and Transit Corridors in Ensuring International Cooperation for Sustainable Development, A/RES/69/213 § (2014)', n.d., https://unctad.org/meetings/en/SessionalDocuments/ares69d213_en.pdf.

[2] UN-OHRLLS and Maeti, 'Report on Best Practices for Effective Transit Transport Corridor Development and Management (Draft Version)'.

[3] MTI Global Practice et al., *Connectivity Along Overland Corridors of the Belt and Road Initiative. Discussion Paper*.

[4] Asian Development Bank, 'CAREC Corridor Performance Measurement & Monitoring Annual Report 2017' (Mandaluyong City, Metro Manila, Philippines, 2019).

Next, a focus should be put to develop and operate transport nodes or intermodal freight hubs with a particular focus on the consolidation of small flows (e.g. with trucks) to create critical masses required to achieve economies of scale (hub-and-spoke economic corridor development model). This is particularly important in the CCWA due to low population and economic activity density.[1]

To finance infrastructure investments, which tend to be long-term and risky, more innovative and diverse financial instruments should be employed. They include blended finance instruments that allows for a mixture of concessionary and non-concessionary finance that crowds in private sector participation. At the same time, the integration of multilateral development banks for finance not only allows possibly for concessionary loans (in combination with blended finance), but ensures high sustainability standards both in terms of environmental and social safeguards. Ideally, the financing also comes in combination with capacity building programs for infrastructure planning and operation that allows to employ better standards and increase efficiency, safety and reliability. Also, green finance instruments (e.g. green bonds) should be used to tap global capital markets for new funds that are sustainably aligned.

In order to amortize investments in linear infrastructure such as roads and railways better, planning and operation should be better integrated between freight and passenger transport. This will lead to both higher efficiencies of shared resources and lower investments for each aspect.

SOFT INFRASTRUCTURE CONNECTIVITY

Soft infrastructure, such as cross-border and transit transport process management, is often underdeveloped between the countries of the CCWA corridor. Soft infrastructure connectivity should therefore be improved to decrease both administrative burden of border crossings for freight and vehicles, as well as improve the speed of border crossings.

CCWA countries should benefit, for example, by applying the Cross-Border and Transit Transport Process Management Toolkit by UNCTAD, United Nations ESCAP and ECA[2] and the CAREC Advanced Transit System (CATS).[3] This should help increase local capacity to improve efficiency at cross-border transit.

Ideally, CCWA countries should also strive for more integrated and broader application of information and communication technologies (ICT) across the corridor enabling the information exchange between the national systems forming the “digital transport corridor” or data pipeline on transit cargos and vehicles minimizing the need for additional Customs or security checks. This would not only increase efficiency of transport (e.g., by reducing traffic obstructions and increase predictability of services), but also reduce irregularities (e.g., through better tracking, digital bill of laden, recorded safety checks to reduce repeat-safety checks, single-window operations). CCWA countries could join the ASYCUDA’s programme for effective customs administration[4] or WCO’s Globally Networked Customs[5] should be strengthened in the CCWA corridor.

Elements of digital infrastructure for the CCWA Economic Corridor might include: information exchange between Customs of the countries and joint control of vehicles, seamless transit solutions (eTIR-carnet, other electronic seals transit solutions used by countries), authorised economic operator programs and their mutual recognition across the corridor, road permits issuing and control of usage, etc.

In order to accelerate and streamline cross-border movement of freight, operators and authorities working in the CCWA, countries could profit from systems like the authorised economic operator (AEO) program with mutual recognition of AEO status multilaterally across the economic corridor. The AEO concept is one of the main building blocks within the WCO SAFE Framework of Standards (SAFE). Operators can be

[1] Brunner, ‘What Is Economic Corridor Development and What Can It Achieve in Asia’s Subregions?’

[2] UNCTAD, ESCAP, and ECA, ‘Cross-Border and Transit Transport Process Management “CT-TPM” Toolkit’, 2012.

[3] Asian Development Bank, *CAREC Corridor Performance Measurement And Monitoring Annual Report 2018*.

[4] ASYCUDA, ‘ASYCUDA - Programme’ <https://asycuda.org/en/programme/> [accessed 8 March 2020].

[5] WCO, ‘Globally Networked Customs’ (World Customs Organization, 2012), http://www.wcoomd.org/en/topics/facilitation/activities-and-programmes/gnc.aspx.

accredited by customs as AEOs when they prove to have high quality internal processes that will prevent goods in international transport to be tampered with.[1] Specific elements include to:

- Ensure the integrity of the information, i.e. what is said to be in a container, really is in the container and nothing else, more, or less;
- Ensure the integrity of its employees, that they will not put goods in the container that should not be there; and
- Secure access to its premises, to prevent unauthorized persons to put goods in the container.

Further use of ICT could also improve transport planning potential, particularly when reporting to or applying different indicators. This will allow both transport authorities and investors to identify gaps and opportunities for more streamlined and integrated planning and investments. This is particularly relevant to measure, record and report infrastructure quality, asset levels, safety, cost etc to create more transparency and increase competitiveness.

RECOMMENDATIONS ON STRENTHENING CONNECTIVITY AMID COVID-19 PANDEMIC AND BEYOND

Importance and urgency of enhancing transport and trade connectivity in the region and difficulties in investing in transport infrastructure are highlighted even more by the COVID-19 induced crisis. While international freight transport might contribute to the spread of virus, for countries it serves the lifeline with essential and pandemic relief supplies and it is crucial for operation and survival of many businesses that cannot switch to the new clients or suppliers is such short term.

Flexibility and adaptivity of road transport in efficient use of logistic networks make it crucial for response measures to pandemic, in serving pandemic hot spots, in allowing supply chains to adapt to closures, quarantines especially as last mile delivery and as a user of land transport corridors. Railway transport proved to be good choice for freight operation during pandemic as it allows to minimum human contacts during haulage while having large carrying capacity.

While showing the depth to which existing problems in transport infrastructure and regional transport coordination might affect crisis response, pandemic situation also caused a number of long due positive shifts: such as removing physical Customs inspections or move to wide and deeper digital documents processing. Retaining this momentum in regional cooperation in pandemic response in international transport is important the stablishing the CCWA as efficient economic corridor. Therefore, the following **might be recommended for CCWA Economic Corridor to go through the pandemic and for future progress**:

Creation of "green lanes or corridors" for road transport along Asian Highways at the length of the CCWA Economic corridor. "Green lane border crossings" in European Union mean border crossings opened for all freight vehicles, with inspections reduced in number or streamlined to essential minimum, all inspections not require driver to leave the vehicle, documents can be accepted in electronic form and their number reduced to bare minimum[2]. Eight countries might discuss the form in which they might implement this concept. Asian Highway countries' expert also recommended that countries mutually recognise or waive transport documents at border crossings along such corridors.[3]

Enhance centralized information sharing on national measures affecting connectivity along the corridor. This might be achieved by supporting ESCAP Policy Responses to COVID-19 in Asia and the Pacific database and ECE Observatory on Border Crossings Status due to COVID-19 with timely sharing

[1] WCO, 'Compendium Of Authorized Economic Operator Programmes. 2019 Edition', 2019, http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/instruments-and-tools/tools/safe-package/aeo-compendium.pdf?db=web.

[2] 'Policy Reponses to Covid-19: Transport Connectivity in Asia and the Pacific' (ESCAP, 24 April 2020), https://www.unescap.org/resources/policy-reponses-covid-19-transport-connectivity-asia-and-pacific.

[3] United Nations ESCAP, 'Virtual Expert Group Meeting on Safe and Seamless Transport Connectivity along the Asian Highway Network during and after the COVID-19 Pandemic, 25 June 2020: Conclusions and Recommendations', accessed 25 July 2020, https://www.unescap.org/sites/default/files/Meeting%20Conclusions%20and%20Recommendations.pdf.

of the changes in national policies and by supporting creation of such centralized platform for AH network.[1]

Maintain and advance the progress in digitalization and facilitation of the cross-border transport made during pandemic response stage. Digitization of procedures, transforming them into touchless or requiring minimum in-person contacts forms would not only serve as an economic stimulation measure but as a public health protection measure as well. Moreover, lockdowns and quarantines pushed businesses to move to wider use of automation in order to allow employees work remotely, move business to e-commerce models so clients do not need to come in person to get service or goods. This means that more people become familiar with these technologies and ready to their applications by governmental agencies.

ESCAP models that contributes to paperless data exchange on international transport operations and trade can be used as references: secure cross-border transport, efficient cross-border transport, integrated border control management system, logistics information database.

Keep materials on lessons learned in implementing sanitary measures in pandemic response at border crossings, logistics terminals as even after COVID-19 spread is controlled, there are other pathogens such as for example seasonal influenza, tuberculosis, measles, polio, etc. which region is fighting continuously. The procedures (reduction of in-person contacts, regular cleaning and disinfection), equipment, social distancing measures, personal protective equipment for personnel, distribution of the masks, hand washing stations, disinfectant, for user, etc. might help during future outbreaks as well. Moreover, countries might make full use of World Health Organization's guidance on measures to undertake on border crossings to control and mitigate infectious diseases spread: International Health Regulations 2005 (IHR), Interim guidance on Controlling the spread of COVID-19 at ground crossings, May 2020, Handbook for public health capacity-building at ground crossings and cross-border collaboration, 2020.[2]

COORDINATION

Coordination between the authorities involved with international transport and trade of the CCWA Economic Corridor should be strengthened. This would allow for better cooperation in identifying and determining priorities in the construction, rehabilitation and maintenance of roads, railways, inland freight terminals and border posts to build an adequate and well-maintained infrastructure across the corridor.

Due to the CCWA countries' complex geopolitical roles, establishing reliable coordination mechanisms among them seems even more relevant. A coordination mechanism for the CCWA Economic Corridor should be established to which all countries should contribute from their own budget to allow better management of the corridor. This not only gives them decision-making agency, but also increases participation. Such a mechanism to be established based on an agreement or MOU stating the participating countries objectives, structure of the mechanism (whether a permanent secretariat to be established or it would rotate along members by a certain rule), how the decisions are made, etc.

Important is that such mechanism not only concerns itself with strategic planning, investment prioritization, adoption of transport and trade facilitation measures, but also implements corridor monitoring by gathering regularly and making publicly available information on actual traffic along the corridor, time and costs of traveling along the corridor and sending the cargos by it, changes in regulations, controlling agencies and other information crucial for transport operators and freight forwarders.

Alternatively, or in addition to, the CCWA countries could coordinate themselves through other existing corridors even though most of such initiatives do not cover every one of them: TRACECA, INSTC, CAREC or TAR and AH networks. Other formats of multilateral coordination existing among most of the CCWA

[1] United Nations ESCAP.

[2] *International Health Regulations (2005)*, 3rd ed. (World Health Organization, 2016), https://apps.who.int/iris/bitstream/handle/10665/246107/9789241580496-eng.pdf;jsessionid=A8E1596F7181AA169C7086091707B809?sequence=1#page=48; 'Controlling the Spread of COVID-19 at Ground Crossings: Interim Guidance 20 May 2020' (World Health Organization, 20 May 2020), https://www.who.int/publications/i/item/controlling-the-spread-of-covid-19-at-ground-crossings; *Handbook for Public Health Capacity-Building at Ground Crossings and Cross-Border Collaboration* (World Health Organization, 2020), https://apps.who.int/iris/bitstream/handle/10665/331534/9789240000292-eng.pdf?sequence=1&isAllowed=y.

countries might be engaged to support connectivity improvement along the economic corridor: the Eurasian Economic Union, Commonwealth of Independent States, Shanghai Cooperation Organization, Economic Cooperation Organization.

In order to accelerate the development, key champions (governmental agencies, industry associations and stakeholders - logistics operators, freight forwarders, warehouse operators, etc., infrastructure development agencies, development banks) should provide support in mapping potential corridor routes and capacities, consensus building and preparing/leading negotiations while ensuring stakeholder integration.[1]

Once the corridor coordination mechanism is established, its roles are:[2]

- Provision of well-defined transport infrastructure networks in ports, surface transport, (roads, railways), inland terminals and border posts;
- Coordination in the construction, expansion, rehabilitation and maintenance of priority infrastructure facilities along the corridor;
- Harmonisation of infrastructure configurations and procedures including for weighbridges, border crossings, road rest sites, etc.;
- Provision of adequate energy and modern ICT networks;
- Development and oversight of budgetary resources for developing Corridor Plans and implementation of programmes and projects;
- Coordination of resource mobilization for corridor programmes and projects implementation;
- Monitoring progress in the corridor operations (time, costs of travelling, traffic volumes and vehicles' numbers), monitoring availability of information on regulations, controlling agencies, practices and documents, etc; and
- Establishment of corridor champions including entities that can mobilise financial resources from governments and corporate world. Key champions may include governmental agencies, industry associations, industry operators, development banks and agencies, multilateral cooperation mechanisms, etc.

The CCWA Economic Corridor should also coordinate with other adjacent corridors, such as the TRACECA, INSTC, CAREC, and others. in order to maximize interoperability. Furthermore, CCWA countries should even better utilize existing infrastructure development initiatives in the region that can accelerate coordination and investments. Different CCWA countries are members of those initiatives, such as the Shanghai Cooperation Organization (SCO), Eurasian Economic Union (EAEU), and the Belt and Road Initiative (BRI). By aligning the CCWA Economic Corridor with selected initiatives and corridors and using the capacities of the supporting institutions of them, particularly those of multilateral development banks (such as the ADB, EIB, AIIB, IFC), sustainability safeguards such as environmental and social safeguards (which can be understood as minimum standards to avoid doing harm in countries with weaker legal institutions) as well as achievement of sustainability goals (actively contributing to sustainable development) will be better integrated into infrastructure planning and financing. One example of such safeguards is the IFC Performance Standards.[3] This will also support the long-term success and resilience of the infrastructure in the CCWA countries.

A final challenge in the CCWA corridor is the quality and availability of data regarding soft and hard connectivity, on which to base decisions for infrastructure improvements and investments. Currently, many CCWA countries do not regularly report or analyze infrastructure connectivity data, such as waiting times at borders, or even soft connectivity requirements. An integrated information and data platform, provided, for instance, by United Nations ESCAP, should allow for improvements. Increased use of information and

[1] UN-OHRLLS and Maeti, 'Report on Best Practices for Effective Transit Transport Corridor Development and Management (Draft Version)'.

[2] UN-OHRLLS and Maeti.

[3] International Finance Corporation (IFC), 'Performance Standards on Environmental and Social Sustainability'.

communications technology as well as related new technologies to collect data and coordinate would increase the benefits.

Chapter III Connectivity on Smart Transport Systems

III.1 Smart Transport Systems with the CCWA Economic Corridor

Recent interests in smart transport systems

Smart transport systems, including intelligent transport systems, have been incorporated at varying degrees by many countries to achieve socio-economic goals and to contribute to environmental issues. Specifically, smart transport systems assist in improving the quality of life of the population, improving road safety, reducing injuries and mortality from crashes, increasing the mobility of goods and passengers, and improving the environmental situation in the transport sector. In large cities, smart transport systems particularly reduce traffic congestion, optimize public transport routes, deliver timely notifications of road conditions and incidents, and reduce adverse environmental impacts resulting from the emission of exhaust gases. On highways, smart transport systems are used extensively on high-speed and toll roads, with the objectives being to improve traffic safety and reduce operating costs for road maintenance.

Smart transport systems integrate a wide range of technical solutions, including digital, information, and telecommunication technologies which are dynamically being developed, improved and updated. Recent trends in smart transport systems include multiple technologies that are expanding the frontiers of the transport environment, revolutionizing the ways in which people utilize new technologies and redefining existing interactions. Central to this is the formation of new values towards that of the digital assets of the transport complex.

There are future developments expected in the area of smart transport systems. A transition to energy efficiency and environmentally friendly modes of transport has recently been observed with cleaner sources of power and energy for vehicles, and emerging technologies. Expansion of unmanned transport services including autonomous driving technology, high-precision positioning and observation, digital mapping, and navigation are also being actively developed in smart transport systems.

There are developments of smart transport systems with respect to cross-border transport and cooperation, to expand the transit and export potential of countries of the Central Asian region. The most important role is played by equipping border crossing points with the latest equipment and technologies that ensure fast, high-quality, convenient, and safe execution of all procedures and border formalities with neighboring countries. The latest elements of smart transport systems currently create seamless border crossing technologies for different modes of transport, optimize multimodal cargo transport, and deliver fast and high-quality clearance of goods. These elements also include the support of goods at all stages of transport end-to-end tracking and a monitoring system for goods, electronic sealing, and an electronic document flow of goods and transport documents. Additionally, telecommunication and navigation systems inform drivers about the numbers of vehicles, weather and traffic situations at border crossing entrance points to calculate the arrival time and the capacity to choose an alternative route via a less busy crossing point. Systems of automated weight and dimensional control, automatic scanning of containers, cars and trailers and the reading of vehicle registration plates are also widely used to enhance cross-border clearances.

Issues faced in smart transport systems

The impetus for the rapid increase in technological uptake in the transport sector is for the more effective and efficient resolution of the multiple social problems in society and enhancement of economic potential.

There is also significant potential for smart transport systems to aid corridor development. Achieving a solution that spans the long term is still a rather precarious matter. Major points that may disrupt this include:

- Awareness of smart transport systems measures
- Technical capacity
- Knowledge and know-how on the ways to apply these measures, especially in a cross-border corridor-specific context and
- Direction to reach multilateral consensus for a strategy that is befitting to all parties involved.

The China–Central Asia–West Asia (CCWA) Economic Corridor of the Belt and Road Initiative (BRI) is a transnational geographical landscape of shared transport infrastructure spanning eight countries of Central and West Asia, namely, China, Iran (Islamic Republic of), Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan, and Turkey. The extensive geographical and topographical conditions along the CCWA economic corridor require international and domestic integration into the international transport space. Such integration enhances the development of the transit and export potential of countries of the CCWA economic corridor to accelerate the movement of goods.

However, the use of smart transport systems is limited with respect to the above-mentioned points through all countries along the CCWA economic corridor. This factor causes high costs and incompatibility of systems along the corridor, effectively undermining the efficacy of existing and future systems. For streamlined cross-border transport movements, the connectivity of smart transport systems as a multilateral strategy is thus a pre-requisite.

Scope of the chapter

Within the context of the CCWA economic corridor, there is no doubt that the potential for smart transport systems will be enormous. Yet, the current problem of an overarching and multilateral strategy to promote smart transport systems along the corridor restricts the ability of each country to maximize the opportunities that are clearly present. With the speed and dynamic ways at which smart transport systems are developing, the need for their application with a wholistic perspective in mind cannot be overemphasized. The application of smart transport systems, if achieved correctly and are optimal in their functionality, can be a catalyst to enhance the long-term sustainability of the CCWA economic corridor. In this regard, this chapter will address situational challenges by developing a corridor-specific strategy to deliver effective smart transport systems for the CCWA economic corridor. This will involve exploring the specific features of smart transport systems, as well as targeting smart transport systems in each country along the corridor. The results are tied together with information collected through a survey of transport readiness and status of smart transport systems in target countries, highlighting local elements and the extent of overall cross-border connectivity.

III.2 Exploration of Representative Smart Transport Applications

The Economic and Social Commission for Asia and the Pacific (ESCAP) has defined intelligent transport systems within the scope of the 2030 Agenda for Sustainable Development and the diverse nature of smart transport systems: "*Intelligent transport systems are an agglomeration of diverse technologies that enhance the sustainability of transport systems in a safer, smarter and greener way*."[1] To negate the requirement for further significant investment in transport infrastructure, smart transport systems can achieve a range of substantial benefits to a country's transport requirements.

[1] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific' (Bangkok, 31 May 2019), https://www.unescap.org/resources/guidelines-regulatory-frameworks-intelligent-transport-systems-asia-and-pacific#.

Given that the awareness and technical capacity of smart transport systems are still not high, six major categories of them are explored: Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Advanced Public Transport Systems (APTS), Commercial Vehicle Operations (CVO) and emerging technologies.

ATMS[1] use information and communication technologies to ensure the seamless flow of road traffic through the use of centralized management strategies that oversee and regulate traffic flow. This increasingly relies on real-time data, obtained through sensors, detectors and surveillance cameras to resolve operational issues that impede traffic flow. In effect, there is a dependence on the technological capacity of systems to effectively monitor the traffic environment and manipulate it to provide drivers with optimal travel conditions.

ATIS[2] provide information on the travel conditions impacting the state of traffic flow. These systems disseminate real-time information by interpreting data that is collected and processed into forms that can inform users while traveling, and publicize them via a multitude of platforms including Variable Message Signs (VMS), the Internet, and radio. To achieve this, technology such as surveillance cameras, fixed sensors, and probes can act as data-collecting agents to assemble the necessary data.

APTS[3] employ diverse technologies and strategies for public transport systems to enhance the efficiency and reliability of public transport operations, as well as users' safety and convenience. These systems can transfer the traditional services of public transport into more streamlined ones. The means of information dissemination include the Internet, mobile devices and information terminals that can improve users' efficiency and reliability.

CVO[4] broadly refers to the operations associated with moving goods and passengers by commercial vehicles, and activities to regulate these operations. Related activities include electronic registration, permitting programs, electronic exchange of data, electronic screening, and roadside operations.

Emerging technologies represent all transport technologies and mobility services that attempt to solve critical issues facing current society and as such can revolutionize the travel environment.[5] There is a focus on innovation that ensures competitiveness and efficiency of transport operation and management in the longer term, with sustainability as a central objective while maintaining optimal safety and reliability of travel. Emerging technologies here include connected vehicles, autonomous vehicles, and smart mobility. Representative types of smart transport systems are in Table 13.

[1] United Nations ESCAP.

[2] United Nations ESCAP.

[3] United Nations ESCAP.

[4] Florida Department of Transportation, 'Commercial Vehicle Operations', n.d., https://www.fdot.gov/traffic/traf-incident/cvo.shtm.

[5] Merja Hoppe and Thomas Luke, 'Emerging Trends in Transport Technologies: The Potential for Transformation towards Sustainable Mobility' (ICTTE Belgrade 201, Belgrade, Serbia, 2018), https://www.researchgate.net/publication/329103605.

Table 13 Summary of the types of smart transport systems

Category	Types	Main Functions
Advanced traffic management systems	Advanced traffic signal control	Relieves traffic congestion by clearing accumulated vehicle queues at specific intersections by optimizing traffic signal timings based on real-time traffic data.[1]
	Ramp metering	Manages the flow of traffic on freeways by regulating the number of vehicles that can enter a freeway at any given time.[2]
	Automatic traffic enforcement	Detects red light running, speed limit and illegal parking violations through monitoring cameras.[3]
	Variable speed limit	Uses dynamic speed limits to prevent or mitigate incidents including crashes in traffic conditions resulting from bottlenecks or other incidents.[4]
	Incident management	Coordinates technological, human, and operational resources in a preplanned manner to detect and respond to an incident, and return a roadway to its full capacity in the aftermath of the incident.[5]
	Electronic toll collection	Uses cashless payments based on wireless communication between in-vehicle devices (on-board units) and toll gate receivers.[6]
	Congestion pricing/electronic road pricing	Levies a fixed, variable, or dynamic toll from drivers passing through or entering certain areas that are prone to congestion for alleviating the level of congestion through the time-wise and mode-wise reallocation of traffic demand.[7]
	Work zone management	Maintains the safety, reliability, and mobility of traffic around work zones, or areas of construction activity, to minimize their disruptiveness to efficient travel and other unanticipated impacts.[8]
	Tunnel/bridge traffic management	Undertakes control, monitoring, and prevention activities related to travel in tunnels and bridges, which magnify the impacts of various incident risks due to the constraints imposed upon the traveler as a result of the enclosed area in tunnels and bridges.[9]
Advanced traveler information systems	Real-time traffic information (mobile/online/roadside)	Updates travelers with specific traffic information regarding route navigation, delays caused by crashes, severe weather or road works through the Internet, radio, and VMS and navigation devices.[10]
	Real-time parking information	Offers real-time information about available parking spots and route guidance through traffic monitoring systems and traffic information devices (e.g. VMS, the Internet and mobile applications).[11]

[1] U.S. Department of Transportation Federal Highway Administration Center for Accelerating Innovation, 'Adaptive Signal Control Technology', 8 September 2017, https://www.fhwa.dot.gov/innovation/everydaycounts/edc-1/asct.cfm.

[2] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'.

[3] NSW Centre for Road Safety, 'Speed Cameras – How Do They Work?', 27 June 2019, https://roadsafety.transport.nsw.gov.au/speeding/speedcameras/howdo_theywork.html#:~:text=Speed%20cameras%20detect%20the%20speed,the%20lights%20have%20turned%20red.

[4] COMPASS: Optimised Co-modal Passenger Transport for Reducing Carbon Emissions, '1.2.01. Variable Speed Limit (VSL) to Improve Traffic Flow', in Handbook of ICT Solutions for Improving Co-Modality in Passenger Transport, n.d., http://81.47.175.201/compass/index.php?option=com_content&view=article&id=555:1201-variable-speed-limit-vsl-to-improve-traffic-flow&catid=19:management.

[5] James D. Carvell, Jr et al., 'Freeway Management Handbook. Module 1. Freeway Management Concepts' (U.S. Department of Transportation Federal Highway Administration, August 1997), https://library.unt.edu/gpo/ota/pubs/fmh/mod1cd.pdf.

[6] Times Mobility Networks Co., Ltd, 'ETC Electronic Toll Collection System', Undated, https://www.timescar-rental.com/beginner/etc.html.

[7] 'Congestion Pricing: A Primer' (U.S. Department of Transportation Federal Highway Administration, December 2006), https://ops.fhwa.dot.gov/publications/congestionpricing/index.htm.

[8] National Academies of Sciences, Engineering, and Medicine, 'Chapter 4. Case Studies: Work Zone Management', in Integrating Business Processes to Improve Travel Time Reliability (Washington, DC: The National Academies Press, 2011), https://www.nap.edu/read/14510/chapter/6.

[9] New South Wales Government Transport Roads & Maritime Services, 'Smart Motorway Design Guide: Tunnel Traffic Management', 2017, https://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/motorway-design/smart-motorway-design-guide-tunnel-traffic-management.pdf.

[10] United Nations ESCAP, 'Policy Framework for the Use and Deployment of Intelligent Transport Systems in Asia and the Pacific: Study Report' (Bangkok, 2017), https://www.unescap.org/sites/default/files/June_Policy%20Framework%20for%20the%20Use%20and%20Deployment%20of%20ITS%20in%20Asia%20and%20the%20Pacific.pdf.

[11] United Nations ESCAP.

Category	Types	Main Functions
	Route guidance/navigation system	Guides the traveler in trip planning by displaying the routes that can be taken from a desired origin to a destination, which is computed based on various methods of data acquisition, data processing, and route calculation.[1]
	Roadside weather information	Integrates various components involved in weather forecasting, which entails collecting surface and atmospheric observations and modeling of data, with information disseminated through a multitude of channels.[2]
Advanced public transport systems	Automatic fare collection	Allows users of public transport to pay fares electronically by smart cards which can increase convenience and comfort to users, and reduce the associated costs from manual fare collection.[3]
	Automatic passenger information	Provides real-time information for travelers including public transport arrival and departure times, and location information obtained from automatic vehicle location systems which can be accessed through the Internet, mobile applications, and information terminals at stations.[4]
	Automatic vehicle location	Determines the geographical location of a vehicle by using global positioning systems in real-time which can support fleet management performance, route selection, schedule control and emergency response.[5]
	Real-time bus priority signal	Makes decisions regarding signal priority for buses based on traffic information that is updated in real-time which gives greater flexibility and effectiveness in adjusting to variations in travel conditions for buses.[6]
Commercial vehicle operations	Weigh-in motion	Is installed on roads or on vehicles to collect data on traffic flow or data pertaining to a vehicle, specifically including its weight and dynamic axle load.[7]
	International electronic border crossing clearance	Comprises an integrated assembly of equipment and technology for facilitating customs checking and safety processes demanded for border crossing clearance.[8]
	Fleet management	Integrates technologies so that carriers can efficiently and effectively manage vehicles through automatic vehicle location systems, mobile communication systems, on-board computers to record data, and routing and dispatching software to determine the optimal routing and scheduling of vehicles.[9]
	Freight administration	Involves electronic freight management which utilizes technology throughout the international supply chain which can reduce the amount of paper used in the transfer of information among the supply chain elements.[10]

[1] Mohammad Khanjary and Seyyed Mohsen Hashemi, 'Route Guidance Systems: Review and Classification' (6th Euro American Conference on Telematics and Information Systems (EATIS), Valencia, Spain, 2012), https://doi.org/10.1145/2261605.2261646.

[2] Catherine Bradshaw Boon and Chris Cluett, 'Road Weather Information Systems: Enabling Proactive Maintenance Practices in Washington State', Research Report Research Project T1803, Task 39 Road Weather Info (Washington State Transportation Center (TRAC), March 2002).

[3] United Nations ESCAP, 'Policy Framework for the Use and Deployment of Intelligent Transport Systems in Asia and the Pacific: Study Report'.

[4] Brian Caulfield and Margaret O'Mahony, 'Real Time Passenger Information: The Benefits and Costs', in Proceedings of the European Transport Conference (ETC) 2003 (Strasbourg, France: Association for European Transport, 2003), http://www.tara.tcd.ie/bitstream/handle/2262/79614/Caulfield%20O'Mahony%2C%20Real%20time%20passenger%20information%20costs%20and%20benefits.pdf.

[5] World Bank, 'Automatic Vehicle Location', 2011, https://www.ssatp.org/sites/ssatp/files/publications/Toolkits/ITS%20Toolkit%20content/its-technologies/automatic-vehicle-monitoring/automatic-vehicle-location.html.

[6] Shireen Chada and Robert Newland, 'Effectiveness of Bus Signal Priority' (U.S. Department of Transportation, Florida Department of Transportation, January 2002), https://nacto.org/docs/usdg/bus_signal_priority_chada.pdf.

[7] Hans van Loo and Aleš Žnidarič, 'Guide for Users of Weigh-In-Motion: An Introduction to Weigh-in-Motion' (ISWIM, International Society for Weigh-in-Motion, May 2019), https://www.is-wim.net/wp-content/uploads/2020/07/ISWIM_Guide-for-users_press.pdf.

[8] United Nations ESCAP, 'Model on Integrated Controls at Border Crossings', 2012, http://www.unescap.org/sites/default/files/MICBC-fulltext_0.pdf.

[9] Cambridge Systematics, Inc. and ATA Foundation Private Fleet Management Institute, 'Commercial Vehicle Fleet Management and Information Systems, Technical Memorandum 3: ITS Fleet Management Technology Resource Guide' (U.S.Department of Transportation Federal Highway Administration, May 1997), http://rosap.ntl.bts.gov/view/dot/3812/dot_3812_DS1.pdf.

[10] Office of the Assistant Secretary for Research and Technology , U.S. Department of Transportation, 'Success Stories Electronic Freight Management (EFM)', June 2012, https://www.its.dot.gov/research_archives/efm/index.htm.

Category	Types	Main Functions
	Freight in-transit monitoring	Utilizes various tracking devices and technology including GPS, remote sensors, and wireless communications to allow for the transparency of freight movement so that its status can be assessed, and decisions made accordingly throughout its transit.[1]
	Freight terminal management	Concerns well-functioning freight terminals as core or intermediate locations in freight movement, to ensure the proper handling, storage, and passage of freight.[2]
	Hazardous material planning and incident response	Assesses the range of risks that hazardous materials transport poses to public safety, the environment, and to security that includes prevention of and response to incidents through security awareness guideline development, reviews of hazardous material shippers and carriers, evaluation of routes commonly used, coordination of appropriate response measures and proper information dissemination to the public.[3]
	Truck parking and reservation	Informs drivers about parking space capacity constraints by utilizing platforms that integrate dynamic information that can be obtained pre-route or en-route on parking space availability so that reservations can be placed.[4]
Emerging technologies	Connected vehicle	Uses wireless technologies, including Wi-Fi, dedicated short-range communications (DSRC) and radio frequencies, to enable the creation of a connected vehicle network in which Vehicle-to-Everything (V2X) communication occurs. This encompasses the sharing of real-time information about the surrounding environment with other vehicles, infrastructure, and devices, allowing for enhanced mobility and safety.[5]
	Autonomous vehicle	Integrates cameras, radar, lidar (image sensing), satellite navigation systems, computer vision, and other technologies that can detect the traffic environment and changes thereof, that can manipulate vehicle mechanisms with the information obtained so that direct human operation of the vehicle can be minimized.[6]
	Smart mobility	Entails the planning of journeys from origin to destination by assembling the full spectrum of mobility options, which can be selected using mobile and other digital platforms.[7]

Source: ESCAP

[1] See https://www.supplychain247.com/article/the_financial_value_of_in_transit_cargo_tracking_data.

[2] Jean-Paul Rodrigue and Brian Slack, '6.1 – The Function of Transport Terminals', in The Geography of Transport Systems, Fifth (New York: Routledge, n.d.), https://transportgeography.org/contents/chapter6/function-of-transport-terminals/.

[3] Transportation Research Board, 'Cooperative Research for Hazardous Materials Transportation: Defining the Need, Converging on Solutions', Special Report, 2005, https://www.nap.edu/read/11198/chapter/4#29.

[4] Cornelia Petz, Céline Lyöen, and Karin Kim Lim, 'Study Regarding Secure Parking Places for Trucks and Commercial Vehicles, Telematics-Controlled Parking and Reservation Systems', ITS ACTION PLAN FRAMEWORK SERVICE CONTRACT TREN/G4/FV-2008/475/01 (Lyon, 10 August 2011), https://ec.europa.eu/transport/sites/transport/files/themes/its/studies/doc/2011_08-secure-parking-places-for-trucks.pdf.

[5] National Association of Counties, 'Connected and Automated Vehicles Toolkit: A Primer for Counties', 2019, https://www.naco.org/sites/default/files/documents/2019%20CAV%20Toolkit%20Four%20Pager_09.5.19%20v2_FINAL_1.pdf.

[6] National Association of Counties.

[7] Oliver Wyman, 'Mobility 2040: The Quest for Smart Mobility', 2018, https://www.oliverwyman.com/content/dam/oliver-wyman/v2-de/publications/2018/Aug/Mobility2040_OliverWyman.pdf.

III.3 Smart Transport Systems in Target Countries along the CCWA Economic Corridor

Although there is tremendous potential in smart transport systems, their use along the CCWA economic corridor is still not clear. As such it would be beneficial to examine the status and sample cases of smart transport systems in target countries along the CCWA economic corridor. A general background, with brief status and sample cases, are presented by each target country.

China

GENERAL BACKGROUND

Development in China, in all sectors including the transport sector, is progressing at an unprecedented rate. In 2017, China's expressway road network covered 130,000 km and accommodated 217.43 million motor vehicles,[1] while the country's extensive rail network covered 127,000 km.[2] China is the world leader in high-speed railway deployment, and it is planned to expand the network to 70,000 km over the next 15 years.[3]

There are more than 200 airports in China. Of these, a major recent airport development is the Beijing Daxing International Airport which opened in 2019. The airport serves as an international integrated aviation hub supplementing the Beijing Capital International Airport. It has the capacity to meet the annual transport demand of 4 million tons of cargo and it is the first airport in the world to feature a high-speed underground train.[4] World Shipping Council data from 2020 notes that seven of the ten largest major seaports in the world are located in China.[5] Also, China is promoting smart port constructions targeting 11 ports in four areas which include intelligent port operation, safety management improvement, logistical integration, and business model innovation.[6]

In terms of information and communication technologies, a total of 1.7 million 5G operating base stations are planned to be operational by the end of 2021, comprising an estimated 1 million to be built over 2021, 600 thousand of which were deployed in 2020 and 100 thousand of which were deployed in 2019. Full 5G coverage and deployment has already been achieved in Beijing and Shenzhen with increased attention being focused on Shanghai.[7] The focus of the government and the transport industry in China is set to continue with the implementation of key technologies such as 5G, big data, AI, cloud, and other future technological innovations.[8]

STATUS OF SMART TRANSPORT SYSTEMS

China has substantial increases in traffic congestion, road crashes, fuel consumption and vehicle emissions due to greater vehicle use and infrastructure creation. In an attempt to curb these rising issues, new technologies have been actively pursued over the past few decades, expanding to the point where the

[1] United Nations ESCAP, 'Using Smart Transport Technologies to Mitigate Greenhouse Gas Emissions from the Transport Sector in Asia' (Bangkok, 30 December 2019), https://www.unescap.org/resources/using-smart-transport-technologies-mitigate-greenhouse-gas-emissions-transport-sector-asia; United Nations ESCAP, 'Smart Port Development Policies in Asia and the Pacific' (Bangkok, February 2021), https://www.unescap.org/sites/default/d8files/event-documents/SmartPortDevelopment_Feb2021.pdf.

[2] United Nations ESCAP, 'Using Smart Transport Technologies to Mitigate Greenhouse Gas Emissions from the Transport Sector in Asia'.

[3] Global Construction Review, 'China Approves $13bn High-Speed Railway from Chengdu to Chongqing', 16 November 2020, https://www.globalconstructionreview.com/news/china-approves-13bn-high-speed-railway-chengdu-cho/.

[4] AviationPros.com, 'New Beijing Mega-Airport Opens with FREQENTIS Networked Voice Communication System at Its Core', 25 September 2019, https://www.aviationpros.com/airports/airport-technology/communications/press-release/21107282/frequentis-usa-inc-new-beijing-megaairport-opens-with-freqentis-networked-voice-communication-system-at-its-core.

[5] SHIPHUB, 'TOP 9 Ports in China', n.d., https://www.shiphub.co/the-biggest-ports-in-china/.

[6] United Nations ESCAP, 'Smart Port Development Policies in Asia and the Pacific'.

[7] Juan Pedro Tomá, 'Chinese Operators to Build over 1 Million 5G Base Stations in 2021: Report', RCR Wireless News, 4 December 2020, https://www.rcrwireless.com/20201204/5g/chinese-operators-build-over-1-million-5g-base-stations-2021-report.

[8] Tomá.

country has successfully implemented many advanced smart transport systems.[1] For example, over a thousand smart city pilot projects have taken place over the world with China accounting for 500 of these projects.[2] Also, 36 cities have introduced bus intelligent application systems, 30 cities have adopted taxi service management information systems, and 110 cities have initiated bus card demonstration projects.[3,4] The stages of smart transport systems development in China could be categorized roughly within four linked stages (see Table 14).[5]

Table 14 Stages of smart transport systems development in China

Stages	Details
Stage 1 (Initial Stage): 1970-2000	– Initiation of research in the late 1970s – Development of the "Intelligent Transport Development Strategy" by the mid-1990s – The system framework of China's intelligent transport systems (first edition) (mid-1990s) – Establishment of the "Domestic Intelligent Transport Systems (ITS) Coordination Steering Group and Office" (2000)
Stage 2 (Key Technology Research Stage): 2001-2010	– "Major Project on the Development and Demonstration of Key Technologies for Intelligent Transport Systems" (2001) – "Domestic Standardization Technical Committee for Intelligent Transport Systems" (corresponding to ISO/TC204) (2003) – Demonstration of construction in 13 cities – Research and development: Comprising a batch of key technologies, special equipment and application systems.
Stage 3 (Breakthrough Stage): 2011-2015	– "Domestic Intelligent Transport Integrated Technology Integration and Application Demonstration" – "Integrated Technology Development and Demonstration Application of Comprehensive Prevention and Disposal of Serious Traffic Accidents" – "Domestic Transport Logistics Public Information Platform"
Stage 4 (Innovation Stage): 2016- Present	– Planning: "Implementation Plans of Promoting Internet + Convenient Transport and Intelligent Transport Development", "Action Plan of Promoting the Development of Smart Transport (2017-2020)" – Standards: "Communication Application Technology", "Cooperation ITS technology", "Mobile Internet Technology for Transport", "Security's Management of Traffic Information", etc. – Application: "A New Generation of Domestic Traffic Control Networks and Intelligent Roads", "Demonstration Project of Comprehensive Transport Information Service Based on Government-enterprise Cooperation"

Source: ESCAP

BRIEF ON THE DEVELOPMENT OF SMART TRANSPORT SYSTEMS

a) Advanced Traffic Management Systems (ATMS)

China has widespread deployment of ATMS throughout the country. Traffic management centers are present in over 25 provinces covering 130,000 km of expressways and 400,000 km of highways.[6] They are responsible for traffic monitoring and control, infrastructure management, toll collection management, and emergency management. In recent years, ATMS has been deployed as part of the framework of smart city plans. Particularly, integrated intelligent passenger transport hubs to be created in Beijing, Shenzhen, Shanghai, Chongqing, Changsha, and Chengdu were announced in 2011 by the Ministry of Transport.[7]

[1] United Nations ESCAP, 'Policy Framework for the Use and Deployment of Intelligent Transport Systems in Asia and the Pacific: Study Report'.

[2] Jie Lin Chia, 'Five Chinese Smart Cities Leading the Way', GovInsider, 10 July 2018, https://govinsider.asia/security/five-chinese-smart-cities-leading-way/.

[3] United Nations ESCAP, 'Policy Framework for the Use and Deployment of Intelligent Transport Systems in Asia and the Pacific: Study Report'.

[4] China Academy of Transportation Sciences, Conference materials (discussion materials) from country consultation in China, (forthcoming).

[5] ESCAP, Smart transport policies around the world, slide presentation for the capacity building workshop, (Bangkok, 17 November 2020).

[6] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'.

[7] United Nations ESCAP.

Source: ESCAP

Figure 13 Beijing traffic management center

- *Adaptive traffic signal control:* Although this system appears to be underutilized nationally, recent technological advancements utilizing big data have enabled multidimensional traffic data collection in real-time. Pilot projects for adaptive optimization of signal control with real-time data from traffic sensors are currently being undertaken in Huai'an, Jiangsu Province, and Zunyi, Guizhou Province.[1]
- *Freeway management:* The Ministry of Transport has established the operations monitoring and service system for national highway networks, which is present in over 30 provincial and municipal road networks.[2] The system promotes connections and information sharing between national, provincial and local areas and covers over 2000 road segments, 130 thousand km of expressways and 400 thousand km of national and provincial highways.[3] Further notable developments towards the construction of smart highways include the launch of the "Next Generation National Transportation Cybernetic System and Smart Highway Demonstration Project" in nine selected provinces by the Ministry of Transport in February 2017.[4]
- *Incident management:* City Brain project in Shanghai where traffic camera data received from an artificial intelligence hub can detect incidents within seconds, resulting in faster response times for first responders.[5]
- *Electronic toll collection:* The Chinese standard for electronic toll collection was first introduced in the 1990's following technical studies and pilot projects supported by the central government.[6] The system had covered 130,000 km of expressways in 29 provinces with 70 million users by 2017.[7] In August 2019, online services were launched to accelerate the installation of electronic toll collection devices (RFID). A goal of automatic electronic payment for 80 per cent of the country's registered vehicles was set for the end of 2019 to improve the efficiency of road transport and reduce logistics costs experienced with manual toll gates.[8]

[1] ITSS Lab at the University of Waterloo, 'Development and Implementation of an Intelligent Traffic Signal Control System (China)', Undated, http://itsslab.com/portfolio/development-and-implementation-of-an-intelligent-traffic-signal-control-system-china/.

[2] United Nations ESCAP, 'Development of Model Intelligent Transport Systems Deployments for the Asian Highway Network' (Bangkok, December 2017), https://www.unescap.org/sites/default/files/4-Model%20ITS%20deployment%20study%20report.pdf.

[3] United Nations ESCAP.

[4] Dezao Hou, 'ITS in China: Updates & Future' (2019 Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS) Development and Operation for Sustainable Transport Systems in Asia and the Pacific, Incheon, Republic of Korea, 2 April 2019), https://www.unescap.org/sites/default/files/Country%20presentation%20-%20China.pdf.

[5] Chia, 'Five Chinese Smart Cities Leading the Way'.

[6] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'; United Nations ESCAP, 'Using Smart Transport Technologies to Mitigate Greenhouse Gas Emissions from the Transport Sector in Asia'.

[7] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'.

[8] Xinhua, 'China Launches Online Services to Popularize Electronic Toll Collection', China Daily (blog), 19 August 2019, http://www.chinadaily.com.cn/a/201908/19/WS5d5a010aa310cf3e35566784.html.

- *Tunnel and bridge traffic management:* The Longling–Ruili highway in Yunnan province, a section of the National Superhighway Network between Hangzhou and Ruili, consists of 154.6 km of expressways and 3.112 km of Class 2 highways, as well as a mega bridge, 158 regular bridges, eight tunnels, and nine highway intersections.[1] Real-time monitoring systems in the tunnels includes lighting, ventilation, traffic guidance, CCTVs, fire alarm/control, and emergency communication.[2] Bridge traffic is managed with similar technology to that of tunnels through 200 bridge health monitoring facilities, which are the responsibility of the nearest traffic monitoring center.[3]

b) Advanced Traffic Information Systems (ATIS)

Various applications are found under ATIS in China, developed by both the public and private sectors. Sample cases are the following.

- *Real-time traffic information (mobile/online/roadside):* Although the VMS is widespread to provide traffic flow, speed and incidents information, the Ministry of Transport has established the China highway information network and waterway travel service board website to provide public travel information.[4] Private companies also offer mobile applications which detail navigation, real-time traffic, taxi calls, bus and flight dynamic information, bus/vehicle driving routes and route planning based on real-time road conditions.[5]
- *Real-time parking information:* Real-time parking initiatives have been launched in Shanghai by tech companies where finding, reserving and paying for parking spaces can be facilitated through a mobile phone application. The application receives real-time information on the occupancy rate of parking lots from sensors embedded under 300 parking lots across the city.[6] The city of Chengdu has devised a standard system to endorse smart parking. It consists of electronic tolling, parking guidance, charging piles for electric vehicles, security cameras and other intelligent facilities.[7]
- *Roadside weather information:* Roadside weather information is gathered from up to 1,700 meteorological monitoring facilities throughout the country.[8] The weather monitoring system deployed on the Shanghai-Nanjing Expressway is an example. A total of 26 automatic meteorological monitoring stations and two highway surface-temperature monitoring stations relay weather condition data wirelessly into the center to be disseminated to the public.[9]

c) Advanced Public Transport Systems (APTS)

APTS in China, known as “The Intelligent Public Transport System”, was initiated by the Ministry of Transport in 2011. Beijing, Shenzhen, Zhengzhou, Shanghai, Jinan, Nanjing, Chengdu, Guangzhou and Xian have already piloted this system.[10]

[1] Advantech, ‘Tunnel Monitoring System for Superhighways in Yunnan, China’, 2018, https://www.advantech.co.th/resources/case-study/82f5f8ef-e6e6-4c50-8b8a-1be00c9a786d.

[2] Advantech.

[3] United Nations ESCAP, ‘Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific’.

[4] United Nations ESCAP, ‘Development of Model Intelligent Transport Systems Deployments for the Asian Highway Network’.

[5] United Nations ESCAP.

[6] Chia, ‘Five Chinese Smart Cities Leading the Way’.

[7] Xinhua, ‘China Focus: Parking Smart in Chinese Metropolises’, XINHUANET.Com (blog), 4 June 2019, http://www.xinhuanet.com/english/2019-06/04/c_138116381.htm.

[8] United Nations ESCAP, ‘Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific’.

[9] Mingliang Yan, Chengsong Yuan, and Xinmin Pan, ‘Weather Monitoring and Forecasting Services for Provincial Highways and Railways in China’ (World Meteorological Organization, April 2009), https://public.wmo.int/en/bulletin/weather-monitoring-and-forecasting-services-provincial-highways-and-railways-china.

[10] United Nations ESCAP, ‘Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific’.

- *Automatic fare collection:* Following the use of smart card systems across all public transport platforms, cashless payments through smartphones are becoming more prevalent across major cities. Since August 2017, this system has allowed passengers to pay by tapping smartphones onto metro gantries and other public transport fare collection receivers.[1]
- *Automatic passenger information and automatic vehicle location:* The Changsha intelligent public transport system is via their notice boards which display real-time bus locations and arrival times.[2] As of June 2020, the country's first 5G intelligent coordination system for smart bus routes was piloted as part of Guangzhou CBD's bus rapid transit system.[3] The city public transport guiding application called "Xingxuntong" informs passengers of bus locations and available seating.[4]
- *Real-time bus priority signal:* Recent developments include a smart bus route opened in Changsha, the capital city of Hunan Province in central China. Vehicle to road coordination technology establishes a system to gather data on location, driving speed and the number of passengers, when a bus approaches an intersection. The system then interacts with the traffic light control system to adjust the duration of the signal lights to ensure that buses have priority.[5]

d) Commercial Vehicle Operations (CVO)

Smart transport systems are being implemented across all segments of the logistics industry through the utilization of logistics data, logistics cloud computing, logistics equipment and other technologies.

- *International electronic border crossing clearance:* In January 2020, China's General Administration of Customs released its "Initiative on Smart Customs, Smart Borders and Smart Connectivity" which uses new technologies for real-time interconnectivity and seamless end to end management to promote the security and facilitation of global trade.[6] China also joined the TIR convention with the opening of all checkpoints to international road transport from June 2019. This decision is in agreement with international conventions while promoting multimodal TIR pilot projects and the evolution to full digitalization of the system towards the eTIR system. It additionally establishes TIR electronic fast lanes at key customs points.[7]
- *Fleet management:* The number of fleet management systems has been rising sharply since the fourth quarter of 2014 where a total of 2.1 million systems were active. A cloud-based platform oversees the connection of freight vehicles and freight terminal machines for remote real-time monitoring. Notable advantages of the system include boosting fleet performance, maximizing productivity and improving safety by monitoring the behavior of drivers, which ultimately results in lower operational costs and fleet optimization.[8]
- *Freight administration:* Most local governments promote the development of local transport logistics information platforms, and more than 100,000 enterprises are involved in these platforms which have produced about 200 million transaction data records. The platforms provide better support for intelligent logistics development in China.[9]

[1] Chia, 'Five Chinese Smart Cities Leading the Way'.

[2] 'Smart Bus Stops Showing How Far Buses Coming', People's Daily Online, 17 April 2018, http://en.people.cn/n3/2018/0417/c313938-9450570.html.

[3] Xiaoci Deng, 'China Pilots First 5G Smart Bus Route in Guangzhou', Global Times, 22 June 2020, https://www.globaltimes.cn/content/1192436.shtml.

[4] Deng.

[5] 'Smart Bus Route Opens in Central China', Beijing Review, 6 May 2020, http://www.bjreview.com/Latest_Headlines/202005/t20200506_800203194.html.

[6] General Administrations of Customs People's Republic of China, 'Initiative on Smart Customs, Smart Borders and Smart Connectivity', January 2020, http://english.customs.gov.cn/Uploads/file/20200117/20200117130714_2732.pdf.

[7] IRU, 'China Pushes Ahead with TIR Implementation', 16 May 2019, https://www.iru.org/resources/newsroom/china-pushes-ahead-tir-implementation.

[8] THV, 'Fleet Management', 2020, https://www.tvh.com/en-cn/services/fleet-management.

[9] United Nations ESCAP, 'Development of Model Intelligent Transport Systems Deployments for the Asian Highway Network'.

- *Freight terminal management:* China intends to construct 150 automated and intelligent smart logistics hubs by 2025 to expand and transform its supply chains. Six different types of hubs have been identified over 212 locations including 41 land ports, 30 seaports, 23 airports, 47 industrial ports, 55 commerce and service ports, and 16 border ports.[1] The hubs seek to assimilate information technology into their operation management and supply chains to yield greater efficiency and reduced costs. Shanghai's Yangshan Phase 4 terminal, which opened in December 2017, has the title of the largest and most advanced automated terminal in the world.[2]

e) Emerging technologies

China has been testing and adopting several new emerging technologies such as autonomous vehicles, connected vehicles and smart mobility that promote seamless connectivity.[3]

- *Connected and Autonomous vehicles:* Technical research is ongoing to develop Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) technologies, together with standards, pilot applications and testbeds. Some connected vehicle technologies have already been developed by tech companies in cooperation with the car industry. They offer an in-car smart interactive system enabling drivers to connect their cars via a smartphone with a multitude of services such as intelligent voice assistance and car navigation.[4] Innovation and development of autonomous vehicle and V2X technology is also accelerating in China with test bases established in Beijing, Xi'an and Chongqing. Policy documents to support autonomous driving road testing were established in November 2017 for cities including Beijing, Shanghai, Chongqing, Changsha, etc.[5] Further to this, national regulations were adopted in 2018 to promote consistency and limit physical and digital variations across regions.[6] A total of 73 automated driving road test licenses have been issued across 12 cities and regions in China in accordance with the regulations.[7] In terms of freight movements, a partially autonomous self-driving heavy-duty truck was launched in September 2020 by China's state-owned truck manufacturer.[8]
- *Smart mobility:* Ride hailing with 521.4 million users and revenue of US$55,558 million, being 36.4 per cent user penetration in 2020, made China the largest market in the world for this service.[9] Despite various limiting factors, major support for car-sharing operators has been provided by the Chinese government. Incentives for their use in major cities such as Shanghai, Chengdu and Wuhan include the provision of free parking spaces and subsidizing various activities with its charging infrastructure, platform development and operations.[10] Free-floating shared bikes are available in many cities in China and have undergone several developments since their introduction in 2016. Bikes can be accessed and paid for and unlocked via mobile phone applications and

[1] James Blackman, 'China to Build 150 Automated and Intelligent Smart Logistics Hubs by 2025', Enterprise IoT Insights (blog), 7 January 2019, https://enterpriseiotinsights.com/20190107/channels/news/china-to-build-smart-logistics-hubs.

[2] Hapag-Lloyd, 'YSH4 in Shanghai: The World's Largest Automated Terminal', 30 September 2019, https://www.hapag-lloyd.com/es/news-insights/insights/2019/09/Shanghai.html.

[3] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'.

[4] Si Ma, 'Huawei Well Set to Jazz up Connected Vehicles', China Daily, 21 September 2020, https://global.chinadaily.com.cn/a/202009/21/WS5f6816cca31024ad0ba7ac0e.html.

[5] Hou, 'ITS in China: Updates & Future'.

[6] Intelligent Transport, 'China Issues National Standards for the Testing of Autonomous Vehicles', 14 August 2018, https://www.intelligenttransport.com/transport-news/70487/autonomous-technology-regulations-china/.

[7] Hou, 'ITS in China: Updates & Future'.

[8] Xinhua, 'New Self-Driving Truck Unveiled in China', China.Org.Cn, 14 September 2020, http://www.china.org.cn/business/2020-09/14/content_76699930.htm.

[9] Josh Horwitz and Yilei Sun, 'Alibaba, Tencent, Car Makers Set up $1.5 Billion China Ride-Hailing Venture', Reuters, 22 March 2019, https://www.reuters.com/article/us-china-ride-sharing/alibaba-tencent-car-makers-set-up-1-5-billionchina-ride-hailing-venture-idUSKCN1R30DS; Statista.com, 'Mobility Markets/Mobility Services: Ride-Hailing & Taxi - China', 2020, https://www.statista.com/outlook/mmo/mobility-services/ride-hailing-taxi/china.

[10] Ninghua Song et al., 'Car Sharing in China: Another Storm in City Mobility' (Arthur D. Little, October 2017), https://www.adlittle.de/en/insights/viewpoints/car-sharing-china-another-storm-city-mobility.

picked up and dropped off at any location as they are dockless.[1] Electric bicycle and electric scooter sharing services were introduced in 2017 but were quickly restricted by local authorities based on problems experienced with bike sharing. Since then, nationwide standards have been introduced including that e-bikes must have a pedaling function, obey a speed limit of 25km/hour, implement fireproofed charging stations, and must weigh less than 55 kg.[2]

Islamic Republic of Iran

GENERAL BACKGROUND

The geographic importance of the Islamic Republic of Iran is vital as many international transit and business corridors pass through the country including Transport Corridor Europe Caucasus Asia (TRACECA), the International North-South Transport Corridor (INSTC), the East-West Corridor, the Asian Highway network, the Southern branch of the Asian Land Transport Infrastructure Development (ALTID) and the Trans-Asian Railway (TAR) transport networks.[3] The topography of the country consists of rugged and mountainous regions at its borders with surrounding countries which in the past has limited the construction of railways. However, the government plans to invest and expand the rail infrastructure to cover more than 25,000 km by 2025 to expand domestic and international trade.[4]

There are eight active airports in the country serving passenger and cargo planes. The largest and most profitable is the Imam Khomeini Airport, which handled over 6.5 million passengers in 2015.[5] Maritime transport encompasses almost 90 per cent of the country's foreign trade through its territorial waters and ports.[6] There are 11 main seaports available nationwide adjoining the Persian Gulf and Caspian Sea. The largest port is Bandar-e-Abbas. The second tier of ports are at Bandar-e-Imam Khomeini, Bushehr and Chabahar all of which are located along the Asian Highway network.[7]

STATUS OF SMART TRANSPORT SYSTEMS

Smart transport systems were first introduced as a form of intelligent transport systems in Tehran in 1992 under the title of Vehicle Over Speed Detection. It focused on deploying advisory radio messages, speed enforcement, CCTVs, VMS and webcams. In 2002, a decision of the Ministry of Road & Transportation was made to develop further intelligent transport systems. This was initially enacted through some pilot projects in order to address any issues at a local level, prior to undertaking development at a national level.[8]

Work on the development of intelligent transport systems strategies and national plans has been progressing since 2012. The Ministry of Science, Research and Technology and Amirkabir University of Technology have been the key institutions for compiling research for the "Iranian Master Plan for Intelligent Transportation Systems".[9] This foundational work provided strategies and operational frameworks for integrating together all intelligent transport systems. It also provided a mechanism to link with other entities and has identified factors affecting transport. These include preventing duplication and providing a roadmap

[1] The Travel Brief, 'How to Use Bike Share in China', 24 June 2018, https://www.thetravelbrief.com/briefs/china-how-to-use-bike-share-in-china.

[2] Weilin Li, 'E-Bikes Are Cruising into China's Small Towns, after Nationwide Standardization', KrASIA (blog), 30 August 2019, https://kr-asia.com/e-bikes-are-cruising-into-chinas-small-towns-after-nationwide-standardization.

[3] Islamic Republic of Iran Ministry of Roads & Urban Development and the Road Maintenance Organization and Transport, 'Country Report Of The Islamic Republic of Iran' (First Meeting of Regional Network of Legal And Technical Experts On Transport Facilitation, Phuket, 10 February 2014), https://www.unescap.org/sites/default/files/2.5.Iran_.pdf.

[4] 'Iran Logistics Industry Overview', Financial Tribune, 3 January 2017, https://financialtribune.com/articles/economy-business-and-markets/56843/iran-logistics-industry-overview.

[5] 'Iran Logistics Industry Overview'.

[6] 'Iran Logistics Industry Overview'.

[7] Faramarz Maddah, 'Islamic Republic of Iran Ministry of Roads and Urban Development, I.R. Iran Country Report' (Sixth Meeting of the Working Group on the Asian Highway, Seoul, Republic of Korea, 3 November 2015), https://www.unescap.org/sites/default/files/Iran_4.pdf.

[8] Metra Consulting Eng Co, '| ITS Deployment Strategies Based on Pilot Project in Developing Countries - Karaj Tehran Corridor: An Iranian Example' (International Seminar on ITS, Kuala-Lumpur, 14 August 2006), https://www.piarc.org/ressources/documents/actes-seminaires06/c14-malaisie06/8632,TS44-Chevreuil-ppt.pdf.

[9] Network & Optimization Research Center, 'Iranian National Plan for Intelligent Transportation Systems', undated, http://norc.aut.ac.ir/publications/books/iranian-national-plan-for-intelligent-transportation-systems/.

for systems development based on a comprehensive and targeted programme.[1] This work has culminated in the Iran National Intelligent Transportation Systems Masterplan (2016).[2] The plan is a roadmap, action plan and national reference for intelligent transport systems architecture which analyzes stakeholders and user requirements, defines 97 service packages, identifies relevant solutions and technologies, and determines data flows, information systems and business processes.

BRIEF ON THE DEVELOPMENT OF SMART TRANSPORT SYSTEMS

a) Advanced Traffic Management Systems (ATMS)

Among a subset of smart transport systems, ATMS have been actively adopted in the Islamic Republic of Iran which can be shown from a couple of representative cases.

- *Adaptive traffic signal control:* Adaptive traffic signal control is evident in Tehran and Mashhad through the deployment of the Sydney Coordinated Adaptive Traffic System (SCATS) that adjusts traffic signal timings based on real-time changes in traffic flow at each intersection. The system has yielded positive results including minimizing stopping times and decreasing congestion and delays by selecting the most appropriate cycle length, splits, and links.[3]
- *Automatic traffic enforcement:* Throughout the country speed cameras have been deployed to monitor speeding violations and traffic volumes. They have proven to be effective, leading to a 60 per cent reduction in speed limit violations in 2009 along Tehran's Niyayesh and SayadeShirazi expressways.[4] By February 2015, there were 385 speed cameras installed across the country including the Asian Highway network which record online speed and average speed.[5]
- *Freeway management and incident management:* The Iran Road Management Center is the centralized headquarter connecting 31 provincial centers. It conducts road data management, road incident management and the analysis of received information, and disseminates information to road users.[6]
- *Electronic toll collection:* A cashless electronic toll system was piloted on four major freeways in early 2019. This system became operational on additional 10 freeways following a review of the limitations noted in the pilot project. Detection of vehicles is either through RFID tags or license plate identification. Payments can be made via mobile device applications or a website with toll fees deducted from a prepaid account.[7]
- *Congestion pricing/electronic road pricing:* Traffic is restricted in the city center of Tehran into two areas. There is a central Restricted Traffic Zone (RTZ) with pass permission access, and a wider Odd-Even Zone (OEZ) enveloping the RTZ which restricts access based on the last number of a

[1] Research Institute of Transport and Intelligent Systems, 'National Document of Iranian Intelligent Transportation Systems Architecture', Undated, http://its.aut.ac.ir/NITS/Iran-ITS-Master-Plan/ProjectStatement/.

[2] Mohammad Zand, 'Utilizing Smart Transport Technologies To Mitigate Greenhouse Gas Emissions in Islamic Republic of Iran, Ministry of Roads and Urban Development' (Utilizing Smart Transport Technologies to Mitigate Greenhouse Gas (GHG) Emissions from the Transport Sector in Asia and the Pacific Virtual Capacity Building Workshop, Bangkok, 17 November 2020), https://www.unescap.org/sites/default/files/Smart%20Transport%20Technologies%20for%20Greener%20Transport%20-%20Islamic%20Rep.%20of%20Iran_0.pdf.

[3] Luca Studer, Misagh Ketabdari, and Giovanna Marchionni, 'Analysis of Adaptive Traffic Control Systems Design of a Decision Support System for Better Choices', Journal of Civil & Environmental Engineering 5, no. 6 (2015), https://www.hilarispublisher.com/open-access/analysis-of-adaptive-traffic-control-systems-design-of-a-decision-supportsystem-for-better-choices-2165-784X-1000195.pdf.

[4] Amin Mirza Boroujerdian and Samane Sheikhy, 'A Method for Traffic Calming Using Radio Transmitter', Hindawi Journal of Advanced Transportation, 12 January 2017, https://doi.org/10.1155/2017/2467283.

[5] Faramarz Maddah, 'Islamic Republic of Iran Ministry of Roads and Urban Development, I.R. Iran Country Report'.

[6] Faramarz Maddah.

[7] 'Electronic Toll Collection Accelerating in Iran', Eghtesad Online, 18 June 2019, https://www.en.eghtesadonline.com/Section-economy-4/29213-electronic-toll-collection-accelerating-in-iran.

vehicle's license plate.[1] Traffic in the RTZ must pay a charge to enter and is restricted to public transport, emergency vehicles and private cars, whose owners pay a daily, weekly or annual fee. The OEZ restricts access on certain days based on whether a vehicle's license plate is an odd or an even number. Vehicles with an odd number can enter on Sundays, Tuesdays and Thursdays, and even-numbered vehicles on Saturdays, Mondays and Wednesdays. Unrestricted access for all vehicles is on Fridays.[2] During 2012 the control of the zone borders was automated through 103 high resolution cameras, which regularly detect more than 80 per cent of infringements.[3]

- *Tunnel traffic management:* Tohid Tunnel in Tehran is located within the area of the Chamran Highway, Touhid Square, Jomhuri Square, and the Navab Highway.[4] This tunnel is equipped with several tunnel traffic management solutions including 70 jet fans, 1,064 lights, sophisticated power generators, a smart firefighting system, traffic alarms and intercom telephones, CCTVs, traffic signs, thermal sensors, air pollution sensors and other facilities.[5]

b) Advanced Traffic Information Systems (ATIS)

Basic ATIS found in the Islamic Republic of Iran includes real-time traffic information and roadside weather information.

- *Real-time traffic information (mobile/online/roadside):* By February 2015, there were 195 VMS installed throughout the country including those on the Asian Highway network. The signs disseminate traffic messages relating to congestion, obstructions, trip time and meteorology.[6]
- *Roadside weather information:* By February 2015, 58 road meteorology stations were installed throughout the country to collect data on road surface temperature, relative humidity ratio, snowfall, rainfall and freezing of road surfaces.[7]

c) Advanced Public Transport Systems (APTS)

Notable examples of APTS are apparent in Tehran with respect to their usage on the underground metro, buses, bus rapid transit and taxis.

- *Automatic fare collection:* Automatic fare collection has evolved from the introduction of magnetic tickets in 1998 as part of the opening of the Tehran Metro. The first version of the Automatic Fare Collection Master plan was formulated in 2008 based on the principle of multimodal travel on the public transport system with one electronic card.[8] From 2010, a comprehensive multimodal e-Ticketing system known as Metrocard was implemented to Tehran's metro, buses, and bus rapid transit services. The system is currently in use on all bus fleets equipped with electronic card readers under the guidance of the municipality.[9]

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[1] '"Human Shields" Help Outsmart Iran's Traffic Cameras', The Observers, France 24 (blog), 28 February 2018, https://observers.france24.com/en/20180228-iran-outsmart-taffic-Tehran-air-pollution.

[2] '"Human Shields" Help Outsmart Iran's Traffic Cameras'.

[3] H. Behruz, A. Safaie, and A. P. Chavoshy, 'Tehran Traffic Congestion Charging Management: A Success Story', WIT Transactions on The Built Environment 128 (2012): 445–56.

[4] Iranian Tunneling Association, 'Urban Tunnels', 22 January 2015, http://irta.ir/page/142/Urban-Tunnels.

[5] 'Cracks Appear in Tohid Tunnel', Financial Tribune, 20 June 2015, https://financialtribune.com/articles/people/19445/cracks-appear-in-tohid-tunnel.

[6] Faramarz Maddah, 'Islamic Republic of Iran Ministry of Roads and Urban Development, I.R. Iran Country Report'.

[7] Faramarz Maddah.

[8] Farshad Jalali, Hojat Behrooz, and Tehran Traffic Control Company – Iran, 'Integrated E Integrated E-Ticket System for Multimodal Ticket System for Multimodal Public Transport Network: Toward a Multi Application e Toward a Multi Application e-Purse: A Review on Tehran Project', https://www.itscanada.ca/files/Reports/5%20TF%20TM%20Integrated%20E-Ticket%20System%20for%20multimodal%20Public.pdf.

[9] Heather Allen, 'An Integrated Approach to Public Transport, Case Study Prepared for the Tehran, Islamic Republic of Iran Global Report on Human Settlements 2013', 2013, https://iran.uitp.org/sites/default/files/documents/Transportation%20of%20Tehran.pdf.

- *Automatic passenger information and automatic vehicle location:* Automatic passenger information and automatic vehicle location are available at bus stations installed with electronic screens displaying bus arrival times.[1] A mobile phone application titled "Tehran Public Transport" also enables users to navigate the bus system of Tehran in real-time. The app features a map of the city along with bus stops, bus routes, departure schedules and an estimated time of arrival for every bus route at any specific bus stop.[2] A headway control system deployed at the bus station alerts passengers of closing doors, departing buses, and providing a countdown timer notifying when buses are leaving stops.[3]
- *Real-time bus priority signal:* Real-time bus priority signaling is available to buses in Tehran. Intersections are managed where late buses are given priority green lights to continue travel while early buses are not given priority so that buses are kept on schedule. There is an intentional delay for vehicles intersecting bus routes in a same traffic signal phase. The SCATS system provides centralized intelligent intersection management.[4]

Source: S. Mehdi Tashakkori Hashemi, 'Urban Public Transport Planning in Tehran and the Outcome of the Implemented BRT Lines'.

Figure 14 Real-time bus priority signal for late buses

d) Commercial Vehicle Operations (CVO)

Although limited information in the public domain is observed, some notable cases under CVO are explored in the Islamic Republic of Iran.

- *Weigh-in-motion:* In 2015, there were 37 weigh-in-motion systems in the country.[5]
- *International electronic border crossing clearance:* eTIR uses real-time digital data exchanged between transport operators, custom authorities, TIR system guaranteeing organisations and the United Nations.[6] Successful eTIR pilot trips were conducted between Teheran in the Islamic Republic of Iran and Izmir in Turkey in November and December of 2015 with the exchange involving the paperless transfer of digital information. In this first phase, vehicles crossed the Iranian-Turkish border post of Bazargan-Gurbulak in both directions.[7] Phase 2 of the project

[1] H. Behruz et al., 'Challenges of Implementation of Intelligent Transportation Systems in Developing Countries: Case Study - Tehran', 2013, https://pdfs.semanticscholar.org/f035/338d0067073e5f2bf54cb194a4543c7e809d.pdf.

[2] Google Play Store, 'Tehran Public Transport', n.d., https://play.google.com/store/apps/details?id=com.neda.buseta&hl=en.

[3] S. Mehdi Tashakkori Hashemi, 'Urban Public Transport Planning in Tehran and the Outcome of the Implemented BRT Lines', https://sustainabledevelopment.un.org/content/dsd/susdevtopics/sdt_pdfs/meetings2010/egm0310/presentation_Mehdi_Hashemi.pdf.

[4] Tashakkori Hashemi.

[5] Faramarz Maddah, 'Islamic Republic of Iran Ministry of Roads and Urban Development, I.R. Iran Country Report'.

[6] Daniel Kern and André Sceia, 'ETIR, the New Digital TIR Carnet', World Customs Organisation News, no. 79 (n.d.), https://mag.wcoomd.org/magazine/wco-news-79/etir-the-new-digital-tir-carnet/.

[7] Kern and Sceia.

involved the introduction of more operators following the success of phase 1 as the system was reliable, inexpensive to implement, and functional in the real-world environment. As of early 2019, 238 eTIR guarantees had been issued and used.[1] Customs authorities benefit from reduced administrative issues with less paperwork, improved security and reduced risk of fraud as the information presented at all custom offices during transit is identical.

- *Fleet management:* Several private freight companies have this system which comprises of a range of functions including vehicle maintenance, vehicle telematics (tracking and diagnostics), driver behaviour management, speed management, fuel management and health and safety management.[2] In addition, all trucks and transit trailers in the country are equipped with satellite navigation systems in order to allow the police to locate them.[3]

e) Emerging technologies

Connected and autonomous vehicles are one of the emerging technologies that the Islamic Republic of Iran has been actively working on to address traffic issues in the country.

- *Connected vehicles:* In response to the high number of crashes in the country "The Connected Vehicle Technology Project" was introduced in October 2011. The goals of the project were to improve road safety, reduce fuel consumption, reduce and/or eliminate environmental issues and identify opportunities for value-added services via the utilization of DSRC technology. Six applications were tested during the project including electronic toll collection, emergency vehicle prioritization, traffic data collection, merging traffic to main road warnings, hazard notification and traffic restriction, and weather information alerts. The project was in its pilot phase in 2015 following initial research, software application preparation and experimental field tests. Further to this, the cooperation of stakeholders was obtained to prepare a roadmap for vehicular communication technology development in the country.[4]
- *Autonomous vehicles:* In 2017, an autonomous driving system was tested that could successfully automatically navigate a 25 km long track and could be used both in urban areas and for intercity travel.[5] Additionally, the system has the ability to interconnect to other autonomous vehicles within the range of less than a few kilometers. The data from the vehicles can be shared so that the system can create an authentic live map of the area which notes the conditions of roads.[6]

Kazakhstan

GENERAL BACKGROUND

Kazakhstan is located at a strategically important position in North and Central Asia, with several overland corridors traversing the country. However, the country's geography is diverse with deserts or semi deserts found in the south-west, mountains to the central, east and south-east, together with steppe and forest steppe zones to the North. These landscapes pose different challenges in the development of transport infrastructure.[7]

[1] Jorge Cachinero, 'The Iran-Turkey Logistic Corridor: ETIR Pilot Projects Forging the Way Ahead', ABC Blogs (blog), 27 February 2019, https://abcblogs.abc.es/jorge-cachinero/otros-temas/the-iran-turkey-logistic-corridor.html?ref=https%3A%2F%2Fwww.google.com%2F.

[2] Asia Telecommunications, 'Fleet Management', undated, http://www.iranthuraya.com/fleet-management.html.

[3] 'Iran Logistics Industry Overview'.

[4] Rostami Habib, 'Connected Vehicle Pilot Project in I.R Iran', 2015, http://wiki.fot-net.eu/index.php?title=Connected_Vehicle_Pilot_Project_in_I.R.IRAN#Size_of_Project.

[5] 'Iranian Autonomous Car Tested', Financial Tribune, 12 June 2017, https://financialtribune.com/articles/auto/66257/iranian-autonomous-car-tested.

[6] 'Iranian Autonomous Car Tested'.

[7] UNCTAD, 'Challenges Policy Options and the Way Forward, Economic Diversification in Selected Asian Landlocked Countries (Bhutan, Kazakhstan, Mongolia, and Turkmenistan)' (Geneva, 2020), https://unctad.org/en/PublicationsLibrary/aldc2020d1_en.pdf.

Kazakhstan has a fairly extensive road and rail infrastructure network with varying degrees of quality. Several international road and railway routes that intersect the country are managed under the frameworks of domestic and international organizations such as the Asian Highway network, the Trans-Asian Railway network, Transport Corridor Europe-Caucasus-Asia (TRACECA), the Commonwealth of Independent States (CIS), the Economic Cooperation Organization (ECO), the Organization for Cooperation of Railways (OSJD), and the Central Asia Regional Economic Cooperation (CAREC) programmes.[1]

The current upgrade and reconstruction of road infrastructure is encapsulated in the "Nurly Zhol" programme. Six major international transit road corridors have been completed or are nearing completion.[2] Rail transport is the most common form of freight transport domestically and internationally. There are five international railway corridors which pass through Kazakhstan.[3] When considering the size of the country and distances between cities, air travel is also a very important transport mode. A joint project in 2016 between railway and air transport sectors involved setting up a cargo airline with initial destinations to major trading partners. The government is now actively working on the creation of freight hubs in the country's airports most notably being the air hub of Karaganda.[4] The country has access to one sea port being Aktau Port adjoining the Caspian Sea which provides international shipping of different dry cargos, crude oil and oil products.[5] Also, the existing port at Aktau is being upgraded and an additional freight terminal at Kuryk is nearing completion.[6]

STATUS OF SMART TRANSPORT SYSTEMS

Kazakhstan has several recent developments in smart transport systems with ambitious plans for additional deployment to assist in the further growth of the country. Digital Kazakhstan is the current state programme which is actively working on the introduction of information and communication technologies in the transport sector. In addition, the Smart Cities initiative is another programme aimed at creating conditions for digitally advanced cities with convenient living environments which include advanced transport infrastructure.[7] To facilitate the expansion of smart transport systems and the Digital Silk Road, high-quality continuous 4G-mobile coverage and information and communication technology development is envisaged by 2022 as part of Digital Kazakhstan.[8]

BRIEF ON THE DEVELOPMENT OF SMART TRANSPORT SYSTEMS

a) Advanced Traffic Management Systems (ATMS)

The main entity administering ATMS in the capital is Astana light rail transport, which was established in 2011. Its priorities involve the establishment of an improved transport system in Nur-Sultan including light rail transport and infrastructure management. A traffic control center has been established in the city to further monitor and report on traffic flows.[9]

- *Adaptive traffic signal control:* Kazakhstan has experience with adaptive traffic signal control in Nur-Sultan. The first test phase of deployment in Nur-Sultan began in 2014 with the introduction of the automated control of 42 crossroads along six roads. The traffic signals allow for the automatic counting of vehicles which is then connected to the traffic control center to manage the direction of

[1] Madina Bazarbekova et al., 'Review of Transportation Modes in Kazakhstan Region, Central Asia', ed. Filippo G. Pratico, Cogent Engineering 5, no. 1 (1 January 2018): 1450799, https://doi.org/10.1080/23311916.2018.1450799.

[2] United Nations ECE, 'Logistics and Transport Competitiveness in Kazakhstan'.

[3] Bazarbekova et al., 'Review of Transportation Modes in Kazakhstan Region, Central Asia'.

[4] 'Kazakhstan to Create a Cargo Airline', Russian Aviator Insider, 7 November 2016, http://www.rusaviainsider.com/kazakhstan-to-create-a-cargo-airline/.

[5] 'Logistics Capacity Assessments (LCAs)', n.d., https://dlca.logcluster.org/display/public/DLCA/LCA+Homepage.

[6] 'Transport & Logistics in Kazakhstan: An Overview', ITE Transport & Logistics, 4 July 2017, https://www.transport-exhibitions.com/Market-Insights/Turkey-and-Eurasia/Transport-Logistics-in-Kazakhstan-An-overview.

[7] Available at https://egov.kz/cms/en/smart-cities.

[8] Digital Kazakhstan, 'Transport Digitalization: Intelligently Made', 4 May 2018, https://digitalkz.kz/en/transport/.

[9] Akimat of Nur-Sultan, 'Smart Traffic Lights Allow Increase the Capacity up to 40%', Official Web-Site of the Nur-Sultan City Akimat (blog), 26 September 2018, http://astana.gov.kz/en/news/news/15323.

priority traffic.[1] From 2015 to 2018, this system covered 93 traffic lights out of 443 available in the city.[2] In total, 402 controlled crossroads are planned to be connected.[3]

- *Automatic traffic enforcement:* There are 78 stationary speed cameras in Nur-Sultan to enforce speed limits, and from January to November 2018, the system recorded 463,000 traffic violations.[4]
- *Variable speed limit:* There is some evidence of variable speed limit signs in place along sections of road in Nur-Sultan.[5] In addition, variable speed notification signs with radar detectors were installed throughout four administrative divisions being Atyrau, Mangistau, South Kazakhstan and Kyzylorda oblasts in 2018.[6]
- *Electronic toll collection:* As of 2018, the Astana-Shchuchinsk Highway is the only toll highway in Kazakhstan. This toll highway has been in operation since 2013 on a trial basis. Toll collection is facilitated through collection points at plazas, plate numbers for identification cameras or RFID tags whilst driving.[7]
- *Congestion pricing/electronic road pricing:* Astana light rail transit in Nur-Sultan introduced congestion pricing in 2019 with special fees for cars entering and exiting the city during morning and evening rush hours. Travel for all vehicles is free outside of peak periods. Approximately 82,000 vehicles enter the capital daily from the nearby villages of Karaganda, Kokshetau, Korgalzhyn, Kosshy, Kostanai and Pavlodar. Of these vehicles 17 per cent (approximately 13,500) use the six connecting roads between 7 a.m.-10 a.m.[8]

b) Advanced Traffic Information Systems (ATIS)

A couple of applications under ATIS are found in Kazakhstan, mainly in Nur Sultan and Almaty.

- *Real-time traffic information (mobile/online/roadside):* Roadside real-time traffic information is displayed on several VMS in Nur Sultan.[9] Also, VMS displays driver recommendations and speed limits received from video cameras and weather sensors installed along the Astana-Shchuchinsk highway.[10] It is apparent that LED smart displays (large totem pole style) are present in Nur Sultan and Almaty. They are linked to fully automated systems that process real-time data through analytic systems captured from cameras and sensors which is then displayed on large flat screens.[11] Further expansion of this system is planned in Nur Sultan as part of the Digital Kazakhstan programme, which includes the development of mobile applications for smart phones together with a website for better route guidance.[12]

[1] Astana LRT, 'Adaptive Control of Traffic Lights', 2020, http://www.alrt.kz/en/project/2.

[2] Akimat of Nur-Sultan, 'Smart Traffic Lights Allow Increase the Capacity up to 40%'.

[3] Astana LRT, 'Adaptive Control of Traffic Lights'.

[4] Akimat of Nur-Sultan, 'Strengthening of Traffic Control in Astana Has Led to a Decrease in the Number of Road Accidents', Official Web-Site of the Nur-Sultan City Akimat (blog), 2018, http://astana.gov.kz/en/news/news/16632.

[5] SMEU Astana, 'Safety on the Whole Way', 2020, https://www.smeu-astana.kz/en/var-signs.

[6] Republic of Kazakhstan and Ministry for Investment and Development, 'CAREC Corridor Implementation Progress, Actions Planned and Support Needs' (17th Transport Sector Coordinating Committee (TSCC), Istanbul ,Turkey, 18 April 2018), https://www.carecprogram.org/uploads/KAZ_EN.pdf.

[7] Digital Kazakhstan, 'Transport Digitalization: Intelligently Made'.

[8] Aidana Yergaliyeva, 'Astana City Administration to Modernize Transport System', The Astana Times, 28 September 2018, https://astanatimes.com/2018/09/astana-city-administration-to-modernise-transport-system/.

[9] SMEU Astana, 'Safety on the Whole Way'.

[10] Digital Kazakhstan, 'Transport Digitalization: Intelligently Made'.

[11] Spintix, 'Case Study: LED Traffc Info in Almaty and Astana', n.d., https://www.spinetix.com/sites/default/files/documents/almaty_case_study.pdf.

[12] Astana LRT, 'Adaptive Control of Traffic Lights'.

- *Route guidance/navigation system and roadside weather information:* A route guidance/navigation system together with roadside weather information is provided via traffic control centers. This information is then relayed to roadside VMS.[1]

c) Advanced Public Transport Systems (APTS)

Fundamental applications for APTS have been introduced to increase the convenience and service quality of public transport systems in some cities in Kazakhstan.

- *Automatic fare collection:* Nur Sultan has introduced an integrated electronic system of fare payment for all means of public transport in the capital via electronic cards. The unified ticket system can extract accurate statistics on passenger flow distribution which can then be used to arrange and improve the effectiveness of the route network.[2]

Source: ASTRA, 'New Transport System of Astana. ITS' (2019 Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS) Development and Operation for Sustainable Transport Systems in Asia and the Pacific, Incheon, Republic of Korea, 2 April 2019).

Figure 15 Electronic fare payment system in Nur Sultan

- *Automatic passenger information and automatic vehicle location:* The real-time management of buses is available through the introduction of computer-based navigation systems. The data transmission system can relay the location of busses to a dispatch center which can provide information to drivers and passengers. The information includes the location of vehicles, time tables and arrival times and is transmitted to VMS at smart bus stops and mobile devices.[3] Enclosed smart bus stops have been in operation in Nur sultan and Petropavlovsk since 2015. They are installed with VMS for real-time bus information, CCTVs, free Wi-Fi, and smart temperature controls which are heated in winter and cooled in summer.[4]

[1] Astana LRT.

[2] ASTRA, 'New Transport System of Astana. ITS' (2019 Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS) Development and Operation for Sustainable Transport Systems in Asia and the Pacific, Incheon, Republic of Korea, 2 April 2019), https://www.unescap.org/sites/default/files/Country%20presentation%20-%20Kazakhstan_0.pdf.

[3] Kairatolla K. Abishev et al., 'An Issue of Intelligent Road Transport in Kazakhstan', Acta Polytechnica CTU Proceedings 12, no. 1–4 (2017), https://ojs.cvut.cz/ojs/index.php/APP/article/view/4004/4552.

[4] ASTRA, 'New Transport System of Astana. ITS'; Aiman Amanzholova, 'The First in Kazakhstan "Smart" Bus Stop Appeared in Petropavlovsk', Kazpravda, 24 January 2015, https://www.kazpravda.kz/en/news/society/the-first-in-kazakhstan-smart-bus-stop-appeared-in-petropavlovsk.

Source: ASTRA, 'New Transport System of Astana. ITS' (2019 Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS) Development and Operation for Sustainable Transport Systems in Asia and the Pacific, Incheon, Republic of Korea, 2 April 2019).

Figure 16 Smart bus stops

d) Commercial Vehicle Operations (CVO)

Evidence of the deployment of CVO is limited but like APTS, basic applications have been found within the reviewed literature.

- *Weigh-in-motion:* In August 2013 weigh-in-motion systems were installed at four stations on two highways in Kazakhstan. Two of the stations are located along the Almaty to Bishkek Highway and the other two stations are along the Astana-Petropavlovsk connection. The systems consist of high-precision weighing modules in conjunction with a rear license plate detection system. A further 18 stations are to be created.[1]
- *International electronic border crossing clearance:* Since April 2018, the Kazakh Ministry of Finance has employed a free online electronic customs system. The system removes the need for direct contact between customs to simplify and speed up the customs clearance process. When goods arrive at their point of destination, an electronic storage document is executed. This process automatically registers goods in addition to issuing a declaration of the goods in question. It has been noted that the time to process and issue declarations is now less than a minute compared to 55 minutes experienced before the adoption of the system which required that drivers visited the customs office.[2]

Kyrgyzstan

GENERAL BACKGROUND

The country is a net importer with exports including gold, minerals, agriculture and foodstuffs, manufactured goods and textiles, and garments.[3] The development of transport infrastructure is constrained by the country's steep topography with 94 per cent of the country occupied by mountains and glaciers.[4] The country's topography affects road transport which is the most common mode of international transport infrastructure, with approximately 95 per cent of cargo and 97 per cent of passenger traffic transported over

[1] 'Kapsch TrafficCom Installs New Weigh-In-Motion Systems in Kazakhstan', 26 September 2013, https://www.roadtraffic-technology.com/uncategorised/newskapsch-trafficcom-installs-new-weigh-in-motion-systems-in-kazakhstan/.

[2] Yerbolat Uatkhanov, 'Kazakhstan Begins Electronic Customs System', The Astana Times, 4 April 2018, https://astanatimes.com/2018/04/kazakhstan-begins-electronic-customs-system/.

[3] OECD, Sustainable Infrastructure for Low-Carbon Development in Central Asia and the Caucasus: Hotspot Analysis and Needs Assessment, Green Finance and Investment (Paris: OECD Publishing, 2019), https://www.oecd-ilibrary.org/environment/sustainable-infrastructure-for-low-carbon-development-in-central-asia-and-the-caucasus_d1aa6ae9-en.

[4] 'FY2018 Ex-Post Evaluation of Japanese Grant Aid Project "Reconstruction of Kok-Art River Bridge on Bishkek-Osh Road" External Evaluator: Mimi Sheikh, International Development Center of Japan, Inc.', n.d., https://www2.jica.go.jp/en/evaluation/pdf/2018_1360060_4_f.pdf.

the road network.[1] There are three major road transport corridors connecting neighboring countries.[2] Due to the country's topography, railways are not a very popular mode of transport.[3] The railway network is also geographically split between the northern and southern sections of the country.[4] Further, in terms of international railway networks, technical standards and track gauges among neighboring countries becomes an issue due to their incompatibility.[5]

Kyrgyzstan has 11 airports, four of which have the capacity to process international flights. Manas International Airport in Bishkek is the largest and best-equipped airport in the country accommodating the capacity to land heavy aircraft.[6]

STATUS OF SMART TRANSPORT SYSTEMS

Important advances include "The National Development Strategy of the Kyrgyz Republic for 2018-2040" adopted in 2018.[7] The strategy summarizes the country's future vision and includes the adoption of digital technology in many sections of society. In support of the strategy, the government adopted a national concept of digital transformation known as "Digital Kyrgyzstan 2019-2023".[8] The transformation is set out in four stages and includes action items to be achieved annually between 2019 to 2023. The pillars of this are the structure, management system and the foundations of the country's digitalization process. Another example is the electronic transport control automated information system introduced by the Ministry of Transport in early 2020.[9] The system is designed to improve the efficiency of transport control, automate the activities of the agency including licensing, regulation, issuing permits for international transport, creating single registries, monitoring weight control, introducing an e-database of superimposed administrative surveys, obtaining statistics and exchanging transport control data with comparable authorities in adjacent countries. The government has also made some positive steps to modernize and reform the transport sector through the mechanism of public-private partnerships.[10]

BRIEF ON THE DEVELOPMENT OF SMART TRANSPORT SYSTEMS

a) Advanced Traffic Management Systems (ATMS)

Basic applications under ATMS including automatic traffic enforcement and electronic toll collection have been introduced or will be installed in the near future.

- *Automatic traffic enforcement:* Traffic enforcement cameras which record road violations were installed in Bishkek as part of the launch of the Safe City project in early 2019. The project is part of a public-private partnership implemented in the cities of Bishkek and Osh, which have been deployed on the Bishkek-Karakol and Bishkek-Manas airport roads. Security cameras are installed at intersections, and in park and recreation areas which are monitored at a centralized facility.[11]

[1] International Road Transport Union, 'Road Transport in Kyrgyzstan - 2013', n.d., https://www.iru.org/sites/default/files/2016-03/en-road-transport-kyrgyzstan-13.pdf.pdf.

[2] Azamat Sulaymanov, 'Kyrgyz Republic – a Land-Linked Nation on the Ancient Silk Road', IRU, 7 December 2017, https://www.iru.org/resources/newsroom/kyrgyz-republic-land-linked-nation-ancient-silk-road; United Nations ECE, 'Logistics and Transport Competitiveness in Kyrgyzstan' (Geneva: United Nations, 2020), https://kyrgyzstan.un.org/sites/default/files/2020-01/Logistics_and_Transport_Competitiveness_in_Kyrgyzstan_2019.pdf.

[3] 'Kyrgyzstan Logistics Infrastructure', Digital Logistics Capacity Assessments (DLCA) (blog), n.d., https://dlca.logcluster.org/display/public/DLCA/2+Kyrgyzstan+Logistics+Infrastructure.

[4] Asian Development Bank, 'Country Partnership Strategy: Kyrgyz Republic, 2013–2017', n.d., https://www.adb.org/sites/default/files/linked-documents/cps-kgz-2013-2017-ssa-03.pdf.

[5] Asian Development Bank.

[6] 'Logistics Capacity Assessments (LCAs)'.

[7] 'Digital Kyrgyzstan National Concept of Digital Transformation', 2019, https://digital.gov.kg/.

[8] 'Digital Kyrgyzstan National Concept of Digital Transformation'.

[9] 'Kyrgyzstan Implements Electronic Transport Control System', Kabar, 21 January 2020, http://en.kabar.kg/news/kyrgyzstan-implements-electronic-transport-control-system/.

[10] OECD, Sustainable Infrastructure for Low-Carbon Development in Central Asia and the Caucasus: Hotspot Analysis and Needs Assessment.

[11] 'Implementation of Safe City Project Will Begin in Bishkek in Autumn', Kabar, 24 July 2018, http://en.kabar.kg/news/implementation-of-safe-city-project-will-begin-in-bishkek-in-autumn/.

Since their inception the Safe City and the unified register of violations automated information systems have yielded positive results, where the number of crashes have decreased by 52 per cent in Bishkek and by 70 per cent over the greater area of Chui Oblast.[1]

- *Electronic toll collection:* There are plans to make electronic toll roads from 2021-2022.[2] The first option involves turning some existing roads into tollways or alternatively the construction of new routes as part of public-private partnerships. The Kuaky-Kochkor is an alternative North-South highway route that may become the first tollway.[3]

b) Advanced Traffic Information Systems (ATIS)

A route guidance/navigation system has been employed along the Uzbekistan-Kyrgysztan-China Road corridor using satellite navigation systems.[4]

c) Advanced Public Transport Systems (APTS)

Only automatic fare collection systems are found as part of APTS in Kyrgyzstan.

- *Automatic fare collection:* An electronic ticketing system was launched in Osh city in early 2019 for the city's buses and trolley buses. The electronic ticketing system is expected to be implemented in all public transport with an electronic wallet system made available in sync with top up cards. Another electronic ticketing project is planned for Bishkek as part of a future public-private partnership.[5]

d) Commercial Vehicle Operations (CVO)

The introduction of the electronic transport control automated information system has contributed to CVO including monitoring weight control and issuing permits of international transport.

- *Weigh-in-motion:* Data from several weigh in motion systems operating on the country's main international corridors are monitored through the electronic transport control automated information system.[6]

[1] 'Deputy PM Razakov Monitors Automated Information Systems', Kabar, 21 August 2019, http://en.kabar.kg/news/deputy-pm-razakov-monitors-automated-information-systems/.

[2] 'Kyrgyzstan to Introduce Toll Roads for Freight and Passenger Transport', Kabar, 14 August 2019, http://en.kabar.kg/news/kyrgyzstan-to-introduce-toll-roads-for-freight-and-passenger-transport/.

[3] 'Ministry of Transport Tells about Future Toll Roads in Kyrgyzstan', 24.Kg News Agency, 3 May 2017, https://24.kg/english/51005.

[4] The survey response from Uzbekistan's Ministry of Transport and Ministry of Investment and Foreign Trade, dated on 1-2 October 2019.

[5] 'E-Ticketing Launched in Osh City of Kyrgyzstan', 24.Kg News Agency, 25 February 2019, https://24.kg/english/110117__E-ticketing_launched_in_Osh_city_of_Kyrgyzstan/.

[6] 'Kyrgyzstan Implements Electronic Transport Control System'.

Source: Ministry of Transport and Roads Kyrgyz Republic, Using Intelligent Transport Technologies to Mitigate Greenhouse Gas Emissions in the Transport Sector, slide presentation prepared for ESCAP, (2019).

Figure 17 Weigh-in-motion systems in Kyrgyzstan

- *International electronic border crossing clearance:* The electronic transport control automated information system has offered positive improvements through maintaining a consistent register of drivers, licenses and vehicles for freight and passenger movements both nationally and internationally. The system also issues and registers permits for international transport and monitors any violations through its electronic database.[1]

Tajikistan

GENERAL BACKGROUND

Approximately 93 per cent of the territory is mountainous and is subject to persistent natural disasters.[2] The country also has the lowest urbanization rate of Central Asia with a population that is predominantly rural.[3] Most of Tajikistan's road infrastructure was constructed before 1991 with major improvements being undertaken in recent years.[4] A total of 83 per cent of the roads are unpaved.[5] Major highway projects provide connections to neighbouring countries which include Dushanbe to Karamyk (Asian Highway route 65 or M41 highway), Dushanbe to Chanak (Asian Highway route 7 or the M34 highway), Kurgantyube to Nijny Pyanj, Dushanbe to Turzunsade, Dushanbe to Kulyab, Kulyab to Darvaz, Murghab to Kulma.[6] Around 50 per cent of exports and imports are carried by railways. There are three domestic railway networks: northern (dominating freight transit traffic), central (mainly for imports) and southern (for low volumes of freight traffic).[7] To improve connectivity various long-distance rail line projects are planned including the Russia-Kazakhstan-Kyrgyz Republic-Tajikistan Railway and the China-Kyrgyz Republic-Tajikistan-Afghanistan-Iran Railway.[8]

There are four international airports being Dushanbe, Khujand, Kulyab and Kurgan Tyube.[9] 89 per cent of all domestic passenger travel happens between Dushanbe and Khujand, while international passenger travel is mostly to and from the Russian Federation (87 per cent of the total).[10]

[1] 'Kyrgyzstan Implements Electronic Transport Control System'.

[2] 'Logistics Capacity Assessments (LCAs)'.

[3] OECD, Sustainable Infrastructure for Low-Carbon Development in Central Asia and the Caucasus: Hotspot Analysis and Needs Assessment.

[4] 'Logistics Capacity Assessments (LCAs)'.

[5] OECD, Sustainable Infrastructure for Low-Carbon Development in Central Asia and the Caucasus: Hotspot Analysis and Needs Assessment.

[6] 'Logistics Capacity Assessments (LCAs)'.

[7] Asian Development Bank, 'Developing Tajikistan's Transport Sector - Transport Sector Master Plan', 2011, https://www.adb.org/sites/default/files/publication/28979/transport-taj.pdf.

[8] OECD, Sustainable Infrastructure for Low-Carbon Development in Central Asia and the Caucasus: Hotspot Analysis and Needs Assessment.

[9] 'Logistics Capacity Assessments (LCAs)'.

[10] Asian Development Bank, 'Developing Tajikistan's Transport Sector - Transport Sector Master Plan'.

STATUS OF SMART TRANSPORT SYSTEMS

In recent years, the government has adopted multiple enabling legislation for transport development and the digitization of the economy. These include the National Development Strategy for the period to 2030 and The Development Program for the Transportation Sector of the Republic of Tajikistan up to 2025.[1] The enabling legislation represents a good precursor for the deployment of smart transport systems. However, it does not directly note the concept of smart transport systems nor its development as a priority. Recent developments in early 2020 involve the country's Digital Economy Concept. It is expanded to the Dushanbe Smart City Project through constructing the required infrastructure to increase Internet bandwidth and speed and to develop the most critical smart city applications.[2]

BRIEF ON THE DEVELOPMENT OF SMART TRANSPORT SYSTEMS

a) Advanced Traffic Management Systems (ATMS)

A prime example of smart transport systems in the country is demonstrated as part of the Safe City Project introduced in Dushanbe in 2013. The project included several ATMS applications such as traffic signals installed at 70 major intersections, 15 urban checkpoints together with 850 CCTVs for monitoring all traffic in the urban area. In addition, 100 police patrols have been equipped with GPS units. All traffic monitoring and control operations are enabled via a traffic control center constructed in Dushanbe.[3]

- *Freeway management:* Traffic monitoring systems are planned to be established during the second phase of the Central Asia Road Link to Sughd Oblast in the north of the country. The system intends to measure the speed of the vehicles, monitor the traffic situation in real-time, record information on the traffic situation, detail the volume of traffic and classify vehicles by length and type.[4]
- *Electronic toll collection:* On April 1, 2010, the first toll road route was opened along the Dushanbe-Chanak Highway. The highway links the capital with the Soghd province in the northern part of Tajikistan. The tollway incorporates RFID tags and a reader to locate and identify vehicles. The cards can be recharged online and are available at selected toll booths along the route and at designated branches of participating banks.[5]
- *Tunnel traffic management:* Future developments in tunnel traffic management throughout the country is under discussion. The intention is to implement five major tunnels using an automated intelligent tunnel traffic control system to monitor and manage tunnel traffic.[6]

b) Advanced Traffic Information Systems (ATIS)

Various traffic information systems have been in service in the capital. A couple of noticeable examples are found.

- *Real-time traffic information (mobile/online/roadside):* A passenger information system for public buses and electric trolley buses have been in service since January 2014. Information boards at 25 bus stops have been installed. In addition, route guidance/navigation systems are present on 60 buses and trolleys, and a real-time parking information system is also under consideration.[7]

[1] Government of the Republic of Tajikistan, 'Resolution on the Endorsement of the National Earmarked Development Program for the Transportation Sector of the Republic of Tajikistan up to 2025' (Dushanbe, April 2011), https://www.wto.org/english/thewto_e/acc_e/tjk_e/WTACCTJK23A1_LEG_10.pdf.

[2] 'Tajikistan's Digital Transformation Wins Korea and World Bank Support', Smart Energy International, 6 February 2020, https://www.smart-energy.com/industry-sectors/policy-regulation/tajikistan-digital-transformation-wins-korea-and-world-bank-support/.

[3] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'.

[4] Farida Yoqubzoda, 'Country Study Report - Innovative & Integrated ITS for the Development & Operation of Sustainable Transport Systems in Urban Areas, Report Prepared for ESCAP', August 2018.

[5] Yoqubzoda; United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'.

[6] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'.

[7] United Nations ESCAP.

c) Advanced Public Transport Systems (APTS)

APTS has been implemented recently with smart card systems and intelligent bus stops mostly in the capital.

- *Automatic fare collection:* These systems were launched in July 2017 for public transport payment and fare allocation. At the commencement of the project, 360 buses and trolleys were equipped with smart card readers and from April 2018 all public buses in the fleet can accept payment using smart cards. The "City Card" operator manages all aspects of the system. Smart card readers are installed on all buses.[1]
- *Automatic passenger information:* Intelligent bus stops to compliment the passenger information system were created in February 2018. As of July 2017, a total of 36 bus stops have been upgraded to be intelligent bus stops with features including electronic boards with information on bus times and route numbers. CCTVs also monitor the areas surrounding the stops.[2]

Source: Yokubzoda Suhrob, 'Intellectual Transport System in Tajikistan' (2019 Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS) Development and Operation for Sustainable Transport Systems in Asia and the Pacific, Incheon, Republic of Korea, 2 April 2019)

Figure 18 Intelligent bus stop in Dushanbe

- *Automatic vehicle location:* Taxis can be accessed through mobile applications. The applications make reservations and locate taxis via satellite navigation systems. It is also a resourceful development for taxi operators in that they can gather data on their fleet location, and track customer movements on a GIS based map.[3]

d) Commercial Vehicle Operations (CVO)

Although not many applications are found under CVO, fundamental applications have been operating in Tajikistan.

- *Weigh-in-motion:* Through the Central Asia Road Links (CARs) Programme, a weigh-in-motion system has been implemented from 2015. The system gathers multiple variables for the enforcement of regulations for overloaded freight vehicles. High-speed weigh-in-motion technology will be integrated as part of a second stage for the route between Kuchkak and Niyozbek municipalities.[4]

[1] Yokubzoda Suhrob, 'Intellectual Transport System in Tajikistan' (2019 Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS) Development and Operation for Sustainable Transport Systems in Asia and the Pacific, Incheon, Republic of Korea, 2 April 2019), https://www.unescap.org/sites/default/files/Country%20presentation%20-%20Tajikistan_0.pdf.

[2] Suhrob.

[3] Yoqubzoda, 'Country Study Report - Innovative & Integrated ITS for the Development & Operation of Sustainable Transport Systems in Urban Areas, Report Prepared for ESCAP'; Dushanbe City Tour - Full Guided - Ep 186, Huub Vlogs, 2018, https://www.youtube.com/watch?v=wUxrHjbHDF8&t=371s.

[4] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'; IRU, 'Tajik Customs Eyes the New Generation TIR', 12 July 2017, https://www.iru.org/resources/newsroom/tajik-customs-eyes-new-generation-tir.

– *International electronic border crossing clearance:* The country has adopted the widely accepted TIR system to facilitate cross border clearance since 1996. The SafeTIR system is a digital platform which permits all participating countries to check the status and validity of each TIR carnet in real-time.[1] The current use of TIR's digital tools provides a foundation for the future introduction of the fully digital eTIR system.[2] In addition to this system, electronic data exchange known as the Unified Automated Information System has been deployed at the Afghanistan border since 2011.[3]

Uzbekistan

GENERAL BACKGROUND

As the geographic center of Central Asia, Uzbekistan is at the crossroad of international transport corridors connecting China to European markets.[4] Logistics services are relatively complicated and expensive as Uzbekistan is a landlocked country with no access to the sea.[5] The capital Tashkent is the largest city in Central Asia and the population is concentrated more to the east, in particular, the region around Tashkent and the Fergana Valley.[6] Uzbekistan has eight main international transport corridors,[7] two European roads traversing the country from north west to south east, and close to the eastern borders,[8] and three Central Asia Regional Economic Cooperation (CAREC) corridors (Mediterranean–East Asia, Russian Federation–Middle East and South Asia, Europe–Middle East and South Asia).[9] The road network is the dominant mode of transport and most roads are in fairly good condition and can be classified as Class 1 or Class 2 under Asian Highway standards. An improvement in the availability of roads in the network which are in good technical condition can remedy sub-standard speeds and long transit-times.[10]

The railway network has over 4,400 km of 1.52-meter broad-gauge tracks capable of handling 120 km/hour trains in most sections.[11] The network has the capacity to accommodate 65 million tons of cargo annually overall comprising 86 per cent of international cargo and 66 per cent of domestic freight in the country, mainly in wagons and containers that are old and in a poor dated condition.[12] As the country is a landlocked country, transport of cargo via air transport is an important part of the transport sector. The country's network of airports is one of the best in the region, the largest being Tashkent Airport. The Navoi Airport is being upgraded into an international air transport hub with a planned international logistics center.[13]

STATUS OF SMART TRANSPORT SYSTEMS

A five-year development strategy over 2017–2021 is designed to achieve greater economic, social and political openness, and build a competitive and market-oriented economy in Uzbekistan. As a

[1] IRU, 'Tajik Customs Eyes the New Generation TIR'.

[2] IRU.

[3] Yoqubzoda, 'Country Study Report - Innovative & Integrated ITS for the Development & Operation of Sustainable Transport Systems in Urban Areas, Report Prepared for ESCAP'.

[4] Shirin Tulaganova, 'Barriers in Enhancement of Logistics in the Republic of Uzbekistan', European Journal of Intelligent Transportation Systems, no. 1 (2) (31 July 2019): 13–15.

[5] Tulaganova.

[6] Asian Development Bank, Uzbekistan Trade Facilitation and Logistics Development Strategy Report (Mandaluyong City, Philippines, 2009), https://www.carecprogram.org/uploads/Transport-and-Trade-Logistics-Uzbekistan.pdf.

[7] Uzbek Agency for Automobile and River Transport and Abdurakhman Abduvaliev, 'Transport Strategy of the Republic Uzbekistan and Prospects of Development of Trans and Prospects of Development of Trans -Asian and Asian and Euro -Asian Transit Carriages, Slide Presentation Prepared for UNECE' (70th Annual Session of the Inland Transport Committee Euro-Asian Transport Links Ministerial Meeting, Geneva, 19 February 2008), https://www.unece.org/fileadmin/DAM/trans/MinisterialITC70/documents/Presentation_UZBEKISTAN_E.pdf.

[8] PADECO Co., Ltd, 'Uzbekistan: Transport Sector Strategy 2006–2020 (Financed by the Japan Special Fund)' (Tokyo, Japan: Asian Development Bank, December 2006), 2006–2020, https://www.adb.org/sites/default/files/project-document/66621/37691-01-uzb-tacr.pdf.

[9] Asian Development Bank, Uzbekistan Trade Facilitation and Logistics Development Strategy Report.

[10] Egis International and Dornier Consulting, 'Logistics Processes and Motorways of the Sea II: In Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine, Uzbekistan. LOGMOS Master Plan' (TRACECA, September 2014), http://www.traceca-org.org/fileadmin/fm-dam/TAREP/65ta/Master_Plan/MP.pdf.

[11] Asian Development Bank, Uzbekistan Trade Facilitation and Logistics Development Strategy Report.

[12] Asian Development Bank.

[13] Asian Development Bank.

complementary measure in January 2019, the government adopted a 2019–2021 "Reform Roadmap". The roadmap outlines how the country will achieve its social and economic goals over the medium term.[1]

The Development Strategy Framework of the Republic of Uzbekistan by 2035[2] was developed in 2019. Several key challenges were outlined in the document including obsolete infrastructure, limited available air service for the population, inefficient rail transport, limited public transport, a need to increase railway electrification, a decrease in transit from the growth of competition from alternative routes, the need to enhance intermodality, the poor quality of transport and logistical services, and problems with the customs clearance of cargo. In response to these challenges, several measures were outlined including the active introduction of innovations in the transport sector, and advanced information and communication technologies.

BRIEF ON THE DEVELOPMENT OF SMART TRANSPORT SYSTEMS

a) Advanced Traffic Management Systems (ATMS)

A couple of ATMS applications have been implemented to increase traffic efficiency and more plans have been set up.

- *Adaptive traffic signal control:* Plans for the introduction of smart traffic lights in pilot mode were made by the Tashkent City Transport Department in September 2018.[3] The project also involved improving public transport comfort, faster bus intervals, and the construction of innovative bus stops with free Wi-Fi and charging stations for mobile devices.[4]
- *Automatic traffic enforcement:* From 2018, Tashkent, Andijan, Namangan and Fergana provinces invested in implementing an automated system for traffic enforcement. Infrastructure to facilitate this project included the installation of road signs, information signs, durable road markings and the laying of transmission lines and telecommunications to the facilities of the automated system.[5]
- *Electronic toll collection:* The phased construction of toll roads has been proposed by the government through the framework of public-private partnerships.[6] A tollway linking Tashkent to Samarkand and Bukhara has been chosen as the route for the first of several toll roads in the country. This route is to be commissioned by the end of 2023.[7] Further routes from Tashkent to Andijan and SyrDarya to Bakht are planned.[8] Toll highways are to be built in parallel to the existing non toll roads to allow drivers to take advantage of the high-speed road during times of congestion.[9]

b) Advanced Traffic Information Systems (ATIS)

A route guidance/navigation system has been employed along the Uzbekistan–Kyrgyzstan–China Road corridor using satellite navigation systems.[10]

[1] World Bank Group, 'The World Bank in Uzbekistan Country Snapshot', April 2019, http://pubdocs.worldbank.org/en/388901555362919729/Uzbekistan-Snapshot-April2019.pdf.

[2] Buyuk Kelajak, 'Development Strategy Framework of the Republic of Uzbekistan by 2035', 2019, https://uzbekistan2035.uz/.

[3] '"Smart Traffic Lights" to Be Installed in Tashkent', Kun.Uz, 29 September 2018, https://kun.uz/en/03984122?q=%2Fen%2F03984122.

[4] '"Smart Traffic Lights" to Be Installed in Tashkent in Pilot Mode', *Uz Daily*, 29 September 2018, https://www.uzdaily.uz/en/post/45946.

[5] 'German ATLAS International to Upgrade Automated Traffic Violation Enforcement System in Four Provinces', The Tashkent Times, 1 November 2011, https://tashkenttimes.uz/national/3128-german-atlas-international-to-upgrade-automated-traffic-violation-enforcement-system-in-uzbekistan.

[6] 'Uzbekistan Launches the Creation of Toll Roads', Grata International, 14 December 2018, https://gratanet.com/news/uzbekistan-launches-the-creation-of-toll-roads.

[7] Maria Levina, 'Tolls Are Coming to Central Asia Highways', The Times of Central Asia, 25 October 2018, https://www.timesca.com/index.php/news/26-opinion-head/20414-tolls-are-coming-to-central-asia-highways.

[8] 'Two Toll Tunnels, Three Toll Highways to Be Built in Uzbekistan', The Tashkent Times, 17 July 2020, https://tashkenttimes.uz/national/4722-two-toll-tunnels-three-toll-highways-o-be-built-in-uzbekistan.

[9] Levina, 'Tolls Are Coming to Central Asia Highways'.

[10] The survey response from Uzbekistan's Ministry of Transport and Ministry of Investment and Foreign Trade, dated on 1-2 October 2019.

c) Advanced Public Transport Systems (APTS)

Two types of APTS applications are found including automatic fare collection and automatic vehicle location.

- *Automatic fare collection:* Further to a pilot project in Samarkand, automated fare collection systems were implemented into all forms of public transport in Tashkent and Fergana in 2018 with payments made via Uzbekistan's TezCard system.[1]
- *Automatic vehicle location:* An online on-demand mobile application was introduced which allows passengers to book taxi services and determine their location.[2]

d) Commercial Vehicle Operations (CVO)

Not many applications are currently being operated under CVO. Only basic applications have been introduced.

- *Weigh-in-motion:* The Uzbekistan Ministry of Transport is embarking on a programme to install automated weight control systems on sections of public roads. Overall, 92 control systems are planned, including 52 on public roads and 40 at customs border crossings.[3]
- *International electronic border crossing clearance:* Preliminary work in digitalizing trade procedures involves the creation of the e-customs and the national single window system for data sharing and exchange.[4] The adoption of the eTIR system currently in pilot mode may be a positive option for improved international electronic border crossing clearance.[5]

Turkmenistan

GENERAL BACKGROUND

Turkmenistan's geographical location adjoining the Caspian Sea facilitates sea transport as well as road, rail and air. Recent development of routes in the North-South (Kazakhstan-Turkmenistan-the Islamic Republic of Iran) and East-West (Turkmenistan-Azerbaijan-Turkey) have enabled the expansion of infrastructure and transit capabilities in the country.[6] In 2019, Turkmenistan was ranked as having the second lowest population density amongst Central Asia after Kazakhstan, at 12.451 people per square km.[7]

As deserts occupy around 80 per cent of the country, sand dune fixation and the cost of the removal of sand encroaching on roads and railways has been an ongoing hinderance to transport infrastructure expansion.[8] Despite this constraint, Turkmenistan is traversed by a number of international transport corridors due to its strategic location.[9] The Ministry of Transport has been embarking on a programme to

[1] World Bank Group, 'The World Bank in Uzbekistan Country Snapshot'.

[2] Kun.uz, 'Yandex Launches Real-Time Bus Movement Tracking Service in Tashkent', 19 September 2019, https://kun.uz/en/news/2019/09/19/yandex-launches-real-time-bus-movement-tracking-service-in-tashkent.

[3] Avazbek Sultonov, 'The Intellectual Transport System of the Republic of Uzbekistan' (Utilizing Smart Transport Technologies to Mitigate Greenhouse Gas (GHG) Emissions from the Transport Sector, Baku, Azerbaijan, 1 October 2019), https://www.unescap.org/sites/default/files/Uzbekistan%20%282%29.pdf.

[4] United Nations ESCAP, 'Readiness Assessment for Cross-Border Paperless Trade: Uzbekistan', 17 September 2019, https://www.unescap.org/resources/readiness-assessment-cross-border-paperless-trade-uzbekistan#.

[5] United Nations ESCAP.

[6] Government of Turkmenistan, Voluntary National Review of Turkmenistan (Ashgabat: Turkmen State Publishing Service, 2019), https://sustainabledevelopment.un.org/content/documents/24723Voluntary_National_Review_of_Turkmenistan.pdf.

[7] World Bank, 'World Development Indicators'.

[8] European Bank for Reconstruction and Development, 'Strategy for Turkmenistan', 2014, https://www.ebrd.com/downloads/country/strategy/turkmenistan.pdf; United Nations ECE, '1st Environmental Performance Review of Turkmenistan', November 2012, https://unece.org/environment-policy/publications/1st-environmental-performance-review-turkmenistan.

[9] OECD, Sustainable Infrastructure for Low-Carbon Development in Central Asia and the Caucasus: Hotspot Analysis and Needs Assessment.

upgrade the railway network involving the construction of new railway lines and rehabilitation of existing lines.[1] Even though no quantitative goals exist, Turkmenistan's National Climate Change Strategy lays out priorities to be achieved by 2030. These include public transport and light rail development, renewal of the car fleet with incentives for greater fuel efficiency, a movement towards vehicles powered by natural gas, and electrification of rail services.[2]

The government is also focusing on transport sector improvements in civil aviation for the movement of passengers and cargo both domestically and internationally. Recent upgrades to the Ashgabat International Airport will serve as a main air connection between Asia and Europe.[3] The new airport opened in 2016 after being completely redesigned and rebuilt. It is now able to serve more than 17 million passengers per year or around 2 thousand passengers per hour. More than 200 thousand tons of cargo can pass through the cargo terminal.[4]

With respect to sea connections, the Turkmenbashi International Sea Port on the Caspian Sea was completed in 2018 and combines ferry, passenger and cargo terminals.[5] The port intends to become an important link for modern transport infrastructure bringing a new level of economic and trade cooperation between the countries of Asia and Europe. The port is able to accept 300,000 passengers and 75,000 trailer trucks and 400,000 TEU containers a year. The projected annual total throughput capacity of this port is 17–18 million tons of cargo and 1.1 miles of berths can serve 17 vessels at once.[6]

STATUS OF SMART TRANSPORT SYSTEMS

The "National Program for Socioeconomic Development 2011-2030" has been proceeded with an objective for the country to become a transnational transit corridor. As such, Turkmenistan has been very active in building its transport infrastructure and increasing trade through the smooth connectivity. Several major infrastructure projects have been completed in recent years with others planned or currently being constructed to expand domestic and international connections.[7] In early 2019, a new institutional set-up was adopted by the government to improve the implementation of reforms on transport, communication and industry. As such, these reforms may improve the integrated planning of the country's transport infrastructure and subsequent deployment of smart transport systems.[8]

BRIEF ON THE DEVELOPMENT OF SMART TRANSPORT SYSTEMS

a) Advanced Traffic Management Systems (ATMS)

It is apparent that there is limited deployment of ATMS throughout the country possibly due to low traffic volumes associated with a low population density. However, automatic traffic enforcement and variable speed limit signs are noted in the capital.

[1] OECD.

[2] United Nations Development Program, 'National Climate Change Strategy of Turkmenistan', 15 June 2012, https://info.undp.org/docs/pdc/Documents/TKM/110712_Strategy_en.pdf.

[3] Reuters, 'Turkmenistan Opens $2.3 Billion Bird-Shaped International Air Terminal', 17 September 2016, https://www.reuters.com/article/us-turkmenistan-airport-idUSKCN11N0QX.

[4] 'The President of Turkmenistan Took Part in the Opening of New Ashgabat International Airport', Turkmenistan Golden Age – State News Agency of Turkmenistan, 2016, http://www.turkmenistan.gov.tm/_eng/?id=6453.

[5] Government of Turkmenistan, Voluntary National Review of Turkmenistan.

[6] John C. K. Daly and Jamestown Foundation, 'Turkmenistan's New Turkmenbashi International Seaport-Another Link in Expanding Eurasian Trade', Eurasia Daily Monitor 15, no. 71 (9 May 2018), https://jamestown.org/program/turkmenistans-new-turkmenbashi-international-seaport-another-link-in-expanding-eurasian-trade/.

[7] Shoaib Ahmad Rahim, 'The Geopolitics of the Lapis Lazuli Corridor', The Diplomat, 22 December 2017, https://thediplomat.com/2017/12/the-geopolitics-of-the-lapis-lazuli-corridor/.

[8] OECD, Sustainable Infrastructure for Low-Carbon Development in Central Asia and the Caucasus: Hotspot Analysis and Needs Assessment.

Source: Allan Mustard, Wikipedia Open Street Map – Turkmenistan, https://wiki.openstreetmap.org/wiki/Turkmenistan.

Figure 19 Variable speed limit sign with radar cameras in Ashgabat

Some ATMS applications are also planned to be implemented as part of the Ashgabat to Turkmenabat expressway which is currently under construction.[1] The project will cover seven interchanges and deploy ATMS such as toll booths, technical centers with video monitoring systems, traffic technical service stations for vehicles, emergency communication points and real-time weather information updates.[2]

b) Advanced Traffic Information Systems (ATIS)

It is apparent that VMS has been deployed in the country which display localized basic information on temperature, wind speed, the time and some advertising.[3]

c) Advanced Public Transport Systems (APTS)

In the case of APTS, public buses in Ashgabat have implemented the automatic fare collection with electronic payment as part of a new fleet of buses introduced in 2018.[4] Electronic cards are available at various points of sale of Ashgabat city with top ups available at post offices, banks and automated self-service terminals located in public places.[5]

d) Commercial Vehicle Operations (CVO)

Planned CVO involves the use of a weigh-in-motion along the Ashgabat to Turkmenabad which is currently under construction. The weigh-in-motion will monitor commercial vehicles using height gauges with automatic axel load meters to maintain traffic flow.[6] Customs procedures also pose another constraint to cross border transport as a significant number of documents are needed for importing and exporting. Additional measures to streamline customs procedures in line with international standards can reduce transport costs and improve competitiveness. International electronic border crossing clearance can assist in achieving this aim.[7] It is anticipated that the eTIR system will be implemented in the future.

[1] 'Turkmen President's Brother-in-Law Involved in Construction of $2.3bn Expressway', Turkmen News, 2 July 2019, https://en.turkmen.news/news/turkmen-president-s-brother-in-law-involved-in-construction-of-2-3bn-expressway/.

[2] 'Turkmen President's Brother-in-Law Involved in Construction of $2.3bn Expressway'.

[3] 'Wide Traffic Signs in Turkmenistan and Russia', True performance signs website, n.d., https://www.trueperformance.eu/en/reference/item/96.

[4] 'In 2018, Dozens of New Comfortable Buses Will Begin to Run on the Intercity Routes', Embassy of Turkmenistan – Malaysia Kuala-Lumpur (blog), n.d., https://malaysia.tmembassy.gov.tm/en/news/9238.

[5] 'Turkmenistan Implements E-Payment System in Public Transport', Azernews, 21 September 2017, https://www.azernews.az/region/119313.html.

[6] 'Turkmen President's Brother-in-Law Involved in Construction of $2.3bn Expressway'.

[7] UNCTAD, 'Challenges Policy Options and the Way Forward, Economic Diversification in Selected Asian Landlocked Countries (Bhutan, Kazakhstan, Mongolia, and Turkmenistan)'.

Turkey

GENERAL BACKGROUND

Turkey is a junction between Europe and Asia. A number of well-developed domestic and international road and rail corridors traverse the country. Roads in Turkey are of a high standard. The General Directorate of Highways under the direction of the Ministry of Transport and Communication is responsible for the creation and maintenance of road networks.[1] The General Directorate of Highways has 67,620 km of road network covering 2,657 km of motorways, 31,066 km of state highways and 33,897 km of provincial roads.[2] Turkey has a well-developed and state-owned railway system with the main carrier responsible for long haul international and domestic freight and passenger movements. The construction of 4,000 km conventional and 10,000 km high speed lines are planned by 2023.[3] High speed rails operate daily from Ankara to Eskişehir to Istanbul, Ankara to Konya and Istanbul to Eskişehir to Konya.[4]

The country has well-developed air transport and there are 55 airports within 100 km of 90 per cent of people's residences. The country aims to have all residents within a 100 km radius of any airport by 2023.[5] Four major container ports with access to the Mediterranean are located at Haydarpasa and Ambarl near Istanbul and Izmir and Mersin.[6]

In terms of information and communication infrastructure, several phases through most of the country have been planned. Fiber optic cable installation along major highways has been completed in the 1st phase pilot region to facilitate smart transport systems and other institutional communication requirements.[7]

STATUS OF SMART TRANSPORT SYSTEMS

Smart transport systems were first introduced in Turkey in 1973 through the İstanbul Straight Bridge Toll Collection System. Smart transport systems deployment has gathered momentum over time with developments, including motorways toll collection systems in 1992, the DSRC non-stop tolling system on motorways, the D-100 highways Bolu mountain pass information system in 1999, contactless card payment systems on motorways in 2005, the Bolu mountain tunnel systems in 2007, strategy and plan in 2014 and BOT motorways – ITS Applications and the foundation of ITS-Turkey in 2016.[8]

There are a couple of legislative frameworks for smart transport systems which are the National Intelligent Transport Systems Strategy 2014-2023 and the supplementing Action Plan 2014-2016 issued in 2014.[9] Recent developments include the adoption of the National Intelligent Transport Systems Strategy and 2020 -2023 Action Plan which was issued on 5 August 2020. The plan covers 31 actions including information and communication infrastructure, testing and application corridors for cooperative-intelligent transport systems, centers and radio broadcasting systems along highways.[10]

BRIEF ON THE DEVELOPMENT OF SMART TRANSPORT SYSTEMS

a) Advanced Traffic Management Systems (ATMS)

[1] 'Logistics Capacity Assessments (LCAs)'.

[2] Murat Dursun Barut, 'Country Study Report - Innovative & Integrated ITS for the Development & Operation of Sustainable Transport Systems in Urban Areas', June 2018.

[3] 'Logistics Capacity Assessments (LCAs)'.

[4] Tom Brosnahan, 'Turkish High-Speed Trains', Turkey Travel Planner, n.d., https://turkeytravelplanner.com/trans/Train/hizli.html.

[5] 'Turkey on Track to Meet Aspiration for All of Its Citizens to Be within 100 Km of an Airport by 2023', Corporate Travel Community (blog), 3 May 2018, https://corporatetravelcommunity.com/turkey-on-track-to-meet-aspiration-for-all-of-its-citizens-to-be-within-100-km-of-an-airport-by-2023/.

[6] Turkish State Railways Ports Department and Hakan Erdogan, 'Container Ports of Turkey' (United Nations Economic Commission for Europe – Government of Greece: Role of Seaports as a Link between Inland and Maritime transport, Piraeus, Greece, 17 September 2008), https://unece.org/fileadmin/DAM/trans/doc/2008/wp5/GE1_Piraeus_Item3_Erdogan.pdf.

[7] Murat Dursun Barut and Salih Ozturk, 'Intelligent Transport Systems on Highways'.

[8] General Directorate of Highways Turkey and Murat Dursun Barut, 'Intelligent Transport Systems (ITS) Applications' (Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS), Incheon, Republic of Korea, 2 April 2019), https://www.unescap.org/sites/default/files/Country%20presentation%20-%20Turkey.pdf.

[9] General Directorate of Highways Turkey and Barut.

[10] Barut and Ozturk, 'Intelligent Transport Systems on Highways'.

The primary feature in Turkey's traffic management system is its interface between the transport environment and the country's traffic control centers. Traffic information is collected from a variety of sensors and then interpreted and followed up by action through ATIS. There are 18 centers in total being 17 centers for highways divisions and a main center headquarters.[1]

- *Adaptive traffic signal control:* Istanbul Municipality Traffic Center has 2,281 signalization systems in operation across the city and 2,726 signalization systems across the inter urban highway network.[2] The introduction of traffic actuated signalling systems is currently in progress with the signalling systems of 210 junctions being modified into traffic actuated signalling. Semi traffic actuated signalling systems have been equipped on 39 junctions and full traffic actuated signalling is present on 171 junctions. Further deployment to another 50 junctions was planned to be completed by February 2021.[3]
- *Automatic traffic enforcement:* Turkey has deployed a series of radar and laser-based speed violation detection systems under the responsibility of the Ministry of Interior Affairs to enforce and provide data on speed limits along freeways and in tunnels. In addition, speed limit warning systems which connect sensors to VMS can notify drivers of their speed along accident black spots.[4]
- *Variable speed limit:* Variable traffic signs are established on highway networks to show speed limits and lane assignments in accordance with real-time traffic conditions.[5]

Source: Murat Dursan Barut, General Directorate of Highways Turkey, Presentation on Intelligent Transport Systems (ITS) Applications for the Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS), (Incheon, Republic of Korea, 2-4 April 2019).

Figure 20 Variable speed limit sign

- *Freeway management:* Traffic management centers established in Ankara, İstanbul, İzmir and Mersin monitor state roads and motorways. The centers monitor data retrieved from the conditions of freeways through weather and road condition sensors, CCTVs and multilane vehicle sensors. The system can notify centers of any incidents and disseminate changes in traffic flow to drivers via ATIS.[6]
- *Electronic toll collection:* The first collection system implemented in 1972 on the 1st İstanbul Straight Bridge. This has increased to a total of 99 toll plazas at present.[7] A total of 1.95 million people utilize the DSRC system while 12 million utilize RFID-type systems. Of the plazas currently in use,

[1] Barut and Ozturk.

[2] General Directorate of Highways Turkey and Barut, 'Intelligent Transport Systems (ITS) Applications'; United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'.

[3] Barut and Ozturk, 'Intelligent Transport Systems on Highways'.

[4] United Nations ESCAP, 'Development of Model Intelligent Transport Systems Deployments for the Asian Highway Network'.

[5] General Directorate of Highways Turkey and Barut, 'Intelligent Transport Systems (ITS) Applications'.

[6] United Nations ESCAP, 'Development of Model Intelligent Transport Systems Deployments for the Asian Highway Network'.

[7] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'.

eight operate on multi-lane free-flow systems. However, since 2014, the classic toll gate styles have been evolving into multi-lane free-flow systems.[1]

- *Tunnel traffic management:* A total of 361 tunnels have been built or are under construction throughout Turkey's national highways network. As part of their construction, a range of systems have been deployed including incident detection, traffic control, emergency call, vehicle height checker, CCTVs, radio broadcasting, public announcement systems, dust/particle detection, air quality control, ventilation, fire detection and extinguishing.[2]
- *Bridge traffic management:* To accommodate peak flow traffic during the morning and evening on the Istanbul straight bridge, a tidal flow reversible lane system is in service.[3] The system is achieved through a range of applications including aligning traffic safety cones on lanes, portable traffic markings on toll plazas and connection roads of the bridges and monitoring through CCTV footage.[4]

b) Advanced Traffic Information Systems (ATIS)

ATIS is at an advanced stage of development in Turkey with real-time traffic information available through a variety of media including VMS, mobile applications and an official website.

- Real-time traffic information (mobile/online/roadside): Roadside traffic conditions and meteorological information is disseminated through VMS. Also, mobile applications have gained popularity since 2012 with more than 3.5 million downloads. They can provide traffic density maps, and details on travel times and route and distance calculations.[5] Istanbul Metropolitan Municipality and Izmir Metropolitan Municipality provide traffic information and road conditions and also details of available parking spaces via mobile applications. Announcements on traffic density are also available on the website.[6] Highway conditions are also notified through a call center toll free line and radio broadcasts which provide information on the status of tunnel and road traffic conditions.[7]

[1] United Nations ESCAP.

[2] General Directorate of Highways Turkey and Barut, 'Intelligent Transport Systems (ITS) Applications'; United Nations ESCAP, 'Development of Model Intelligent Transport Systems Deployments for the Asian Highway Network'.

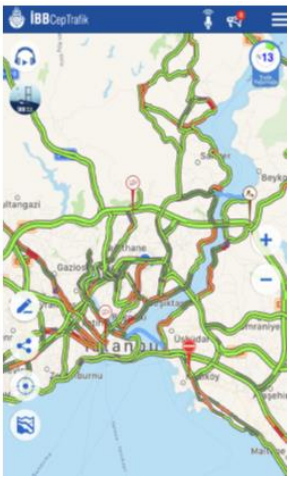
[3] United Nations ESCAP, 'Development of Model Intelligent Transport Systems Deployments for the Asian Highway Network'.

[4] United Nations ESCAP.

[5] United Nations ESCAP, 'Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific'.

[6] General Directorate of Highways Turkey and Barut, 'Intelligent Transport Systems (ITS) Applications'.

[7] General Directorate of Highways Turkey and Barut.



Source: Murat Dursan Barut, General Directorate of Highways Turkey, Presentation on Intelligent Transport Systems (ITS) Applications for the Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS), (Incheon, Republic of Korea, 2-4 April 2019).

Figure 21 Traffic density map via mobile applications

- *Real-time parking information:* An intelligent real-time parking system is available in the İstanbul metropolitan area with payment possible via a public transport card. The system alerts drivers to information on vacant parking spaces through mobile applications, VMS, and a real-time traffic density map.[1] An illegal parking enforcement system is also in operation in Istanbul which monitors cars parked in non-parking areas using CCTVs.
- *Roadside weather information:* Information on meteorological conditions is disseminated to VMS and mobile applications with data gathered from cameras, roadside meteorological sensors and other sources. A network of 68 meteorological information stations have been installed which detect temperature, wind, precipitation, humidity, air pressure, and visibility.[2]

c) Advanced Public Transport Systems (APTS)

Examples of APTS can be observed in metropolitan municipalities such as İstanbul, Ankara, İzmir and also in some other municipalities. Public buses are equipped with modern features such as cameras and mobile recording devices, Wi-Fi service, USB charging, a passenger counting system and an emergency button.[3]

- *Automatic fare collection:* A single contactless electronic card for all types of public transport is available and payments can be made at stops or through web and mobile applications.[4] For example, in the capital a smart ticketing system called “Istanbul Card” can be used with all public transport, parking and taxis.[5]
- *Automatic passenger information and vehicle location:* Information on monitoring public transport fleets and operations in real-time is used to inform passengers about bus schedules, arrival times and line numbers via mobile applications, intelligent bus stop signs and a website. Information on the technical features of incoming buses such as Wi-Fi, disabled apparatus and air conditioning is

[1] Barut, ‘Country Study Report - Innovative & Integrated ITS for the Development & Operation of Sustainable Transport Systems in Urban Areas’.

[2] Barut.

[3] Barut.

[4] United Nations ESCAP, ‘Development of Model Intelligent Transport Systems Deployments for the Asian Highway Network’.

[5] Frost and Sullivan, ‘A Guide to Intelligent Transport Systems and Best Practices’ (New York, 2018), https://www.isbak.istanbul/wp-content/uploads/2018/01/a-guide-to-intelligent-transportation-systems-and-best-practices-a-guide-to-intelligent-transportation-systems-and-best-practices.pdf.

also available.[1] As an example the İstanbul Metropolitan Municipality can instantly track the location of vehicles from the center and make any operational changes in the event of service failure or traffic congestion.[2]

Source: Murat Dursan Barut, General Directorate of Highways Turkey, Presentation on Intelligent Transport Systems (ITS) Applications for the Expert Group Meeting and Regional Meeting on Intelligent Transport Systems (ITS), (Incheon, Republic of Korea, 2-4 April 2019).

Figure 22 Automatic passenger information mobile application

d) Commercial Vehicle Operations (CVO)

In addition to fundamental applications, advanced CVO applications are also noted, such as fleet management and freight in-transit monitoring.

- *Weigh-in-motion:* A total of 99 roadside inspection stations are located on the country's highway networks which include weight-in-motion devices. They can enable inspection of the speed, vehicle class, number of axles, the distance between two axles and the weight of freight vehicles with minimal interruption in traffic flow. The stations also include license plate recognition cameras and VMS to enforce legislation and inform drivers to drive safely under the highway's regulations.[3]
- *International electronic border crossing clearance and freight administration:* It is anticipated that further expansion of the eTIR is to be rolled out in Turkey to integrate with other TIR participating countries following the successful pilot project.[4]
- *Fleet management and freight in-transit monitoring:* By utilizing Machine to Machine (M2M) applications, the remote monitoring and management of vehicles and communications between vehicles are possible through mobile networks via a special sim-card installed in an on-board unit. The system can retrieve data on speed, direction and location. Additional sensors can retrieve data on the status of the vehicle such as fuel consumption which can be used for administrative purposes. Further, the data collected from vehicles can be utilized to get information about traffic density.[5] The system can also monitor working hours for drivers to facilitate a safe limit on driving time. The system is fairly widespread with over 4 million M2M members in Turkey as of December 2016.[6]

e) Emerging technologies

[1] Barut, 'Country Study Report - Innovative & Integrated ITS for the Development & Operation of Sustainable Transport Systems in Urban Areas'.

[2] Barut.

[3] Barut.

[4] Kern and Sceia, 'ETIR, the New Digital TIR Carnet'.

[5] United Nations ESCAP, 'Development of Model Intelligent Transport Systems Deployments for the Asian Highway Network'.

[6] Frost and Sullivan, 'A Guide to Intelligent Transport Systems and Best Practices'.

The General Directorate of Highways assessed the feasibility of connected vehicles and cooperative-intelligent transport systems including V2I and V2V applications in 2014 and 2015. Minimal progress has been made since then and V2I and V2V applications are only at a basic level in Turkey at present. These applications are limited to DSRC for electronic toll collection systems on motorways and low-level applications in adaptive speed control in vehicles without autonomous driving.[1]

III.4 Analytical Findings on Smart Transport Systems along the CCWA Economic Corridor

To overcome any limitations from the desk research, target countries along the CCWA economic corridor were consulted through a survey to provide first-hand information that could help to understand the situation of smart transport systems in the target countries. Consultation with target countries was considered essential for achieving any lessons and insights from their experiences. Equally it was considered prudent to gain a further understanding of what smart transport systems could be deployed from target countries with minimal experience in this area. Responses were received from all target countries with the exception of Kazakhstan and Turkmenistan.

The survey included questions on the following topics:

- Smart transport systems status
- Corridor-specific smart transport systems
- Cross-border smart transport systems and
- Priority corridors, possible action plans and corridor specific strategies.

Responses from target countries indicated that the deployment status of smart transport systems varied from country to country and was dependent on several limiting factors which are further noted in the following sections. The results obtained from the respondents serve as a foundation for further development opportunities for smart transport systems along the CCWA economic corridor. The following sections provide an outline of the results of the survey and conclusions that can be inferred.

III.4.1 Current status of smart transport systems across target countries

Five categories (ATMS, ATIS, APTS, CVO and emerging technologies) were applied to determine the most common and desired applications under each system. ATMS (37.9 per cent) ranks as the first option among the range of systems. This is considered to imply that a basic set of services related to traffic management are required to be installed with their effectiveness rated before more advanced technologies are explored. Following on in order of importance, CVO (27.1 per cent) followed by ATIS (17.6 per cent), APTS (12.6 per cent) and lastly emerging technologies (4.8 per cent) have been deployed.

ADVANCED TRAFFIC MANAGEMENT SYSTEMS (ATMS)

Among ATMS, automatic traffic enforcement, electronic toll collection and tunnel traffic management are the most widespread applications that have been broadly applied in target countries. To a lesser extent, adaptive traffic signal control and ramp metering, followed by variable speed limit, incident management, congestion pricing/electronic road pricing and freeway management, work zone management and bridge traffic management, have also been deployed. The success of these measures has been demonstrated by improved traffic flow and safety, and in alleviating traffic delays. For instance, it is considered that when electronic toll collection can be utilized on urban toll expressways instead of processing payments manually,

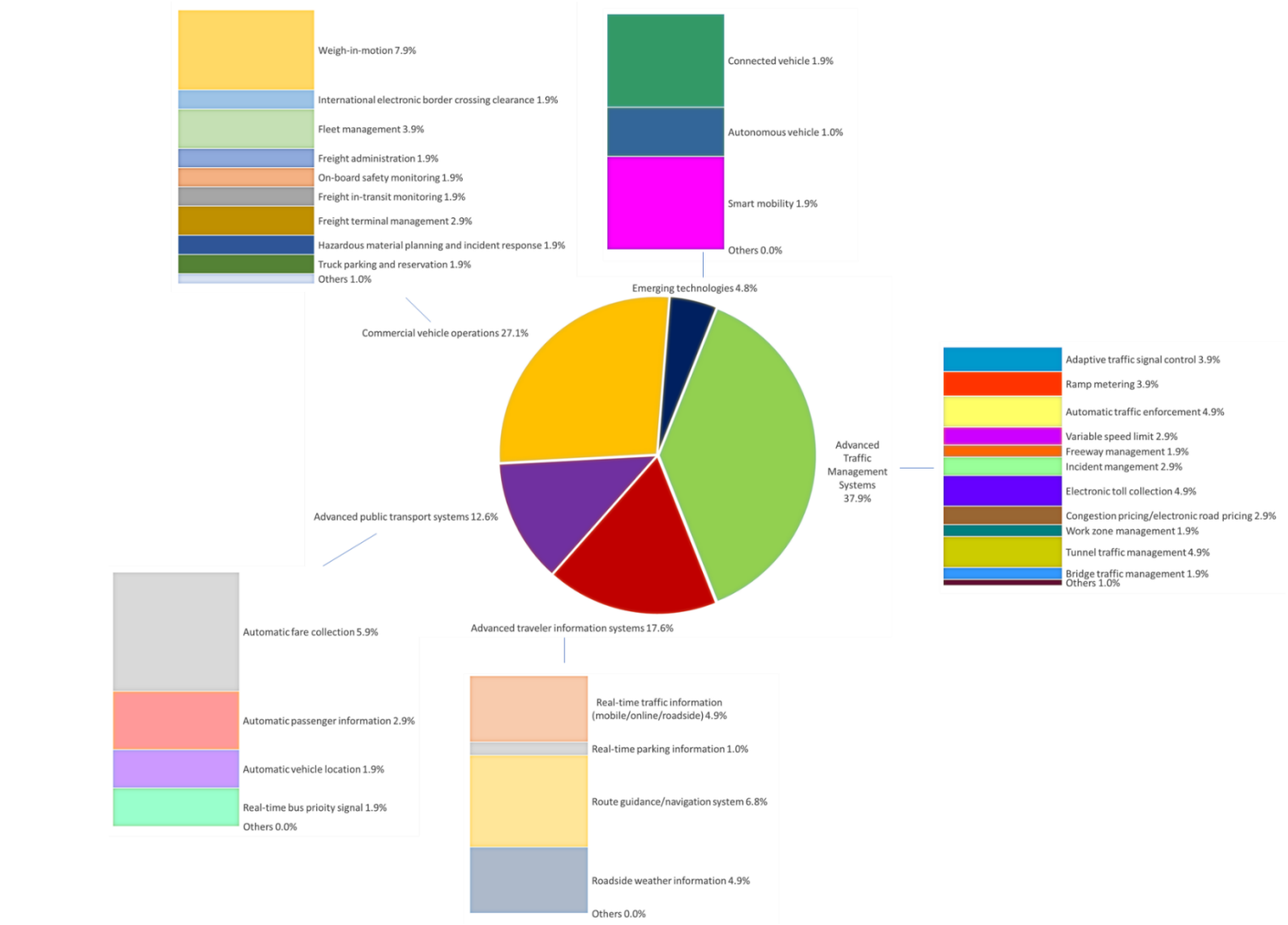
[1] Barut, 'Country Study Report - Innovative & Integrated ITS for the Development & Operation of Sustainable Transport Systems in Urban Areas'.

delays are minimized and traffic demand can be managed by charging vehicles for road usage when areas are congested.[1]

ADVANCED TRAVELER INFORMATION SYSTEMS (ATIS)

In the case of existing ATIS, route guidance/navigation systems rank foremost in providing information to road users. This is considered intuitive as this type of basic technology is readily available. Secondly, real-time traffic information (mobile/online/roadside) and roadside weather information provide fast and reliable estimations of travel time. Real-time parking information is currently less developed but can also contribute to an efficient streamlined travel experience.

[1] United Nations ESCAP, Review of Developments in Transport in Asia and the Pacific 2017 (Bangkok: United Nations, 2017), http://www.unescap.org/sites/default/files/publications/Review2017_Hires_21Dec2017.pdf.



Source: ESCAP

Figure 23 Smart transport systems currently in operation

ADVANCED PUBLIC TRANSPORT SYSTEMS (APTS)

In terms of APTS, automatic fare collection is the predominant subcategory. Automatic passenger information is ranked second followed by both automatic vehicle location and real-time bus priority signal. The existing attention towards automatic fare collection is considered to form part of basic economic management of public transport which can in turn reduce delays in travel time. It is recognized as an initial step towards public recognition of the efficiency of APTS. More advanced technologies can lead onto providing real-time information on public transport services through the Internet to allow travelers to choose the most practical services to meet their needs.[1]

COMMERCIAL VEHICLES OPERATIONS (CVO)

Weigh-in-motion is the primary subcategory of CVO followed by fleet and freight terminal management. This is because the use of weigh-in-motion reduces weighing delays and is an economically feasible alternative to static weighing stations. It increases traffic flow and allows for the efficient movement of freight. Other subcategories rated as being equally important are international electronic border crossing clearance, fleet management, freight administration, on-board safety monitoring, freight in-transit monitoring, hazardous material planning, incident response and truck parking and reservation.

EMERGING TECHNOLOGIES

Innovations in emerging technologies occupies the smallest allocation out of all five categories. This is considered to be an expected result given that these fledgling technologies are a high-level option of smart transport systems. This subcategory is reserved more for countries that are at a higher level of smart transport systems maturity where most other systems have already been deployed. There are also fewer restrictions for their application. Among three concepts of emerging technologies, connected vehicles and smart mobility are slightly more widespread than autonomous vehicles.

III.4.2 Future plans of smart transport systems for the next 10 years across target countries

When comparing existing and planned smart transport systems, similar trends are apparent. ATMS ranks as the primary option among the range of systems which indicates that traffic management aspects are both the current and the future priorities of target countries. The following changes are noted:

- Advanced traffic management systems (a decrease from 37.9 to 33.2 per cent)
- Advanced traveler information systems (a decrease from 17.6 to 12.9 per cent)
- Advanced public transport systems (an increase from 12.6 to 21.6 per cent)
- Commercial vehicle operations (a decrease from 27.1 to 23.5 per cent) and
- Emerging technologies (an increase from 4.8 to 8.8 per cent).

Based on the above comparisons, it is apparent that countries are intending to place more emphasis on advanced public transport systems and emerging technologies over the next 10 years. This appears to be due to the evolution of current forms of smart transport systems becoming evolved enough to warrant less attention, hence more concerted focus is predicted in the development of higher order smart transport systems categories.

ADVANCED TRAFFIC MANAGEMENT SYSTEMS (ATMS)

The respondents envisage the changes in ATMS over the next 10 years from the existing situation to have a greater focus on ramp metering, freeway management, incident management, work zone management and bridge traffic management. Less focus is envisaged for adaptive traffic signal control, automatic traffic

[1] United Nations ESCAP.

enforcement, variable speed limit, electronic toll collection, congestion pricing/electronic road pricing and tunnel traffic management.

ADVANCED TRAVELER INFORMATION SYSTEMS (ATIS)

In the case of ATIS, an increase in real-time parking information is envisaged over the next 10 years, with less focus on real-time traffic information (mobile/online/roadside), route guidance/navigation systems and roadside weather information from present deployment. It is considered that this is linked to other subcategories of ATIS gaining traction in the near future, which would increase the attention on developing higher order ATIS such as real-time parking information.

ADVANCED PUBLIC TRANSPORT SYSTEMS (APTS)

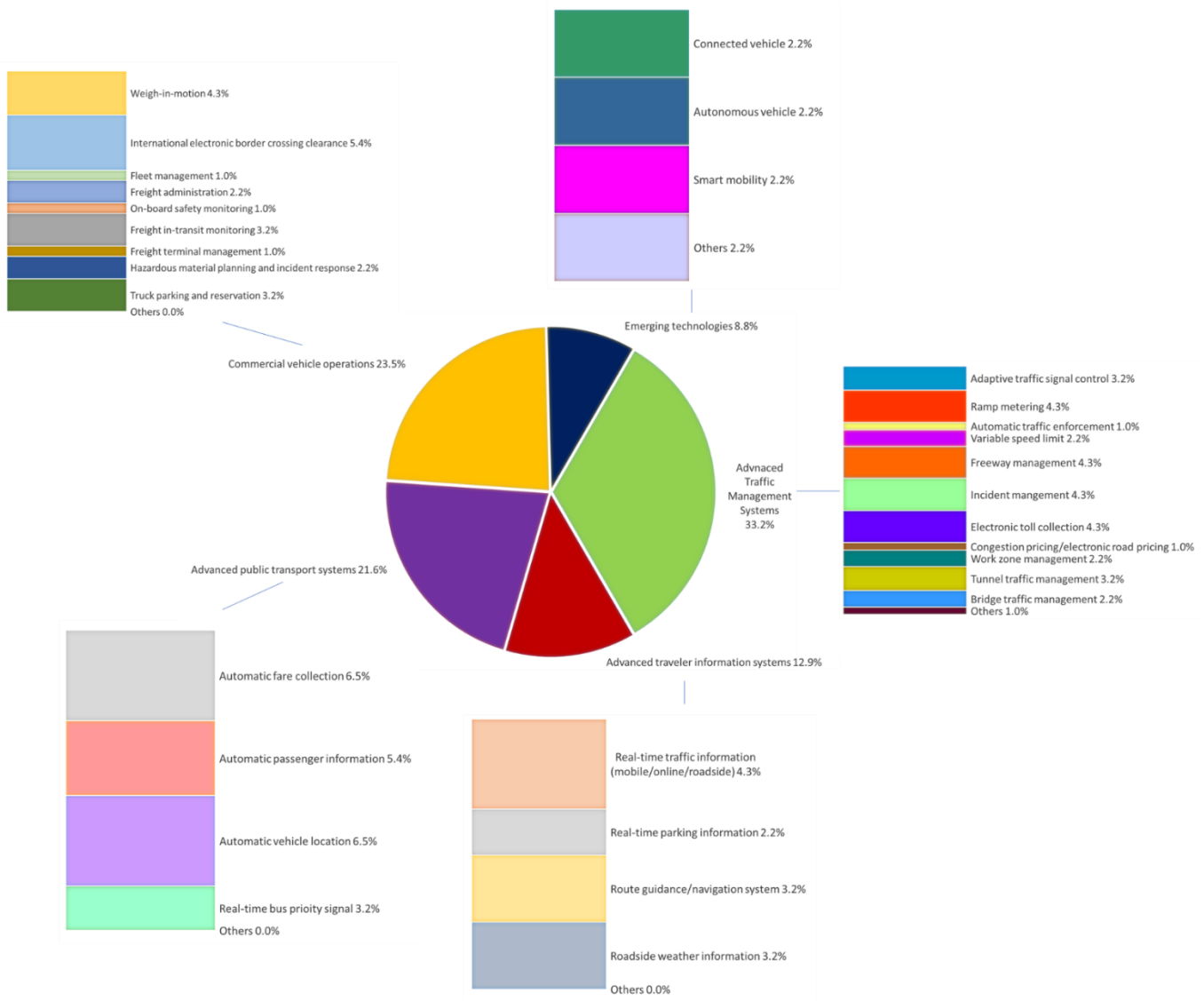
Target countries envisage an overall expansion in the use of APTS from their present situation over a 10-year timeframe for all subcategories of automatic fare collection, automatic passenger information, automatic vehicle location and real-time bus priority signal. This is considered as a logical and sequential trend to encourage public transport options following the implementation of an acceptable functioning level of ATMS measures.

COMMERCIAL VEHICLES OPERATIONS (CVO)

In the case of CVO, there is a greater focus on international electronic border crossing clearance, freight administration, freight in-transit monitoring, hazardous material planning, incident response, and truck parking and reservation. Less focus is placed on weigh-in-motion, fleet management, on-board safety monitoring and freight terminal management.

EMERGING TECHNOLOGIES

An increase in the adoption of emerging technologies from their existing deployment is likely with the subcategories of connected vehicle, autonomous vehicles, smart mobility and other options, which are considered to be of equal importance over the next 10 years. This is considered to be an optimistic result as target countries appear to be open to enhancing the efficiency of their transport networks through the deployment of new technologies which may become available over the next 10 years.



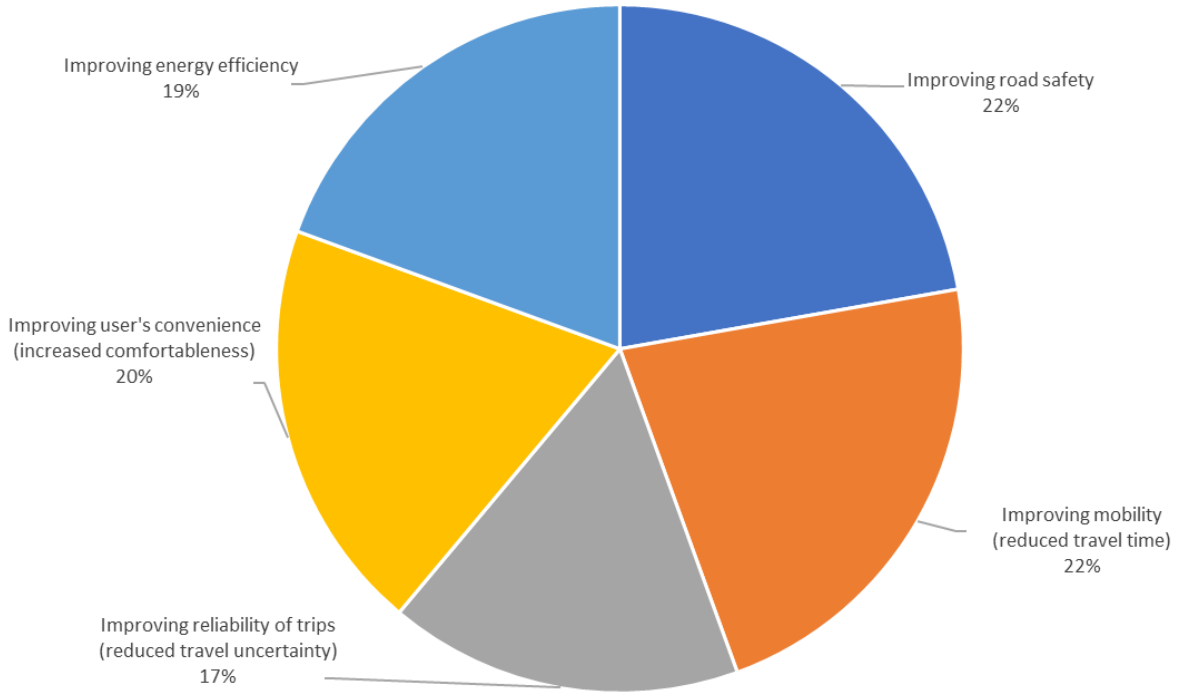
Source: ESCAP.

Figure 24 Smart transport systems planned for deployment within the next 10 years

III.4.3 Main benefits and challenges from smart transport systems in target countries

BENEFITS ANTICIPATED BY SURVEY RESPONDENTS

Five typical benefits were presented for the survey based on various literature reviews of past smart transport systems studies. These benefits explain most of the utilities associated with the deployment of smart transport systems. The respondents noted that all benefits are relatively equally weighted with the greatest benefits being from improving both road safety as well as mobility (reduced travel time). These results clearly demonstrate that the respondents are aware of the wide range of benefits from deploying smart transport systems.

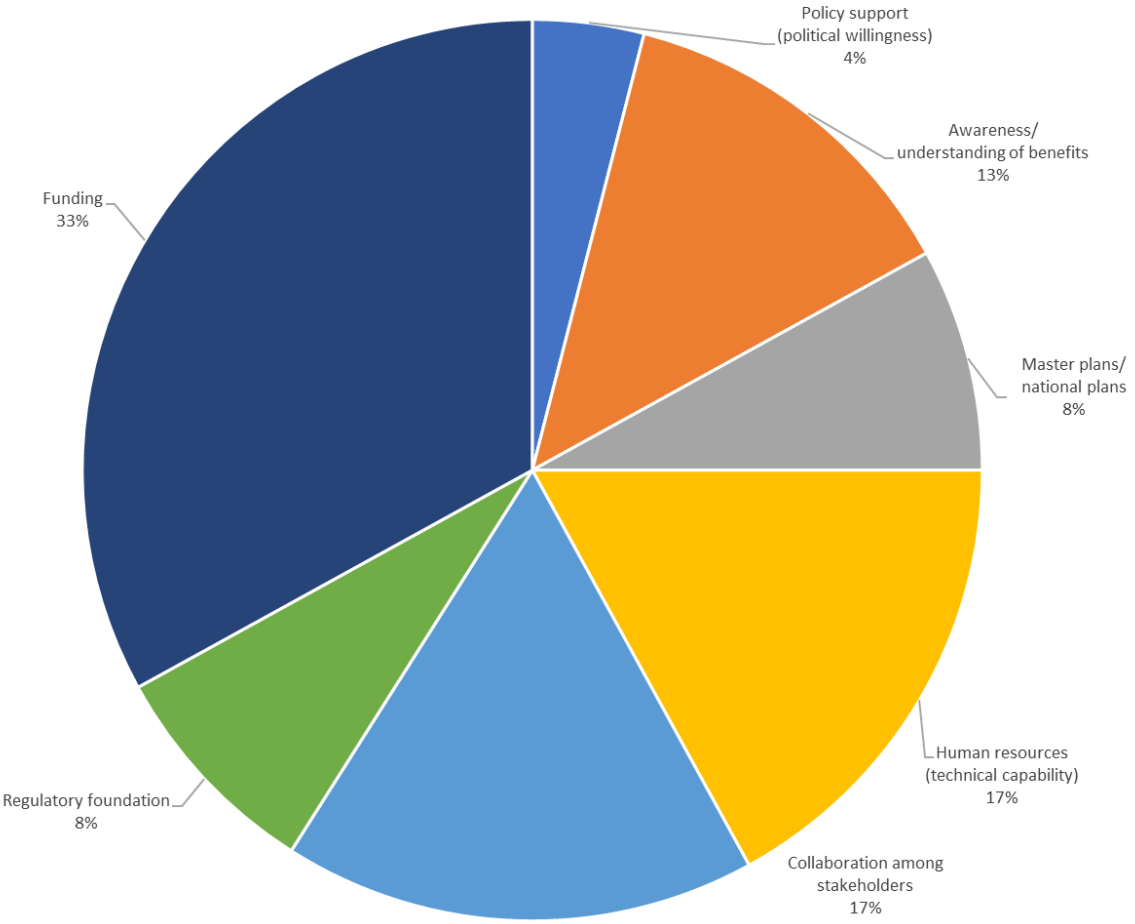


Source: ESCAP

Figure 25 Proportion of benefits from smart transport systems in target countries

OBSTACLES TO SMART TRANSPORT SYSTEMS DEVELOPMENT

It is important to identify that considerably difficult challenges and barriers need to be overcome to deploy new smart transport systems and/or to boost the existing ones. The respondents reported that limited funding was the most significant obstacle. In addition, there is limited human resources, collaboration among stakeholders, and awareness and challenges to understanding of the benefits of smart transport systems relatively equally rated as significant challenges. It is anticipated that these challenges stem from an inadequate knowledge base and inadequate technical capability, which can be overcome through knowledge sharing and education programmes following the introduction and effective operation of common smart transport systems.



Source: ESCAP

Figure 26 Proportion of challenges found for smart transport systems development

III.4.4 Examination of smart transport systems in priority corridors

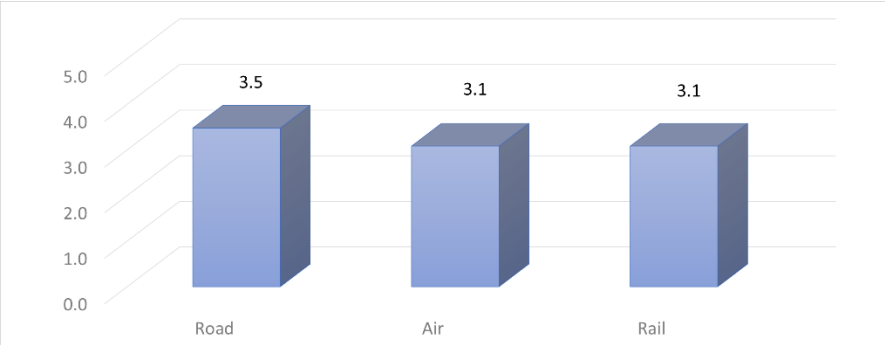
BRIEF OVERVIEW OF SMART TRANSPORT SYSTEMS IN PRIORITY CORRIDORS

a) Prevalent mode of transport in priority corridors

According to the survey conducted for target countries, the most frequently used mode of transport in their first and second priority corridors in respective countries is primarily road based at 63.2 per cent, secondly rail at 21 per cent and lastly air transport at 15.8 per cent. It is understood that the prevalence of road transport within priority corridors is reflective of the limiting factors for the creation of cost-effective rail networks. Such constraints include mountainous topography, which increases the cost of investment in rail, and regulatory obstacles between target countries.

b) Readiness of smart transport systems in priority corridors

The status of smart transport systems readiness along the first and second priority corridors in their respective countries was investigated through the survey. A score of 5 being a high score of readiness and a score of 1 being a low score of readiness. Target countries are predominantly ready to utilize smart transport systems along their road corridors (3.5), followed by rail (3.1) and air (3.1).

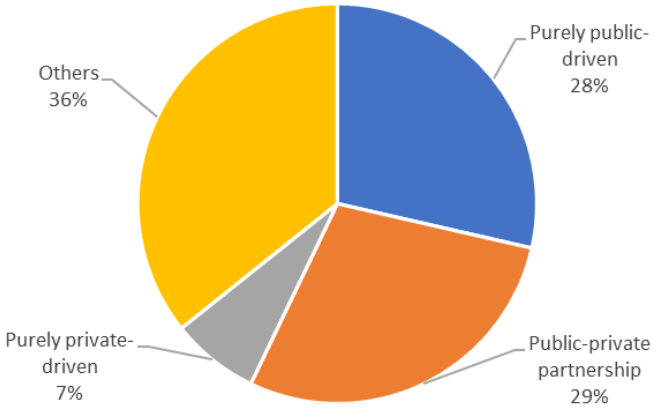


Source: ESCAP

Figure 27 Revealed readiness of smart transport systems in priority corridors

c) Types of funding schemes for smart transport systems projects in priority corridors

The source of funding schemes for smart transport systems projects in priority corridors chosen from the respondents is being investigated further or is unknown (36 per cent) at this stage in most target countries. Purely publicly driven (28 per cent) or public-private partnerships (29 per cent) for the most part are equally used, with a very small portion being privately driven (7 per cent).



Source: ESCAP

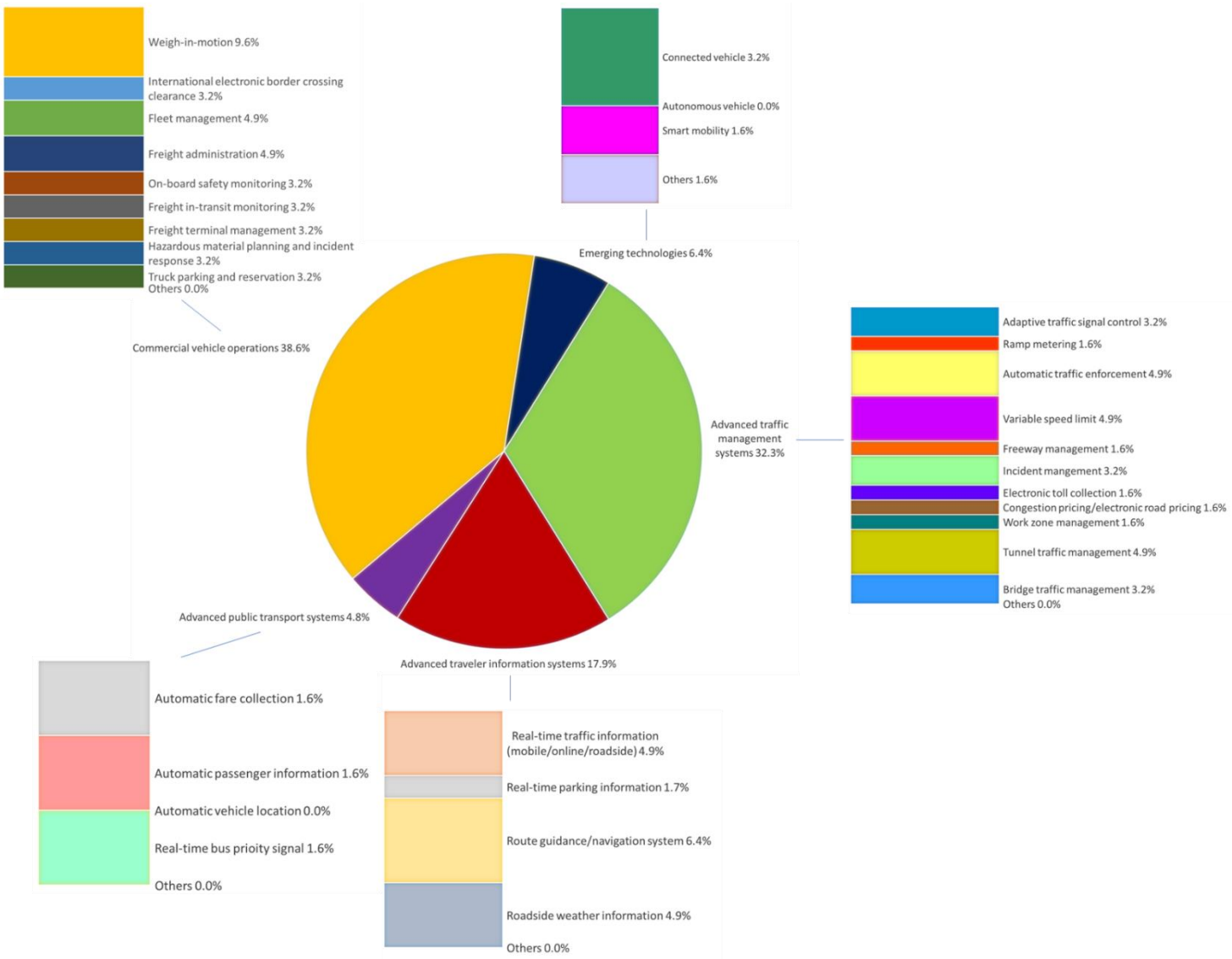
Figure 28 Proportion of funding schemes for smart transport systems projects in priority corridors

III.4.5 Analysis of smart transport systems for cross-border movements

CURRENT STATUS OF SMART TRANSPORT SYSTEMS FOR CROSS-BORDER MOVEMENTS

CVO (38.6 per cent) represent the bulk of smart transport systems currently operating in target countries for cross-border movements between neighbouring countries. This indicates that commercial trade

between countries is presently the main priority when considering the use of cross-border smart transport systems for efficient freight movements. This is followed by ATMS (32.3 per cent), ATIS (17.9 per cent), emerging technologies (6.4 per cent), and lastly APTS (4.8 per cent). APTS are ranked as last, as public transport is not a main mode of transport for cross-border movements.



Source: ESCAP

Figure 29 Smart transport systems currently in operation for cross-border movements

a) Advanced Traffic Management Systems (ATMS)

ATMS still play a critical role in the efficient movement across borders, as it does with internal traffic movements within a country. The most applicable subcategories of ATMS are automatic traffic enforcement, variable speed limit and tunnel traffic management. To a lesser extent, adaptive traffic signal controls, incident management and bridge traffic management are utilized. Ramp metering, freeway management, electronic toll collection, congestion pricing/electronic road pricing and work zone management are the least utilized. It is noted that ramp metering (1.6 per cent), electronic toll collection (1.6 per cent) and congestion pricing/electronic road pricing (1.6 per cent) are ranked lower for cross-border movements when compared to ones for all areas of target countries, while the use of bridge traffic management is notably increased (3.2 per cent).

b) Advanced Traveler Information Systems (ATIS)

Route guidance navigation systems are the most widely used for cross-border movements, given that cross-border movements happen generally over long distances where such systems have been proven to be very advantageous. Real-time traffic information (mobile/online/roadside), roadside weather information and finally real-time parking information are used to a lesser extent.

c) Advanced Public Transport Systems (APTS)

The survey results note that automatic fare collection, automatic passenger information and real-time bus priority signal are deployed in an equal capacity for cross-border movements. Particularly, automatic fare collection shows a lower utilization, while automatic vehicle location appears unavailable in any country. This differs from the results for smart transport systems on a country wide basis.

d) Commercial Vehicle Operations (CVO)

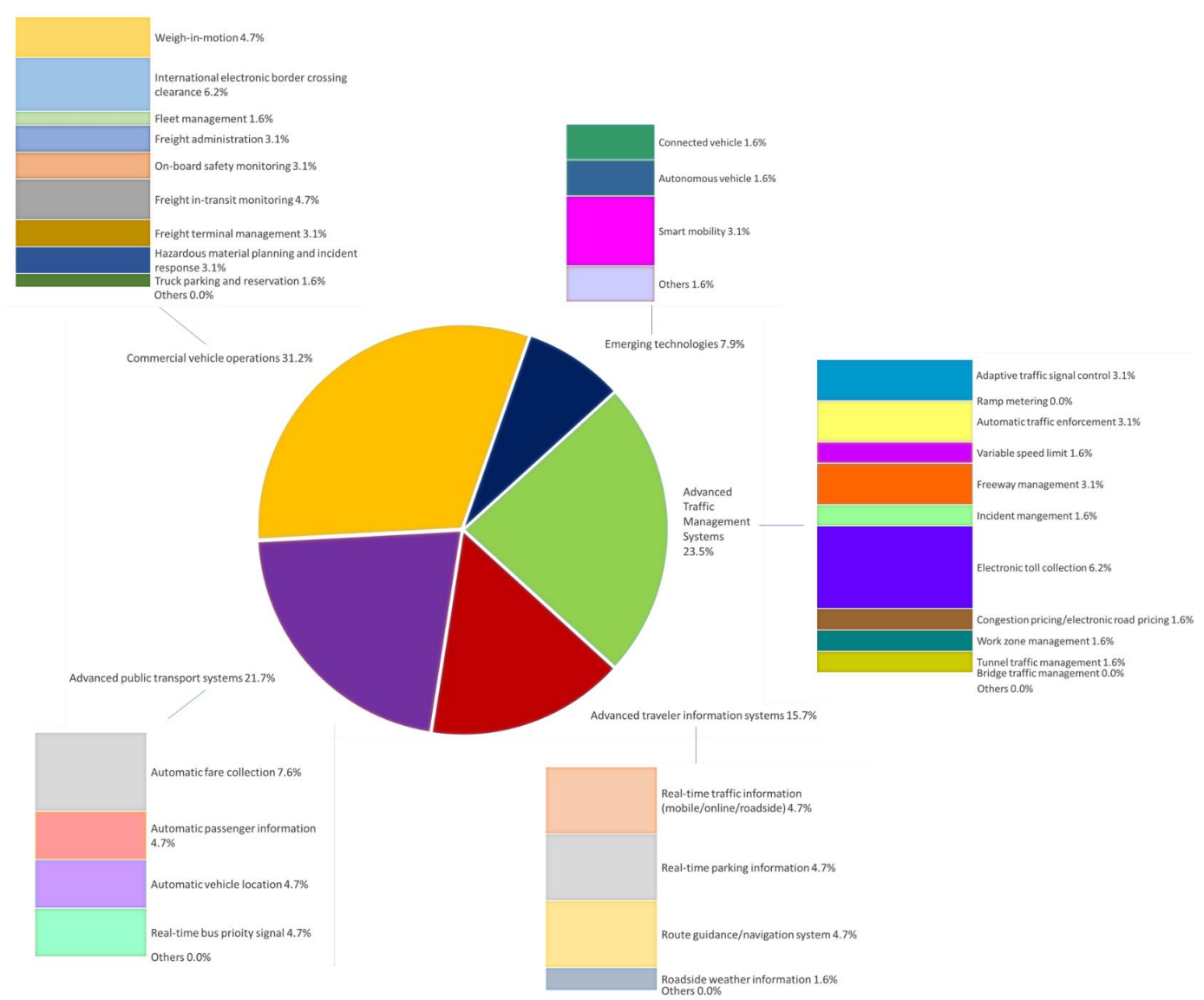
Weigh-in-motion is the predominant technology under CVO. This might be considered representative of a low-cost smart transport system when compared to the cost of a weigh station, to efficiently enforce tax and safety regulations across international borders. Fleet management and freight administration have been deployed to a lesser extent. All applications under CVO show higher utilization for cross-border movements compared to the ones for all areas of target countries.

e) Emerging technologies

Emerging technologies are rated low amongst respondents with a low priority for deployment to date. Connected vehicles are the predominant choice of emerging technologies showing an increase (from 1.9 per cent to 3.2 per cent) when compared to the one for all areas of target countries in this category. Further expansion in this area may prove to be viable in the future, if and when there is improved access to new technologies.

SMART TRANSPORT SYSTEMS PLANNED FOR CROSS-BORDER MOVEMENTS OVER THE NEXT 10 YEARS

Comparing the most frequently used systems for cross-border movements to those anticipated over the next 10 years, the following changes are indicated:



Source: ESCAP

Figure 30 Smart transport systems planned for deployment within the next 10 years for cross-border movements

- Advanced traffic management systems (a decrease from 32.3 to 23.5 per cent)
- Advanced traveler information systems (a decrease from 17.9 to 15.7 per cent)
- Advanced public transport systems (an increase from 4.8 to 21.7 per cent)
- Commercial vehicle operations (a decrease from 38.6 to 31.2 per cent) and
- Emerging technologies (an increase from 6.4 to 7.9 per cent).

Based on the above comparisons, it is apparent that countries place more emphasis on advanced public transport systems and emerging technologies for international crossings. These changes are consistent with the results noted on a country wide basis in section 4.2. This is possibly due to an increasing interest in more advanced forms of smart transport systems.

a) Advanced Traffic Management Systems (ATMS)

Changes in ATMS over the next 10 years show the respondents envisage a greater focus on electronic toll collection, followed by freeway management. Less focus is given to adaptive traffic signal control, ramp metering, automatic traffic enforcement, variable speed limit, incident management, congestion pricing/electronic road pricing, work zone management, tunnel traffic management and bridge traffic management. Compared to the results for all areas of target countries, electronic toll collection and automatic traffic enforcement are more emphasized over the next 10 years for cross-border movements.

b) Advanced Traveler Information Systems (ATIS)

The respondents envisage an uptake in real-time parking information over the next 10 years. Attention to real-time traffic information (mobile/online/roadside) and route guidance/navigation systems remain relatively unchanged. A decrease in the deployment in roadside weather information is envisaged as it is understood that this infrastructure may already be in place.

c) Advanced Public Transport Systems (APTS)

A significant increase in attention to APTS is prioritized for cross-border movements over the next 10 years. Improvements to all sub-applications are envisaged, particularly automatic vehicle location. This may improve the attractiveness and efficiency of cross-border public transport and lead to a reduction in the impact of private car usage on the environment. When comparing the results on a country wide basis, automatic toll collection (7.6 per cent) receives slightly more attention due to long-distance trips associated with cross-border movements.

d) Commercial Vehicle Operations (CVO)

Although some opportunities exist for further development of international electronic border crossing clearance and freight in-transit monitoring over the next 10 years, all other sub-applications remain relatively unchanged. However, when compared to the results for all areas of target countries, international electronic border crossing clearance (6.2 per cent), freight in-transit monitoring (4.7 per cent) and freight terminal management (3.1 per cent) show a slightly greater emphasis towards cross-border movements.

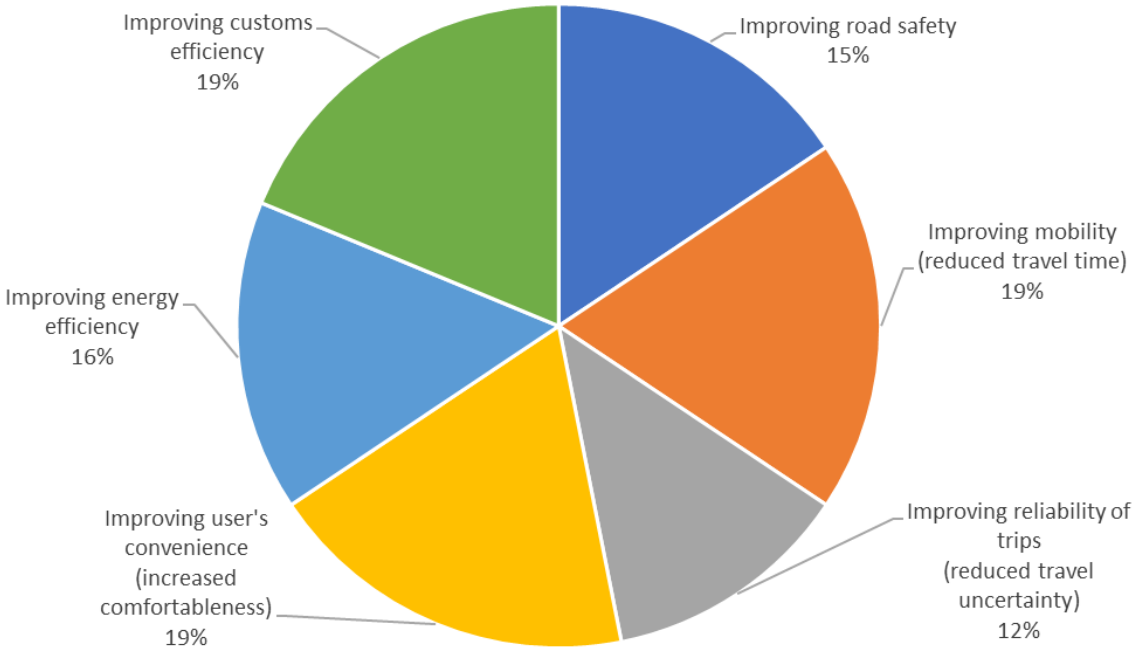
e) Emerging technologies

Respondents anticipate future development opportunities over the next 10 years in emerging technologies, predominantly in an expansion in the use of smart mobility, connected and autonomous vehicles. Given

that smart mobility generally focuses on urban transport, other advanced forms of technologies might bring more attention towards cross-border movements.

MAIN BENEFITS FROM SMART TRANSPORT SYSTEMS FOR CROSS-BORDER MOVEMENTS

The main benefits from smart transport systems in relation to border crossing movements are relatively equally weighted with improved customs efficiency, user convenience (increased comfort levels) and greater mobility (reduced travel time) which is considered to be the most beneficial. It is noted that when comparing the benefits expected from smart transport systems on a country wide basis (section 4.3.1), improved customs efficiency is ranked highly as an expected benefit with cross-border movements (increasing from 0 to 19 per cent).

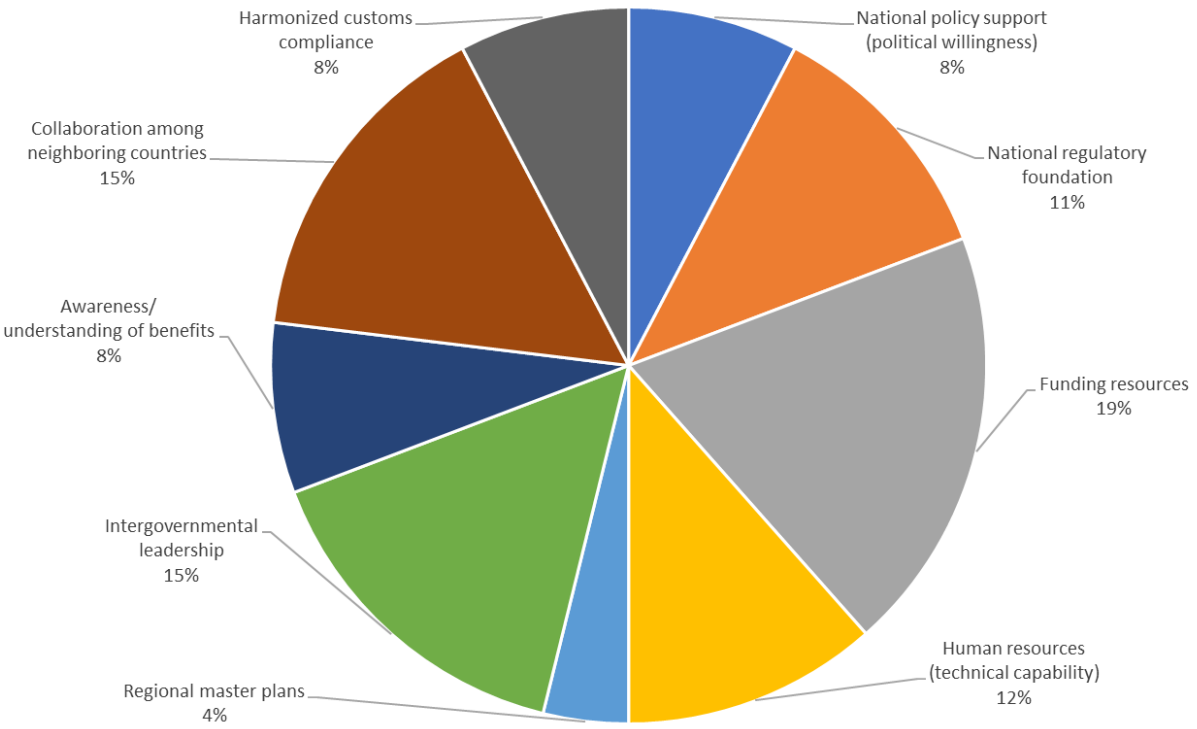


Source: ESCAP

Figure 31 Proportion of benefits from smart transport systems when crossing borders

OBSTACLES TO SMART TRANSPORT SYSTEMS DEVELOPMENT FOR CROSS-BORDER MOVEMENTS

Limited funding resources are considered the greatest hurdle for smart transport systems adoption for cross-border movements. This is followed by limited collaboration among neighbouring countries, inadequate intergovernmental leadership, limited technical human resources, inefficient and inadequate national regulations, synchronized customs compliance, limited political willingness to create policy frameworks national policy support (political willingness), limited awareness/understanding of benefits and lastly limited constructed and adequate regional master plans. When compared to general challenges identified from smart transport systems on a country wide basis (section 4.3.2), although limited funding resources are still in the highest rank as a main challenge, its influence decreases, and new challenges arise such as collaboration among neighboring countries, intergovernmental leadership, and harmonized customs compliance. Particularly, collaboration among neighboring countries and intergovernmental leadership are regarded as one of the most important factors for the successful deployment of smart transport systems for cross-border movements.



Source: ESCAP

Figure 32 Proportion of challenges found for smart transport systems to cross-border movements

III.4.6 Major lessons learned for formulating policy recommendations

A SNAPSHOT OF CURRENT AND PLANNED SMART TRANSPORT SYSTEMS

Several countries have good experience in smart transport systems planning and deployment whereas others are less developed. This is evident in the following table which compares the current and planned smart transport systems within the next 10 years for each target country.

In terms of the current use of smart transport systems, automatic fare collection (7 out of 8) under APTS and weigh-in-motion (7 out of 8) under CVO are most frequently deployed, followed by automatic traffic enforcement (6 out of 8) under ATMS, and real-time traffic information (mobile/online/roadside) (6 out of 8) and route guidance/navigation systems (6 out of 8) under ATIS, in target countries along the CCWA economic corridor. However, when including planned applications, weigh-in-motion under CVO has the highest frequency (8 out of 8) that all target countries have already implemented or are planning to deploy. Electronic toll collection (7 out of 8) under ATMS, real-time traffic information (mobile/online/roadside) (7 out of 8) under ATIS and automatic fare collection (7 out of 8) under APTS are the most prevalent applications after weigh-in-motion in target countries. Among all planned applications, international electronic border crossing clearance under CVO is the most frequently noted application for deployment over four countries. This means that regardless of the types of applications, the importance of cross-border movements with smart transport systems are well noted by target countries which is already reflected in their plans. It is also noted that green transport receives particular interest as a planned technology among target countries.

Table 15 Status of smart transport systems in use and in plans

(○: applications currently operating, ☆: applications planned for the next 10 years)

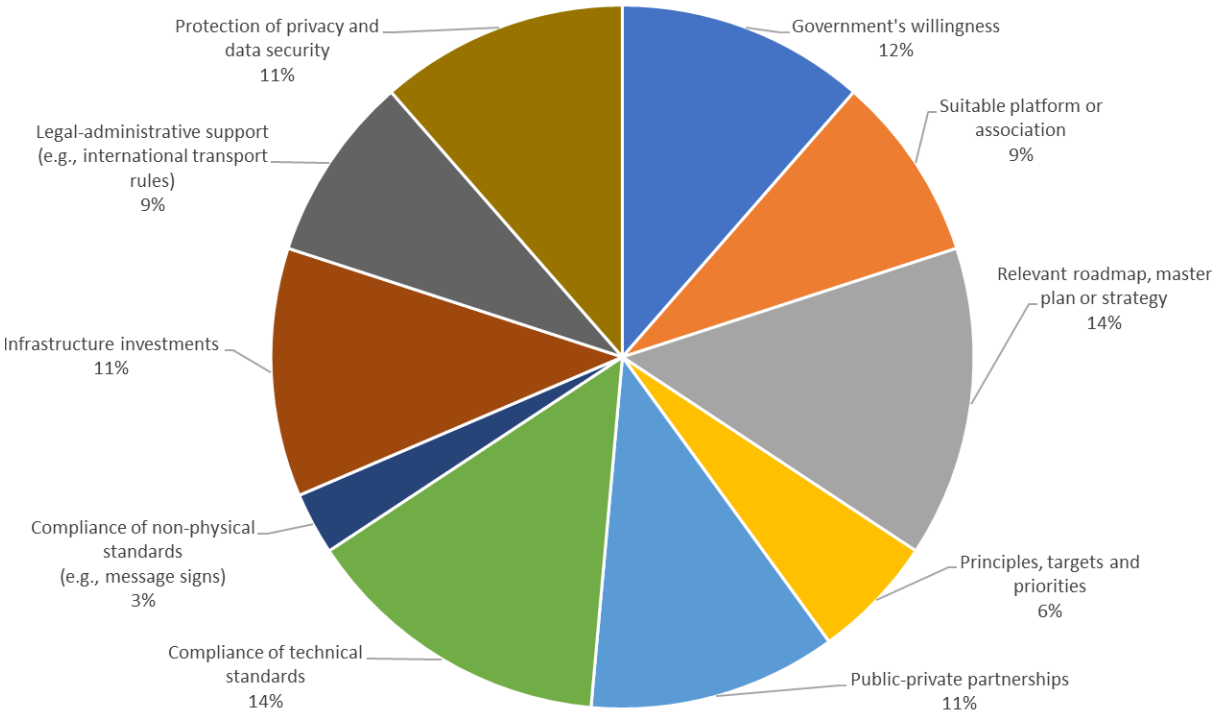
Categories	Sub-applications	China	Iran	Kazakhstan	Kyrgyzstan*	Tajikistan	Uzbekistan	Turkmenistan	Turkey	Frequency (planned)
Advanced traffic management systems	Adaptive traffic signal control	○	○	○	☆	○	☆			4(2)
	Ramp metering	○	○		☆	○	☆		☆	3(3)
	Automatic traffic enforcement	○	○	○	○			○	○	6(0)
	Variable speed limit	○	☆	☆	☆		○	○		3(3)
	Freeway management	○	○	○	☆	☆		☆		3(3)
	Incident management	○	☆	○			☆		○	3(2)
	Electronic toll collection	○	○	○	☆	○	☆		○	5(2)
	Congestion pricing/electronic road pricing		○	○	○		☆			3(1)
	Work zone management	○				☆				1(1)
	Tunnel traffic management	○	○		○	☆			○	4(1)
	Bridge traffic management	○				☆				1(1)
Advanced traveler information systems	Real-time traffic information (mobile/online/roadside)	○	○	○	○	☆		○	○	6(1)
	Real-time parking information	○								1(0)
	Route guidance/navigation system	○	○	○	○	○	○			6(0)
	Roadside weather information	○	○	○	○	☆			○	5(1)
Advanced public transport systems	Automatic fare collection	○	○	○	○	○		○	○	7(0)
	Automatic passenger information	○	○		☆	☆			○	3(2)
	Automatic vehicle location	○	○	○	☆	☆				3(2)
	Real-time bus priority signal	○	○		☆					2(1)
Commercial vehicle operations	Weigh-in-motion	○	○	○	○	○	○	☆	○	7(1)
	International electronic border crossing clearance	○	☆	○	☆	☆	☆			2(4)
	Fleet management	○	○	☆					○	3(1)
	Freight administration	○		☆		☆				1(2)
	On-board safety monitoring	○								1(0)
	Freight in-transit monitoring	○		☆	☆		☆			1(3)
	Freight terminal management	○	○	☆						2(1)
	Hazardous material planning and incident response	○				☆				1(1)
	Truck parking and reservation	○	☆				☆			1(2)
Emerging technologies	Connected vehicle	○	○							2(0)
	Autonomous vehicle	○								1(0)
	Smart mobility	○								1(0)
	Others	☆					☆ (green transport)			0(2)

*: Information in Kyrgyzstan was compiled from two survey results submitted by two different experts.

Note: As responses were not received from Kazakhstan or Turkmenistan, the information for these two countries in the table was created based on literature reviews from relevant multiple sources, including reports and meeting materials as outlined in this chapter. As such, there is a possibility that because of limited public sources, the information presented may be slightly different from the actual circumstances in these countries.

KEY CONSIDERATIONS FOR POLICY RECOMMENDATIONS

The top two key considerations noted by the target countries were for a relevant roadmap, master plan or strategy, and compliance with technical standards. As noted from the identified main challenges above, collaboration among neighboring countries and intergovernmental leadership are the biggest barriers to implementing smart transport systems for cross-border movements. It is understood that a relevant roadmap, master plan or strategy has been emphasized by respondents due to such challenges. Likewise, compliance with technical standards is selected as a major consideration because improving customs efficiency, user's convenience and mobility are the main benefits expected from compatibility and interoperability of systems among neighboring countries. A government's willingness, infrastructure investments and public-private partnerships are also chosen as major keywords when developing policy recommendations. Given that funding resources are the most important issues pointed out by target countries, more investments through diverse financing schemes will be of interest to target countries to minimise this barrier and further deploy smart transport systems along the CCWA economic corridor.

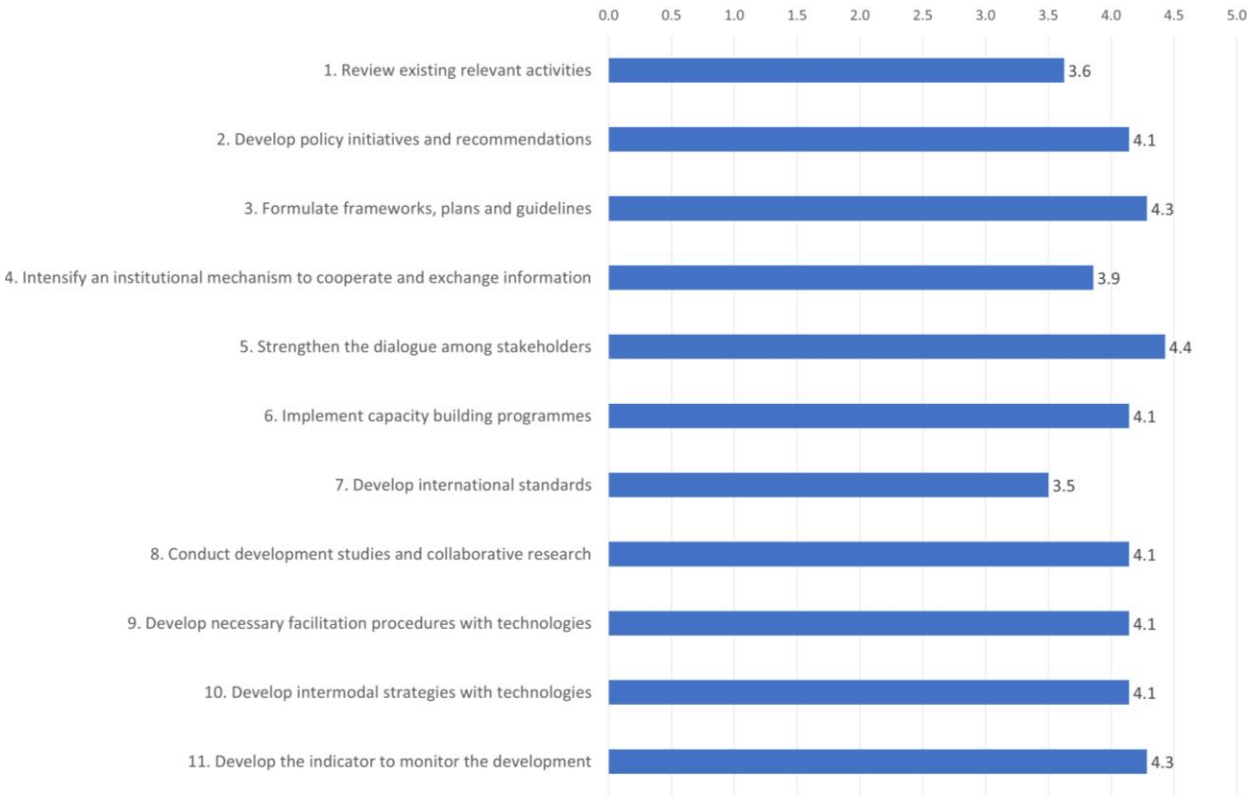


Source: ESCAP

Figure 33 Phrases for inclusion in a corridor specific strategy

POSSIBLE ACTION PLANS FOR POLICY RECOMMENDATIONS

In the surveys, respondents were asked what action plans were needed to be included in the corridor specific strategy for the effective connectivity of smart transport systems along the CCWA economic corridor. A score of 5 being the most important and a score of 1 being the least important. As noted in the results all of the action plans are between a score of 3.5 and 4.5 indicating that they all have values from the least, to average importance and high importance. The top three action plans promote strengthening dialogue between stakeholders, and formulating frameworks, plans and guidelines, and developing indicators to monitor development. These action plans have been given due consideration as policy recommendations along the CCWA economic corridor.



Source: ESCAP

Figure 34 Suggested action plans for a corridor specific strategy

III.5 Chapter Conclusions

This chapter has sought to provide a range of meaningful information on increasing the connectivity of smart transport systems along the CCWA economic corridor which can enhance the capacity and knowledge base of policymakers. This will assist national governments in target countries to develop policies, plans and strategies, and to evaluate the status and performance of smart transport systems in their respective countries. This is achieved through the guidance of policies which will form part of a multilateral corridor specific strategy aimed to deliver effective connectivity of smart transport systems along the CCWA economic corridor.

As can be seen from sections 3 and 4, there is evidence that the adoption of smart transport systems is gaining traction in target countries along the CCWA economic corridor. These technological changes have yielded positive results in relieving traffic problems. However, fragmentation, slow roll outs and inconsistency of services still persist as a result of policies which are less than effective, absent and lag behind the progression of smart transport systems deployment. As smart transport systems have been rapidly improving and becoming more diverse in recent years, prompt attention is required by policymakers to stay abreast of the current issues in smart transport systems for facilitating a modern and efficient transport ecosystem. As such, it is considered that the following policy recommendations could be prioritized at the national and corridor-specific levels.

PROMOTION OF THE USE OF SMART TRANSPORT SYSTEMS AT THE NATIONAL LEVEL

Target countries along the CCWA economic corridor may or may not have acknowledged or be aware of the full potential of smart transport systems in resolving traffic issues. It is also evident that various plans or initiatives at the national level exist but with a limited scope. As such, national governments are encouraged to jointly investigate the status of smart transport systems and to determine the direction of their respective countries based on their own prioritization of needs. Such investigation inclusively involves consideration of options, such as emerging technologies, policy, regulatory and legal requirements, local demands, funding schemes, technical fundamentals, and dialogue with stakeholders. With this, future directions for developments and deployments of smart transport systems can be set up that will be described in detail in policies, plans and/or strategies. Institutionally, each target country is also encouraged to develop and promote relevant national agencies for continuous development and deployments of smart transport systems along the CCWA economic corridor.

ENHANCEMENT OF COOPERATION AND COLLABORATION AMONG NEIGHBORING COUNTRIES

Target countries might underutilize their own smart transport systems when there are significant gaps in the development of smart transport systems between adjacent countries. This could become problematic for the efficient movement of passengers and freight along the CCWA economic corridor. The role of smart transport systems at a transnational level has been acknowledged where the social, economic and environmental landscape is similar between neighboring countries and where mutually beneficial outcomes can be achieved. For example, there is some evidence of cooperation and collaboration among neighboring countries at the subregional level, such as the eTIR system between the Islamic Republic of Iran and Turkey. However, widespread evidence of this is still not enough. When enhanced cooperation and collaboration among neighboring countries is further achieved, the technological development gap can be further refined which can enhance the streamlined movement of passengers and freight among neighboring countries. Sharing agendas, goals, plans and lessons learned from neighboring countries will be beneficial to increase cooperation and collaboration by United Nations agencies, other development agencies and national relevant associations.

SET UP OF OVERARCHING GOALS AND ACTION PLANS THROUGH THE CORRIDOR SPECIFIC STRATEGY

Given the scale of the CCWA economic corridor, there are large discrepancies in the levels of development with differing conditions for adopting smart transport systems in target countries. This can result in development gaps with regard to smart transport systems among target countries. To remedy this, overarching policy goals and detailed action plans need to be provided for greater guidance with respect to smart transport systems utilization within a corridor specific strategy. They can support intermittent national- or subregional-level activities while being consistent with global and regional agendas. This top-down pragmatic approach can offer some flexibility for national policymakers in the preparation of policies and corresponding action plans that are specific to the opportunities and constraints present in their respective countries. Overarching goals and action plans can include details on how to increase the capacity of policymakers to provide technical assistance, financial support and policy guidance for the wider spread and interoperability of smart transport systems. Target countries can ultimately progress in a similar direction to deploy smart transport systems in a wide-ranging and inclusive fashion.

A list of possible action plans which can be considered relevant for inclusion in the corridor specific strategy is the following. The order of possible action plans is based on the priorities identified from the survey in section III.4.

1. *Strengthening the dialogue among stakeholders* – Dialogue on relevant issues can be strengthened through intergovernmental leadership, regional cooperation, the creation of national agencies and participation in international events to share status, challenges/issues, ideas, and lessons learned.
2. *Formulate frameworks, plans and guidelines* – Intergovernmental leadership with the cooperation and collaboration of relevant stakeholders and governments can contribute to create frameworks, plans and guidelines across the region traversed by the CCWA economic corridor. Well-developed regional guidelines and frameworks about regulatory and technical issues assist in the roll out of smart transport systems along the CCWA economic corridor, while addressing limitations such as low awareness, and limited understanding of smart transport systems.
3. *Develop indicators to monitor the development* – Cooperation and collaboration between relevant stakeholders, involving extensive research work can help develop suitable indicators. Following the development of indicators, a performance evaluation such as a cost benefit analysis would most likely ensue at a national and corridor-specific level. The performance evaluation can be applied to assess whether the proposed smart transport systems development is suitable at a micro or macro level in addressing traffic issues given the cost of its investment along the CCWA economic corridor.
4. *Develop policy initiatives and recommendations* – Intergovernmental leadership with the cooperation and collaboration of relevant stakeholders and governments seeks to provide a set of policy initiatives and recommendations that can be used for developing country-specific policies.
5. *Implement capacity building programmes* – Capacity building for policymakers can ensue with greater cooperation and collaboration between relevant stakeholders resulting in a greater awareness of smart transport systems and how they can be effectively deployed, operated, and maintained along the CCWA economic corridor.
6. *Conduct development studies and collaborative research* – To ensure the sustainability and full utilization of smart transport systems along the CCWA economic corridor, analytical studies and research works need to be conducted through greater cooperation and collaboration with experts and scholars.

7. *Develop necessary facilitation procedures with technologies* – Given that the efficiency of cross-border movements is critical among neighboring countries, necessary facilitation procedures need to be developed with smart transport systems under intergovernmental leadership with support from relevant stakeholders and governments.
8. *Develop intermodal transport strategies with technologies* – Considering that efficient intermodal transport is instrumental for sustainable transport, detailed strategies with smart transport systems need to be developed and focus on the movement of passengers and freight along the CCWA economic corridor. Harmonized intermodal transport strategies with smart transport systems can provide clear future directions that can be achieved through the cooperation and collaboration among stakeholders.
9. *Intensify institutional mechanisms to cooperate and exchange information* – Correspondence among relevant entities and experts at and beyond the national level through a solid institutional mechanism can strengthen the development progress and operational efficiency of smart transport systems along the CCWA economic corridor.
10. *Review existing relevant activities* – To identify needs and limitations, and set up future directions, reviewing existing relevant activities is a prerequisite at the national and corridor-specific levels. All stakeholders can be made aware of the previous and present status of smart transport systems through this action plan.
11. *Develop international standards* – Technical and non-technical standards seek to harmonize and integrate smart transport systems consistently along the CCWA economic corridor. Further cooperation and collaboration between relevant stakeholders under intergovernmental leadership are required to develop both agreed technical and non-technical standards given the high degree of variability between the development of target countries and the diversity of smart transport systems.

POLICY DEVELOPMENT TO PREPARE FOR EMERGING TECHNOLOGIES

It has been noted that various forms of smart transport systems are emerging in the market. Despite their obvious benefits, it is evident that most target countries, with the exception of China, along the CCWA economic corridor have been slow to bring them to a pilot stage or to even acknowledge their potentials. Robust policy acknowledgement of emerging technologies can lay the foundation for a new period of transport history so as to avoid potential conflicts with current systems. Continuous support with timely policies, plans and strategies for the advent of such technologies can assist in fully utilizing their benefits and maximizing their advantages to address traffic issues along the CCWA economic corridor into the future.

UTILIZATION OF SMART TRANSPORT SYSTEMS IN RESPONSE TO THE COVID-19 PANDEMIC

The impact of the COVID-19 pandemic has caused significant global disruption to the socio-economic structure of countries and in turn the trade and transport ecosystem across the CCWA economic corridor. Its ramifications are felt with containment measures such as quarantines, travel restrictions and lockdowns, resulting in slumps in travel demand, impacts on services, and gaps in supply chains.[1] The pandemic has effectively closed borders and posed limitations on air, truck, and shipping movements. This is particularly noticeable in the landlocked developing countries of Central Asia. Mostly, outdated cross border customs procedures can then result in long queues and days of waiting time at borders and backlogs of freight along the CCWA economic corridor.

Despite these limitations, the deployment of smart transport systems has the ability to facilitate better connectivity whilst avoiding or reducing the frequency of human contact which reduces the spread of the virus. Regional coordination and cooperation in conjunction with smart transport systems' capabilities can enhance the cross-border transport of passengers and freight. This reduces timely and costly checks and restrictions, particularly with regard to the movement of critical medical supplies to combat the virus.[2] As outlined previously, the free flow of goods across the region can be facilitated through paperless cross border procedures to minimize the physical interaction between customs officers and truck drivers who may cross several international boundaries. The acceleration of smart transport systems in this area is suggested as a policy recommendation for the safe, secure, timely and cost-efficient movement of passengers and goods.

Additionally, the impact of the COVID-19 pandemic on public transport has generally limited the numbers of passengers as social distancing is more difficult to practice generating greater opportunities for the potential

[1] United Nations ESCAP, 'Socio-Economic Response to COVID-19: ESCAP Framework', 20 May 2020, https://www.unescap.org/resources/socio-economic-response-covid-19-escap-framework.

[2] United Nations ECE, 'Responding to the Socio-Economic Impacts of the COVID-19 Pandemic in the UNECE Region' (Geneva, 2020), https://unece.org/fileadmin/DAM/UNECE_COVID_Brochure_EN.pdf.

infection of passengers.[1] APTS and emerging technologies, where details of the numbers of passengers can be disseminated to the public, may prove to be effective for passengers to make informed choices about when to travel. As such, continued policy support and further smart transport systems deployment will aid in providing a sustainable recovery from this pandemic into the future.

[1] Yair Wiseman, 'Intelligent Transportation Systems along with the COVID-19 Pandemic Will Significantly Change the Transportation Market', The Open Transportation Journal 15 (17 March 2021), https://benthamopen.com/FULLTEXT/TOTJ-15-11.

Conclusions

Transport connections along the China – Central Asia – West Asia (CCWA) Economic Corridor are one of the backbones of Eurasian, inter-regional connectivity. They ensure market access and transport connectivity for landlocked Central Asian countries and widen economic opportunities for West Asian countries. However, to serve these purposes efficiently, they need to be reliable, have operational inter-country, inter-networks, intermodal transport connectivity, and be supported by enabling soft infrastructure and efficient digital systems.

The development and maintaining of sustainable and resilient transport corridor sufficient to support interconnected economic space along it is on-going process. This process includes continuous adjustment of capacity of the hard infrastructure, continuous implementation of legal, procedural, management, technological innovations. Therefore, while acknowledging the progress already achieved by the countries in recent years domestically and at subregional level, the report makes recommendations and suggestions for improvements of connectivity along the CCWA corridor in several aspects (see more details in previous sections).

Green infrastructure development

To ensure that in the process of bringing closer the achievement of some of the sustainable development goals transport infrastructure development would not undermine progress towards the others, planning of the transport infrastructure should therefore minimize both climate and biodiversity risks (deforestation, flooding, pollution and invasion of species) through mitigation measures. Infrastructure needs also be planned with adaptation measures to cope with climate change, e.g., more extreme weathers such as storms, draughts, heat waves.

To accelerate the sustainable infrastructure investments that face multiple challenges from lack of information for analysis and comparison to riskier investment environment of the countries where they are often needed, participation of multilateral development banks, of local and private investors, usage of blended finance instruments combining concessionary finance (e.g., from development banks, governments, donors) with non-concessionary finance (e.g., investors, banks), international standards for guidance are recommended.

It might be needed to develop new indicators to measures how infrastructure supports sufficient, interoperable, fast, easy, safe, cheap, green, reliable, resilient and social international freight transportation and how well countries cooperate to achieve infrastructure connectivity. Data availability continues to be the main issue in such efforts. The report suggests one of the approaches - the Sustainable Infrastructure Connectivity Indicator (SICI). SICI partly relies on external data (e.g., cost of different services) that should be more easily available due to existing data providers and queries, and partly on self-evaluation (e.g., many sufficiency indicators).

Further enhancement of infrastructure connectivity

Enhancements and improvements in hard infrastructure connectivity in and between the CCWA countries require investments in all dimensions – in roads, railways and their rolling stock, dry ports and intermodal facilities, border crossings, etc.

In railway sector, the main capacity constraint is insufficient double-tracking and electrification of railways. Among the variety of options for a train run from China to Turkey along CCWA, there is no single one fully or mostly electrified; same goes for double-tracking. The other issues to address range from missing links China – Kyrgyzstan – Uzbekistan, Kyrgyzstan – Tajikistan, to insufficient handling capacities and/or efficiency of operations at border crossings with bogies changes, lower quality of railway sections between the borders than that at main lines, track situation and maintenance, aging railway fleet.

In road sector, the road quality is not always optimal for ensuring international transit (there are sections with roads below AH Class III standard at AH 61, AH 62, AH 70 in Kazakhstan and AH65, AH66 in Tajikistan). Quality, efficiency and speed of road maintenance and rehabilitation might require strengthening in capacity at Central Asian segments, especially in Tajikistan and Uzbekistan.

Development of intermodal logistics hubs, dry ports and terminals is important area where more investments needed. In CCWA, due to low population and economic activity density, the focus should be on the consolidation of small flows (e.g., with trucks) to create critical masses required to achieve economies of scale (hub-and-spoke economic corridor development model).

Border crossings require upgrades to accommodate larger traffic, installation of scanning, communication, data processing and other equipment to reduce delays, costs.

Hard infrastructure improvements require innovative and diverse financial instruments to encourage these long-term and risky investments. The instruments include blended finance instruments that allow for a mixture of concessionary and non-concessionary finance and crowd in private sector participation. Participation of multilateral development banks allows for concessionary loans in combination with blended finance and, in the

same time, ensures high sustainability standards both in terms of environmental and social safeguards. To tap global capital markets for new funds that are sustainably aligned green finance instruments, such as green bonds, should be used.

Improvements in operational connectivity

Critical aspects of soft infrastructure: cross-border, transit and transport management – often need improvement between countries along CCWA Economic Corridor. There are tools the countries might apply for their benefit, such as the Cross-Border and Transit Transport Process Management Toolkit by UNCTAD, United Nations ESCAP and ECA and the CAREC Advanced Transit System (CATS). Countries could profit from systems like the authorised economic operator (AEO) program with mutual recognition of AEO status multilaterally across the economic corridor.

More broadly, to ensure the smooth and quick freight movements along the corridor, to encourage trade and transit, to decrease administrative burden of border crossings for freight and vehicles and to speed up border crossing formalities, the countries should also strive for enabling the information exchange between the national systems forming the “digital transport corridor” or data pipeline on transit cargos and vehicles minimizing the need for additional Customs or security checks.

Elements of digital infrastructure for the CCWA Economic Corridor might include: information exchange between Customs of the countries and joint control of vehicles, seamless transit solutions (eTIR-carnet, other electronic seals transit solutions used by countries), authorised economic operator programs and their mutual recognition across the corridor, road permits issuing and control of usage, etc.

Transport Connectivity Amid Covid-19 Pandemic and Beyond

Importance and urgency of enhancing transport and trade connectivity in the region and difficulties in investing in transport infrastructure are highlighted even more by the crisis induced by COVID-19 pandemic. The crisis, the measures taken by countries to protect both safety of people, personnel employed in logistics and international trade control, on one hand, and security of food, medical and other supply, on the other, brought to light the necessity of: creation of “green lanes or corridors” for road transport along Asian Highways at the length of the CCWA Economic corridor; centralized information sharing on national measures affecting connectivity along the corridor; speeded up the progress in digitalization and facilitation of the cross-border transport (it is desirable to maintain the progress achieved and the speed of improvements in this aspect); speeding up deployment of smart transport systems to facilitate better connectivity whilst avoiding or reducing the frequency of human contact which reduces the spread of current virus and other pathogens that might require controlling; keeping materials on lessons learned in implementing sanitary measures in pandemic response at border crossings, logistics terminals for future emergencies.

Deployment of smart transport systems for more efficient and sustainable operations of the corridor and facilitation of cross-border transport

Countries of CCWA economic corridor are increasingly adopting the smart transport systems and the positive results in relieving traffic problems are evident. However, the speed of rolling out the systems is slow, the deployment is fragmented and inconsistent due to the policies that do not catch up with progress of the systems’ deployment.

Rapid growth in sophistication and diversification of smart transport systems put pressure on policy makers to stay abreast of the current issues in smart transport systems to create and support modern and efficient transport ecosystem. The policies and their implementation should acknowledge the emerging technologies and leave room for timely testing, identification of potentially beneficial technologies and their deployment in future.

To achieve the objective of modern and efficient transport ecosystem, it is recommendable for the countries to assign/establish national agencies for continuous development and deployment of smart transport systems along the CCWA economic corridor. Such national agencies then should maintain close contacts with their counterparts in other CCWA countries to avoid technological and physical gaps in deployment of smart transport systems at cross-border stretches and adjacent territories along the corridor that would cause underutilization of such systems deployed nationally and undermine their impact on facilitation of cargo and passenger movements. Overall, the corridor countries should set up overreaching goals and action plans for corridor specific strategy in use and deployment of smart transport systems.

Coordination

Establishing a reliable coordinating mechanism between the CCWA countries, either by an agreement or an MOU, would provide the countries with regular platform for discussions and negotiations on optimal schedule of hard infrastructure investments and finding better partnership arrangements, on harmonized changes in soft infrastructure and digital corridor creation, in deployment of ICT and smart transport systems, etc. Having contributed to the mechanism budget, the countries would acquire decision-making agency and participate

more actively in the corridor development. Important is that such mechanism not only concerns itself with strategic planning, investment prioritization, adoption of transport and trade facilitation measures, but also implements corridor monitoring by gathering related indicators, to ensure informed policy making and investment decisions.

Annexes

Annex I Statistical data

Table I-1 Foreign trade value in countries along CCWA Economic Corridor (2000-2019)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
China											
Foreign trade total (million USD)	474,297	509,651	620,766	850,988	1,154,554	1,421,906	1,760,438	2,176,175	2,563,255	2,207,535	2,974,001
Export (million USD)	249,203	266,098	325,596	438,228	593,326	761,953	968,978	1,220,060	1,430,693	1,201,612	1,577,754
Import (million USD)	225,094	243,553	295,170	412,760	561,229	659,953	791,461	956,115	1,132,562	1,005,923	1,396,247
Iran (Islamic Republic of)											
Foreign trade total (million USD)	41,971	40,077	48,522	59,426	77,625	98,687	103,933	..	..	..	138,482
Export (million USD)	28,345	23,904	28,186	33,788	44,628	60,012	63,247	..	..	..	83,785
Import (million USD)	13,626	16,173	20,336	25,638	32,997	38,675	40,686	..	..	..	54,697
Kazakhstan											
Foreign trade total (million USD)	13,666	14,766	16,224	21,318	32,853	45,179	61,905	80,435	108,987	71,604	81,268
Export (million USD)	8,679	8,486	9,643	12,916	20,079	27,846	38,244	47,748	71,172	43,196	57,244
Import (million USD)	4,987	6,280	6,581	8,402	12,773	17,333	23,661	32,687	37,815	28,409	24,024
Kyrgyzstan											
Foreign trade total (million USD)	1,059	943	1,040	1,299	1,660	1,780	2,512	3,551	5,690	4,152	4,711
Export (million USD)	504	476	460	582	719	672	794	1,134	1,618	1,178	1,488
Import (million USD)	554	467	579	717	941	1,108	1,718	2,417	4,072	2,974	3,223
Tajikistan											
Foreign trade total (million USD)	1,459	1,340	1,460	1,678	2,106	2,239	3,124	4,015	4,682	3,580	3,852
Export (million USD)	784	652	739	797	915	909	1,399	1,468	1,409	1,010	1,195
Import (million USD)	675	688	721	881	1,191	1,330	1,725	2,547	3,273	2,570	2,657
Turkey											
Foreign trade total (million USD)	81,635	72,733	87,032	116,593	160,661	190,251	225,111	277,334	333,991	243,071	299,428
Export (million USD)	27,485	31,334	35,762	47,253	63,121	73,476	85,535	107,272	132,027	102,143	113,883
Import (million USD)	54,150	41,399	51,270	69,340	97,540	116,774	139,576	170,063	201,964	140,928	185,544
Uzbekistan											
Foreign trade total (million USD)	6,212	6,307	5,700	6,689	8,669	9,500	11,171	15,720	21,197	21,210	22,199
Export (million USD)	3,265	3,170	2,988	3,725	4,853	5,409	6,390	8,992	11,493	11,771	13,023
Import (million USD)	2,947	3,137	2,712	2,964	3,816	4,091	4,782	6,728	9,704	9,438	9,176

Source: National Bureau of Statistics of China <http://data.stats.gov.cn>; United Nations Comtrade Database <https://comtrade.un.org/>; Agency on Statistics under President of the Republic of Tajikistan <https://www.stat.tj/ru/tables-external-sector>; The State Committee of Republic of Uzbekistan on statistics <https://stat.uz/en/open-data>.
Note: ".." – data not available; no data for Turkmenistan.

Table I-1 Foreign trade value in countries along CCWA Economic Corridor (2000-2019), continued

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
China										
Foreign trade total (million USD)	3,641,864	3,867,119	4,158,993	4,301,527	3,953,033	3,685,557	4,107,138	4,622,444	4,576,126	4,646,260
Export (million USD)	1,898,381	2,048,714	2,209,004	2,342,293	2,273,468	2,097,631	2,263,345	2,486,696	2,499,029	2,590,650
Import (million USD)	1,743,484	1,818,405	1,949,989	1,959,235	1,679,565	1,587,926	1,843,793	2,135,748	2,077,097	2,055,610
Iran (Islamic Republic of)										
Foreign trade total (million USD)	198,863	..	140,555	142,578	100,078	125,850	157,456	137,854	96,428	..
Export (million USD)	130,544	..	92,123	90,328	60,037	83,148	105,844	96,618	54,600	..
Import (million USD)	68,319	..	48,432	52,250	40,041	42,702	51,612	41,236	41,828	..
Kazakhstan										
Foreign trade total (million USD)	126,118	136,820	133,503	120,754	76,522	61,950	78,102	94,767	97,775	85,031
Export (million USD)	88,108	92,282	84,699	79,459	45,954	36,775	48,503	61,109	58,066	46,950
Import (million USD)	38,010	44,538	48,805	41,295	30,567	25,175	29,599	33,658	39,709	38,081
Kyrgyzstan										
Foreign trade total (million USD)	6,240	7,056	7,756	7,501	5,510	5,268	6,245	7,127	6,975	5,649
Export (million USD)	1,979	1,683	1,773	1,819	1,441	1,423	1,757	1,835	1,986	1,965
Import (million USD)	4,261	5,373	5,983	5,681	4,068	3,844	4,487	5,292	4,989	3,684
Tajikistan										
Foreign trade total (million USD)	4,463	5,138	5,313	5,275	4,326	3,930	3,973	4,224	..	..
Export (million USD)	1,257	1,360	1,162	977	891	899	1,198	1,073	..	..
Import (million USD)	3,206	3,778	4,151	4,297	3,436	3,031	2,775	3,151	..	..
Turkey										
Foreign trade total (million USD)	375,749	389,007	403,464	399,787	351,057	341,148	390,793	391,062	391,182	389,166
Export (million USD)	134,907	152,462	151,803	157,610	143,850	142,530	156,993	168,023	180,839	169,651
Import (million USD)	240,842	236,545	251,661	242,177	207,207	198,618	233,800	223,039	210,343	219,515
Uzbekistan										
Foreign trade total (million USD)	26,366	26,416	28,270	27,530	24,924	24,232	26,566	33,430	41,751	36,299
Export (million USD)	15,021	13,600	14,323	13,546	12,508	12,095	12,554	13,991	17,459	15,128
Import (million USD)	11,345	12,817	13,947	13,984	12,417	12,138	14,012	19,439	24,292	21,172

Source: National Bureau of Statistics of China <http://data.stats.gov.cn>; nitednComtrade Database <https://comtrade.un.org/>; Agency on Statistics under President of the Republic of Tajikistan <https://www.stat.tj/ru/tables-external-sector>; The State Committee of Republic of Uzbekistan on statistics <https://stat.uz>; WTO <https://www.wto.org/english/res_e/statis_e/daily_update_e/trade_profiles/IR_e.pdf>; Agency for Strategic planning and reforms of the Republic of Kazakhstan Bureau of National statistics <https://stat.gov.kz/>.

Note: ".." – data not available; no data for Turkmenistan.

Table I-2 Indices of foreign trade value in countries along CCWA Economic Corridor (2000-2020)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
China											
Foreign trade total, % year-on-year	7.5%	21.8%	37.1%	35.7%	23.2%	23.8%	23.6%	17.8%	-13.9%	34.7%	22.5%
Export, % year-on-year	6.8%	22.4%	34.6%	35.4%	28.4%	27.2%	25.9%	17.3%	-16.0%	31.3%	20.3%
Import, % year-on-year	8.2%	21.2%	39.8%	36.0%	17.6%	19.9%	20.8%	18.5%	-11.2%	38.8%	24.9%
Iran (Islamic Republic of)											
Foreign trade total, % year-on-year	-4.5%	21.1%	22.5%	30.6%	27.1%	5.3%					43.6%
Export, % year-on-year	-15.7%	17.9%	19.9%	32.1%	34.5%	5.4%					55.8%
Import, % year-on-year	18.7%	25.7%	26.1%	28.7%	17.2%	5.2%					24.9%
Kazakhstan											
Foreign trade total, % year-on-year	8.0%	9.9%	31.4%	54.1%	37.5%	37.0%	29.9%	35.5%	-34.3%	13.5%	55.2%
Export, % year-on-year	-2.2%	13.6%	33.9%	55.5%	38.7%	37.3%	24.8%	49.1%	-39.3%	32.5%	53.9%
Import, % year-on-year	25.9%	4.8%	27.7%	52.0%	35.7%	36.5%	38.1%	15.7%	-24.9%	-15.4%	58.2%
Kyrgyzstan											
Foreign trade total, % year-on-year	-10.9%	10.2%	24.9%	27.8%	7.2%	41.2%	41.4%	60.2%	-27.0%	13.5%	32.4%
Export, % year-on-year	-5.6%	-3.3%	26.4%	23.5%	-6.5%	18.2%	42.8%	42.6%	-27.2%	26.3%	33.0%
Import, % year-on-year	-15.7%	24.0%	23.8%	31.2%	17.7%	55.1%	40.7%	68.5%	-27.0%	8.4%	32.2%
Tajikistan											
Foreign trade total, % year-on-year	-8.2%	9.0%	14.9%	25.5%	6.3%	39.5%	28.5%	16.6%	-23.5%	7.6%	15.9%
Export, % year-on-year	-16.9%	13.4%	7.8%	14.8%	-0.7%	53.9%	4.9%	-4.0%	-28.3%	18.3%	5.2%
Import, % year-on-year	1.9%	4.8%	22.2%	35.2%	11.7%	29.7%	47.7%	28.5%	-21.5%	3.4%	20.7%
Turkey											
Foreign trade total, % year-on-year	-10.9%	19.7%	34.0%	37.8%	18.4%	18.3%	23.2%	20.4%	-27.2%	23.2%	25.5%
Export, % year-on-year	14.0%	14.1%	32.1%	33.6%	16.4%	16.4%	25.4%	23.1%	-22.6%	11.5%	18.5%
Import, % year-on-year	-23.5%	23.8%	35.2%	40.7%	19.7%	19.5%	21.8%	18.8%	-30.2%	31.7%	29.8%
Uzbekistan											
Foreign trade total, % year-on-year	1.5%	-9.6%	17.3%	29.6%	9.6%	17.6%	40.7%	34.8%	0.1%	4.7%	18.8%
Export, % year-on-year	-2.9%	-5.7%	24.6%	30.3%	11.5%	18.1%	40.7%	27.8%	2.4%	10.6%	15.3%
Import, % year-on-year	6.4%	-13.5%	9.3%	28.7%	7.2%	16.9%	40.7%	44.2%	-2.7%	-2.8%	23.6%

Note:

1) Calculated based on Table I-1,

2) No data for Turkmenistan.

Table I-2 Indices of foreign trade value in countries along CCWA Economic Corridor (2000-2020), continued

	2012	2013	2014	2015	2016	2017	2018	2019	Early/Mid 2020	2020
China										
Foreign trade total, % year-on-year	6.2%	7.5%	3.4%	-8.1%	-6.8%	11.4%	12.5%	-1.0%	-6.6% (January – June 2020)	1.5%
Export, % year-on-year	7.9%	7.8%	6.0%	-2.9%	-7.7%	7.9%	9.9%	0.5%	-6.2% (January – June 2020)	3.7%
Import, % year-on-year	4.3%	7.2%	0.5%	-14.3%	-5.5%	16.1%	15.8%	-2.7%	-7.1% (January – June 2020)	-1.0%
Iran (Islamic Republic of)										
Foreign trade total, % year-on-year			1.4%	-29.8%	25.8%	25.1%	-12.4%	-30.1%	-7.9% (January – March 2020)	
Export, % year-on-year			-1.9%	-33.5%	38.5%	27.3%	-8.7%	-43.5%	-16.9% (January – March 2020)	
Import, % year-on-year			7.9%	-23.4%	6.6%	20.9%	-20.1%	1.4%	16.0% (January – March 2020)	
Kazakhstan										
Foreign trade total, % year-on-year	8.5%	-2.4%	-9.5%	-36.6%	-19.0%	26.1%	21.3%	3.2%	-6.9% (January – May 2020)	-13.0%
Export, % year-on-year	4.7%	-8.2%	-6.2%	-42.2%	-20.0%	31.9%	26.0%	-5.5%	-5.5% (January – May 2020)	-19.1%
Import, % year-on-year	17.2%	9.6%	-15.4%	-26.0%	-17.6%	17.6%	13.7%	18.0%	-9.3% (January – May 2020)	-4.1%
Kyrgyzstan										
Foreign trade total, % year-on-year	13.1%	9.9%	-3.3%	-26.5%	-4.4%	18.6%	14.1%	-2.1%	-22.7% (January – June 2020)	-19.0%
Export, % year-on-year	-14.9%	5.3%	2.6%	-20.8%	-1.3%	23.5%	4.4%	8.2%	1.2% (January – June 2020)	-1.1%
Import, % year-on-year	26.1%	11.3%	-5.0%	-28.4%	-5.5%	16.7%	17.9%	-5.7%	-31.8% (January – June 2020)	-26.2%
Tajikistan										
Foreign trade total, % year-on-year	15.1%	3.4%	-0.7%	-18.0%	-9.2%	1.1%	6.3%			
Export, % year-on-year	8.1%	-14.6%	-15.9%	-8.9%	0.9%	33.3%	-10.4%			
Import, % year-on-year	17.9%	9.9%	3.5%	-20.1%	-11.8%	-8.5%	13.6%			
Turkey										
Foreign trade total, % year-on-year	3.5%	3.7%	-0.9%	-12.2%	-2.8%	14.6%	0.1%	0.0%	-12.0% (January – May 2020)	-0.5%
Export, % year-on-year	13.0%	-0.4%	3.8%	-8.7%	-0.9%	10.1%	7.0%	7.6%	-19.7% (January – May 2020)	-6.2%
Import, % year-on-year	-1.8%	6.4%	-3.8%	-14.4%	-4.1%	17.7%	-4.6%	-5.7%	-5.2% (January – May 2020)	4.4%
Uzbekistan										
Foreign trade total, % year-on-year	0.2%	7.0%	-2.6%	-9.5%	-2.8%	9.6%	25.8%	24.9%	-8.6% (January – March 2020)	-13.1%
Export, % year-on-year	-9.5%	5.3%	-5.4%	-7.7%	-3.3%	3.8%	11.4%	24.8%	-10.5% (January – March 2020)	-13.4%
Import, % year-on-year	13.0%	8.8%	0.3%	-11.2%	-2.2%	15.4%	38.7%	25.0%	-7.2% (January – March 2020)	-12.8%

Source: Calculated from Table I-1.

Note:

1) 2011-2019, 2020 calculated based on Table I-1.

2) Early/Mid 2020 (last reported interval) calculated from data of: General Administration of Customs, People's Republic of China, <http://www.customs.gov.cn>; Statistical Center of Iran<https://www.amar.org.ir/english/Latest-Releases-Page/ID/12943/Quarterly-National-Accounts-1390-1398>; Ministry of National Economy of the Republic of Kazakhstan, Committee of Statistics, <https://stat.gov.kz/edition/publication/month>; National Statistical Committee of the Kyrgyz Republic, <http://www.stat.kg>; Turkish Statistical Institute, <http://www.turkstat.gov.tr >.

3) No data for Turkmenistan.

Table I-3 Export and import in countries along CCWA Economic Corridor, 2020

Period	Export, million USD				Import, million USD			
	China	Kazakhstan	Kyrgyzstan	Turkey	China	Kazakhstan	Kyrgyzstan	Turkey
Jan-20	146,224	4,331	110	14,701	149,772	2,429	376	19,214
Feb-20	146,224	4,757	203	14,608	149,772	2,231	291	17,644
Mar-20	185,146	4,813	154	13,353	165,213	2,448	328	18,822
Apr-20	200,234	4,459	179	8,978	154,901	2,707	190	13,559
May-20	206,813	3,953	138	9,958	143,887	2,812	236	13,394
Jun-20	213,574	3,167	219	13,461	167,153	3,610	308	16,318
Jul-20	237,630	2,558	170	14,891	175,300	3,646	327	17,718
Aug-20	235,260	3,246	138	12,457	176,330	3,712	319	18,757
Sep-20	239,760	3,570	227	15,991	202,760	3,728	320	20,846
Oct-20	237,180	3,769	138	17,318	178,740	3,606	356	19,714
Nov-20	268,070	4,025	133	16,090	192,650	3,138	290	21,143
Dec-20	281,930	3,666	155	17,844	203,750	3,517	344	22,386

Source: General Administration of Customs, People's Republic of China, <http://www.customs.gov.cn>; Ministry of National Economy of the Republic of Kazakhstan, Committee of Statistics, <https://stat.gov.kz/edition/publication/month>; National Statistical Committee of the Kyrgyz Republic, <http://www.stat.kg>; Turkish Statistical Institute, <http://www.turkstat.gov.tr >.

Table I-4 Indices of export and import in countries along CCWA Economic Corridor, 2020

Period	Export, % year-on-year				Import, % year-on-year			
	China	Kazakhstan	Kyrgyzstan	Turkey	China	Kazakhstan	Kyrgyzstan	Turkey
Jan-20	-17%	-19%	5%	6%	-4%	7%	-1%	19%
Feb-20	-17%	4%	31%	2%	-4%	2%	-7%	10%
Mar-20	-13%	40%	-26%	-18%	-3%	-7%	-31%	3%
Apr-20	-9%	-14%	12%	-41%	-6%	-16%	-58%	-25%
May-20	-8%	-22%	2%	-41%	-8%	-22%	-41%	-28%
Jun-20	1%	-37%	27%	16%	3%	6%	-19%	8%
Jul-20	7%	-42%	-3%	-7%	-1%	-9%	-25%	-8%
Aug-20	10%	-32%	24%	-6%	-2%	-4%	-27%	21%
Sep-20	10%	-33%	40%	5%	13%	4%	-26%	23%
Oct-20	11%	-26%	-32%	6%	5%	-10%	-16%	8%
Nov-20	21%	-17%	-26%	-1%	5%	-2%	-32%	16%
Dec-20	18%	-27%	-29%	16%	7%	0%	-22%	12%

Note:

1) Calculated based on 2019 and 2020 data from General Administration of Customs, People's Republic of China, <http://www.customs.gov.cn>; Ministry of National Economy of the Republic of Kazakhstan, Committee of Statistics, <https://stat.gov.kz/edition/publication/month>; National Statistical Committee of the Kyrgyz Republic, <http://www.stat.kg>; Turkish Statistical Institute, <http://www.turkstat.gov.tr >..

Annex II Connectivity updates on the CCWA countries

The appendix highlights major development and upgrades of rail connectivity, road connectivity, border crossings and dry ports in the CCWA. It is not a complete or exhaustive list, nor a complete overview of infrastructure. The tables highlight main developments since the 2017 report by United Nations ESCAP titled "Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- and Inter-Regional Transport Connectivity" analyzed the region's transport and infrastructure bottlenecks. The tables list a variety of updates and new infrastructure projects that are identified as being relevant to improve connectivity by closing previous bottlenecks in the Eurasian Central Corridor. The Eurasian Central Corridor covers connectivity along CCWA Economic Corridor only partially but covering major transport links it serves as a good proxy to illustrate recent relevant developments.

II.1 RAIL CONNECTIVITY IN THE CCWA COUNTRIES

CHINA

China railways operate on standard gauge of 1,435 mm. During the 13th five-year plan period (2016-2020), there were a number of railway projects in Xinjiang Uygur Autonomous Region built, extended and pre-planned, with the project investment estimated at around 48.5 billion yuan (about USD 8 billion). It is expected that by the end of 2020 the operating mileage of Xinjiang railway will exceed 10,000 km.[1] With 5 more new railway lines planned Xinjiang's railway network by 2020 is supposed to cover all prefectural administrative centers and more than 75 per cent of cities and counties.[2] Table II-1 shows selected railway bottlenecks and developments of China relevant for the CCWA corridor.

Table II-1 Selected railway bottlenecks and developments in China's CCWA corridor

Stretch	Shared Corridor	Status 2017	Update 2019
Korla-Urumqi	Eurasian Central Corridor; CAREC 1, 2, 3, 5, 6; EATL 3, 6, 7; ECO 1B, 5, 6; INSTC; OSJD 10; TRACECA 27, 31, 41;	Double-tracked, electrified	
Kashi-Luntai	Eurasian Central Corridor; CAREC 1, 2, 3, 5, 6; EATL 3, 6, 7; ECO 1B, 5, 6; INSTC; OSJD 10; TRACECA 27, 31, 41;	Single-tracked, non-electrified	
Luntai-Korla	Eurasian Central Corridor; CAREC 1, 2, 3, 5, 6; EATL 3, 6, 7; ECO 1B, 5, 6; INSTC; OSJD 10; TRACECA 27, 31, 41;	Double-tracked, non-electrified	
Urumqi-Jinghe	Eurasian Northern Corridor; CAREC Corridors 1, 2, 5; EATL routes 2, 4, 5; OSJD Corridors 2, 5	Double-tracked, electrified	
Yining-Khorgos	Eurasian Northern Corridor; CAREC Corridors 1, 2, 5; EATL routes 2, 4, 5; OSJD Corridors 2, 5	Single-tracked, non-electrified	
Jinghe-Yining	Eurasian Northern Corridor; CAREC Corridors 1, 2, 5; EATL routes 2, 4, 5; OSJD Corridors 2, 5	Single-tracked, electrified	
Karamay-Bakhty		Under construction	Began operation in Aug 2019[4]
Ruoqiang-Khotan			Planning to built single-tracked, electrified railway[5]
Golmud-Korla		Under construction	In operation[6]

Source: by Dr. Christoph Nedopil.

[1] '新疆铁路营业里程 2020 年将突破一万公里|里程|十三五|新疆= The Operating Length of Xinjiang's Railways Will Exceed 10,000 Kilometers by 2020', accessed 13 December 2019, http://news.sina.com.cn/c/2017-11-28/doc-ifypapmz5642257.shtml.

[2] '2020 年新疆 75%以上县市通火车 重点建设轨道交通项目 15 个', accessed 13 December 2019, www.sohu.com/a/191872805_763498.

[3] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[4] '新疆铁路大发展！正在建设一条铁路，投资 50 多亿，2019 年将通车！', 克拉玛依市 (blog), accessed 27 December 2019, www.sohu.com/a/249011280_709929.

[5] '好消息！新疆又一条铁路开建，5 月 1 日全面动工！以后出疆越来越方便了！', 5 January 2019, https://www.163.com/dy/article/EE24GS5305372WHB.html.

[6] '新疆第三条出疆铁路即将全线通车！', accessed 27 December 2019, https://baijiahao.baidu.com/s?id=1650788882085692416&wfr=spider&for=pc.

KAZAKHSTAN

Kazakhstan operates a 1,520 mm gauge railway network. Most of the electrified lines are situated in the northern, central and southern Kazakhstan. The western and eastern parts of the country are served by diesel locomotives.[1]

In a vast country with low population density, rail transport can contribute significantly to economic development. Accordingly, by 2021, Kazakhstan plans to build 1,302 km of railway sections, electrify 522 km of railway lines and modernize 6,925 km of the upper track structure (see Table II-3).[2]

Table II-3 Selected railway bottlenecks and developments in Kazakhstan

Stretch	Shared Corridor	Status 2017	Update 2019
Kokshetau-Petropavlovsk	Eurasian Northern Corridor	Single-tracked, non-electrified	
Zhetyken-Khorgos	Eurasian Northern Corridor	Single-tracked, non-electrified	
Almaty-Yining (China)	Eurasian Northern Corridor	Single-tracked, non-electrified	
Aktau-Beyneu	Eurasian Central Corridor	Single-tracked, non-electrified	
Mointy – Aktogay		Non-electrified	Planning to electrify[4]
Tobol – Nikeltau		Non-electrified	Planning to electrify[5]

Source: by Dr. Christoph Nedopil.

ISLAMIC REPUBLIC OF IRAN

The Islamic Republic of Iran's railway operates on standard gauge of 1,435 mm. Of the whole network 81.6 per cent of the main lines are single track and 18.4 per cent are double tracked.[6] The Islamic Republic of Iran's railway connects to Turkmenistan (gauge break), Azerbaijan (gauge break), Pakistan (gauge break), and Turkey.

Relevant upgrades and bottlenecks of rail transport in the Islamic Republic of Iran are shown in Table II-2.

Table II-2 Selected railway bottlenecks and developments in the Islamic Republic of Iran

Stretch	Shared Corridor	Status 2017	Update 2019
Astara-Qazvin	Eurasian Central Corridor	Under construction	164 km Qazvin-Rasht railway completed in 2019 with an estimated cost saving of USD 2,500 for every 15 tons of cargo[8] Rasht-Astara railway to be finished in 2023; Qazvin-Loshan is double-tracked; Loshan-Astara part will be single-tracked
Rasht-Anzali	Eurasian Central Corridor		Under construction to be completed by 2021[9]
Sarakhs-Bafq	Eurasian Central Corridor	Single-track, non-electrified the Mashhad – Kashmar section is being electrified and the branch from the mainline to Mashhad is double-tracked	
Bafq-Bandar Abbas	Eurasian Central Corridor	Double-tracked	Electrification project: under negotiation[10]

[1] Mykola Zasiadko, 'Kazakhstan Will Electrify over 1,000 Kilometres of Tracks', *RailTech.Com* (blog), 30 August 2019, https://www.railtech.com/infrastructure/2019/08/30/kazakhstan-will-electrify-over-1000-kilometres-of-tracks/.

[2] 'Kazakhstan Could Play Key Transport Logistics Role for Rising Euro-Asian Trade: UN Report', *United Nations ECE* (blog), 16 May 2019, https://unece.org/transport/press/kazakhstan-could-play-key-transport-logistics-role-rising-euro-asian-trade-un.

[3] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[4] Zasiadko, 'Kazakhstan Will Electrify over 1,000 Kilometres of Tracks'.

[5] Zasiadko.

[6] Karla Koopmann and Henry Ashcroft, 'Iran Railway Assessment', *Digital Logistics Capacity Assessments (DLCA)* (blog), 12 August 2019, https://dlca.logcluster.org/display/public/DLCA/2.4+Iran+Railway+Assessment.

[7] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[8] Railway Gazette, 'Qazvin – Rasht Section of Asia to Europe Link Opened', 19 March 2019, https://www.railwaygazette.com/infrastructure/qazvin-rasht-section-of-asia-to-europe-link-opened/48217.article.

[9] Railway Gazette, 'Turkey Publishes 2020 Rail Plan', 13 November 2019, https://www.railwaygazette.com/infrastructure/turkey-publishes-2020-rail-plan/55085.article.

[10] Reconnecting Asia, 'Hormozgan Route (Sirjan-Bafq-Bandar Abbas) Electrification', 14 November 2019, https://reconnectingasia.csis.org/database/projects/hormozgan-route-sirjan-bafq-bandar-abbas-electrification/a43116b0-5532-497f-ba43-3357e1dc6a51/.

Stretch	Shared Corridor	Status 2017	Update 2019
Mirjaveh-Qom	Eurasian Central Corridor	Single-tracked, non-electrified	
Qom-Karaj	Eurasian Central Corridor	Double-tracked, non-electrified	
Karaj-Razi		Single-tracked, non-electrified	
Tehran-Mashhad	Eurasian Central Corridor	Double-track, highest possible speed is 160 km/h	Electrification in progress with speeds up to 200 km/h[1]
Garmsar - Incheboroun	Trans-Asian Railway section	Non-electrified	Electrification project to be completed within 2022[2]
Mahabad-Urmia		Maragheh-Mababad was operationalized in 2013, Mahabad-Urmia part was missing	Completed in 2018[3]
Mianeh-Tabriz	Islamic Republic of Iran-Europe Railway	Under construction	Mianeh-Bostanabad was completed in 2019, the Bostanabad-Tabriz would conclude after 2020[4]

Source: by Dr. Christoph Nedopil.

KYRGYZSTAN

Railways in Kyrgyzstan use 1,520 mm gauge. The Kyrgyzstan's rail is geographically divided into two sections with no connection between them. There are plans to connect the sections as well as connect Kyrgyzstan railways system to China. The following Table II-4 gives an overview of upgrades and bottlenecks of rail transport in Kyrgyzstan.

Table II-4 Selected railway bottlenecks and developments in Kyrgyzstan

Stretch	Shared Corridor	Status 2017	Update 2019
Lugovaya- Alamedin	CAREC Corridor 1	Non-electrified	Planning to be electrified[6]
Balykchi-Kochkor-Kara Keche		Missing link	Under construction[7] distance between East Asia and Middle East / Southern Europe will be cut down by 900 km and the transportation time will be 7-8 days[8] Connection to the existing railway (Bishkek-Balykchi)

Source: by Dr. Christoph Nedopil.

TAJIKISTAN

Tajikistan railways use 1,520 mm gauge. With road transport covering about 90 per cent of freight transport in Tajikistan, the volume of the rail-based freight transport has stagnated, and in fact shrunk to 165 million ton-kilometres in 2017 (from 1,282 ton-kilometres in 2009).[9]

The following Table II-5 gives an overview of bottlenecks and upgrades in Tajikistan's railway.

Table II-5 Selected railway developments in Tajikistan

Stretch	Status 2017	Update 2019
Dushanbe (Tajikistan) -Kashi (China)	No railway	Railway being discussed[11]

[1] Reconnecting Asia, 'Tehran-Mashhad Railway (Electrification)', 14 November 2019, https://reconnectingasia.csis.org/database/projects/tehran-mashhad-railway-electrification/d3e8a998-fa10-418c-965d-77fc24ddd552/.

[2] Financial Tribune, 'Electrification of Major Iranian Railroad Kicks Off in Coop. With Russia.', 1 July 2018, https://financialtribune.com/articles/domestic-economy/89035/electrification-of-major-iranian-railroad-kicks-off-in-coop-with.

[3] Ministry of Roads & Urban Development, 'Mahabad-Urmia Railway Inaugurated', 26 November 2018, https://www.mrud.ir/en/About/Media/Management-News/DNNArticle-Detail-View/ArticleId/15232/Mahabad-Urmia-Railway-Inaugurated.

[4] Tasnim News Agency, 'Iran, Turkey Reopen Key Border Crossing to Help Boost Trade'.

[5] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[6] TRACECA, 'Railway Transport', accessed 20 November 2019, http://www.traceca-org.org/en/countries/kyrgyzstan/railway-transport/.

[7] TRACECA.

[8] News Central Asia, 'China-Kyrgyzstan-Uzbekistan Railway Line – Risks and Rewards', 22 June 2018, http://www.newscentralasia.net/2018/06/22/china-kyrgyzstan-uzbekistan-railway-line-risks-and-rewards/.

[9] KNOEMA, 'Tadschikistan Schienennetz, Beförderte Güter, 1960-2018', 2017, https://knoema.de//atlas/Tadschikistan/Schienennetz-beförderte-Güter.

[10] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[11] United Nations ESCAP.

Stretch	Status 2017	Update 2019
Tajikistan / Afghanistan / Turkmenistan		Tajikistan and Afghanistan have reached an agreement on the construction of a rail link to connect the two countries to Turkmenistan. It is expected to span about 400 km from Atamyrat, Turkmenistan, via Afghanistan to Panj Tajikistan.[1]

Source: by Dr. Christoph Nedopil.

TURKEY

Turkey railway is running on 1,435 mm gauge. Despite strong progress, bottlenecks in Turkey's railway remain and are listed in Table II-6.

Table II-6 Selected railway bottlenecks and developments and developments in Turkey

Stretch	Shared Corridor	Status 2017	Update 2019
Canbaz-Centinkaya	Eurasian Central Corridor	Only Divrigi-Centinkaya part is electrified	
Kapikule-Ankara	Eurasian Central Corridor	Electrified Only Istanbul-Eskisehir part is double-tracked	Kapikule-Halkali (Istanbul) section: Planning for double-tracked
Ankara-Sivas	Eurasian Central Corridor	Being electrified, single-tracked	
Ankara-Cetinkaya	Eurasian Central Corridor	Single-tracked, non-electrified	
Cetinkaya-Malatya	Eurasian Central Corridor	Electrified, single-tracked	Will begin modernizing in 2020[3]
Van lake	Eurasian Central Corridor	No railway, capacity of ferry is limited (4 ferry ships, each with a 9-10 wagon capacity or a total capacity of 1,500 tons)	increase capacity by employing 2 ferry ships that can carry 50 wagons each
Malatya-Van-Kapikoy	Eurasian Central Corridor	Single-tracked Non-electrified	
Bursa-Osmaneli		In 2015, Osmaneli-Yenisehir (50 km): Tender process started. Yenisehir-Golbasi-Bursa (56 km): Construction works continue. Bursa-Bandirma (93 km): Preliminary analysis not done yet.[4]	High-speed railway construction for freight service continue[5]
Samsun-Kalin			reopened in 2019 The line has now more capacity for both passenger trains and freight train[6]
Ulukisla-Yenice			Electrification[7]
Marmaray tunnel		Ferry	Freight train[8]
Aliaga – Çandarli – Bergama			Will start construction in 2020
Adana – Mersin			Modernisation of the Adana – Mersin route, including four-tracking and construction of a branch to Çukurova airport
Halkali-Kapikule	Eurasian Central Corridor	Electrified[9]	

[1] Caravanserai, 'Tajikistan, Afghanistan Reach Agreement on Railway to Turkmenistan', accessed 7 November 2019, https://central.asia-news.com/en_GB/articles/cnmi_ca/newsbriefs/2019/07/18/newsbrief-01.

[2] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[3] Railway Gazette, 'Turkey Publishes 2020 Rail Plan'.

[4] Onur Uysal, 'Bursa Osmaneli High Speed Line', *Rail Turkey* (blog), 3 November 2015, https://railturkey.org/2015/11/03/bandirma-bursa-osmaneli-high-speed-line/.

[5] 'Eurasia Rail - International Rolling Stock, Infrastructure & Logistics Exhibition', 9 October 2018, https://www.eurasiarail.eu/Articles/news-article-1.

[6] Onur Uysal, 'What Will Happen in 2019?', *Rail Turkey* (blog), 27 December 2018, https://railturkey.org/2018/12/27/what-will-happen-in-2019/.

[7] Uysal.

[8] Uysal.

[9] Onur Uysal, 'Electrification at Full Speed', *Rail Turkey* (blog), 10 January 2018, https://railturkey.org/2018/01/10/electrification-at-full-speed/.

Stretch	Shared Corridor	Status 2017	Update 2019
Eskisehir-Tavsanli		Electrified[1]	

Source: by Dr. Christoph Nedopil.

TURKMENISTAN

The Turkmenistan railway uses 1,520 mm gauge. The railway connecting Tejen, Sarakhs and Mashhad, built by Turkmenistan and the Islamic Republic of Iran in 1996, has become a vital link of Central Asian, Russian, and European rail systems with South Asia and the Persian Gulf. Accordingly, Turkmenistan's rail connects to the Islamic Republic of Iran (gauge break), Afghanistan, Kazakhstan, Uzbekistan (service halted) and via the Caspian sea port of Turkmenbashi to Azerbaijan.

The following Table II-7 gives an overview of upgrades and bottlenecks of rail transport in Turkmenistan.

Table II-7 Selected railway bottlenecks and developments in Turkmenistan

Stretch	Shared Corridor	Status 2017	Update 2019
Turkmenabat–Mary–Ashgabat–Turkmenbashi	CAREC 2, 3, and 6		Preparing Railway Modernization Projects[2]
Serkhetabat-Torgundi		Will be rebuilt[3]	Completed in 2018[4]
Kerki-Aqina		Single-track[5]	
Bereket-Etrek	North-South railway corridor	Rail line under construction	Rail line under construction[6]

Source: by Dr. Christoph Nedopil.

UZBEKISTAN

Railways in Uzbekistan run on 1,520 mm gauge. Uzbekistan's railway connects to Turkmenistan, Kazakhstan, Kyrgyzstan, Tajikistan, some of which were interrupted.

The following Table II-8 gives an overview of upgrades and bottlenecks of rail transport in Uzbekistan.

Table II-8 Selected railway bottlenecks and developments in Uzbekistan

Stretch	Shared Corridor	Status 2017	Update 2019
Karshi-Termez	Eurasian Central Corridor	Non-electrified	electrified
Pap-Andijon	CAREC Corridor	Non-electrified	Electrification in progress[8]
Uzbekistan/Tajikistan			Uzbekistan has reportedly completed repair works on a long-idle railroad linking it to southern Tajikistan and start resuming train traffic from March 2018.[9]
Bukhara-Miskin	Eurasian Central Corridor	Missing railway link	Railway in planning[10]
Toshkent – Namangan		Non-electrified	Completion of electrification project is planned for second quarter of 2020[11]
Kumkurgan - Termez	Eurasian Central Corridor	Single-track	
Hairatan - Naibabad	Eurasian Central Corridor	Single-track	
Tashkenkt – Issyk-Kul		Closed in winter-months	Open all year around

[1] Uysal.

[2] CAREC Program, 'Preparing the CAREC 2, 3, and 6 (Turkmenabat–Mary–Ashgabat–Turkmenbashi) Railway Modernization Projects', accessed 15 November 2019, https://www.carecprogram.org/?project=preparing-carec-2-3-6-turkmenabat-railway-modernization-projects.

[3] Caravanserai, 'Tajikistan, Afghanistan Reach Agreement on Railway to Turkmenistan'.

[4] 'Turkmenistan – Afghanistan Railway Modernised' (Railway Gazette, 26 February 2018), https://www.railwaygazette.com/freight/turkmenistan-afghanistan-railway-modernised/46022.article.

[5] 'Turkmenistan - Transportation' (International Trade Administration, 21 July 2019), https://www.export.gov/article?id=Turkmenistan-Transportation-Market.

[6] CAREC Program, 'Construction of Bereket–Etrek–Turkmenistan–Iran Border Railway', accessed 12 December 2019, https://www.carecprogram.org/?project=construction-of-bereket-etrek-turkmenistan-iran-border-railway.

[7] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[8] Uzbekistan National Rail, 'During the Implementation of the Project 'Electrification of Railway Line Pap-Andijan-Namangan', 8 June 2019, http://railway.uz/en/informatsionnaya_sluzhba/novosti/15737/.

[9] Lucy Styles and Henry Ashcroft, 'Tajikistan Railway Assessment - Logistics Capacity Assessment', *Digital Logistics Capacity Assessments (DLCA)* (blog), accessed 11 November 2019, https://dlca.logcluster.org/display/public/DLCA/2.4+Tajikistan+Railway+Assessment.

[10] Railway Gazette, 'Opening and Electrification in Uzbekistan', 16 January 2018, https://www.railwaygazette.com/infrastructure/opening-and-electrification-in-uzbekistan/45781.article.

[11] Railway Gazette.

Stretch	Shared Corridor	Status 2017	Update 2019
			established in 2015. Following a 2-year hiatus, it will now run all year round[1]
Urgench-Khiva		Missing link	Railway in planning[2]
Karshi-Kitab		Non-electrified	Full stretch of 124 km electrification completed[3]

Source: by Dr. Christoph Nedopil.

II.2 ROAD CONNECTIVITY IN THE CCWA COUNTRIES

CHINA

Table II-9 Selected road transport bottlenecks and developments in China's CCWA corridor

Road stretch	Shared Corridor	Status 2017	Update 2019
Urumqi - Kashi	Eurasian Central Corridor	Primary/Class I Four lanes and toll Asphalt paved	
Kashi - Irkeshtam	Eurasian Central Corridor	Primary/Class II toll road, last 117km to the border is 2 lanes toll free asphalt paved road	
Urumqi - Kuytun		Extension project ongoing, extending four lanes road into eight lanes road.[5]	Finished in 2019
Kashi - Karakax			Finished in 2019, tolled[6]
Xiaocaohu - Urumqi			Extension project ongoing[7]
Dunmazha - Nalati			Finished in 2019, 2 directions with 4 lanes, class I[8]
Korla - Urumqi			Started construction[9]

Source: by Dr. Christoph Nedopil.

ISLAMIC REPUBLIC OF IRAN

Table II-10 Selected road transport bottlenecks and developments in Islamic Republic of Iran

Road stretch	Shared Corridor	Status 2017	Update 2019
Rasht - Qazvin	Eurasian Central Corridor	75% of the section is in mountainous area Passes over ca. 400 bridges	
Sarakhs - Sabzevar	Eurasian Central Corridor	67% of the section runs through mountains and 33% of the section runs through hilly terrain.	
Sirjan - Bandar Abbas	Eurasian Central Corridor	1/3 of the section runs through mountainous area	
Kerman - Mirjaveh	Eurasian Central Corridor	Mix of category I and II roads Mostly two lanes, 57 km of four-lane road Asphalt-concrete	
Zehedan - Kerman	Eurasian Central Corridor	147 km of mountain road	
Kerman - Marand	Eurasian Central Corridor	Primary/Class I Mix of two/four/six lane roads	

[1] Eurasianet, 'Uzbekistan Opens New Railway Routes to Kyrgyzstan', 8 November 2019, https://eurasianet.org/uzbekistan-opens-new-railway-routes-to-kyrgyzstan-russia.

[2] Railway Gazette, 'Opening and Electrification in Uzbekistan'.

[3] Asian Development Bank, 'Uzbekistan: Kashkadarya Regional Road Project', October 2018, https://www.adb.org/projects/50063-001/main?__cf_chl_jschl_tk__=64e741a535ab6d42ba4df58d72239a9a34224829-1583828485-0-AUS52veipMvlcuMEyHGkV9Plyxg736CwFEEGC-c_5tMj1PUzNlPczvG8ezV5FzTUk35L8Cxu9NEw8fFNM7G5QbT2Apg6yXO-_vxkHQaydPiPo4gb0rj0Oqk3dfkniePKzNi5NUNe6b9DfLRLUIyHPezbz_Cu1mooJdCSAtbnAw6jFlxs_yvTJpy_dwnDCOFoifG5uqiejxOzbb8Msr1s252T-gN1nxoPZr2KbTT8lejDGAYI5qBi_J0eseFc6G8xk64aeLjlTIU0f7dnPLFwI8d5EN4bXqHmbaPVvcceDSfL.

[4] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[5] '9 月 30 日！连霍高速乌鲁木齐至奎屯段"四改八"改扩建项目提前一月交工_乌奎', accessed 28 December 2019, www.sohu.com/a/321666469_118570.

[6] '重要通知！G3012 线喀什（疏勒）至叶城至墨玉段二期高速公路正式并网收费_手机搜狐网', accessed 28 December 2019, http://m.sohu.com/a/333511905_727669.

[7] '2019 年新疆 11 个公路建设项目将建成通车！_旅游', accessed 28 December 2019, www.sohu.com/a/291830641_243953.

[8] '墩麻扎至那拉提高速公路开通-新疆新闻-亚心网', accessed 28 December 2019, http://www.iyaxin.com/system/2019/08/30/035864079.shtml.

[9] '2019 年新疆 11 个公路建设项目将建成通车！_旅游'.

[10] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

Road stretch	Shared Corridor	Status 2017	Update 2019
		Asphalt-concrete Naeen – Qom, Salafchegan – Tehran and Qazvin – Bostanabad are tolled	
Marand - Bazargan	Eurasian Central Corridor	Mix of category I and II roads Passes through hilly and mountainous area	
Sarahs - Mirjaveh	Eurasian Central Corridor	mix of Primary, I,II and III two or four lanes and 45km of six lanes Asphalt-concrete	
Tabriz - Marand-Bazargan		Under construction[1]	
Isfahan - Shiraz	Asian Highway	Under construction[2]	
Tehran - Chalous	Asian Highway	Under construction[3]	Under construction[4] Section 1 and 4 is complete, section 2 and 3 will take longer because of the mountain terrain

Source: by Dr. Christoph Nedopil.

KAZAKHSTAN

Table II-11 Selected road transport bottlenecks and developments in Kazakhstan

Road stretch	Shared Corridor	Status 2017	Update 2019
Almaty - Khorgos	Eurasian Northern Corridor	Planning of a four-lane paved-concrete toll road	Modernization of highway management in progress; upgrade and construction, including associated bypasses, bridges, interchanges, and ancillary facilities in progress[6]
Daut-Ota – Beyneu - Atyrau	Eurasian Central Corridor	Class II road with 2 lanes and an asphalt concrete surface Beyneu - Atyrau is being augmented into a Class I	
Atyrau - Kotyaevka	Eurasian Central Corridor	2 lanes with hard surfacing, class III	
Almaty - Astana	Western Europe - Western China transport corridor		Kurty - Burybaital part increased road capacity, reduced travel time and proper safety standards[7]
Shymkent - Tashkent	CAREC Corridor 3	four lanes, asphalt-paved[8]	Rehabilitated into Class I[9]
Aktobe - Kandyagash	CAREC Corridor 1 and 6	Class II, III 2 lanes[10]	Planning to improve to four lanes, class I[11]
Kumertau - Sagarchin	Western Europe - Western China transport corridor		Constructing a four-lane road, class I, maximum speeds of 120 km/h[12]

[1] '900 Km of Freeways Under Construction in Iran', *Financial Tribune*, 30 June 2017, https://financialtribune.com/articles/domestic-economy/67350/900-km-of-freeways-under-construction-in-iran.

[2] '900 Km of Freeways Under Construction in Iran'.

[3] '900 Km of Freeways Under Construction in Iran'.

[4] 'New Timeline for Tehran-North Freeway Completion', *Financial Tribune*, 28 July 2019, https://financialtribune.com/articles/domestic-economy/99156/new-timeline-for-tehran-north-freeway-completion.

[5] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[6] World Bank, 'East-West Roads Project (Almaty-Korgos Section): Western Europe - Western China International Transit Corridor (CAREC - 1b): Implementation Status & Results Report', 28 June 2016, http://documents.worldbank.org/curated/en/838561467146044025/pdf/ISR-Disclosable-P128050-06-28-2016-1467146031534.pdf.

[7] EBRD, 'Kurty-Burybaital Road Project Extension II' (European Bank for Reconstruction and Development), accessed 19 November 2019, www.ebrd.com/work-with-us/projects/psd/kurtyburybaital-road-project-extension-ii.html.

[8] Asian Development Bank, 'CAREC Corridor 3 (Shymkent-Tashkent Section) Road Improvement Project', 5 October 2012, https://www.adb.org/projects/46145-001/main.

[9] Asian Development Bank.

[10] Asian Development Bank, 'Central Asia Regional Economic Cooperation Corridors 1 and 6 Connector Road (Aktobe–Kandyagash) Reconstruction Project', 27 September 2019, https://www.adb.org/projects/52286-001/main.

[11] Asian Development Bank.

[12] Zawya, 'Highway Kumertau-Sagarchin-Border of Kazakhstan - Western Europe - Western China', 5 March 2019, https://www.zawya.com/mena/en/project/050319092521/highway-kumertau-sagarchin-border-of-kazakhstan-western-europe-western-china/.

Road stretch	Shared Corridor	Status 2017	Update 2019
Karaganda - Balkhash	Asian Highway route		Will be opened in 2020[1]

Source: by Dr. Christoph Nedopil.

KYRGYZSTAN

Table II-12 Selected road transport bottlenecks and developments in the Kyrgyzstan

Road stretch	Shared Corridor	Status 2017	Update 2019
Irkeshtam - Karamyk	Eurasian Central Corridor	Class II 2 lane-road with asphalt pavement	
Epkin - Bashkugandy	CAREC Corridor 1 and 3		Rehabilitated[3]
Balykchy - Kochkor	CAREC Corridor 1 and 3		Rehabilitated[4]

Source: by Dr. Christoph Nedopil.

TAJIKISTAN

Table II-13 Selected road transport bottlenecks and developments in Tajikistan

Road stretch	Shared Corridor	Status 2017	Update 2019
Karamyk - Jirgital; Rasht – Labi Jar	Eurasian Central Corridor	1 lane	
Dushanbe – Nizhniy Panj	Eurasian Central Corridor	2 lanes (10 km are four lanes)	
Dushanbe – Turzunsade(Border to Uzbekistan)	Asian Highway route	2 lanes	Extension to 4 lanes
Dushanbe – Kulyab	Asian Highway route	Mountainous region	A new highway with 2 long tunnels over the 3200-high mountain pass has shortened the trucking time for this segment of the route to Khorog in the Pamirs. [6]
Chashmasoron – Kurgonteppa	CAREC Corridor 2, 5 and 6	2 lanes	Extension to four lanes; building new pavements and structures, as well as the development of well-designed facilities to reduce existing road safety deficiencies.[7]
Obigarm – Nurobod	CAREC Corridor 2, 3 and 5		Due to newly constructed dam, a new 2-lane road will replace the existing one.
Dushanbe – Kurgonteppa	CAREC Corridor 2, 5 and 6	bituminous and granular road	Removal of bituminous and granular, placing asphalt concrete.[8]
Murghab – Kulma	Asian Highway		There is a highway on the Chinese side to the border and improvement works are ongoing from the border crossing at Kulma to Murghab in the Pamirs (91 km). [9]
Pamir Highway	Asian Highway		Serpentine, rocks and cliffs and in some places the absence of any road infrastructure, falling rocks, sand and dust.[10]

Source: by Dr. Christoph Nedopil.

[1] Zhanna Shayakhmetova, 'Karaganda-Balkhash Highway to Open in 2020', *The Astana Times* (blog), 15 October 2019, https://astanatimes.com/2019/10/karaganda-balkhash-highway-to-open-in-2020/.

[2] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[3] Asian Development Bank (ADB), 'Central Asia Regional Economic Cooperation Corridors 1 and 3 Connector Road Project', Text, Asian Development Bank (ADB), 2 June 2015, https://www.adb.org/projects/48401-007/main.

[4] Asian Development Bank (ADB).

[5] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[6] Lucy Styles and Henry Ashcroft, 'Tajikistan Road Network', *Digital Logistics Capacity Assessments (DLCA)* (blog), 21 June 2019, https://dlca.logcluster.org/display/public/DLCA/2.3+Tajikistan+Road+Network.

[7] Road Traffic Technology, 'ADB to Support Tajikistan Road Rehabilitation Project', *Road Traffic Technology* (blog), 28 March 2018, https://www.roadtraffic-technology.com/news/adb-support-tajikistan-road-rehabilitation-project/.

[8] Ministry of Transport of the Republic of Tajikistan, 'Notification of Results of the Bidding for Contract CP-01 Rehabilitation and Improvement of the Dushanbe–Kurgonteppa Road, from Km 0+275 to Km 33+475', 7 November 2019, mintrans.tj/en/news/notification-results-bidding-contract-cp-01-rehabilitation-and-improvement-dushanbe-kurgonteppa.

[9] Styles and Ashcroft, 'Tajikistan Road Network'.

[10] Central Asia Guidebook, 'The Pamir Highway | Tajikistan & Kyrgyzstan', 21 June 2019, https://centralasiagb.com/tajikistan/the-pamir-highway/.

TURKEY

Table II-14 Selected road transport bottlenecks and developments in Turkey

Road stretch	Shared Corridor	Status 2017	Update 2019
Sarp - Piraziz	Eurasian Central Corridor	Category I, four lanes, hard surface	
Gurbulak - Ankara	Eurasian Central Corridor	Mix of category I and III, four lanes and above. 1,010 km of asphalt surface 159 km of hard surface	
Istanbul - Izmir	Asian Highway route		New sections are put into use, which will reduce the travel time between Istanbul and Izmir from 8 hours to 3.5 hours.
Piraziz - Gerede	Eurasian Central Corridor	Mix of class I, II and III, toll free, four/six lanes, asphalt-concrete	
Gümüşhane Belt Highway			Under construction[2]
Köstere Deresi - Gümüşhane Highway			Under construction [3]
Northern Marmara Highway			Completed in 2018 [4]

Source: by Dr. Christoph Nedopil.

TURKMENISTAN

Table II-15 Selected road transport bottlenecks and developments in Turkmenistan

Road stretch	Shared Corridor	Status 2017	Update 2019
Tejen - Sarakhs	Eurasian Central Corridor 2	2 lanes and a hard surface.	
Turkmenbashi - Farab	Eurasian Central Corridor 2	Under-construction	Partially constructed[6], three-lane asphalt road, 12.5 m wide direction with barrier fences.[7]
Dashoguz – Ashgabat	Eurasian Central Corridor 2	Under-construction	Partially constructed [8], two-way, three lanes, 12.5 m wide in each direction. [9]
Ashgabat - Turkmenabat	Eurasian Central Corridor 2	Under discussion[10]	Four lanes road planed.[11]
Ashgabat - Turkmenbashi	Eurasian Central Corridor 2	Six lanes highway constructing	Six lanes highway project completed.
Turkmenbashi - Garabogaz			Designed to be four lanes. [12]
Turkmenabat - Dashoguz	Asian Highway route		Planned. [13]
Mary - Serhetabat	Asian Highway route		Planned. [14]

Source: by Dr. Christoph Nedopil.

[1] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[2] Cengiz, 'Highway Projects', Cengiz Holding, accessed 15 November 2019, https://www.cengizholding.com.tr/sectors/insaat/karayolu-projeleri/?lang=en.

[3] Cengiz.

[4] Cengiz.

[5] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[6] International Trade Administration, USA, 'Turkmenistan - Transportation', 21 July 2019, https://www.export.gov/article?id=Turkmenistan-Transportation-Market.

[7] Embassy of Turkmenistan, 'Road Construction In Turkmenistan Is Gaining Momentum', 15 November 2019, https://afghanistan.tmembassy.gov.tm/en/news/21943.

[8] International Trade Administration, USA, 'Turkmenistan - Transportation'.

[9] Embassy of Turkmenistan, 'Road Construction In Turkmenistan Is Gaining Momentum'.

[10] Huseyn Hasanov, 'Turkmenistan, Iran Discuss Road Construction Projects', *Trend.Az* (blog), 30 January 2016, https://en.trend.az/casia/turkmenistan/2487725.html.

[11] RFE/RL, 'Turkmenistan Hopes New Highway Will Help Diversify Economy', RadioFreeEurope/RadioLiberty, 26 January 2019, https://www.rferl.org/a/turkmenistan-highway-/29732397.html.

[12] Embassy of Turkmenistan, 'Road Construction In Turkmenistan Is Gaining Momentum'.

[13] Embassy of Turkmenistan.

[14] Embassy of Turkmenistan.

UZBEKISTAN

Table II-16 Selected road transport bottlenecks and developments in Uzbekistan

Road stretch	Shared Corridor	Status 2017	Update 2019
Sariosiyo – Guzar	Eurasian Central Corridor	passes through hilly terrain, mix of Class I, II and III sections; two lanes (10 km of four lanes)	
Guzar – Sherabad	Eurasian Central Corridor	mix of Class I, II and III; bituminous surface; two lanes	
Karshi – Kitab	Asian Highway route	Two lanes	Upgrade and widen the existing road into a 4 lane with rigid pavement[2]
Roads in Khorezm and Kashkadarya	CAREC Corridor 3	Rehabilitation planning[3]	Rehabilitation ongoing[4]
Guzar – Sherabad	Eurasian Central Corridor		

Source: by Dr. Christoph Nedopil.

II.3 BORDER CROSSING AND BORDER CONNECTIVITY IN THE CCWA COUNTRIES

CHINA

Table II-17 Border connectivity in China's section of the CCWA Economic Corridor

Bordering country	Border crossing	Status 2017	Update 2019
Kyrgyzstan	Arkaxtam (China) - Irkeshtam (Kyrgyzstan)	Open for cargo and passengers from Kyrgyzstan, China and third countries. 17 hours to Kyrgyzstan; 5 hours to China green channel for agricultural products Open for bilateral freight transport	
Kyrgyzstan	Turugart (China) - Torougart (Kyrgyzstan)	Open for bilateral freight transport	
Kazakhstan	Khorgos (China) – Nur Zholy (Kazakhstan)	Open for bilateral freight transport	Nur Zholy is opened in late 2018. The border opens at 10.30 Beijing time, operates 7 days/week.[6]
Kazakhstan	Alatawshankou (China) - Dostyk (Kazakhstan)	Open for bilateral freight transport	
Kazakhstan	Baketu (China) - Bakhty (Kazakhstan)	Open for bilateral freight transport	
Tajikistan	Kulma Pass (China) - Kulma Pass (Tajikistan)	Open for bilateral freight transport	

Source: by Dr. Christoph Nedopil.

ISLAMIC REPUBLIC OF IRAN

Table II-18 Border connectivity in Islamic Republic of Iran

Bordering country	Border crossings	Status 2017	Update 2019
Turkey	Gurbulak (Turkey) - Bazargan (Islamic Republic of Iran)	Road transport permit required, with or without restrictions on routes and border-crossing posts	the busiest border crossing

[1] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[2] Asian Development Bank, 'Uzbekistan: Kashkadarya Regional Road Project'.

[3] CAREC Program, 'Third CAREC Corridor Road Investment Program', 7 September 2015, https://www.carecprogram.org/?project=third-carec-corridor-road-investment-program-2018.

[4] CAREC Program.

[5] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'; United Nations ESCAP, 'Handbook on Cross-Border Transport along the Asian Highway Network', 2017, http://www.unescap.org/sites/default/files/English%20version-Handbook-AH%26Indicators-final.pdf.

[6] Caravanistan, 'Kazakhstan Border Crossings', *Caravanistan* (blog), accessed 3 September 2019, https://caravanistan.com/border-crossings/kazakhstan/.

[7] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

Bordering country	Border crossings	Status 2017	Update 2019
		Average waiting varies from 4h to 79h (e.g. 53h at Gurbulak and 41h at Bazargan). Border crossing procedures up to 5h on Turkish side and 12 hours on Iranian side. Open for bilateral freight transport [1]	open 24/7[2]
Turkey	Kopikoy (Turkey) - Razi (Islamic Republic of Iran)	Serves for both passenger and freight trains.	Opening hour: 9-17[3]
Turkmenistan	Sarakhs (Islamic Republic of Iran) - Sarahs (Turkmenistan)	Iranian side: checks can take up to 5 hours and queuing up to 39 hours. Turkmenistan: 13 hours to pass through Open for bilateral freight transport	Opening hour: 8-15[4]
Turkmenistan	Bajgiran (Islamic Republic of Iran) - Chovdan Pass (Turkmenistan)	Open for bilateral freight transport	
Turkmenistan	Inche Boroun (Islamic Republic of Iran) - Gudurolum (Turkmenistan)	Open for bilateral freight transport	

Source: by Dr. Christoph Nedopil.

KAZAHKSTAN

Table II-19 Border connectivity in Islamic Republic of Iran

Bordering country	Border crossing	Status 2017	Update 2019
Uzbekistan	Daut-Ota (Uzbekistan) - Tazhen (Kazakhstan)	6-8 hours waiting times Road facilities improvements were planned for 2014-2016 under the CAREC framework[6] Open for bilateral freight transport	the main cause of delay at the Tazhen – Daut-Ota (KAZ–UZB) BCP was time spent waiting in line, followed by customs controls, and border security
Uzbekistan	Karakalpakia (Uzbekistan) - Beyneu/Oazis (Kazakhstan)	Open for passenger and cargo trains. Require exchange of containers for trains. [7]	
Uzbekistan	Zhibek Zholy (Kazakhstan) - Chernyavka (Uzbekistan)	Open for bilateral freight transport	
China	Khorgos (China) – Nur Zholy (Kazakhstan)		Nur Zholy is opened in late 2018. The border opens at 10.30 Beijing time, operates 7 days/week.[8]
China	Alatawshankou (China) - Dostyk (Kazakhstan)	Open for bilateral freight transport	
China	Baketu (China) - Bakhty (Kazakhstan)	Open for bilateral freight transport	
Kyrgyzstan	Kordai (Kazakhstan) - Georgievka (Kyrgyzstan)	Open for bilateral freight transport	
Kyrgyzstan	Chaldovar (Kazakhstan) - Chaldovar (Kyrgyzstan)	Open for bilateral freight transport	
Turkmenistan	Bekdash (Kazakhstan) - Bekdash (Turkmenistan)	Open for bilateral freight transport	

Source: by Dr. Christoph Nedopil.

[1] United Nations ESCAP, 'Handbook on Cross-Border Transport along the Asian Highway Network'.

[2] Caravanistan, 'Iran Border Crossings', accessed 25 February 2020, https://caravanistan.com/border-crossings/iran/.

[3] Caravanistan.

[4] Caravanistan.

[5] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[6] United Nations ESCAP.

[7] United Nations ESCAP.

[8] Caravanistan, 'Kazakhstan Border Crossings'.

KYRGYZSTAN

Table II-20 Border connectivity in Kyrgyzstan

Bordering country	Border crossing	Status 2017	Update 2019
China	Arkaxtam (China) - Irkeshtam (Kyrgyzstan)	Open for cargo and passengers from Kyrgyz, China and third countries. Average border-crossing times is 17 hours on the Arkaxtam side, and 5 hours on the Irkeshtam side; green channel for agricultural products.	
China	Torougart (Kyrgyzstan) - Turugart (China)	Open for bilateral freight transport.	
Tajikistan	Karamyk (Tajikistan) - Karamyk (Kyrgyzstan)	Closed to international transit traffic; low level of automatization; open for bilateral freight transport.	Improving the inspection facilities including customs, sanitary and quarantine, and veterinary checkpoints is improving to handle traffic growth and improving the inspection process.[2]
Kazakhstan	Kordai (Kazakhstan) - Georgievka (Kyrgyzstan)	Open for bilateral freight transport.	
Kazakhstan	Chaldovar (Kazakhstan) - Chaldovar (Kyrgyzstan)	Open for bilateral freight transport.	
Uzbekistan	Near Osh (Kyrgyzstan) - Near Andijon (Uzbekistan)	Open for bilateral freight transport.	

Source: by Dr. Christoph Nedopil.

TAJIKISTAN

Table II-21 Border connectivity in Tajikistan

Bordering country	Border crossing	Status 2017	Update 2019
Kyrgyzstan	Karamyk (Tajikistan) - Karamyk (Kyrgyzstan)	No international transportation; low level of automatization; open for bilateral freight transport.	Improvement plan started: the inspection facilities including customs, sanitary and quarantine, and veterinary checkpoints will be improved to handle traffic growth and improve the inspection process.[4]
China	Kulma Pass (China) - Kulma Pass (Tajikistan)	Open for bilateral freight transport.	A new customs terminal is being built at Kulma, which will reduce waiting time at the border (currently up to 8 hours).[5]
Uzbekistan	Sariosiyo (Uzbekistan) – Dusti (Tajikistan)	Long waiting time, up to 6 hours; border crossing often closed with prior notice due to the tension between two countries; freight transloading required.	
Uzbekistan	Khujand (Tajikistan)- Aybek (Uzbekistan)	Freight transloading required.	

Source: by Dr. Christoph Nedopil.

[1] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'; United Nations ESCAP, 'Handbook on Cross-Border Transport along the Asian Highway Network'.

[2] CAREC Program, 'CAREC Regional Improvement of Border Services Project', accessed 11 November 2019, https://www.carecprogram.org/?project=carec-regional-improvement-of-border-services-project.

[3] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[4] CAREC Program, 'CAREC Regional Improvement of Border Services Project'.

[5] Styles and Ashcroft, 'Tajikistan Road Network'.

TURKEY

Table II-22 Border connectivity in Turkey

Bordering country	Border crossings	Status 2017	Update 2019
Islamic Republic of Iran	Kopikoy (Turkey) - Razi (Islamic Republic of Iran)	Serves for both passenger and freight trains.	Opening hour: 9-17.[2]
Islamic Republic of Iran	Gurbulak (Turkey) - Bazargan (Islamic Republic of Iran)	Road transport permit required, with or without restrictions on routes and border-crossing posts Time varies from 4h to 79h, queuing (53h at Gurbulak and 41h at Bazargan), related checks up to 5h on Turkish side and 12 hours on Iranian side. Open for bilateral freight transport	Open 24/7.[3]

Source: by Dr. Christoph Nedopil.

TURKMENISTAN

Table II-23 Border connectivity in Turkmenistan

Bordering country	Border names	Status 2017	Update 2019
Uzbekistan	Farap (Turkmenistan) - Alat (Uzbekistan)	The average waiting time was 6.2 hours (Alat) and 7.1 hours (Farap) for trucks heading to Turkmenistan, for those heading to Uzbekistan it was 5.4 hours (Alat) and 5.6 hours (Farap). Operating regime: daylight.[5]	
Uzbekistan	Khodzhadavlet (Uzbekistan) – Farap (Turkmenistan)	Inefficient train exchange at the BCP, and delays in the acceptance of the trains.	
Islamic Republic of Iran	Sarakhs (Islamic Republic of Iran) - Sarahs (Turkmenistan)	4h of border-crossing stop. Islamic Republic of Iran: 5hours+39h queuing Turkmenistan: 13h to pass. Operating regime: daylight. [6]	Opening hours: 8-15[7]
Kazakhstan	Temirbaba-border with Kazakhstan	Operating regime: daylight. [8]	Closed since June, 2018. [9]

Source: by Dr. Christoph Nedopil.

UZBEKISTAN

Table II-24 Border connectivity in Uzbekistan

Bordering country	Border crossing	Status 2017	Update 2019
Turkmenistan	Alat (Uzbekistan) – Farap (Turkmenistan)	The average waiting time was 6.2 hours (Alat) and 7.1 hours (Farap) for trucks heading to Turkmenistan, for those heading to Uzbekistan it is 5.4 hours (Alat) and 5.6 hours (Farap). Open for bilateral freight transport.	

[1] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[2] Caravanistan, 'Iran Border Crossings'.

[3] Caravanistan.

[4] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[5] Advantour, 'Turkmenistan Border Crossing Points with Neighbouring Countries', accessed 15 November 2019, https://www.advantour.com/turkmenistan/border-crossing.htm.

[6] Advantour.

[7] Caravanistan, 'Iran Border Crossings'.

[8] Advantour, 'Turkmenistan Border Crossing Points with Neighbouring Countries'.

[9] Advantour.

[10] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

Turkmenistan	Khodzhadavlet (Uzbekistan) – Farap (Turkmenistan)	Inefficient train exchange at the BCP, and delays in the acceptance of the trains.	
Tajikistan	Sariosiyo (Uzbekistan) – Dusti (Tajikistan)	Long waiting time, up to 6 hours; border crossing often closed with prior notice due to the tension between two countries. Freight transloading	
Kazakhstan	Daut-Ota (Uzbekistan) - Tazhen (Kazakhstan)	6-8 hours waiting times Open for bilateral freight transport	Improvement plans under CAREC.[1]
Kazakhstan	Karakalpakia (Uzbekistan) - Beyneu/Oazis (Kazakhstan)	Need exchange of containers	
Uzbekistan	Zhibek Zholy(Kazakhstan) - Chernyavka(Uzbekistan)	Open for bilateral freight transport	
Uzbekistan	Near Osh (Kyrgyzstan) - Near Andijon (Uzbekistan)	Open for bilateral freight transport	
Uzbekistan	Khujand (Tajikistan) - Aybek (Uzbekistan)	Freight transloading	

Source: by Dr. Christoph Nedopil.

II.4 DRY PORTS

CHINA

Table II-25 Dry ports in China's section of the CCWA Economic Corridor

Dry ports and Terminals	Corridor	Status 2017	Update 2019
Xinjiang Railway International Logistics Park, Urumqi	Eurasian Central Corridor	153 ha	3,600 tons of cargo everyday, handling 1,400 trains per year[3]
Kashi International Logistics Park, Kashi	Eurasian Central Corridor	219,029 sq m, functions include warehousing, delivery, information exchange, parking	
Kashi Yuanfang International Logistic Port	Eurasian Central Corridor	533,000 sq m planned, 255,000 sq m ready, includes warehouses, office buildings, and production facilities	
Horgos International Logistics Park, Horgos			

Source: by Dr. Christoph Nedopil.

ISLAMIC REPUBLIC OF IRAN

Table II-26 Dry ports in the Islamic Republic of Iran

Dry ports and terminals	Corridor	Status 2017	Update 2019
Sarakhs Special Economic Zone, Khorasan Razavi Province	Eurasian Central Corridor	5,200 ha Wide and standard gauge tracks	
Shahid Rajaee Port, Bandar Abbas City			2,400 hectares Cargo Throughput:70 Million Tons Container Terminal Throughput: 3 Million TEUs Berths Depth: 15 m; Berths Number: 23 Berths with 7.31 km Length Domestic Railway Length: Existed Railway: 23.5 km; Under Construction Railway: 16 km[5]

[1] United Nations ESCAP.

[2] United Nations ESCAP.

[3] 张洁, 'Xinjiang Becomes Logistics Hub of Belt and Road', *Chinadaily.Com.Cn* (blog), 20 November 2019, www.chinadaily.com.cn/a/201808/12/WS5b6f8e9ca310add14f385424.html.

[4] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[5] Digital Logistics Capacity Assessments (DLCA), 'Logistics Capacity Assessment Iran, Islamic Republic Of', *Digital Logistics Capacity Assessments (DLCA)* (blog), accessed 25 April 2019, https://logcluster.org/dlca/Iran,%20Islamic%20Republic%20of-v17-20190425_1232.pdf.

Dry ports and terminals	Corridor	Status 2017	Update 2019
Sirjan Special Economic Zone, Kerman Province	Eurasian Central Corridor	Multipurpose zone, has customs facilities, warehouses (200,000 sq m of covered storage space), support infrastructure for industry and trade 1,380 ha area 60 industrial units with more than 400 million dollars in productions[1]	
Salafchegan Special Economic Zone, Qom Province	Eurasian Central Corridor	Provides warehousing; storage; handling services; has customs facilities; issues licenses, certificates of origin, and other necessary documentation; has support infrastructure for industries and trade 2,000 ha area Almost %60 of Islamic Republic of Iran's major industries located within a 230 km distance Customs, warehouses, loading and unloading equipment, utilities, insurance and business services[2]	
Imam Khomeini International Airport, Tehran Province	Eurasian Central Corridor	Area of 13,700 ha, including free trade zone, free economic zone, industrial and commercial facilities; more than 16,000 m2 warehouse with 3,500 m2 cool warehouse[3]	
Sahlan Special Economic Zone, Tabriz, East Azerbaijan Province	Eurasian Central Corridor	Single window services; tax-free regime Capacity of handling 3 million ton freight per year 345,000 m2 warehouses, container terminal with 25,000 TEU[4]	
Motahari Rail Station, Mashhad, Khorasan Razavi Province			

Source: by Dr. Christoph Nedopil.

KAZAKHSTAN

Table II-26 Dry ports Kazakhstan

Dry ports and Terminals	Corridor	Status 2017	Update 2019
Khorgos	Eurasian Northern Corridor		Opened in 2018 with an area of 129 ha In 2018, 15 million tons of freight a year, 5000 TEUs per day, with a capacity to hold 18,000 containers.[6] 7 gantry cranes.[7] Handling time for train: 3 hours, 55 minutes.[8] Expected to eventually increase to 30 million tons per year.[9]
Atyrau	Eurasian Central Corridor	18.1 ha 10 feeder roads, open storage, process containers, oversized and overweight cargoes, bulk	

[1] Mehdi Safari Moghadam, 'Iran Dry Ports'.

[2] Mehdi Safari Moghadam.

[3] Mehdi Safari Moghadam.

[4] Mehdi Safari Moghadam.

[5] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[6] Majorie Leijen, 'Faster and More Trains through Kazakhstan This Year', RailFreight.Com, 20 August 2018, https://www.railfreight.com/business/2018/08/02/faster-and-more-trains-through-kazakhstan-this-year/.

[7] Philip Saunders, 'The Dry Port of Khorgos: Zone Overview', 18 April 2019, https://www.adrianoplegroup.com/post/the-dry-port-of-khorgos-zone-overview.

[8] Majorie Leijen, 'Khorgos East Gate: From Steppes to High-Tech Facility', RailFreight.Com, 30 April 2019, https://www.railfreight.com/specials/2019/04/30/khorgos-east-gate-from-steppes-to-high-tech-facility/.

[9] Arranz and Marcelo Duhalde, 'Belt and Road Initiative'.

Dry ports and Terminals	Corridor	Status 2017	Update 2019
Altynkol	Eurasian Northern Corridor		Opened in 2018.[1]
Continental Logistics Transport and Logistics Centre, Nur-Sultan			
Astyk Logistics, Nur-Sultan			
Continental Logistics Shymkent Transport and Logistics Centre, Shymkent			

Source: by Dr. Christoph Nedopil.

TAJIKISTAN

Table II-27 Dry ports in Tajikistan

Dry ports and Terminals	Corridor	Status 2017	Update 2019
Vakhdat	Eurasian Central Corridor	Terminal does not own the equipment but can rent it if needed.	
Dushanbe (dry)	Eurasian Central Corridor	No transshipment equipment.	
Tursunzade (dry) (border to Uzbekistan)	Eurasian Central Corridor	Terminal does not own the equipment it needs. Loading and unloading is manual.	New 21.4 ha terminal at Tursunzade is planned.[3] ABBAT is planning to develop full scale dry port.
Kulma pass (border to China)	Asian Highway route		A new customs terminal is being built at Kulma, which will reduce wait time at the border (currently up to 8 hours).[4]
Vakhdat (dry)	Eurasian Central Corridor	No loading and unloading automation, no transshipment equipment.	
Karamyk, Jirgital (dry)	Eurasian Central Corridor	No loading and unloading automation, no transshipment equipment.	
Khujand (dry)[5]	Asian Highway	No loading and unloading automation, no transshipment equipment.	
Fotekhobod (border to Uzbekistan)		5.5 ha	Railway will be connected.[6]
Nizhniy Panj, Qumsamgir[7] (dry)		Opened in 2017[8]	Planning to develop full scale dry ports.
Kurgan-Tube (dry)	Eurasian Central Corridor	Trucks in Afghan cannot proceed further than Kurgan-Tube where their cargo is discharged at a tuck terminal.[9]	
Khorog[10]			

Source: by Dr. Christoph Nedopil.

[1] United Nations Office on Drugs and Crime, 'New Port Control Unit Established in "Altynkol" Dry Port on the Kazakh-Chinese Border under UNODC-WCO Global Container Control Programme', United Nations Office on Drugs and Crime (UNODC), accessed 4 December 2019, https://www.unodc.org/centralasia/en/news/new-port-control-unit-established-in-altynkol-dry-port-on-the-kazakh-chinese-border-under-unodc-wco-global-container-control-programme.html.

[2] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[3] United Nations ESCAP.

[4] Lucy Styles and Henry Ashcroft, 'Tajikistan Road Corridors to Afghanistan', *Digital Logistics Capacity Assessments (DLCA)* (blog), accessed 21 May 2019, https://dlca.logcluster.org/display/public/DLCA/2.3.1+Tajikistan+Road+Corridors+to+Afghanistan.

[5] United Nations Office on Drugs and Crime, 'Expanding Container Control Programme to New Priority Dry Ports in Tajikistan', United Nations Office on Drugs and Crime (UNODC), accessed 12 November 2019, https://www.unodc.org/centralasia/en/news/expanding-container-control-programme-to-new-priority-dry-ports-in-tajikistan.html.

[6] United Nations ESCAP, 'Regional Framework For Development, Design, Planning And Operation Of Dry Ports Of International Importance', 2017, https://www.unescap.org/events/regional-framework-development-dry-ports-international-importance-north-and-central-asia.

[7] United Nations ESCAP.

[8] United Nations ESCAP.

[9] United Nations ESCAP.

[10] United Nations Office on Drugs and Crime, 'Expanding Container Control Programme to New Priority Dry Ports in Tajikistan'.

TURKEY

Table II-28 Dry ports in Turkey

Dry ports and terminals	Corridor	Status 2017	Update 2019
Gelemen	Eurasian Central Corridor	680,000 sqm Rail-to-road transloading facilities, provides customs services. In operation, the first phase is complete, the second phase is ongoing.	
Kars	Eurasian Central Corridor	Under construction	
Palandoken/Erzurum	Eurasian Central Corridor	Under construction	
Sivas	Eurasian Central Corridor	200,000 sqm handling capacity 1 million tons/year. In preparations to tender the construction works.	
Bogazkopru/Kayseri	Eurasian Central Corridor	Tendering procedures for the 2nd phase of the project are ongoing.	
Kazan/Ankara	Eurasian Central Corridor	389,000 sqm heat-isolated warehouses, customs services, laboratories, inspection facilities, maintenance and repair workshops, drivers' and crews' services facilities, office buildings.	
Hasanbey/Eskisehir	Eurasian Central Corridor	625,000 sqm Handling capacity 1.4 million tons/year Under construction	
Bozuyuk/Bilecik	Eurasian Central Corridor	400,000 sqm Handling capacity of 1.9 million tons/year Tendering procedures for the 2nd phase of the project are ongoing	
Kosekoy/Izmit	Eurasian Central Corridor	748,000 sqm Handling capacity of 2 million tons/year Tendering procedures for the 2nd phase of the project are ongoing	
Halkali/Istanbul	Eurasian Central Corridor	220,000 sqm Handling capacity 2 million tons/year	
Yesilbayir/Istanbul	Eurasian Central Corridor	Planning: Area 1 million sq m. One of the 21 logistics centres to be constructed by Ministry of Transport, Maritime Affairs and Communications by 2023. Handling capacity 6 million tons/year.	
Tekirda			Modernisation and capacity expansion.[2]
Kocaeli Railport			Under construction: The terminal will have an annual capacity of 100,000 twenty-foot equivalent units (TEU) and 500,000 tons general cargo after implementation of the Phase 1 of the Railport. This capacity will be realised on a terminal area of 26.5 hectares, with 5,000 square meters of warehouse storage capacity.[3] Railport would have a 120,000-vehicle and 100,000-container storage capacity.[4]

Source: by Dr. Christoph Nedopil.

[1] United Nations ESCAP, 'Comprehensive Planning of Eurasian Transport Corridors to Strengthen the Intra- And Inter-Regional Transport Connectivity. Study Report 2017'.

[2] EBRD, 'Tekirdag Port Project', accessed 13 November 2019, www.ebrd.com/work-with-us/projects/psd/50172.html.

[3] EBRD, 'Railport Turkey', accessed 13 November 2019, www.ebrd.com/work-with-us/projects/psd/railport-turkey.html.

[4] Gokhan Ergocun, 'Turkey's 1st Intermodal Cargo Terminal to Open in 2020', ANADOLU AGENCY, 13 May 2019, https://www.aa.com.tr/en/economy/turkeys-1st-intermodal-cargo-terminal-to-open-in-2020/1476259.

TURKMENISTAN

Table II-29 Dry ports in Turkmenistan

Dry ports and terminals	Corridor	Status 2017	Update 2019
Turkmenbashi			Expansion complete: includes ferry, passenger and container terminals, as well as ship repair facilities. The new port has a total annual capacity of 17 million tons of dry cargo, 300,000 passengers, and 75,000 vehicles.[1]
Ekerem		Plans for expansion of Ekarem into a second major Caspian port.[2]	

Source: by Dr. Christoph Nedopil.

[1] International Trade Administration, USA, 'Turkmenistan - Transportation'.

[2] Global Security, 'Turkmenistan - Caspian Sea', accessed 18 December 2019, https://www.globalsecurity.org/military/world/centralasia/turkmen-caspian.htm.

Annex III Transport related agreements across CCWA Economic Corridor

Table III-1 Multilateral transport related agreements across countries of the CCWA Economic Corridor

	China	Iran (Islamic Republic of)	Kazakhstan	Kyrgyzstan	Tajikistan	Turkey	Turkmenistan	Uzbekistan
ESCAP Resolution 48/11 Road and rail transport modes in relation to facilitation measures, 1992, and ESCAP Regional Agreements								
Intergovernmental Agreement On The Asian Highway Network	X	X	X	X	X	X	X	X
Intergovernmental Agreement on the Trans-Asian Railway Network	X	X	S		X	S	X	X
Intergovernmental Agreement on Dry Ports	X	S	X		X	S	X	
Convention on Road Traffic, 1968	S[Y]	X	X	X	X	X	X	X
Convention on Road Signs and Signals, 1968	S[Y]	X	X	X	X		X	X
Customs Convention on the International Transport of Goods under Cover of TIR Carnets (TIR Convention), 1975	X	X	X	X	X	X	X	X
Customs Convention on the Temporary Importation of Commercial Road Vehicles, 1956				X		X		X
Customs Convention on Containers, 1972	X		X	X		X		X
International Convention on the Harmonisation of Frontier Controls of Goods, 1982		X	X	X	X	X		X
Convention on the Contract for the International Carriage of Goods by Road (CMR), 1956		X	X	X	X	X	X	X
International railway transport agreements								
Convention concerning International Carriage by Rail (COTIF), 1999		X				X		
Uniform Rules concerning the Contract of International Carriage of Goods by Rail (CIM), 2010		X				X		
Agreement on International Goods Transport by Rail (SMGS Agreement), 1951	X	X	X	X	X		X	X
Agreement on the Uniform Transit Tariff (ETT), 1991	X		X	X	X			X
Agreement on the International Railway Transit Tariff (MTT), 1997			X	X	X			X
Agreement on Rules for the Use of Wagons in International Traffic (PGW), 2009	X	X	X	X	X			X
Agreement on the Accounting Rules in International Transport of Passengers and Goods by Rail, 1991	X		X	X	X			X
Agreement on Organizational and Operational Aspects of Combined Transportation between Europe and Asia, 1997	X		X	X				X
Multilateral transport agreements								
Economic Cooperation Organization Transit Transport Framework Agreement, 1998		X	X	X	X	X	X	X
Basic Multilateral Agreement on International Transport for Development of the Europe-the Caucasus-Asia Corridor, 1998			X	X	X	X		X
Agreement between the Governments of the Member States of the Shanghai Cooperation Organization on Creating Favorable Conditions for International Road Transportation, 2014	X		X	X	X			X

	China	Iran (Islamic Republic of)	Kazakhstan	Kyrgyzstan	Tajikistan	Turkey	Turkmenistan	Uzbekistan
Agreement for Traffic in Transit among the Governments of the People's Republic of China, the Kyrgyz Republic, the Republic of Kazakhstan and the Islamic Republic of Pakistan, 1995	X		X	X				
Agreement on International Road Transportation among the Governments of the Republic of Uzbekistan, the People's Republic of China and the Kyrgyz Republic, 1998	X			X				X
Agreement on Establishing the System of International Road Transport Permit among State Joint-Stock Motor Transport Corporation of the Republic of Uzbekistan (Uzavtotrans), Uzbek State Stock Concern of Automobile Road Construction and Utilization (Uzvatoyul) and Ministry of Internal Affairs of the Republic of Uzbekistan, the Ministry of Communications of the People's Republic of China and the Ministry of Transportation and Communications of the Kyrgyz Republic, 1998	X			X				X
Agreement between the Governments of the Republic of Kazakhstan, the Republic of Kyrgyzstan, the Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan on Principles of Cooperation and Conditions of Relations in the Area of Transport, 1992			X	X	X		X	X
Agreement on the Establishment of an International Transport and Transit Corridor (Ashgabat Agreement) between the Governments of the Islamic Republic of Iran, the Sultanate of Oman, Turkmenistan and the Republic of Uzbekistan, 2011							X	X
Trilateral Agreement among Islamic Republic of Iran, India, Turkmenistan		X					X	
Agreement on establishment of an international transport and transit corridor among Iran, India and Afghanistan (Chabahar Agreement), 2016		X						
Trilateral Agreement among Islamic Republic of Iran, India, Afghanistan on transit of goods via Chabahar, 2018		X						
Lapis-Lazuli Transit, Trade & Transport Route Agreement, 2017						X	X	
Joint Cooperation Protocol on Development of Transport among the Member States of the Cooperation Council of the Turkic Speaking States, Baku, 2013			X	X		X		X
Agreements under the Commonwealth of Independent States (CIS)								
Agreement on Weights and Dimensions of Vehicles Undertaking International Transport on Roads of the CIS Member States, 1999			X	X	X			X
Agreement on Cooperation of the CIS Member States in the Field of International Road Freight Transport, 2003			X	X	X			X
Agreement on Introduction of the International Vehicle Weight Certificate in the CIS Member States, 2004			X	X	X			X
Agreement on Building a Common Transport Space and Cooperation on Transport Policy among the Members of the CIS, 1997			X	X	X			X

Note: X = Ratification, accession, definite signature; S = Signature

Sources: ESCAP Database of Agreements Related to International Road Transport https://tadb.unescap.org, United Nations Treaty Collection https://treaties.un.org, Intergovernmental Organisation for International Carriage by Rail[1] https://otif.org; Organization for Cooperation between railways[2] https://en.osjd.org.

[1] OTIF membership and application of appendices to COTIF 1 May 2019. <https://otif.org/fileadmin/images/pictures/Table1P_EN.pdf>

[2] OSJD, 'Report on The Activities of the Organisation for Co-Operation between Railways for 2018'.

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